South Stream
Offshore Pipeline
ENERGISING EUROPE

Chapter 11: Terrestrial Ecology

This page has been intentionally left blank

Table of Contents

Tables

Figures

11 Terrestrial Ecology

11.1 Introduction

This chapter presents an assessment of the potential impacts of the Project on terrestrial ecology. The assessment has identified sensitive ecology receptors within the Project's zone of influence and considered the potential for these receptors to be impacted upon by the Project activities. The assessment follows the recommendations and requirements of the International Finance Corporation (IFC) Performance Standards 6 (PS6): Biodiversity Conservation and Sustainable Management of Living Natural Resources and other applicable standards (see Section 11.6.5).

In order to assess potential impacts, this chapter provides a description of the approach to the study. The scoping process is detailed, during which receptors were identified through an analysis of survey data, and a review of local, national and international requirements and standards. This chapter describes the spatial and temporal boundaries used in the assessment, the baseline conditions within these areas, the assessment methodology, the mitigation measures required to avoid or minimise any significant adverse effects, and the likely residual effects after these measures have been implemented. The relevant stakeholder consultation activities on-going and undertaken for the Project are also documented. The potential for cumulative impacts with other projects in the surrounding area is addressed in **Chapter 20 Cumulative Impact Assessment**.

This Project adheres to the 'mitigation hierarchy' as defined in IFC PS6, i.e. impacts should be progressively avoided, minimised, restored or offset if necessary, with priority given to the actions which are earliest in the hierarchy. Therefore, the Project will seek to avoid impacts on biodiversity. When avoidance of impacts is not possible, measures to minimise impacts and to restore biodiversity will be implemented. Offsetting is only considered if these measures do not result in a reasonable expectation of no net loss of biodiversity (or a net gain in respect of critical habitats). Given the complexity in predicting project impacts on biodiversity over the long term, the Project will adopt a practice of adaptive management in which the implementation of mitigation and management measures are responsive to changing conditions and the results of monitoring, until the necessary management objectives have been achieved.

11.2 Scoping

The terrestrial ecology impact assessment for the Project was defined through a scoping process, which identified ecological receptors and potentially significant impacts related to the Project. An important component of the scoping process was the definition of existing baseline conditions (i.e. the prevailing ecological characteristics against which the potential impacts of the Project could be assessed). Baseline conditions were identified primarily through the review of ecological information available from studies undertaken for the Project, including extensive feasibility, engineering and environmental surveys carried out in 2011, 2012 and 2013 (detailed in Section 11.4.4). Key steps in the scoping process for terrestrial ecology comprised the following:

- The Project design was reviewed to identify activities with a potential to significantly affect ecological receptors;
- Ecological receptors within the Project's likely area of influence (see Section 11.3 for definition) were identified through a review of secondary data (see Section 11.4.2 for further detail), primary data (detailed in Section 11.4.4), and professional expertise;
- A gap analysis of the available information to identify shortfalls of ecological knowledge that would need to be addressed within the ESIA and in particular those that required additional ecological field surveys;
- Identified Project activities and receptors were examined through an Environmental Issues Identification (ENVIID) process (described in this section below);
- A review of relevant national and international legislative requirements and international standards and guidelines to ensure legislative and policy compliance (relevant requirements are detailed in Section 11.6.5 Applicable Standards and **Chapter 2 Policy, Legislation and Administrative Framework**); and
- Stakeholder consultation activities, including consultation meetings held after the scoping report was disclosed (detailed below).

11.2.1 ENVIID

An ENVIID was undertaken to assist in the identification of environmental and social issues and receptors, including those relevant to the terrestrial ecology (the ENVIID process is further described in **Chapter 3 Impact Assessment Methodology**). During the ENVIID process, each activity was examined, drawing upon the experience of the technical specialists and their understanding of the extent and nature of the Project activities and the natural environment, to understand:

- How activities were expected to interact with ecology receptors, and whether this would result in a positive or negative impact; and
- Which receptors would potentially be impacted by each activity and the potential significance of that impact.

The outcome of the ENVIID was a register which identified the various elements of the Project and their interaction or potential impact on sensitive ecological receptors.

11.2.2 Stakeholder Engagement

A number of stakeholder consultation activities were undertaken during the scoping phase (details can be found in **Chapter 6 Stakeholder Engagement**). The key issues that were raised by stakeholders related to the reinstatement of the cliff area to the west of the Study Area and general protection of the natural environment. Details of the issues raised relevant to this chapter are detailed in Table 11.1.

Table 11.1 Stakeholder Consultation Issues

Stakeholder	Document / Event	Date	Issues / Concerns Raised	Relevant ESIA Section
Local Communities	Written comments (via Comment Forms) on EIA ToR	1st – 31st August 2012	Project will adversely affect ecological system. Natural environment should not be harmed.	Chapter 11 throughout
Local Communities	Written comments (via Comment Forms) on Scoping Report	20th November 2012-31st January 2013	Sceptical about reinstatement. Who will monitor this and be responsible.	11.6.9 and 11.6.13
			Gazprom has not performed well on the issue of recultivation and environmental protection.	Chapter 11 throughout
Local communities	Comments made by telephone on ESIA Scoping Report	29th November 2012	Natural environment should not be harmed.	Chapter 11 throughout
Local communities (Supsekh)	Comments made in person in ESIA Scoping consultation meetings	10th December 2012	Will the ecosystem be restored in accordance with international standards. Are there any planned restoration activities.	Chapter 11 throughout 11.6.9 and 11.6.13
Local communities (Varvarovka and Sukko)	Comments made in person in ESIA Scoping consultation meeting	11th December 2012	Concern that juniper trees have been cut down, while representatives promised, nothing would be cut down. Will juniper be re-planted or the area recultivated. Risk of erosion.	11.6.9
Regional NGOs	Comments made in person in ESIA Scoping consultation meeting	13th December 2012	Ecosystem is in critical condition due to impact of fishing and recreation. Pipeline construction will adversely impact ecosystem.	Chapter 11 throughout

Continued…

Stakeholder	Document / Event	Date	Issues / Concerns Raised	Relevant ESIA Section
			It was declared that juniper trees would not be cut down. But juniper trees have now been cut down.	11.6.10 and 11.6.13
Local Communities	Written comments (via Comment Forms) on Draft EIA	29th April – 31st May 2013	Concerns on environmental impact from the Project appeared to be the stakeholders main concerns as high level comments on this issue were the most frequently raised. Natural environment should not be harmed.	Chapter 11 throughout

Complete.

11.2.3 Analysis of Alternatives

An important part of the ESIA process was the analysis of alternatives (see **Chapter 4 Analysis of Alternatives** for more detail). In the course of considering Project design alternatives, technical decisions were taken that resulted in avoidance of some potential impacts completely.

A comparative ecological analysis of the two alternative routes (reasoning for the two routes can be found in **Chapter 4 Analysis of Alternatives**) was conducted by Gazprom in 2010 (Ref. 11.1); reference is also made in Appendix 20.1. That study showed that the location of the Russkaya compressor station (CS) had fewer environmental impacts compared to the alternative Beregovaya location. Undertaking the Project at the Beregovaya location in close proximity to the existing compressor station of the Blue Stream Pipeline Compressor Station would have resulted in unacceptable cumulative impacts associated with the contemporaneous operation of the Blue Stream Pipeline Compressor Station and the compressor station required for the Project. On this basis, the Russkaya CS site was selected, resulting in the Anapa landfall location being selected.

11.3 Spatial and Temporal Boundaries

11.3.1 Spatial Boundaries

11.3.1.1 Landfall Section

A detailed description of the landfall, nearshore and offshore sections of the Project Area is provided in **Chapter 5 Project Description**; the landfall, nearshore and offshore sections are

defined primarily in relation to the different construction activities employed in each, and are not defined in ecological terms.

The landfall section, including the landfall facilities[1], is approximately 4 km in length. In this section, the pipelines extend from the tie-in approximately 100 m upstream of the landfall facilities, in a south-westerly direction to four microtunnel entry shafts approximately 2.4 km from the landfall facilities. The pipelines will enter the microtunnels and continue in a south-westerly direction for approximately 1.4 km, to emerge from the seabed approximately 400 m offshore. According to this technical definition, the landfall section includes approximately 400 m of marine environment, which is not a focus of this chapter. (Marine receptors within the nearshore and offshore sections (including sea birds) are addressed within **Chapter 12 Marine Ecology**). Upstream and downstream of the landfall facilities, the four pipelines will be installed using open-cut construction techniques.

Study Area and Wider Study Area

When defining study areas for terrestrial ecology, various elements of the Project were reviewed. Within the landfall section these included:

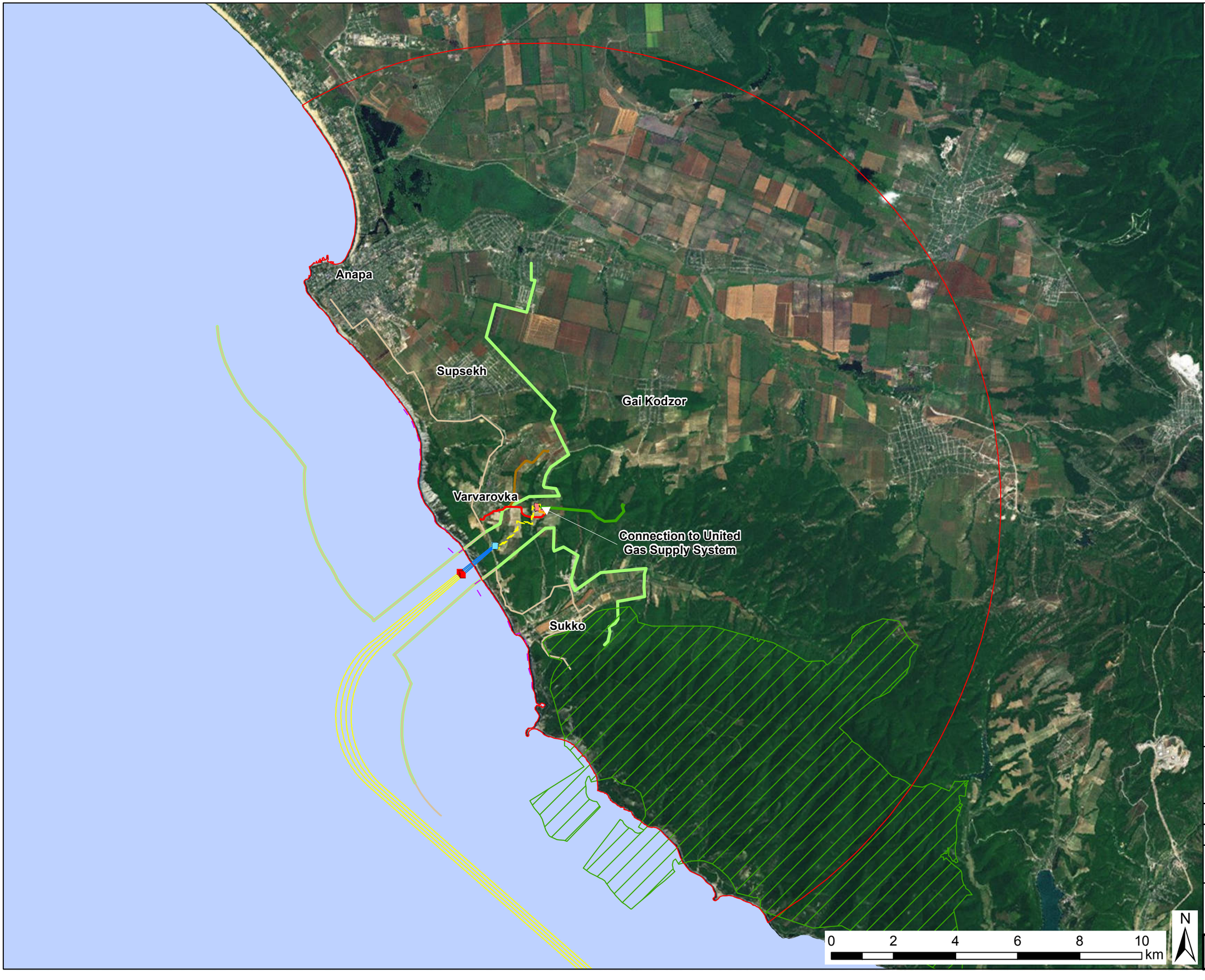
- The four pipelines that will be installed using open-cut construction techniques;
- Access roads and junction(s) for access of operations vehicles from existing roads to the Right of Way (RoW);
- The landfall facilities; and
- Microtunnel onshore entry shafts and section of microtunnelling extending as far as the shoreline.

A Wider Study Area was defined as 15 km around the centrepoint of these elements (although only extending up to the coastline, see Figure 11.1). Contextual information on the occurrence of protected or designated sites and threatened species in this area was reviewed.

The Study Area was more focused than the Wider Study Area, and covered an area of approximately 1 km surrounding the landfall section, extending to the coastline. Where access roads were located outside of this 1 km buffer, the Study Area was extended to 50 m either side of the proposed alignment (see Figure 11.2). The Study Area was subject to field survey in 2011, 2012, and 2013 (see Section 11.4).

[1] The landfall facility (approximately 4.85 ha in area) will include of metrology equipment, PIG traps, ESD valves, block and other valves, gas heating system, electrical instrumentation and other equipment; see Chapter 5 for further details.

This page has been intentionally left blank



LEGEND

- Boundary of the state nature reserve "Utrish"
- The boundary of the first area of sanitary protection zone (exclusion zone)
- The boundary of the second area of sanitary protection zone (limitation zone)
- The boundary of the third area of sanitary protection zone (monitored zone)
- Wider Study Area (15 km)

Russian Sector of South Stream Offshore Pipeline

- Proposed landfall section pipelines
- Landfall facilities
- Proposed microtunnels
- Proposed offshore pipelines
- Microtunnel entry shaft
- Microtunnel exit pit
- 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
- 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: WIDER STUDY AREA

Drawn	Checked	Approved	Date
DH	DK	CP	29 May 2014

URS Internal Project No.	Scale @ A3
46369082	1:110,000

This document has been prepared in accordance with the scope of URS' appointment with its client and is subject to the terms of that appointment. URS accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided. Only written dimensions shall be used.
© URS Infrastructure & Environment UK Limited

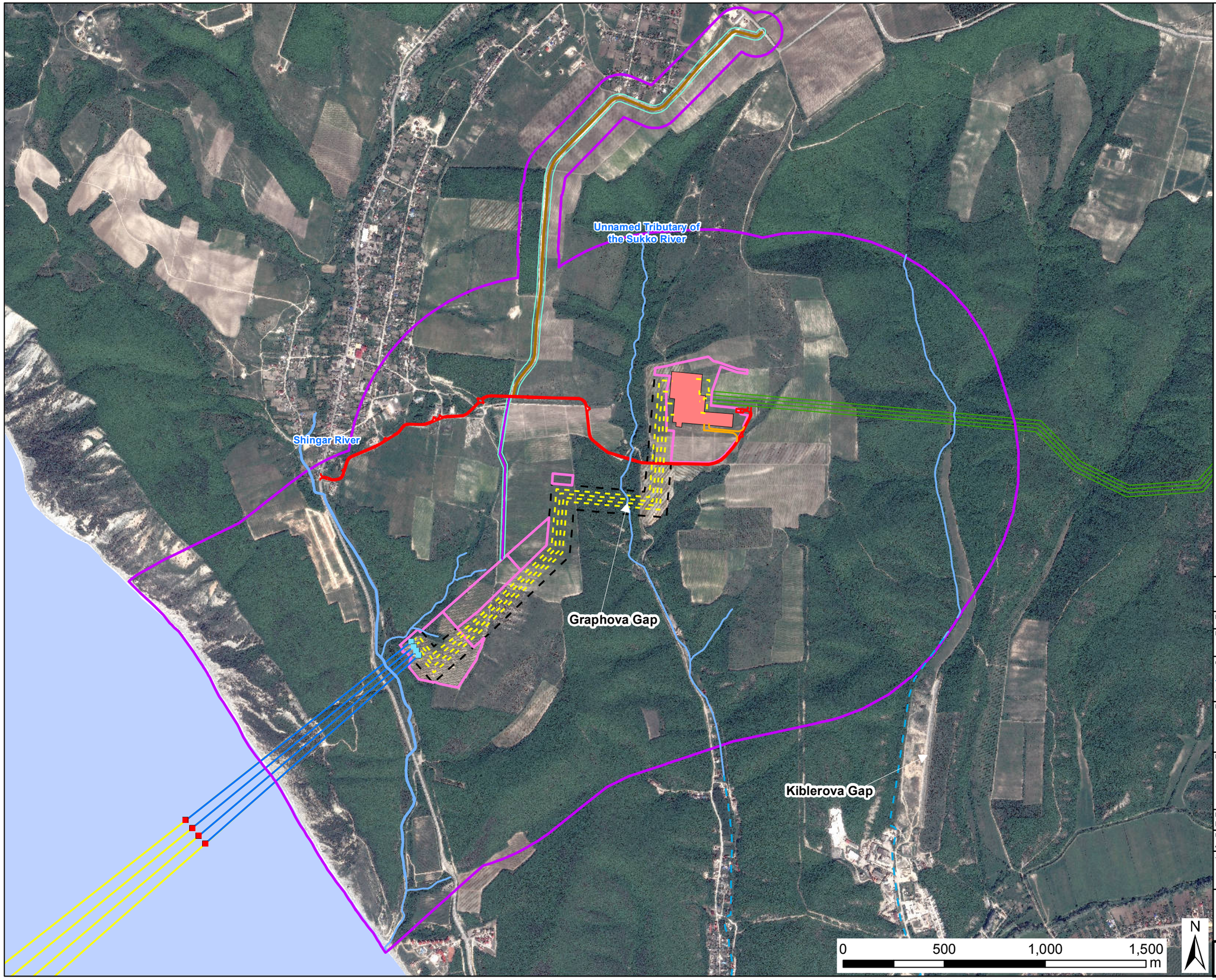
URS Infrastructure & Environment UK Limited
Scott House
Alencon Link, Basingstoke
Hampshire, RG21 7PP
Telephone (01256) 310200
Fax (01256) 310201
www.ursglobal.com

Drawing Number: Figure 11.1

Rev:

Plot Date: 29 May 2014
File Name:I:\5004 - Information Systems\46369082_South_Stream\MXDs\Report Maps - Russia\Russian ESIA v2\Chapter 11 Ecology\Figure 11-1 Landfall Wider Study Area.mxd

This page has been left intentionally blank



LEGEND

- Rivers
- Inferred watercourses
- Study area

Russian Sector of South Stream Offshore Pipeline

- Proposed landfall section pipelines
- Landfall facilities
- Proposed microtunnels
- Proposed offshore pipelines
- Microtunnel entry shaft
- Microtunnel exit pit
- Construction corridor
- Temporary construction area for road construction
- Construction sites
- Permanent access road to be constructed by SSTTBV
- Temporary access road constructed by SSTTBV
- Varvarovka bypass road (used by Project during construction only)

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: STUDY AREA

Drawn	Checked	Approved	Date
DH	RW	MW	07/05/2014

URS Internal Project No.	Scale @ A3
46369082	1:18,000

This document has been prepared in accordance with the scope of URS' appointment with its client and is subject to the terms of that appointment. URS accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided. Only written dimensions shall be used.
© URS Infrastructure & Environment UK Limited

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

URS

Drawing Number: Figure 11.2

Rev:

Plot Date: 07 May 2014
File Name:I:\15004 - Information Systems\46369082_South_Stream\MXDs\Report Maps - Russia\Russian ESIA v2\Chapter 11 Ecology\Figure 11-2 Study Area.mxd

This page has been left intentionally blank

11.3.2 Temporal Boundaries

The assessment includes the four phases of the Project:

- Design and Development;
- Construction and Pre-Commissioning (the duration of which is approximately 18 months);
- Operational including Commissioning (an approximately 50 year period); and
- Decommissioning.

Therefore, the temporal boundary for the assessment is the end of the Decommissioning Phase, including associated demolition, removal of infrastructure and restoration works.

11.4 Baseline Data

11.4.1 Introduction

An extensive literature review and consultation with statutory bodies, interested parties and universities (see Sections 11.4.2 and 11.4.3) provided contextual information on potential terrestrial ecology receptors (habitats and species) within the Wider Study Area, and on their ecology, distribution, and pertaining threats. This information provided the contextual base upon which further field surveys were planned (see Section 11.4.4).

11.4.2 Secondary Data[2]

11.4.2.1 International, National and Regional Assessments of Extinction Risk

In order to identify the potential presence of plant and animal species of conservation importance within the Study Areas, international, national and regional assessments of extinction risk were consulted. These included:

- The RDB of the Russian Federation (RF) for plants (Ref. 11.2) and for animals (Ref. 11.3);
- The Red Data Book (RDB) of the Krasnodar Krai (KK) for plants (Ref. 11.4) and for animals (Ref. 11.5); and
- The International Union for Conservation of Nature (IUCN) Red List of Threatened Species (RL) (Ref. 11.6).

[2] Secondary data refer to existing information that was not collected for the purpose of the Project; e.g. published literature, or reports / information held by government and non-governmental organisations. Primary data refer to information that was collected specifically for the Project; e.g. ecological surveys described in Section 11.4.4.

Table 11.2 IUCN RL, RDB RF, and RDB KK Classification System

IUCN	RDB RF	RDB KK
Extinct in the Wild (EXW)	Probably extinct (0)	Probably extinct in the region (0)
Critically Endangered (CR): Species facing an extremely high risk of extinction in the wild	Endangered (1)	Disappearing in the wild (1) Critically Endangered – (1A) Endangered – (1B)
Endangered (EN): Facing a very high risk of extinction in the wild		
Vulnerable (VU) facing a high risk of extinction in the wild	Dwindling in numbers (2)	Vulnerable – (2)
Near Threatened (NT) close to qualifying for or is likely to qualify for a threatened category in the near future	Rare (3)	Rare (3)
Data Deficient (DD) Inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and / or population status.	Undefined by status (4)	Lack of data (5)
Least Concern (LC) Widespread and abundant taxa are included in this category	Recovers and restores (5)	Recoverable (4)
N/A	N/A	Dependent on human activity (6) Specially controlled (7)

These publications provide taxonomic, conservation status and distribution information for each listed species. Table 11.2 presents the classification system used by the IUCN RL, the RDB RF and the RDB KK for representing the extinction risk of species (Ref. 11.2, Ref. 11.3, Ref. 11.4, Ref. 11.5 and Ref. 11.6).

The IUCN considers species listed as VU and above to be species of particular conservation concern due to their high risk of extinction in the wild. Species classified as VU or above on the

IUCN Red List, or two and above on the RDB RF and RDB KK are referred to as 'threatened' in this chapter.

For ease of reference, all species which are listed on the IUCN RL, RDB RF and RDB KK are referred to in this chapter as 'red list species', or as species of conservation concern / importance.

Within the Russian Federation, species assessed as categories 1-3 by the RDB RF and RDB KK, are afforded protection under Russian legislation and are therefore 'protected species' (Ref. 11.7).

11.4.2.2 Consultation

Statutory Body Consultation

The Ministry of Natural Resources of Krasnodar Krai (MNRKK) was consulted in February 2013 to provide information on the presence of threatened flora and fauna, as well as protected areas, within the Wider Study Area. The MNRKK confirmed that the landfall section of the Project Area was outside of any designated site of regional or national importance. The MNRKK also confirmed that the RDB KK and RDB RF are the official documents which contain information on the status and distribution of threatened and protected species within the Krasnodar region.

The Ministry of Natural Resources and Environment (MNRE) of the Russian Federation was consulted in February 2013 to obtain information on the Utrish Specially Protected Natural Area (SPNA) and to enquire whether the MNRERF were aware of previously conducted ecological studies within the Wider Study Area. The MNRERF returned lists of RDB species supported by the Utrish SPNA and confirmed that it has no knowledge of previously conducted ecological surveys within the Wider Study Area.

Other Interest Groups

External Experts

A meeting was held with Semon Kustov, an invertebrate specialist from the Kuban State University on 11th September 2013. The purpose of the meeting was to discuss the potential presence of threatened invertebrate species included in the RDB RF and RDB KK. Mr Kustov was able to provide information on the known distribution and ecology of these species.

A meeting was held with Dr Olga Leontyeva from Moscow State University on the 31st July 2013. Dr Leontyeva is an ecologist with more than 20 years' experience, and a recognised expert in the biology and ecology of Nikolski's tortoise, *Testudo graeca nikolskii*. The discussion with Dr Leontyeva addressed the species' population status within the Study Area, habitat requirements and biology. Taking into consideration existing data, the need for and scope of an additional population size class survey was discussed, and planned for October 2013. Dr Leontyeva also advised on a mitigation strategy in relation to Project activities proposed at the time.

Utrish Nature Reserve

An initial meeting was held in Anapa with Dr Alexandr Grigorievich Krokhmal, Director of State Nature Reserve "Utrish" on 18th April 2013. The purpose of the meeting was to understand the purpose, objectives and focus of the Utrish, which the Director explained. Potential cooperation during Construction and Operational Phase of the Project - in particular, mitigation measures for the Red Data Book species – were briefly discussed. Dr Krokhmal stated that, on the basis of information available to him, he had no concerns about the Project. A subsequent visit to the territory of the reserve was conducted on 1st June 2013 to contextualise information received from the Director.

A further meeting was held with Dr Krokhmal on 12th September 2013 to discuss potential involvement of the Utrish SPNA in providing mitigation options for Nikolski's tortoise.

11.4.3 Data Gaps

A review of secondary data provided information on the likely presence of habitats and species within the Wider Study Area. However, secondary data alone were insufficient to accurately determine habitat type and quality, as well as species presence or absence within the Study Area. Field surveys (for primary data) were therefore undertaken to obtain this information, so that potential impacts could be assessed.

11.4.4 Primary Data / Baseline Surveys

11.4.4.1 Study Area

Introduction

Baseline surveys were undertaken in 2011, 2012, and 2013 to determine the presence of terrestrial ecology receptors within the Study Area. The field surveys have been used as the primary source for characterising the terrestrial ecology baseline. The approach and methods employed for these surveys are presented below.

The surveys completed in 2011 were limited to publically accessible areas across the entire Study Area (Figure 11.3). The surveys completed in 2012 focussed primarily on the Pipeline construction corridor (Figure 11.4). The surveys completed in 2013 focussed on the access route options (Figure 11.4).

Habitats and Flora

2011 Habitats and Flora Survey

Botanical surveys were undertaken between April and July 2011 to map broad habitat types within the Study Area in accordance within generally accepted survey methodology (Voronov, 1973, as cited in Ref. 11.9). Prior to the field survey, aerial photographs were reviewed to determine the location and extent of broad habitat areas or vegetation communities. These areas were then ground-truthed to confirm or to amend the findings of the aerial photography

review, as well as to gather information on the structure and composition of vegetation within the broadly identified habitat types.

Following the ground-truthing, a series of sample plots were prepared and surveyed within the Study Area (see Figure 11.3 for sample plot locations) with an exhaustive list of plant species recorded within each plot. Specimens requiring laboratory identification were stored and later examined. Species were identified with the use of local flora guides (Kosenko, 1970 and Zernov, 2002 as cited in Ref. 11.9); species of conservation concern were determined by reference to the RDB RF and RDB KK. Within each plot, abundance and projective cover were defined according to the Domin scale (Braun-Blanquet, 1965 as in Ref. 11.9). The location of each plot was recorded using a Global Positioning System (GPS) (Figure 11.3) and the plot and individual plant specimens photographed.

Surveys were undertaken at a suitable time of year for botanical survey (between April and July), when a wide range of both flowering forbs and grasses would have been visible for identification.

In addition, the freshwater habitat surveys were undertaken which included sampling both phytoplankton and zooplankton to contribute to the characterization of the waterbodies present (Ref. 11.9).

2012 Red List Flora Survey

Targeted botanical surveys were undertaken in August 2012. Surveyors focussed on recording species of conservation concern, along the proposed Pipeline construction corridor and within the landfall facilities footprint. Where encountered, red list species were recorded and mapped with the use of a GPS (see Figure 11.6). The location and extent of the area surveyed in 2012 is shown in Figure 11.4.

2013 Red List Flora Survey

Targeted botanical surveys were undertaken over a one-week period during June 2013. Surveyors focussed on recording red list species along the proposed access route options. Where encountered, red list plant species were recorded and mapped with the use of a GPS (see Figure 11.6). The location of the 2013 survey transects is depicted in Figure 11.4.

Fauna

Introduction

Extensive baseline surveys conducted for the Project in 2011 provided substantial primary data that informs this impact assessment. Surveys undertaken between April and July 2011 employed various methods to record and count animals present within the Study Area, including:

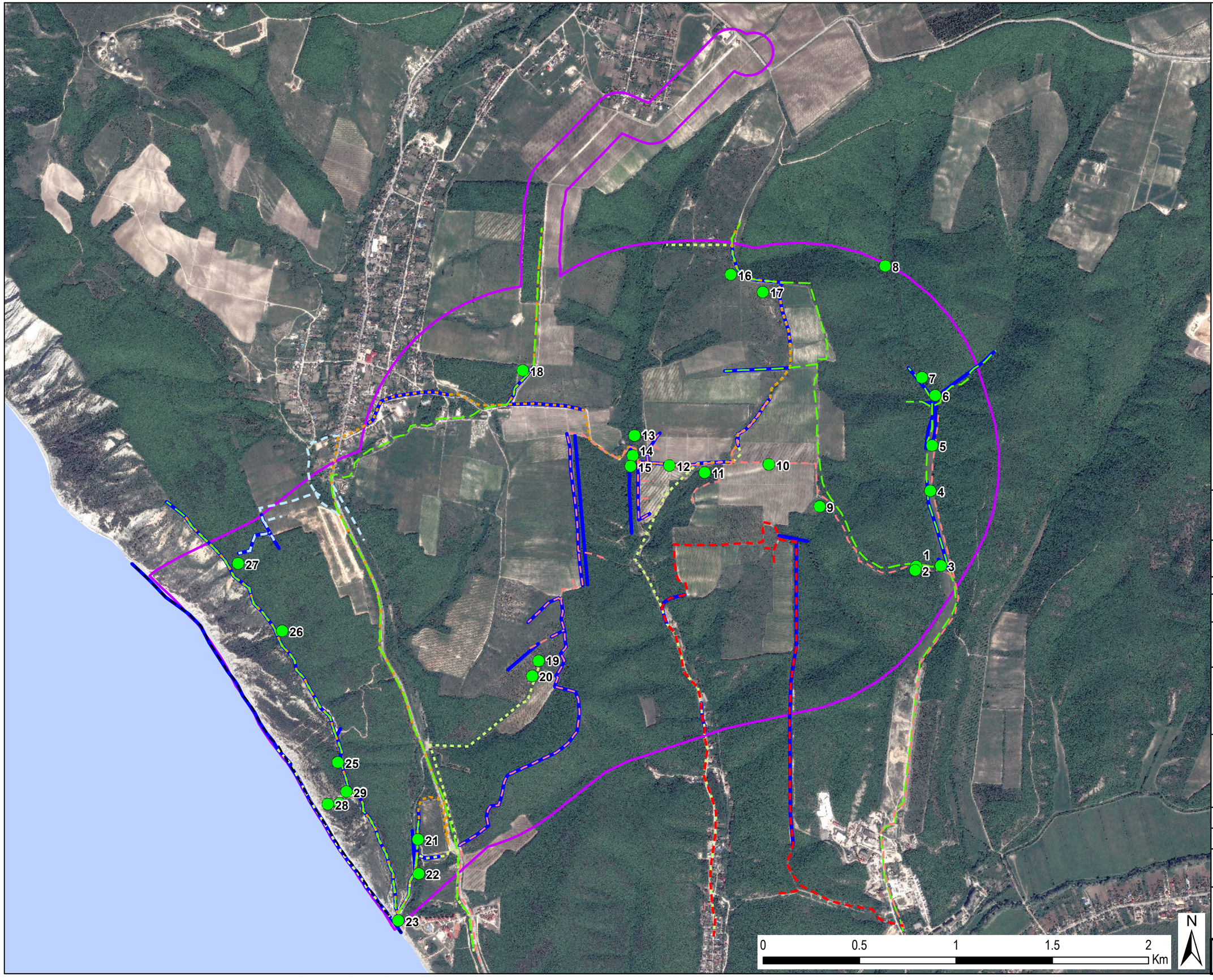
- Walked and driven transects surveys - employed to count amphibians, reptiles, birds, and larger mammals (Table 11.3);
- Traps and habitat cylinders - used to count smaller mammals such as rodents; and

- Various aquatic sampling methods – employed to determine fish, phytoplankton and zooplankton presence and populations (Ref. 11.9).

Details of the 2011 faunal survey transects are summarised in Table 11.3, and depicted in Figure 11.3 and Figure 11.5. The following sections describe the surveys for faunal groups.

Table 11.3 Faunal Survey Transect Information

Route Number	Route Type	Date	Length (km)	Faunal Surveys Completed
1	On-foot	April, 16 2011	5.8	Herpetofauna Birds Mammals
2	Vehicle and on-foot	April, 17 2011	13.1	Herpetofauna Birds Mammals
3	Vehicle and on-foot	April, 18 2011 April, 19 2011 July, 22 2011	19.9	Herpetofauna Birds Mammals
4	Vehicle and on-foot	May, 22 2011	12.8	Birds Mammals
5	Vehicle and on-foot	June, 09 2011	2.1	Herpetofauna Birds Mammals
6	On-foot	May, 22 2011 June, 09 2011 July, 22 2011	2.4	Herpetofauna Mammals
7	Vehicle and on-foot	April, 29 2011	8.8	Birds Mammals



LEGEND

- Plots of Vegetation Descriptions
- Route 1
- Route 2
- Route 3
- Route 4
- Route 5
- Route 6
- Route 7
- Census Routes
- Study area

Projection: Lambert Conformal Conic

Copyright

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 PROJECT

Drawing Title: 2011 SURVEY TRANSECTS AND PLOTS

Drawn	Checked	Approved	Date
DH	RW	MW	05/03/2014

URS Internal Project No.	Scale @ A3
46369084	1:18,000

This document has been prepared in accordance with the scope of URS' appointment with its client and is subject to the terms of that appointment. URS accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided. Only written dimensions shall be used.
© URS Infrastructure & Environment UK Limited

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

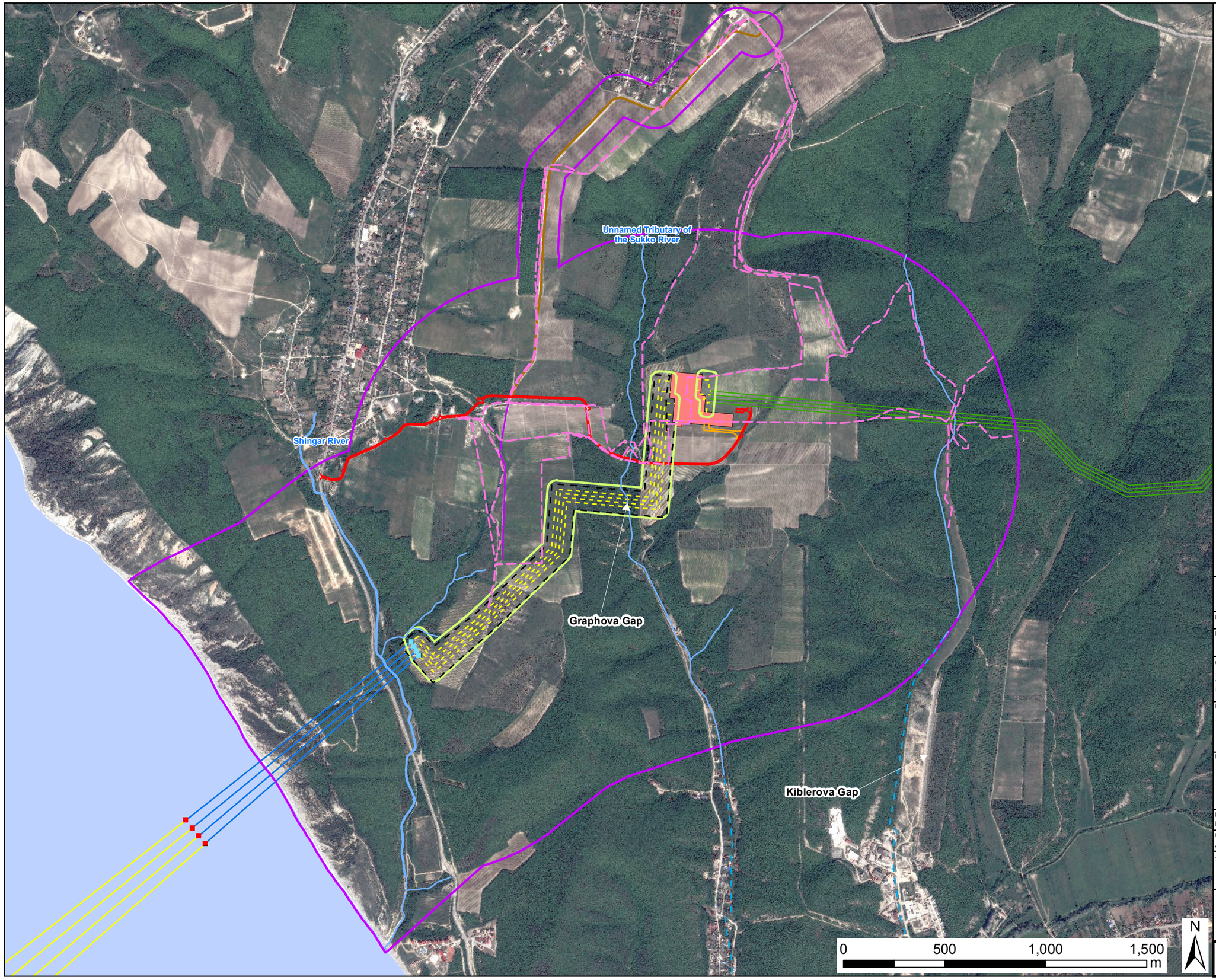
URS

Drawing Number: Figure 11.3

Rev:

Plot Date: 05 Mar 2014
File Name:I:\5004 - Information Systems\46369082_South_Stream\MXDs\Report Maps - Russia\Russian ESIA v2\Chapter 11 Ecology\Figure 11-3 2011 Survey Transects and Plots.mxd

This page has been left intentionally blank



LEGEND

- Ecology 2013 Transect Routes
- Rivers
- Inferred watercourses
- 2012 survey area
- Study area

Russian Sector of South Stream Offshore Pipeline

- Proposed landfall section pipelines
- Landfall facilities
- Proposed microtunnels
- Proposed offshore pipelines
- Construction corridor
- Microtunnel entry shaft
- Microtunnel exit pit
- Permanent access road to be constructed by SSTTBV
- Temporary access road constructed by SSTTBV
- Varvarovka bypass road (used by Project during construction only)

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: 2012 AND 2013 TRANSECTS AND PLOTS

Drawn	Checked	Approved	Date
DH	RW	MW	05/03/2014

URS Internal Project No.: 46369082

Scale @ A3: 1:18,000

This document has been prepared in accordance with the scope of URS' appointment with its client and is subject to the terms of that appointment. URS accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided. Only written dimensions shall be used.
© URS Infrastructure & Environment UK Limited

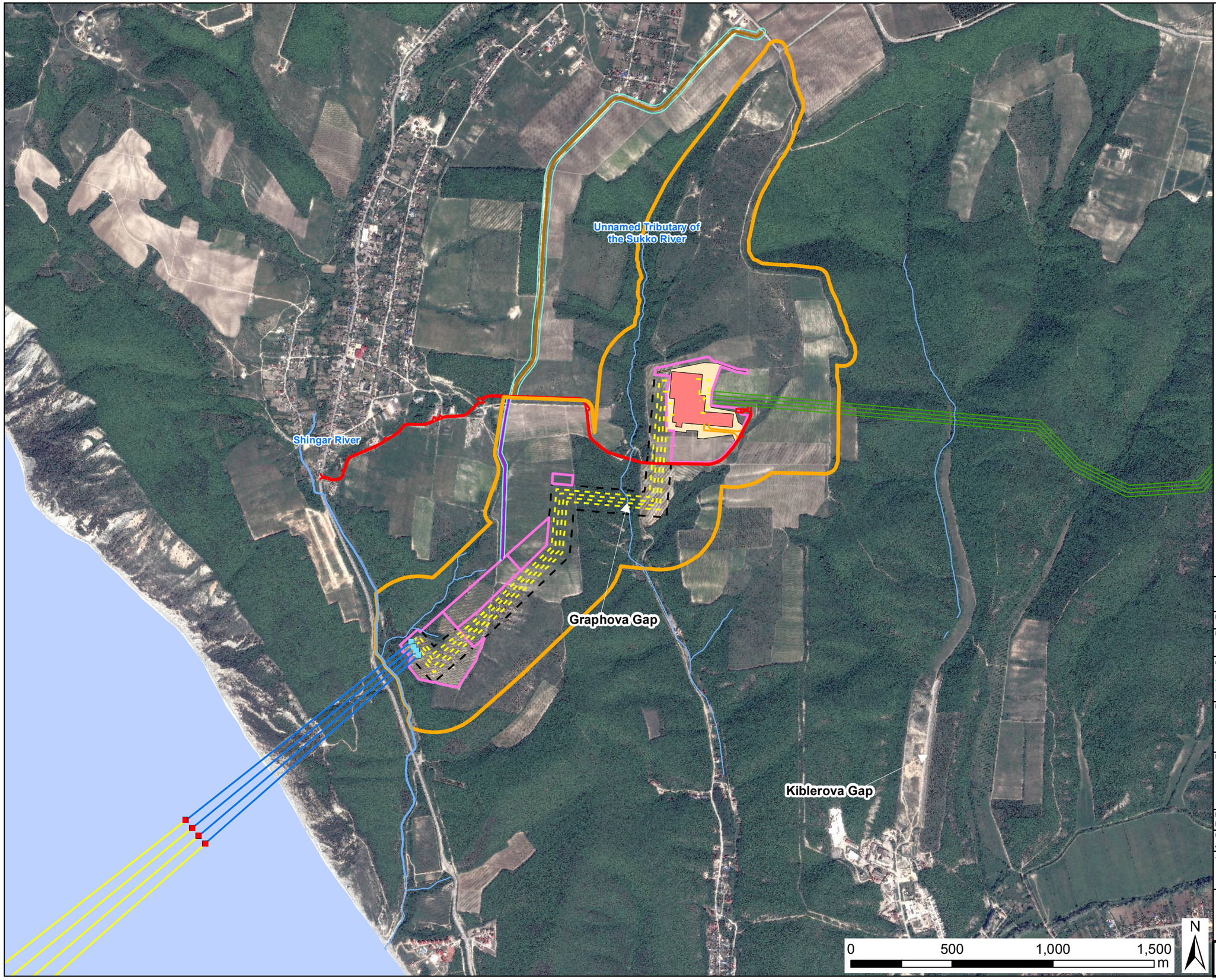
URS Infrastructure & Environment UK Limited
Scott House
Alencon Link, Basingstoke
Hampshire, RG21 7PP
Telephone (01256) 310200
Fax (01256) 310201
www.ursglobal.com

Drawing Number: Figure 11.4

Rev:

Plot Date: 05 Mar 2014
File Name:I:\5004 - Information Systems\46369082_South_Stream\MXDs\Report Maps - Russia\Russian ESIA v2\Chapter 11 Ecology\Figure 11-4 2012 and 2013 Transects and Plots.mxd

This page has been left intentionally blank



LEGEND

- Tortoise monitoring survey area
- Rivers

Russian Sector of South Stream Offshore Pipeline

- Proposed landfall section pipelines
- Landfall facilities
- Proposed offshore pipelines
- Proposed microtunnels
- Microtunnel entry shaft
- Microtunnel exit pit
- Construction corridor
- Cut and fill side slopes
- Temporary construction area for road construction
- Construction sites
- Permanent access road to be constructed by SSTTBV
- Temporary access road constructed by SSTTBV
- Varvarovka bypass road (used by Project during construction only)

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: TORTOISE MONITORING SURVEY AREA

Drawn	Checked	Approved	Date
DH	RW	MW	18 Feb 2014

URS Internal Project No.	Scale @ A3
46369082	1:18,000

This document has been prepared in accordance with the scope of URS' appointment with its client and is subject to the terms of that appointment. URS accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided. Only written dimensions shall be used.
© URS Infrastructure & Environment UK Limited

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

URS

Drawing Number: Figure 11.5

Rev:

Plot Date: 18 Feb 2014
File Name:I:\15004 - Information Systems\46369082_South_Stream\MXDs\Report Maps - Russia\Russian ESIA v2\Chapter 11 Ecology\Figure 11.5 Tortoise Monitoring Survey Area.mxd

This page has been left intentionally blank

Invertebrates

2011 Surveys

Freshwater zoobenthos surveys were sampled in the two small watercourses within the Study Area. The zoobenthos were sampled, fixed in formalin and identified under a microscope using appropriate keys (e.g. Lipin, 1950, as cited in Ref. 11.9).

2012 Surveys

Invertebrate surveys were undertaken during 2012 and were largely restricted to a habitat suitability assessment, although where observed, species were recorded. Surveyors focussed on assessing the suitability of habitat along the Pipeline and landfall facilities construction footprint (excluding the micro-tunnel area) to support red list invertebrates.

Fish

Fish were sampled in 2011 in the two small watercourses within the Study Area in accordance with the best practice methods contained in Rass, Kazakova, 1966; Pravdin, 1966; Koblitskaya, 1981 (as cited in Ref. 11.9) and identified using field keys (Berg, 1948; Troiskiy and Tsunikova, 1988 as cited in Ref. 11.9). Presence or absence and where appropriate, population densities of fish were determined in accordance with these methods.

Herpetofauna

2011 Surveys

Transect surveys were employed to determine population densities of amphibian and reptile species within the Study Area. These were undertaken along transects 1, 2, 3, 5, and 6. Surveyors walked along each route with the aim of observing individual animals, as well as signs such as shed skins and droppings. Due to the relatively small size of herpetiles, the transect width was limited to two metres (one metre each side of the transect line). Where species were recorded, their location was noted with the use of a GPS. Surveys were timed to include early morning surveys, when reptile activity was likely to be at its highest. The population survey followed standard survey methodology for assessing herpetofauna populations, as is described in Novikov, 1953; Pesenko, 1982; and Scherbak, 1989 (as is cited in Ref. 11.9). This comprised the following:

- The peak count (highest number of individuals recorded on one survey across the entire survey effort) of each species was recorded per habitat type;
- The population density for each species was then calculated using a density formula which arrived at a number of species per 1 hectare (ha) (Chelintsev, 1996 as cited in Ref. 11.6); and

Relative abundance was also calculated based on the following scale of animal occurrence: 0 – species not encountered; 1- species is rare; 2 – species inconsiderable in number; 3 – species is common; and 4 – species is numerous with many encounters on the majority of routes (Pestov,

2004 as cited in Ref. 11.9).During the transect surveys potential refuges encountered, such as wood or rock piles, were checked for sheltering individuals.

Additional specific surveys for amphibians were undertaken concurrently, which included the visual inspection of water bodies for both larvae and adults. Where waterbodies were too deep or turbid for visual inspection, hand nets were used to capture animals. Potential amphibian spawning sites such as streams and ephemeral puddles were identified and mapped.

2012 Surveys

The proposed Pipeline and landfall facilities construction footprint was surveyed over six days in August 2012. The aim of the survey was to supplement the information collected during the 2011 surveys and target the proposed Pipeline construction corridor and within the landfall facilities footprint. Surveyors walked a series of transects through suitable reptile habitat with the aim of observing individuals or signs (e.g. shed skins, tracks etc.) (See Figure 11.6). In addition, surveyors conducted refugia searches, checking under fallen wood or boulders, to uncover sheltering reptiles. Care was taken to not harm or disturb any individuals where uncovered. Surveys were timed to include early morning and late afternoon surveys, when the probability of recording basking reptiles was greatest.

Amphibian surveys were undertaken concurrently with reptile surveys in 2012. Surveys involved direct observation and listening for (in the case of European tree frog *Hyla arborea schelkownikowi*) individual amphibians and their signs and refugia surveys. Areas most likely to support amphibians, including wet areas within the mesophilic forest and meadow and adjacent to streams, were targeted.

2013 Surveys

Route options for the temporary access roads were surveyed for reptiles and amphibians during June 2013. Surveyors walked a series of transects through suitable reptile habitat with the aim of observing individuals or signs (e.g. shed skins, tracks etc.) (Figure 11.4). In addition, surveyors conducted refugia searches, checking under fallen wood or boulders, to uncover sheltering reptiles. Care was taken to not harm or disturb any individuals were uncovered. Surveys were timed to include early morning and late afternoon surveys, when the probability of recording basking reptiles was greatest.

In addition to the access road survey, a targeted Nikolski's tortoise *Testudo graeca nikolskii* survey was undertaken by Dr. Leontyeva from the 8th October to the 14th November 2013. This survey had the following primary objectives:

- To determine an approximate size class estimate for the Nikolski's tortoise population within the Tortoise Survey Area (see Figure 11.5)[3]; and

[3] The Tortoise Survey Area is a subset of the Study Area and was defined based on the location of the Project's infrastructure and the known daily range of tortoise (approximately 300 m)

- To obtain information on the habitat preference and the likely distribution of the tortoise within the Study Area during its hibernation period.

The survey area covered the Pipeline footprint and associated access roads plus approximately 300 m buffer. The survey was completed by between three and five surveyors, walking transects through the Tortoise Survey Area. The total length of transects walked by the surveyors was 260 km. The visible survey width of the transects varied between four and six metres, depending on the density of the vegetation. This gives an approximate area surveyed of 130 ha (assuming an average of 5 m survey width). The location of all tortoises found during the survey was recorded using a GPS. Individual tortoises were marked with a temporary marker to avoid double counting during the survey. Furthermore, information including each individual's sex, approximate age, and size was recorded, as well as a description of the habitat within which it was observed. Photographs of each individual were also taken.

As well as recording tortoises, incidental sightings of other herpetiles species were also noted during the survey.

Birds

2011 Surveys

During 2011, both transect and point count surveys were completed. Bird surveys were undertaken within the Study Area during six days between April and June 2011. During all surveys, information including the species, habitat and signs of breeding was recorded (Ref. 11.6).

Bird transect surveys were completed along routes 1-5 and 7, which totalled 18.5 km in length (see Figure 11.3 and Table 11.3). The surveys followed 'the borderless strip' methodology described by Ravkin 1967 (as is cited in Ref 11.9). This method involved surveyors recording all birds which were heard or seen within each habitat type. Surveyors recorded the species, number of individuals, behaviour (e.g. nesting, feeding, and resting) and distance from the recorder. The census routes were representative of the habitats contained within the Study Area, with routes covering the following areas:

- Xerophilous shrub woodland (shiblyak) – 4.17 km;
- Mesophilic forest – 2 km;
- Juniper woodland and tomillyar – 3.18 km;
- Steppefied secondary meadow – 2.63 km;
- Mesophilic meadow – 0.8 km;
- Coastal shingle – 2.4 km; and
- Urban and agricultural habitats – 4.45 km.

Bird population densities were calculated according to Ravkin, 1967 (as cited in Ref. 11.9). This method calculates the density of birds encountered perched and flying separately.

Species composition within habitats with a complex structure, including the mesophilic and secondary steppefied meadow, juniper woodland and urban areas, was further investigated using point counts. Surveyors identified a typical stand of vegetation (or plot) within each habitat type subject to this survey method and recorded bird species and numbers within each plot. Surveying of each plot was repeated at each plot over the course of the three months (from April – June 2011).

2012 Surveys

During the August 2012 survey of the proposed Pipeline construction corridor and within the landfall facilities footprint, incidental sighting of birds were recorded. Information about the species, sex, age, behaviour, and habitat was recorded. The surveys included early mornings when birds are likely to be more active. A single dusk survey was also completed.

2013 Surveys

During the June 2013 survey of the access road options and landfall sites, a field ornithologist recorded all bird species observed. The following information was collected for each species recorded: sex, age, notes on behaviour and the habitat in which the species was observed. Population densities were not calculated. The surveys included early mornings when birds are likely to be more active.

Mammals

2011 Surveys

Mammal surveys were undertaken in 2011 within the Study Area, which employed both transect surveys and the use of traps (depending on the species). A summary of the methods employed for these surveys is provided below (Ref. 11.9).

Small rodents were surveyed using a trap-line methodology. This involved using baited traps arranged in a line of 25 traps, spaced 5 m apart. Fifty trapping days were undertaken within mesophilic forest and shiblyak habitats, while 25 trapping days were completed within the mesophilic meadow and steppefied meadow, juniper woodland and agricultural land. A conversion factor developed by Ravkin and Livanov, 2008 (as cited in Ref. 11.9) was used to determine population density for each species recorded.

Small insect eating mammals (excluding moles, and hedgehogs) were counted using cylinder traps. Five cylinders were installed every 50 m along a 15 cm high polyethylene fence in accordance with the method described in Ravkin and Livanov, 2008 (as cited in Ref. 11.9). Traps were placed for 10 days within both the shiblyak and mesophilic forest, whilst 5 trapping days were completed in the steppefied meadow. A conversion factor developed by Ravkin and Livanov, 2008 (as cited in Ref. 11.9) was used to determine population density for these species.

Bats were recorded through visual observation at dusk (sound detectors were not employed for survey). Additionally, structures such as trees and buildings located along the Pipeline and landfall facilities construction footprint (excluding the micro-tunnel area) assessed for their bat roost potential.

Concerning carnivores and other large mammals, information on the presence, distribution, and habitat preference of these species was gathered through sightings of individuals and recording of animal signs (e.g. burrows, snuffle holes, tracks, faeces, etc.) during the walked and driven transects. The population density of species recorded was determined using a formula based on the distance of each transect and number of interaction per species noted.

2012 Surveys

The 2012 surveys were focussed on assessing the suitability for and recording the presence and behaviour of mammals within habitats within the Pipeline and landfall facilities construction footprint (excluding the micro-tunnel area).

As well as sightings of species, surveyors searched for and recorded mammal field signs (such as footprints, mammal paths feeding remains, droppings, and burrows or holes which may have been used by mammals). A single dusk survey was completed when emerging nocturnal species (such as bats) are best recorded.

In addition, surveyors assessed potential structures, including trees and buildings (where appropriate), for their potential to support roosting bats. Trees were classified in accordance with guidance provided by the Bat Conservation Trust (UK) (Ref. 11.10).

2013 Surveys

The 2013 survey repeated the methodology of the 2012 survey, although it focused on the access road options under consideration at the time of the survey (Figure 11.4).

11.4.4.2 Habitat Characterisation according to IFC PS6

As required by IFC PS6, each habitat type is assessed as either modified or natural habitat. These are defined by IFC PS6 (Ref. 11.11) as follows:

Modified habitats are areas that may contain a large proportion of plant and / or animal species of non-native origin, and / or where human activity has substantially modified an area's primary ecological functions and species composition. Modified habitats may include areas managed for agriculture, forest plantations, reclaimed coastal zones, and reclaimed wetlands.

Natural habitats are areas composed of viable assemblages of plant and / or animal species of largely native origin, and / or where human activity has not essentially modified an area's primary ecological functions and species composition.

A subset of the above two habitat groupings represent either modified or natural habitat which is of particular ecological importance, termed 'critical habitat'. This classification is of importance in the determination of the extent and type of mitigation measures required. A separate critical habitat assessment was undertaken to identify areas of this type and is presented in Appendix 11.1, the conclusions of which are integrated into this chapter in the relevant sections.

11.4.5 Data Assumptions and Limitations

11.4.5.1 Habitats and Flora

The optimal period for habitat and botanical survey is generally between April and August, when the majority of plant species are apparent and critical identification features such as flowers and seeds are observable. The 2011 surveys, undertaken between April and July, 2012 surveys, undertaken during August and 2013 surveys, undertaken during June, are therefore likely to have captured a large proportion of the plant species present within the Study Area.

It is acknowledged that the Study Area is relatively floristically diverse and therefore contains plants with a range of flowering strategies (early or late flowering plants). While a small proportion of species may therefore not have been recorded or were under-recorded, the survey timings are not considered a limitation as sufficient information has been gathered to classify habitats and identify their dominant and indicator species.

In terms of red list plant species, secondary data has provided sufficient information to identify which species are likely to be present within the Study Area. Primary data (field surveys), have been undertaken at an appropriate time of year for identifying these species, and have covered a representative proportion of the Study Area, including the proposed Pipeline, landfall facilities, and access roads.

Sufficient data has therefore been gathered to determine the type of habitats, their distribution, and presence (or potential presence) of red list plants within the Study Area.

11.4.5.2 Fauna

Invertebrates

The invertebrates potentially present within the Study Area exhibit a variety of lifecycles, with optimum survey periods for species varying between March and September. The 2012 invertebrate survey (the only survey where invertebrates were surveyed) was undertaken during a six day period during August 2012, is therefore likely to have missed or under-recorded a large proportion of the invertebrates potentially present within the Study Area.

Therefore, species presence or likely absence from within the Study Area has largely been completed through a combination of secondary data sources and based on habitat suitability assessments. The potential presence of threatened invertebrate species was further investigated through consultation with an invertebrate specialist from Kuban State University.

In combination, the primary and secondary data has provided sufficient information to determine with confidence the presence or absence of habitats suitable to support populations of red list invertebrates within the Study Area.

Amphibians and Reptiles

Timing of Surveys

The active period for amphibians and reptiles is largely between March and October. The optimal survey period is generally during cooler months (such as March, April, May and September – mid-October). Surveys were undertaken during April and July (2011), August (2012), and June and October – November (2013). Therefore, the surveys were generally conducted during the main active period, although not always at an optimal time of year.

The 2013 targeted Nikolski's tortoise survey undertaken by Dr. Leontyeva and team, encountered cold, unseasonal weather in late September and early October. The temperatures experienced at this time were considered by Dr. Leontyeva low enough to prompt a potentially significant proportion of the local tortoise population to go in to hibernation early. This view was confirmed through survey, which revealed that a number of tortoises were already beginning to 'dig-in' for hibernation. The weather conditions are therefore likely to have reduced the number of active tortoises within the Tortoise Survey Area, and their numbers are therefore likely to have been under-recorded.

Methods Employed

The walked transect method employed for all reptile surveys, while relatively effective at recording larger reptiles such as Nikolski's tortoise, can under record smaller species and those which are highly sensitive to human presence (such as lizards and some snake species). A proportion of reptile species may therefore have been missed or under-recorded during the field survey.

Implications for the ESIA

The limitations associated with survey timing and methods have been addressed by:

- Employing a relatively high survey effort (61 days of transect surveys over the course of the three year survey period). This included 11 days in 2011, 6 days in 2012, and 40 days in 2013. The repeat visits over a three-year period increase the likelihood of presence or absence of species being confirmed; and
- Undertaking a thorough review of secondary data sources, including consultation with Dr Olga Leontyeva, a recognised national expert in herpetology from Moscow State University (see 'Herpetofauna' within Section 11.5.1.3).

The methods employed during the field surveys combined with the data gathered through the review of secondary data, are considered sufficient to determine the presence or likely absence of various species of reptile, to assess species population densities, and to assess the likely effects of the Project on these species.

Birds

Within the Study Area, birds are present throughout the year, either breeding (peak periods are between March and July inclusive), on migration (the spring migration occurs between mid-February and mid-June and the autumn migration between mid-July and mid-November), or

overwintering (overwintering birds generally arrive in approximately October and leave in March). The 2011 field surveys (undertaken between April and June) would therefore have recorded a sample of breeding birds and spring migrants although they would have missed overwintering birds. The field surveys in 2012 (August) and 2013 (June) would have largely recorded middle to late season breeders and the last of the spring migrants.

The limitations inherent in the timing of the field survey have been mitigated for through the provision of secondary data which have provided context to the field survey data.

The terrestrial ecology baseline for birds presented in this chapter is therefore considered to be an accurate representation of bird species composition and habitat occupation within the Study Area.

Mammals

Mammal species potentially present within the Study Area are generally most active between March and September when mating, rearing of young, and foraging activity occur. The field surveys in 2011 (April - June), 2012 (August) and 2013 (June) were therefore undertaken at an appropriate time for recording mammals. However, due to the fact that larger mammals are highly mobile and may be transient within the Study Area at certain times, these species could potentially have been missed or under-recorded during the transect surveys.

The limitations in terms of survey timing and duration have been addressed through supplementing field survey data with a thorough literature review. The secondary data has provided additional information with which to predict species' presence or likely absence from within the Study Area throughout the year, while the field survey information has provided data to determine their likely presence or absence from the Study Area based on habitat preferences.

In terms of bats, ultra-sound detection and recording was not employed during surveys. Bats are difficult to record and identify without this equipment and individuals may therefore have been missed or under-recorded. The identification or differentiation between species of bat which were observed also could not be undertaken.

Physical data has been gathered to determine whether roosting bats are likely to be directly affected by the Project. Furthermore, sufficient information has been gathered to identify potential commuting and foraging habitat for bats. Finally, secondary data sources have allowed the determination of those species of bat which are likely to be present within the Study Area (based on their known range and habitat preferences).

11.5 Baseline Characteristics

The baseline information in this section summarises the findings of the 2011, 2012, and 2013 surveys and the secondary data reviewed for the Project. It characterises the ecology of the Study Area.

11.5.1 Study Area

11.5.1.1 Designated Sites

Special Protected Natural Areas

The Utrish SPNA is located approximately 3.8 km south-east of the Pipeline construction corridor (see Figure 11.1). It covers an area of approximately 10,800 ha and includes both onshore (9225 ha) and offshore (783 ha) areas.

Habitats and Flora

The onshore portion of the Utrish SPNA is located at the north-western extremity of the Caucasus mountain range and abuts the Black Sea along its western boundary. Two bands of vegetation predominate within the site, largely the result of the altitudinal differentiation within the area and the mountainous terrain (the influence of slope aspect and steepness). The vegetation of the lower altitudinal belt (0 – 200 m) is characterised by xerophilous (shiblyak) vegetation comprising juniper *Juniperus* sp. and pubescent oak *Quercus pubescens*. The vegetation of the upper altitudinal belt (150 m – 500 m) is characterised by mesophilic broad-leaved forests of oriental beech *Fagus orientalis*, oriental hornbeam *Carpus orientalis*, sessile oak *Quercus petraea* and ash *Fraxinus excelsior* (Ref. 11.12).

The SPNA supports a total of 117 endemic plant species, nine percent of the total number of plant species recorded within the SPNA (Ref. 11.12). The reserve does not support plant species listed as threatened (Vulnerable and above) on the IUCN RL, but it does support 72 species listed as threatened on the RDB RF or the RDB KK.

Invertebrates

The Utrish SPNA supports a large variety of invertebrate species. This includes 3 species listed as threatened on the IUCN RL and 51 species listed as threatened on either the RDB RF or RDB KK (Ref. 11.12). The juniper woodland, shiblyak and steppefied meadow contained within the reserve are of particular importance for sustaining populations of threatened insects which are dependent on the food plants contained within these habitat types.

Herpetofauna

The Utrish SPNA supports at least 14 species of reptile and eight species of amphibian. It is of particular importance to Nikolski's tortoise, a species listed as CR on the IUCN RL. It has been estimated that the SPNA supports a population of between 5000 – 6000 Nikolski's tortoise (or ca. 20 to 30 percent of the global population of this species) (Ref 11.12). It also supports two other threatened species of reptile listed on the RDB KK (the Aesculapian ratsnake *Elaphe longissima* and European glass lizard *Pseudopus apodus*) and three species of threatened amphibian listed on the RDB RF or RDB KK (southern crested newt *Triturus karelini*, smooth newt *Lissotriton vulgaris lantzi* and Caucasian toad *Bufo verrucosissimus*).

Birds

The Utrish SPNA supports approximately 157 species of bird belonging to 43 families of 19 orders (Ref. 11.12). It supports a variety of species throughout the year, including breeding, over-wintering, and transient species that use the site as a stop-over point on migration. The site supports a number of species which are listed on the IUCN RL (e.g. peregrine falcon *Falco peregrinus*) RDB RF and RDB KK (e.g. short-toed snake eagle *Circaetus gallicus*, booted eagle *Hieraaetus pennatus*, oystercatcher *Haematopus ostralegus*, gull-billed tern *Gelochelidon nilotica*, little tern *Sterna albifrons*, wood lark *Lullula arborea* and rufous-tailed rock thrush *Monticola saxatilis*).

Mammals

Utrish SPNA supports approximately 45 species of mammal (Ref. 11.12). This includes five species of bat listed as threatened on the RDB RF or RDB KK: barbastelle *Barbastella barbastellus*, lesser mouse-eared bat *Myotis blythii*, pond bat *Myotis dasycneme*, Bechstein's bat *Myotis bechsteinii*, and Leisler's bat *Nyctalus leisleri*.

Protective Forest Areas

All forest or woodland habitat within the Study Area are identified as 'protective forests', as defined within the Forest Code of the Russian Federation (Ref. 11.13). This includes all mesophilic forest, shiblyak and juniper woodland. These forests are recognised as important features within the environment, as they perform important functions, such as protection of water resources and soils, and recreational spaces for local communities. This designation is not strictly related to the forest's intrinsic 'biodiversity value', but rather is associated with the ecological function it provides.

Anapa Resort Town Sanitary Protection Area

The town of Anapa was assigned the status of a federal resort by President Decree No. 1954 dated September 22, 1994. It was given this status due to its recreational value as a 'health improving' (spa) resort area. This designated area is referred to as a Sanitary Protection Area.

The centre of the Pipeline construction corridor is located approximately 500 m from the boundary of the second and third exclusion zones of the Sanitary Protection Area of Anapa (Figure 11.1).

It is acknowledged that habitats and plant and animal species are important components of the Sanitary Protection Area and contribute to the town of Anapa's status as a resort area. The potential for the Project to affect these 'component parts' of the Sanitary Protection Area is considered in this chapter and any potential for indirect effects to the designated site will therefore be accounted for. However, as this Sanitary Protection Area is designated for its amenity and recreational value, it not considered further in this chapter.

11.5.1.2 Habitats and Flora

Introduction

The Study Area is located in the foothills between the Greater Caucasus mountain range and the Azov-Kuban lowland. It largely comprises an undulating plateau extending north-east away from a steep coastal cliff with the shoreline of the Black Sea at its base. The plateau has been eroded by streams; forming steep gullies in places (see **Chapter 7 Physical and Geophysical Environment**). The Pipeline crosses two small watercourses within the Study Area, which include the Shingar River (1.5 - 2.5 m wide) and an unnamed tributary of the Sukko River (see **Chapter 8 Soils, Groundwater and Surface Waters**).

The Study Area falls within a typically Mediterranean climatic zone, and it experiences relatively warm and moist winters and hot dry summers. On average, the warmest months are June to September with a maximum monthly average temperature of 21.0 °C. The coolest are November to March, with a minimum average temperature of 4.4 °C. The annual average precipitation is 539 millimetres (mm) (an average of 45 mm per month), mainly in the form of rain. The maximum recorded daily precipitation is 85.9 mm. There is relatively little seasonal variation in precipitation, with the greatest amount occurring during the months of November, December and January.

A diversity of soil types exists within the Study Area, which reflects the variety of bedrock and soil forming processes that underlie it (Ref. 11.9). Soils covering higher slopes and ridges are typically formed by the weathering and re-deposition of calcareous argillites and interbedded sandstones and siltstones. Soils encountered within river valley systems typically comprise weathered calcareous marls, interbedded limestones, siltstones and shales. Valley bottoms comprise variable gravel and sand deposits with occasional layers of clays and loam material interbedded in the coarser grained material (Ref. 11.9).

The topography, soil types, climate, as well as anthropogenic influence, has created relatively diverse conditions on which a range of habitat types have developed (Ref. 11.9). This has in turn created diverse conditions within which various plants and animals, including species of conservation concern, can inhabit. The following section describes these habitats and presents those species which either have been, or have the potential to be, present within the Study Area.

Habitats and Flora

The Study Area supports a range of relic arid sub-Mediterranean vegetation types that have a restricted range within Russia. Surveys undertaken in 2011 recorded a total of eight natural[4]

[4] Natural habitats are areas composed of viable assemblages of plant and/or animal species of largely native origin, and / or where human activity has not essentially modified an area's primary ecological functions and species composition. As per IFC PS 6 (Ref. 11.38).

and two modified [5] terrestrial habitat types within the Study Area (Ref. 11.9). These are: xerophilous shrub woodland (also known as shiblyak), mesophilic forest, juniper woodland, secondary steppefied meadow, mesophilic meadow, tomillyar, rocky outcrops, coastal shingle and agricultural habitats. In addition, running water habitat is present in the form of two watercourses. These habitat types are discussed in further detail, below and their location and extent mapped on Figure 11.6. Table 11.4 presents the area of each habitat type within the Study Area.

Table 11.4 Area (Ha) of Habitat Type within the Study Area.

Habitat Type	Area of Habitat Within the Study Area (ha)*
Shiblyak	431
Mesophilic forest	63
Juniper woodlands	56
Tomillyar	7
Steppefied secondary meadow	111
Mesophilic meadow	10
Rocky outcrops	8
Coastal shingle	3
Urban and Agricultural habitats	273
Running water	2

* Refer to Table 11.33 for area of loss within the project footprint

Surveys recorded approximately 340 species of plant belonging to 75 families within the Study Area (Ref. 11.9). This data revealed that species diversity is highest in the Asteraceae (39 species), Poaceae (36 species), Fabaceae (23 species), Lamiaceae (23 species), and Brassicaceae (16 species) families. The average species richness with the various plant communities within the Study Area varies between nine species per 100 m^2 on the eroded slopes to 22 species per 100 m^2 within the tomillyar habitat.

[5] Modified habitats are areas that may contain a large proportion of plant and/or animal species of non-native origin, and / or where human activity has substantially modified an area's primary ecological functions and species composition. As per IFC PS 6 (Ref. 11.38).

Shiblyak

Shiblyak woodland is the dominant woodland type in the Study Area. It comprises dwarf woodland and shrub vegetation communities 4 m – 6 m in height. Shiblyak is characterised by xerophytic species that are adapted for surviving in dry environments (Flerov 1926, Maleev 1931, Povarnitsyn 1940, as is cited in Ref. 11.9). These woodlands are diverse in structure, floristically rich and are dominated by woody species including pubescent oak *Quercus pubescens*, oriental hornbeam *Carpinus orientalis* and juniper species. Occasionally, other species such as Pitsynda pine *Pinus pityusa*, common pine *Pinus sylvestris*, field maple *Acer campestre*, European alder *Alnus glutinosa* and Mt. Atlas mastic tree *Pistacia mutica* are present. Within the understory, European cornel *Cornus mas* is dominant. Species including blood twig dogwood *Thelycrania australis* and common privet *Ligustrum vulgare* are also occasionally present. Within the ground layer, herbaceous species include wood avens *Geum urbanum*, forest violet *Viola silvestris*, Kavakh peony *Paeonia kavachensis* and common primrose *Primula vulgaris*. Grasses include heath false brome *Brachypodium pinnatum*, cocksfoot *Dactylus glomerata* and Japanese bromegrass *Bromus japonicus* (Ref. 11.9).

The shiblyak habitat within the Study Area comprises predominantly native plant species and there is little evidence of human modification of this habitat type. Shiblyak is therefore considered to be a **natural habitat** according to IFC PS 6 criteria.

Mesophilic Forest

Within the Study Area, mesophilic forest is restricted to the riverine floodplains and valleys of the Graphova and Kiblerova gaps, as well as along the floodplain of the Shingar River (refer to Figure 11.6). The woodland reaches a height of approximately 14 m – 16 m and is dominated by woody species including European alder and almond-leaved willow *Salix triandra*, with locally dominant stands of European ash *Fraxinus excelsior*, Caucasian pear *Pyrus caucasica* and field maple. The understory comprises predominantly Eurasian cornel, blood twig dogwood and common privet. Localised stands of common hazel *Corylus avellana*, European elder *Sambucus nigra* and bladdernut *Staphylea pinnata* are also present. The ground layer is relatively dense and comprises bishop's weed *Aegopodium podagraria,* common nettle *Urtica dioica*, wood avens, white dead-nettle *Lamium album* and cleavers *Gallium aparine*. In the spring, forb species include Siberian squill *Scilla sibirica*, lesser celandine *Ficaria verna*, Arum lily *Arum orientale*, common primrose and Greek corydalis *Corydalis marschalliana*, as well as orchid species such as man orchid *Orchis mascula*.

The mesophilic forest within the Study Area comprises predominantly native plant species with little evidence of human modification of this habitat type. It is therefore considered to be a **natural habitat** in accordance with IFC PS 6 criteria.

Juniper Woodland

Within the Study Area, juniper woodland mainly occurs on the coastal cliffs, although other isolated stands are present. Juniper woodland is a relatively heterogeneous community, dominated in the canopy by juniper species, with abundant pubescent oak and oriental hornbeam. Within the shrub layer, southern sumac *Rhus coppalinum*, common privet, Etruscan honeysuckle *Lonicera etrusca*, evergreen jasmine *Jasminum fruticans* and bladder fern

Cystopteris dickieana are relatively abundant. The ground-layer is diverse and comprises species including felty germander *Teucrium polium*, wall germander *Teucrium chamaedrys*, sword-leaf inula *Inula ensifolia*, goldendrop *Onosma polyphyllum*, common ephedra *Ephedra distachya* and bindweed *Convovulus cantabrica*. During the spring months, the more open areas within the juniper woodland contain species including mouse hyacinth *Muscari muscarini*, dwarf flag iris *Iris pumila* and Breckland speedwell *Veronica praecox*.

An isolated area of sparse juniper woodland is present along the Pipeline route, bordered by two areas of agricultural land (refer to Figure 11.6). This area contains species as listed for the habitat above, in addition to common pine, blackthorn *Prunus spinosa*, goat's beard *Tragopogon graminifolius* and melic grass *Melica transsilvanica*.

The juniper woodland within the Study Area comprises predominantly native plant species with little evidence of human modification of this habitat type. It is therefore considered to be a **natural habitat** in accordance with IFC PS 6 criteria.

Tomillyar

Tomillyar is relatively fragmented and scarce within the Study Area, largely confined to the coastal cliffs (Ref. 11.9). The habitat comprises herbaceous plant communities with the majority of species associated with dry and hot environments. Dominant species include felty germander, Marshall's thyme *Thymus marschallianus*, sage-leaf mullein *Phlomis tuberosa* and goldendrop. Grass species include melic grass *Melica spp.*, cocksfoot, and golden feather grass *Stipa pulcherrima*. Tomillyar is generally species-rich, containing on average 13 – 15 species per m^2. The vegetation structure is also relatively diverse, comprising three different height tiers. The first tier is generally fragmented and comprises grasses and herbs such as sage-leaf mullein and pyramidal orchid *Anacamptis pyramidalis*. The second tier is represented by medium-height herbs including felty germander and thin-leaved flax *Linum tenuifolium*, while the third tier is represented by creeping or low growing species including *Thymus helendzicus*, Marshall's thyme, and sprawling needle sunrose *Fumana procumbens*. In the spring, species including mouse hyacinth *Hyacinthus orientalis* and reticulated iris *Iris reticulata* are evident.

The tomillyar within the Study Area comprises predominantly native plant species with limited evidence of human modification. It is therefore considered to be a **natural habitat** in accordance with IFC PS 6 criteria.

Secondary Steppefied Meadow

Secondary steppefied meadow occupies a relatively large proportion of the Study Area. They are areas dominated by grasses and herbaceous species that were previously agricultural land (i.e. former vineyards, orchards and fields), which have been derelict for some time.

The dominant grasses within these areas include crested wheatgrass *Agropyron pectiniforme*, couch grass *Elytrigia repens*, Japanese brome, cock's-foot, and bushgrass *Calamagrostis epigeios*. Grasses make up approximately 75-80 percent of the sward within these areas. Abundant forbs within the meadow areas include blue daisy *Cichorium intybus,* lady's bedstraw *Galium verum* and British inula *Inula britannica*. Threatened forbs found within this habitat type include monkey orchid *Orchis simia* and pyramidal orchid. Shrub species contained within the

meadow areas include common smoke tree *Cotinus coggygria*, dog rose *Rosa canina*, young specimens of Pubescent oak and juniper.

Secondary steppe meadow areas used to be agricultural land and so have been modified to a large extent. The habitat in its current condition does however contain predominantly native plant species which are representative of natural meadow communities. However, as this habitat is essentially modified from its natural (or original) state through human intervention (and was most likely modified from shiblyak woodland in the majority of areas) it is considered to be **modified habitat** in accordance with IFC PS 6 criteria.

Mesophilic meadow

Within the Study Area, mesophilic meadow is rare. Thin strips of the habitat are located along the river floodplains, predominantly within the Graphova and Kiblerova valleys. These vegetation communities are typical of periodically inundated soils which support plants favouring nutrient-rich environments. Within this habitat type, three different plant sub-communities were recorded: a grass-forb sub-community, a forb-dominant sub-community, and a sub-community comprising almost entirely of plants belonging to the family Fabiaceae (Ref. 11.9).

Approximately 85-90 percent of the vegetation within the grass-forb sub-community comprises grasses. The vegetation structure comprised roughly four tiers. The first tier contains taller grasses and forbs including velvet mullein *Verbascum Thapsus*, wild sunflower *Verbisina enclioides*, Fuller's teasel *Dipsacus fullonum* and common agrimony *Agrimonia eupatoria*. The second tier contains lower growing grasses and forbs, such as bush grass, cocksfoot, yarrow *Achillea millefolium* and common agrimony. The third tier comprises predominantly creeping forbs, including cinquefoil *Potentilla reptans* and wild strawberry *Fragaria vesca*. The fourth tier is largely comprises of moss species.

The forb-dominant sub-community comprises various forbs including blue daisy, wild carrot *Daucus carota,* Italian aster *Aster amellus* and field daisy *Leucanthemum vulgare*. Smooth-stalked meadow-grass *Poa pratensis,* field brome *Bromus arvensis*, sterile brome *Bromus sterilis* and other grass species are also present. Although rare, monkey orchid has been recorded within this sub-community type at a density of 1-2 plants per 100 m^2.

The Fabiaceae-dominant plant sub-community is present at the edges of the mesophilic meadow. The dominant species here is crown vetch *Coronilla coronata*, which in places covers 100 percent of the land surface.

The areas of mesophilic meadow within the Study Area comprise predominantly native plant species with limited evidence of human modification to this habitat type. It is therefore considered to be a **natural habitat** in accordance with IFC PS 6 criteria.

Rocky Outcrops

Fragmented areas of rock or scree habitat are restricted to areas of the coastal cliffs. Shrubs growing within these areas include southern sumac, Jerusalem thorn *Parkinsonia aculeate*, bladder fern and common smoke tree. There is a relatively high diversity of herbaceous species growing within these areas, with species including dog's parsley *Seseli ponticum*, sword-leaf

inula, pyramidal orchid, thorny-head lamira *Lamyra echinocephala*, goldilocks *Linosyris vulgari*) and felty germander. Species diversity within these areas is 5 – 10 per m^2.

The areas of rocky outcrops within the Study Area comprise predominantly native plant species with limited evidence of human modification to this habitat type. It is therefore considered to be a **natural habitat** in accordance with IFC PS 6 criteria.

Coastal Shingle

Coastal shingle exists along the coastal strip to the west of the Study Area. No plant species were recorded within these areas.

These areas are subject to limited modification through human activity and are therefore considered to be a **natural habitat** in accordance with IFC PS 6 criteria.

Urban and Agricultural Habitats

Urban and agricultural habitats form a considerable part of the Study Area and include vineyards, orchards, fallows and other habitats associated with human activity (e.g. roads) (Ref. 11.9). Within these areas, fragmented grass-forb communities are present (largely adjacent to the access roads servicing the abandoned vineyards) comprising wormwood *Artemisia absinthium*, Bermuda grass *Cynodon dactylon*, yellow foxtail grass *Setaria glauca*, green foxtail grass *Setaria viridis*, bristle thistle *Carduus acanthoides*, field bindweed *Convolvulus arvensis*, common nettle, Mediterranean elder *Sambucus ebulus* and horse sorrel *Rumex confertus*.

The areas of agricultural habitats have been heavily modified through human influence. Although these areas contain pockets of semi-natural vegetation, they are considered to be a **modified habitat** in accordance with IFC PS 6.

Running Water

The landfall section of the Project crosses two small watercourses, the Shingar River and an unnamed tributary of the Sukko River (Figure 11.7). Both watercourses have the characteristics of upper course streams, being narrow (less than 3 m), occur in valleys with relatively steep gradients and exhibit short response time to rainfall events. These watercourses therefore have episodic high and low flows in response to seasonal rainfall patterns. In summer, the channels partially dry-out to leave intermittent pools along the rivers' reach. Within the Graphova gap, at least two pools have been enlarged through a combination of excavation and embankment. Both pools appear to hold water all year, even when the remainder of the watercourse has dried.

The phytoplankton communities found within the Study Area reflect the physical characteristics of the watercourses. Their low species richness and abundance are typical of watercourses in their upper courses and also possibly reflect the low water temperatures and mineral concentrations (phytoplankton and zooplankton communities tend to be generally best developed in lacustrine environments or slow flowing rivers). Species recorded include green algae, diatoms (which were dominant) and blue-green algae (which were far less prevalent).

Average phytoplankton biomass in the Shingar River was 0.41 g/m^3 and 0.37 (g/m^3) in the unnamed tributary of the Sukko River.

As many zooplankton species feed on phytoplankton, the low density of phytoplankton is reflected by low zooplankton populations within the two watercourses. The composition of the zooplankton associated with the two watercourses comprised a mixture of Rotifers (six species), Copepods and Cladocerans. Average zooplankton biomass in the Shingar River was 0.13 g/m^3 and 0.11 g/m^3 in the unnamed tributary of the Sukko.

The running water within the Study Area is subject to limited modification through human activity and is therefore considered to be a **natural habitat** in accordance with IFC PS 6 criteria.

Red List Plant Species

Secondary data indicates that the Study Area has the potential to support 28 red list plants species (Ref 11.2, Ref. 11.4). This includes 28 plant species listed in the RDB KK, 14 on the RDB RF and two on the IUCN RL (some species are listed in more than one list or book). In total, the three surveys recorded 26 different red list plant species within the Study Area (Figure 11.6). Table 11.5 presents all red list plants recorded during the 2011, 2012 and 2013 surveys, along with the habitats within which they are likely to occur.

Table 11.5 Red List Plant Species Recorded in the Study Area

Name of Species	Habitat	Conservation Status		
		IUCN	RDB RF	RDB KK
Astragalus subuliformis	Juniper scrub / woodland, shiblyak, tomillyar	Not assessed	Not listed	3
Colchicum umbrosum	Woodland	Not assessed	2	2
Fern-leaved speedwell *Veronica filifolia*	Juniper scrub / woodland, shiblyak, tomillyar	Not assessed	1	1
Siderites euxina	Juniper scrub / woodland, shiblyak, tomillyar	Not assessed	Not listed	2
Etruscan honeysuckle *Lonicera etrusca*	Juniper scrub / woodland	Not assessed	3	1
Phlomis taurica	Juniper scrub / woodland, shiblyak, tomillyar	Not assessed	Not listed	2
Dwarf flag iris *Iris pumila*	Juniper scrub / woodland, shiblyak, tomillyar	Not assessed	3	2

Continued…

Name of Species	Habitat	Conservation Status		
		IUCN	RDB RF	RDB KK
Sea kale *Crambe maritima*	Coastal	Not assessed	Not listed	2
Bladdernut *Staphylea pinnata*		Not assessed	3	2
Golden feather grass *Stipa pulcherrima*	Tomillyar	Not assessed	3	2
Campanula komarovii	Juniper scrub, steppe meadow	Not assessed	3	2
Linum hirsutum	Steppe meadow	Not assessed	Not listed	2
Stinking juniper *Juniperus foetidissima*	Juniper scrub / woodland, shiblyak, tomillyar	Least Concern	2	1
Greek juniper *Juniperus excelsa*	Juniper scrub / woodland, shiblyak, tomillyar	Least Concern	2	1
Jurinea stoechaedifolia	Juniper scrub / woodland, shiblyak, tomillyar	Not assessed	Not listed	2
Goldendrop *Onosma polyphyllum*	Tomillyar / rocky areas	Not assessed	3	2
Paeonia kavachensis *Paeonia caucasica*	Juniper scrub / woodland, shiblyak, tomillyar	Not assessed	3	2
Red helleborine *Cephalanthera rubra*	Woodland	Not assessed	3	2
Chamaecytisus wulffii	Rocky areas, steppe meadow	Not assessed	Not listed	2
Rindera tetraspis	Juniper scrub / woodland, rocky areas	Not assessed	Not listed	1
Fibigia eriocarpa	Woodland	Not assessed	Not listed	2
Mt. Atlas mastic tree *Pistacia mutica*	Juniper scrub / woodland, shiblyak, tomillyar	Not assessed	3	1

Continued…

Name of Species	Habitat	Conservation Status		
		IUCN	RDB RF	RDB KK
Salvia ringens	Coastal	Not assessed	Not listed	2
Pyramidal orchid *Anacamptis pyramidalis*	Juniper scrub / woodland, tomillyar, steppe meadow/rocky areas	Not assessed	3	2
Early purple orchid *Orchis mascula*	Mesophilic forest	Not assessed	3	2
Monkey orchid *Orchis simia*	Mesophilic forest	Not assessed	3	2

Complete.

The density of red list plant species for each habitat type was estimated during the 2011 surveys for 14 of the total 26 species; the results presented within Table 11.6 below. Red list species were recorded within all habitat types apart from the coastal shingle and agricultural habitats. The greatest diversity of red list flora was found within the juniper woodlands (8 species), tomillyar (4 species) and rocky outcrops (five species).

Table 11.6 Density of Red List Plant Species within the Study Area (individuals per Ha)

	Habitat Type						
Species	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Greek juniper	25		220				
Stinking juniper			90				
Bladdernut		1					
Paeonia caucasica	300	120					
Salvia ringens							100
Mt. Atlas mastic tree			20				
Etruscan honeysuckle			100				
Rindera tetraspis			150				80
Goldendrop						120	150
Dwarf flag iris			180			200	100
Pyramidal orchid			100	80		80	160
Early purple orchid		80					
Monkey orchid			30		60		
Golden feather grass						70	

Biotopes: 1 – shiblyak; 2 – mesophilic woodland; 3 – juniper woodland; 4 – steppefied meadow; 5 – mesophilic meadow; 6 – tomillyar; 7 – rocky outcrops.

Flora Species

A - *Juniperus excelsa*
B - *Juniperus foetidissima*
C - *Paeonia kavachensis*
D - *Iris pumila*
E - *Veronica filifolia*
F - *Pistacia mutica*
G - *Salvia ringens*
H - *Jurinea stoechaedifolia*
I - *Astragalus subuliformis*
J - *Phlomis taurica*
K - *Siderites euxina*
L - *Crambe maritima*
M - *Anacamptis pyramidalis*
N - *Campanula komarovii*
O - *Cephalanthera rubra*
P - *Chamaecytisus wulffii*
Q - *Colchiëum umbrosum*
R - *Fibigia eriocarpa*
S - *Linum lanuginosum*
T - *Lonicera etrusca*
U - *Onosma polyphyllum*
V - *Orchis mascula*
W - *Orchis simia*
X - *Phlomis taurica*
Y - *Pistacia mutica*
Z - *Rindera tetraspi*
AA - *Staphylea pinnata*
AB - *Stipa pulcherrima*

Unnamed Tributary of the Sukko River
Shingar River
Graphova Gap
Kiblerova Gap

LEGEND

- Flora survey results
- Study area
- Juniper Woodlands
- Mesophilic Forest
- Mesophilic Meadow
- Vineyards And Orchards
- Residential Area And Ruderal Habitats
- Rocky Outcrops
- Seaside Gravel
- Shiblyak (Undersized Xerophilous Forest)
- Steppefied Secondary Meadow
- Tomillyar
- Rivers

Russian Sector of South Stream Offshore Pipeline

- Proposed landfall section pipelines
- Landfall facilities
- Proposed microtunnels
- Proposed offshore pipelines
- Construction corridor
- Cut and fill side slopes
- Temporary construction area for road construction
- Construction sites
- Permanent access road to be constructed by SSTTBV
- Temporary access road constructed by SSTTBV
- Varvarovka bypass road (used by Project during construction only)

United Gas Supply System

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

Projection: Lambert Conformal Conic

0 500 1,000 1,500 m

N

Purpose of Issue: For Information

Client: South Stream Offshore Pipeline — ENERGISING EUROPE

Project Title: SOUTH STREAM OFFSHORE PIPELINE

Drawing Title: STUDY AREA HABITATS AND FLORA RESULTS

Drawn	Checked	Approved	Date
DH	RW	MW	05 Mar 2014

URS Internal Project No.	Scale @ A3
46369082	1:18,000

This document has been prepared in accordance with the scope of URS' appointment with its client and is subject to the terms of that appointment. URS accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided. Only written dimensions shall be used.
© URS Infrastructure & Environment UK Limited

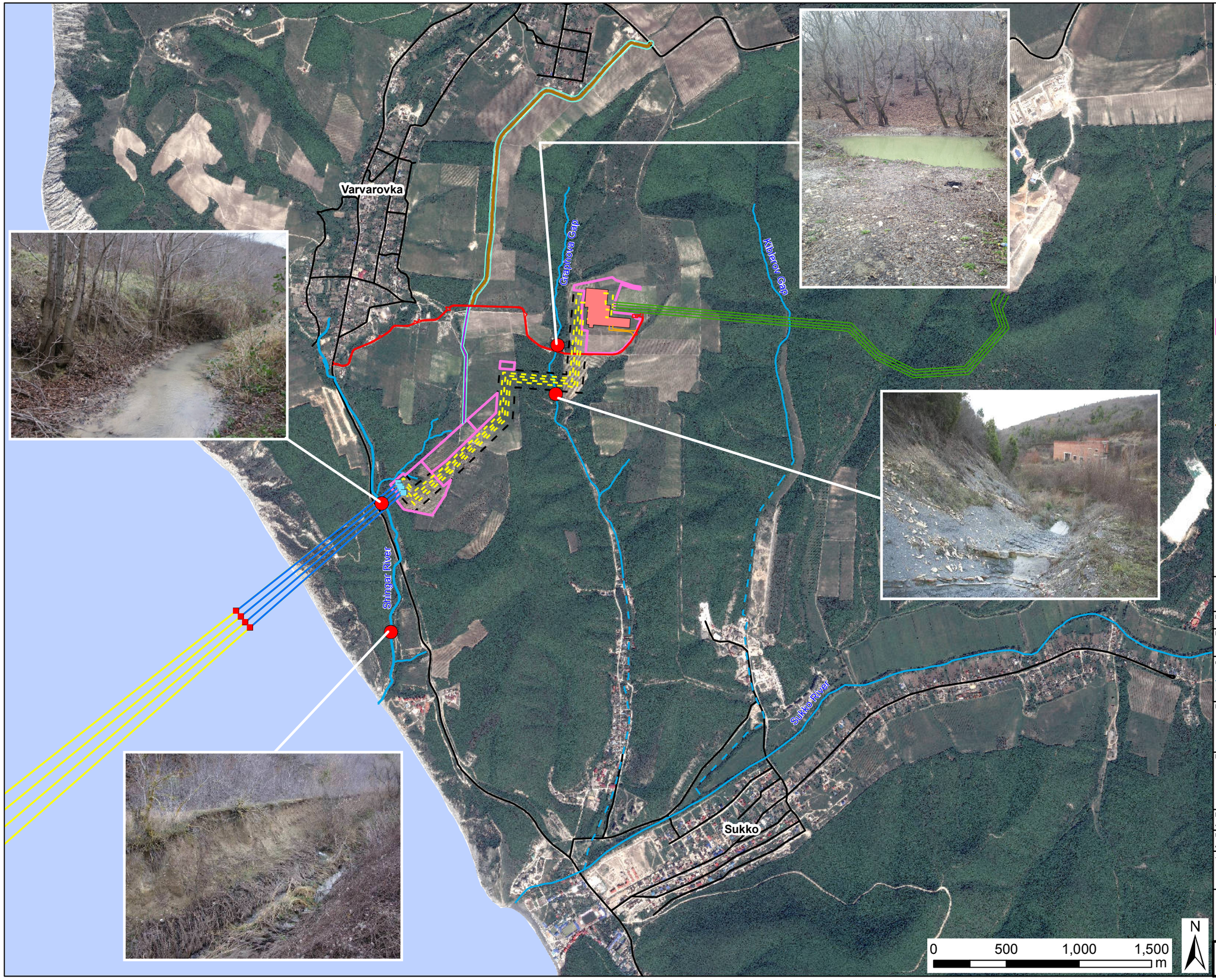
URS Infrastructure & Environment UK Limited
Scott House
Alençon Link, Basingstoke
Hampshire, RG21 7PP
Telephone (01256) 310200
Fax (01256) 310201
www.ursglobal.com

Drawing Number: Figure 11.6

Rev:

Plot Date: 05 Mar 2014
File Name:I:\5004 - Information Systems\46369082_South_Stream\MXDs\Report Maps - Russia\Russian ESIA v2\Chapter 11 Ecology\Figure 11-6 Landfall Study Area Habitats and Flora Results.mxd

This page has been left intentionally blank



LEGEND

- Photo locations
- Rivers
- Inferred watercourses
- Existing roads

Russian Sector of South Stream Offshore Pipeline

- Proposed landfall section pipelines
- Landfall facilities
- Proposed microtunnels
- Proposed offshore pipelines
- Microtunnel entry shaft
- Microtunnel exit pit
- Construction corridor
- Temporary construction area for road construction
- Construction sites
- Permanent access road to be constructed by SSTTBV
- Temporary access road constructed by SSTTBV
- Varvarovka bypass road (used by Project during construction only)

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: RIVER CROSSINGS AND PHOTOGRAPHS

Drawn	Checked	Approved	Date
JM	IS	MW	18 Feb 2014

URS Internal Project No.: 46369082

Scale @ A3: 1:25,000

This document has been prepared in accordance with the scope of URS' appointment with its client and is subject to the terms of that appointment. URS accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided. Only written dimensions shall be used.
© URS Infrastructure & Environment UK Limited

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 11.7

Rev:

Plot Date: 18 Feb 2014
File Name:I:\5004 - Information Systems\46369082_South_Stream\MXDs\Report Maps - Russia\Russian ESIA v2\Chapter 11 Ecology\Figure 11.7 River Crossings and Photographs.mxd

This page has been left intentionally blank

11.5.1.3 Fauna

Introduction

The mosaic of habitats described in the previous section, as well as their relative floristic diversity, provide suitable foraging, breeding, and sheltering habitat for a range of fauna (Ref. 11.9). During surveys undertaken in 2011, 2012, and 2013, a variety of invertebrate, amphibian reptile, bird and mammal species were recorded across the habitat types present within the Study Area. The results of these surveys are detailed below.

Invertebrates

According to secondary data, 43 red list invertebrate species have the potential to be present within the Study Area. All 43 are listed on the RDB KK and nine on the RDB RF. Three species have been assessed as threatened on the IUCN RL. Table 11.7 indicates their habitat preference and conservation status.

Targeted invertebrate surveys were not undertaken in the 2011 and 2013 surveys. During the 2012 surveys, six red list invertebrate species were recorded within the Study Area. These species are highlighted in **bold** in Table 11.7 and their locations are shown in Figure 11.8.

Subsequent to the field surveys, a meeting was held with Dr Semen Kustov from the Kuban State University to discuss the known distribution and ecology of the threatened species of invertebrate listed in Table 11.7. The aim of this meeting was to obtain additional information on the likelihood of these species to be present and on their habitat requirements. Based on the information obtained during the meeting, a number of these species are considered unlikely to be present within the Study Area:

- *Cardiophorus juniperinus* - Very rare species only known from two locations within Utrish. Requires juniper deadwood habitats occurring on the ground;
- *Platypteronyx auritus* – Has only been recorded within Utrish;
- *Kretania zamotajlovi* - Very rare species which has only been recorded from 3 locations within Utrish. Populations have been reduced by collectors and possibly number less than 500 individuals;
- *Zygaena laeta* – Only known from one site near Novorossiysk and has not been recorded since the 1980s. Possibly extinct; and
- *Jordanita graeca* – RDB KK record from Utrish is considered likely to be an error as the species is otherwise restricted to lowland habitats on the Taman Peninsula.

Table 11.7 Red List Invertebrate Species Potentially Present Within the Study Area

Habitat Preference	Species	Conservation Status		
		IUCN	RDB RF	RDB KK
Beetles - Coleoptera				
Mesophilic forest	Ground beetle sp. *Carabus caucasicus*	Not assessed	2	2
	Greater capricorn beetle *Cerambyx cerdo*	VU	Not listed	7
	Cerambyx nodulosus	Not assessed	2	2
	Rosalia longicorn *Rosalia alpina*	VU	2	2
	Flower beetle *Cetonischema speciosa*	Not assessed	Not listed	2
	Jewel beetle *Capnodis cariosa*	Not assessed	Not listed	2
	Stag beetle *Lucanus cervus*	Not assessed	2	7
	Necydalis ulmi	Not assessed	Not listed	3
	Forest caterpillar hunter *Calosoma sycophanta*	Not assessed	2	7
Juniper woodland	*Cardiophorus juniperinus*	Not assessed	Not listed	1B
Meadow	*Chrysochares asiaticus*	Not assessed	Not listed	3
Other	Weevil sp. *Lixus canescens*	Not assessed	Not listed	1B
	Weevil sp. *Platypteronyx auritus*	Not assessed	Not listed	1A

Continued...

Habitat Preference	Species	Conservation Status		
		IUCN	RDB RF	RDB KK
Moths and Butterflies - Lepidoptera				
Meadow	Argus sp. *Kretania zamotajlovi*	Not assessed	Not listed	1A
	Yellow-banded skipper *Pyrgus sidae*	Not assessed	Not listed	1B
	Levantine skipper *Thymelicus hyrax*	Not assessed	Not listed	1B
	Tesselated skipper *Muschampia tessellum*	Not assessed	Not listed	2
	Southern festoon *Zerynthia polyxena*	Not assessed	Not listed	2
	Caucasian spring copper *Tomares callimachus*	Not assessed	Not listed	2
	Eastern baton blue *Pseudophilotes vicrama schiffermulleri*	Not assessed	Not listed	2
	Zephyr blue ssp *Plebejides sephirus kubanensis*	Not assessed	Not listed	2
	Dalmatian ringlet *Proterebia afra*	Not assessed	Not listed	2
	Large blue *Maculinea arion*	NT	Not listed	2
	Clouded apollo *Parnassius mnemosyne*	Not assessed	2	7
	Moth sp. *Zygaena laeta*	Not assessed	Not listed	1A
	Moth sp. *Jordanita graeca*	Not assessed	Not listed	1B
	Moth sp. *Jordanita chloros*	Not assessed	Not listed	1B

Continued…

Habitat Preference	Species	Conservation Status		
		IUCN	RDB RF	RDB KK
	Moth sp. *Lemonia ballioni*	Not assessed	Not listed	1B
	Feathered footman *Spiris striata*	Not assessed	Not listed	3
	Brown tiger moth *Hyphoraia aulica*	Not assessed	Not listed	5
Tomillyar	Purple tiger moth *Rhyparia purpurata*	Not assessed	Not listed	3
Vineyard/orchard	Death's-head hawk moth *Acherontia atropos*	Not assessed	Not listed	3
Bees and Wasps - Hymenoptera				
Meadow	Bee sp. *Bombus zonatus*	Not assessed	Not listed	2
	Carpenter bee sp. *Xylocopa valga*	Not assessed	2	7
	Solitary wasp sp. *Scolia hirta*	Not assessed	Not listed	7
	Solitary wasp sp. *Scolia maculata*	Not assessed	Not listed	7
Other: Leaf Hoppers Hemiptera, Flies Diptera, Crickets Orthoptera, Mantids Mantidae, and Dragonflies Odonta				
Mesophilic forest	Leafhopper sp. *Fieberiella lugubris*	Not assessed	Not listed	3
Meadow	**Fly sp. *Neorhynchocephalus tauscheri***	Not assessed	Not listed	2
Meadow	Predatory bush cricket *Saga pedo*	VU	2	7
Juniper	Leafhopper sp. *Liguropia juniperi*	Not assessed	Not listed	3

Continued…

Habitat Preference	Species	Conservation Status		
		IUCN	RDB RF	RDB KK
Water	Blue emperor dragonfly *Anax imperator*	LC	2	7
Other	Mantis sp. *Empusa fasciata*	Not assessed	Not listed	2
Other	**Mantis sp. *Bolivaria brachyptera***	Not assessed	Not listed	7

Complete.

Aquatic Macro-invertebrates

The taxa recorded during the 2011 surveys are found in a range of benthic freshwater habitats. The community recorded in both streams included the larvae of caddis flies (Trichoptera), dragonflies (Odonata), mayflies (Ephemeroptera), mysids (Gammaridae) and polychaetes (Polychaeta), many of which are often associated with good quality waters. No red list species were recorded.

Fish

Six species of fish were recorded within the Study Area. Southern riffle minnow was abundant in both watercourses with western transcaucasian gudgeon, colchian minnow and Rodion's river goby occurring less frequently. In downstream reaches of the Shingar River, Caucasian chub and three-spine stickleback occurred in in low numbers. One species has been assessed on the IUCN RL and none are listed on the RDB RF. Rodion's river goby *Neogobius rhodioni* and Colchis minnow *Phoxinus phoxinus colchicus* are listed on the RDB KK within appendix 3 (Table 11.8).

Table 11.8 Fish species recorded within the Study Area

Species	IUCN	RDB RF	RDB KK
Southern riffle minnow *Alburnoides bipunctatus fasciatus*	Not assessed	Not listed	Not listed
Western transcaucasian chub *Gobio gobio lepidolaemus*	Not assessed	Not listed	Not listed
Rodion's river goby *Neogobius rhodioni*	Not assessed	Not listed	App 3
Colchis minnow *Phoxinus phoxinus colchicus*	Not assessed	Not listed	App 3

Continued…

Species	IUCN	RDB RF	RDB KK
Caucasian chub *Leuciscus cephalus orientalis*	Not assessed	Not listed	Not listed
Three-spine stickleback *Gasterosteus aculeatus*	LC	Not listed	Not listed

Complete.

Herpetofauna (Amphibians and Reptiles)

The woodland, grassland, wet and open habitats, as well as the ecotones (habitat edges) between them, provide suitable habitat for amphibian and reptile species. Desk study information indicated the potential presence of five amphibian and 16 reptile species within the Study Area (Ref. 11.9, Ref. 11.3, and Ref. 11.5). During the field surveys in 2011, 2012 and 2013 a total of five amphibian and 15 species of reptile were recorded (these are shown in **bold** in Table 11.9). Table 11.9 lists all herpetofauna species potentially present within the Study Area and their conservation status.

Two amphibian species and ten reptile species recorded during the field surveys are threatened at the regional, national, and/or international level. In addition, meadow lizard is assessed as Near Threatened by the IUCN. The locations of RDB herpetiles recorded during the 2011, 2012, and 2013 are presented on Figure 11.9 and Figure 11.10.

Bird Species
A - *Anser Ënser*
B - *Ardeola ralloides*
C - *Charadrius dubius*
D - *Circaetus gallicus*
E - *Coracias garrulus*
F - *Coturnix coturnix*
G - *Dendrocopos leucotos*
H - *Falco peregrinus*
I - *Falco vespertinus*
J - *Grus grus*
K - *Gypaetus barbatus*
L - *Haematopus ostralegus*
M - *Hieraaetus pennatus*
N - *Lullula arborea*
O - *Melanocorypha calandra*
P - *Monticola saxatilis*
Q - *Oenanthe pleschanka*
R - *Pernis apivorus*

Invertebrate Species
S - *Bolivaria brachyptera*
T - *Capnodis cariosa*
U - *Cetonischema speciosa speciosa*
V - *Lucanus cervus*
W - *Neorhynchocephalus tauscheri*
X - *Xylocopa valga*

Mammal Species
Y - *Chiroptera*

Unnamed Tributary of the Sukko River
Shingar River
Graphova Gap
Kiblerova Gap

0 500 1,000 1,500 m

N

LEGEND

Fauna survey results
- Birds
- Invertebrates
- Mammals
- Study area
- Rivers

Russian Sector of South Stream Offshore Pipeline
- Proposed landfall section pipelines
- Landfall facilities
- Proposed microtunnels
- Proposed offshore pipelines
- Construction corridor
- Temporary construction area for road construction
- Construction sites
- Permanent access road to be constructed by SSTTBV
- Temporary access road constructed by SSTTBV
- Varvarovka bypass road (used by Project during construction only)

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

Projection: Lambert Conformal Conic

Purpose of Issue: For Information

Client: South Stream Offshore Pipeline — ENERGISING EUROPE

Project Title: SOUTH STREAM OFFSHORE PIPELINE

Drawing Title: STUDY AREA FAUNA SURVEY RESULTS

Drawn	Checked	Approved	Date
DH	RW	MW	05 Mar 2014

URS Internal Project No.: 46369082
Scale @ A3: 1:18,000

This document has been prepared in accordance with the scope of URS' appointment with its client and is subject to the terms of that appointment. URS accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided. Only written dimensions shall be used.
© URS Infrastructure & Environment UK Limited

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

Drawing Number: Figure 11.8
Rev:

Plot Date: 05 Mar 2014
File Name:1:\5004 - Information Systems\46369082_South_Stream\MXDs\Report Maps - Russia\Russian ESIA v2\Chapter 11 Ecology\Figure 11-8 Landfall Study Area Fauna Survey Results.mxd

This page has been left intentionally blank

Table 11.9 Herpetofauna Potentially Present within the Study Area

Species	Latin Name	Conservation Status		
		IUCN	*RDB RF*	*RDB KK*
Amphibians				
Green toad *Pseudepidalea viridis*		LC	Not listed	Not listed
European tree frog *Hyla arborea schelkownikowi*		LC	Not listed	Not listed
Eurasian marsh frog *Pelophylax ridibundus*		LC	Not listed	Not listed
Caucasian toad *Bufo verrucosissimus*		NT	2	7
Long-legged wood frog *Rana macrocnemis*		LC	Not listed	3
Reptiles				
Nikolski's tortoise		CR	1	1B, EN
European Pond Turtle *Emys orbicularis*		NT	Not listed	3
European glass lizard *Pseudopus apodus*		Not assessed	Not listed	1B, EN
Slow worm *Anguis fragilis*		Not assessed	Not listed	Not listed
Meadow lizard *Darevskia praticola*		NT	Not listed	Not listed
Brauner's rock Lizard *Darevskia brauneri*		LC	Not listed	3
Sand lizard *Lacerta agilis exigua*		LC	Not listed	3
Three-lined lizard *Lacerta media*		LC	3	3
Grass snake *Natrix natrix*		LC	Not listed	Not listed

Continued…

Species	Latin Name	Conservation Status		
		IUCN	*RDB RF*	*RDB KK*
Tessellated water snake	*Natrix tessellata*	LC	Not listed	Not listed
Smooth snake	*Coronella austriaca*	Not assessed	Not listed	Not listed
Steppe Viper	*Pelias renardi*	Not assessed	Not listed	3
Caspian whipsnake	*Hierophis caspius*	Not assessed	Not listed	3
Pallas whipsnake	*Elaphe sauromates*	Not assessed	Not listed	3
Aesculapian ratsnake	*Zamenis longissima*	LC	2	2
Dahl's Whip Snake	*Platyceps najadum*	LC	Not listed	3

Complete.

The preferred habitat of herpetofauna recorded within the Study Area was identified through literature review (Ostrovskikh and Chuskin 1998, Ostrovskikh and Plotnikov 2006, as are cited within Ref. 11.9), through consultation with Dr. Olga Leontyeva, and through observations made during the 2011, 2012 and 2013 field surveys. These are summarised in Table 11.10.

Table 11.10 Herpetofauna habitat preferences within the Study Area

Species	Coastal Shingle	Rocky Outcrops	Juniper Woodland	Tomillyar	Shiblyak	Mesophilic Forest	Mesophilic Meadow	Steppefied Meadow	Agricultural Habitats
Amphibians									
Green toad					-	-	-	-	+
European tree frog					+	+	+	+	+
Eurasian Marsh frog						+	+		

Continued…

Species	Coastal Shingle	Rocky Outcrops	Juniper Woodland	Tomillyar	Shiblyak	Mesophilic Forest	Mesophilic Meadow	Steppefied Meadow	Agricultural Habitats
Caucasian Toad					+	+	+	+	
Long-legged wood frog						+			
Reptiles									
Nikolski's tortoise		+	+	+	+	+	-	+	-
European glass lizard		+	+	+	+	+	-	+	-
Slow worm						+	+		-
Meadow lizard			-		+	+	+	+	
Brauner's rock lizard		+			-				
Sand lizard						+	+	+	
Three-lined lizard		+	+	+					
Grass snake	+					+	+		
Tessellated Water snake	+					+			
Smooth snake				-			+		
Steppe viper								+	-
Caspian whipsnake			+	+	+	-	-	+	_

Continued...

Species	Coastal Shingle	Rocky Outcrops	Juniper Woodland	Tomillyar	Shiblyak	Mesophilic Forest	Mesophilic Meadow	Steppefied Meadow	Agricultural Habitats
Pallas whipsnake			+		+			-	
Aesculapian ratsnake			+	+	+	+		+	+
Dahl's whipsnake			+	+	+			-	

Notes: + High probability of habitat occupation; - Low probability of habitat occupations; 'blank' Occupation unlikely.

Complete.

The coastal shingle habitats within the Study Area were shown to support grass snake and tessellated water snake, both of which prey on fish present along the coastal strip (Ref. 11.9). Brauner's rock lizard was also recorded on the coastal cliffs and rocky outcrops habitat basking and feeding on small invertebrates present within the habitat.

Within the stands of juniper woodland, three species were recorded during field surveys: Nikolski's tortoise, European glass lizard and Dahl's whipsnake. In addition to these species, other reptile species including meadow lizard, large whipsnake, and Pallas whipsnake potentially occur within this habitat (Ref. 11.9).

The structure and plant species contained within the areas of tomillyar habitat are relatively similar to that in juniper woodland. Consequently, similar species of reptile are supported by these habitats, including glass lizard, large whipsnake, Dahl's whipsnake, three-lined lizard and Nikolski's tortoise (Ref. 11.9).

Within the stands of shiblyak woodland, Nikolski's tortoise, European glass lizard, Pallas whipsnake, and meadow lizard were recorded during the 2011, 2012 and 2013 surveys. European tree frog was also recorded within this habitat. The shiblyak habitat within the Study Area is structurally and floristically relatively diverse, providing a variety of habitats for reptiles and amphibians to forage, bask, shelter, and breed (Ref. 11.9).

Conditions within the mesophilic woodlands suit reptiles and amphibians that favour moist or wetter environments, including tessellated water snake, grass snake, marsh frog and European tree frog. Meadow lizards and sand lizards were also recorded within these areas during the surveys (Ref. 11.9). Where the mesophilic forest areas grade into mesophilic meadow, species favouring these edge habitats were found. This included tessellated water snake, large whip snake, smooth snake, slow worm, sand lizard, and meadow lizard (Ref. 11.9).

The steppefied secondary meadow was shown to support Nikolski's tortoise, European glass lizard, meadow lizard, and sand lizard. Although not recorded in these habitat areas during any of the surveys large and Pallas whipsnake, may occur within these areas.

Nikolski's tortoise is known to occur within agricultural habitats early in the season (April to early May); however, none were recorded in this habitat type during the field surveys. Other species of snake and lizard may be present in agricultural habitats but were also not recorded. Two species of amphibian; green toad and Caucasian toad were recorded in or on the tracks adjacent to the vineyards in August 2013. It is considered that due to the relatively high levels of human disturbance within agricultural habitats, the occurrence of these species is, in general, short-term and episodic (Ref. 11.9). These habitats are thus not considered optimal habitat for many reptile and amphibian species. That said, for opportunistic species, such as the large whipsnake and Pallas whipsnake, the suitability of these areas increases during the orchard and vineyard fruiting periods, as numbers of prey species such as birds and rats increase within these areas at these times (Ref. 11.9).

It is important to note that the distribution of reptile and amphibians within the Study Area changes according to seasonal and climatic variability. In the spring and autumn months, when temperatures are generally cooler, reptiles prefer open habitats where they are able to bask and warm themselves. During the summer months when temperatures are very high and there is a general lack of moisture within open habitats, reptiles will move to the forest areas where it is cooler. Amphibians such as the European tree frog, Eurasian marsh frog, green toad and Caucasian toad will be present in ponds and waterbodies during the breeding season (roughly March – July), but as these ephemeral waterbodies dry up these species will move to adjacent terrestrial habitat (Ref. 11.9).

Based on the surveys undertaken in 2011, the relative abundance of each reptile and amphibian species present within the Study Area was determined. Table 11.11 below summarises this information for each species.

Table 11.11 Relative abundance of reptiles and amphibians within the Study Area

Species	Nature of the occurrence	Abundance
Green toad	Individual specimens infrequently observed along some transect routes	Rarely occurring species within the Study Area.
Slow worm		
Three-lined lizard		
Grass snake		
Smooth snake		
Large whipsnake		
Pallas whipsnake		
Dahl's whipsnake		

Continued…

Species	Nature of the occurrence	Abundance
European tree frog	Individual species regularly observed on some transect routes	Occasionally occurring species within the Study Area
Eurasian marsh frog		
Nikolski's tortoise		
Brauner's rock lizard		
Tesselated water snake		
European glass lizard	Small numbers of these species regularly observed along the transect routes	Frequently occurring species within the Study Area
Sand lizard		
Meadow lizard	Large numbers of species regularly observed along transect routes.	Abundant species within the Study Area

Complete.

Herpetile Hibernation Habitat Preference

All species of reptile and amphibian hibernate, and it is considered that this could happen in all habitat types within the Study Area, with the exception of active vineyards. However, the results of surveys undertaken by Dr. Olga Leontyeva during October – November 2013 (during which 51 individual Nikolski's tortoise were recorded), suggest that Nikolski's tortoise may favour hibernation sites near the ecotone between the forested valleys and meadows (see Figure 11.9); during the survey, Dr. Leontyeva stated that these data indicate that individuals are moving into these areas to hibernate over the winter period (Ref. 11.14).

In terms of hibernation habitat preferences for other herpetile species, they will find old animal burrows, cracks in tree roots or other suitable areas (e.g. under large logs, rubbish or under buildings) within grassland or forest areas for hibernation, but generally within areas with suitable vegetation coverage.

The hibernation season will vary slightly from species to species and according to prevailing night-time temperatures. However, in general terms is considered to last from mid-October to mid-April. Nikolski's tortoise will begin to emerge from hibernation after approximately five consecutive days where night-time temperatures have been above 10^{o}C.

Nikolski's Tortoise Population Estimate

Given the high sensitivity of Nikolski's tortoise (i.e. listed as internationally Critically Endangered), an attempt was made to determine the size of the population likely to be supported within the Study Area. An estimate was derived from a review of studies undertaken since 1985, and consideration of data obtained during the targeted Nikolski's tortoise field survey undertaken for the Project by Dr. Olga Leontyeva between October and November 2013.

Studies reviewed included the following:

- Inozemtsev and Pereshkolnik in 1985 (Ref. 11.15);
- Lukina and Sokolenko in 1991 (Ref. 11.16);
- Pestov and Leontyeva In 2011 (Ref. 11.17); and
- Leontyeva *et al.* in 2012 (Ref. 11.18).

Inozemtsev and Pereshkolnik (1985) state that the species can occur in densities of 0.2 to 0.5 per ha depending on the type and quality of the habitats present. Lukina and Sokolenko (1991) recorded 0.2/ha in Sochi National Park and in the Anapa district on the edge of agricultural land. Based on the total area of 'suitable' habitat contained within the Study Area (691 ha, a figure which excludes agricultural and urban habitats which are generally considered to be sub-optimal for supporting tortoises), this would equate to a population of between 138 – 345 individuals for the Study Area.

Pestov and Leontyeva (2011) calculated a range of population densities for different habitat types, based on data from over 300 km of transects completed during 2007-2011 on the Abrau Peninsula (Ref. 11.17). Table 11.12 presents the derived density figures / habitat type (ha).

Table 11.12 Calculated densities of Nikolski tortoise within the Study Area based on Pestov and Leontyeva (2011)

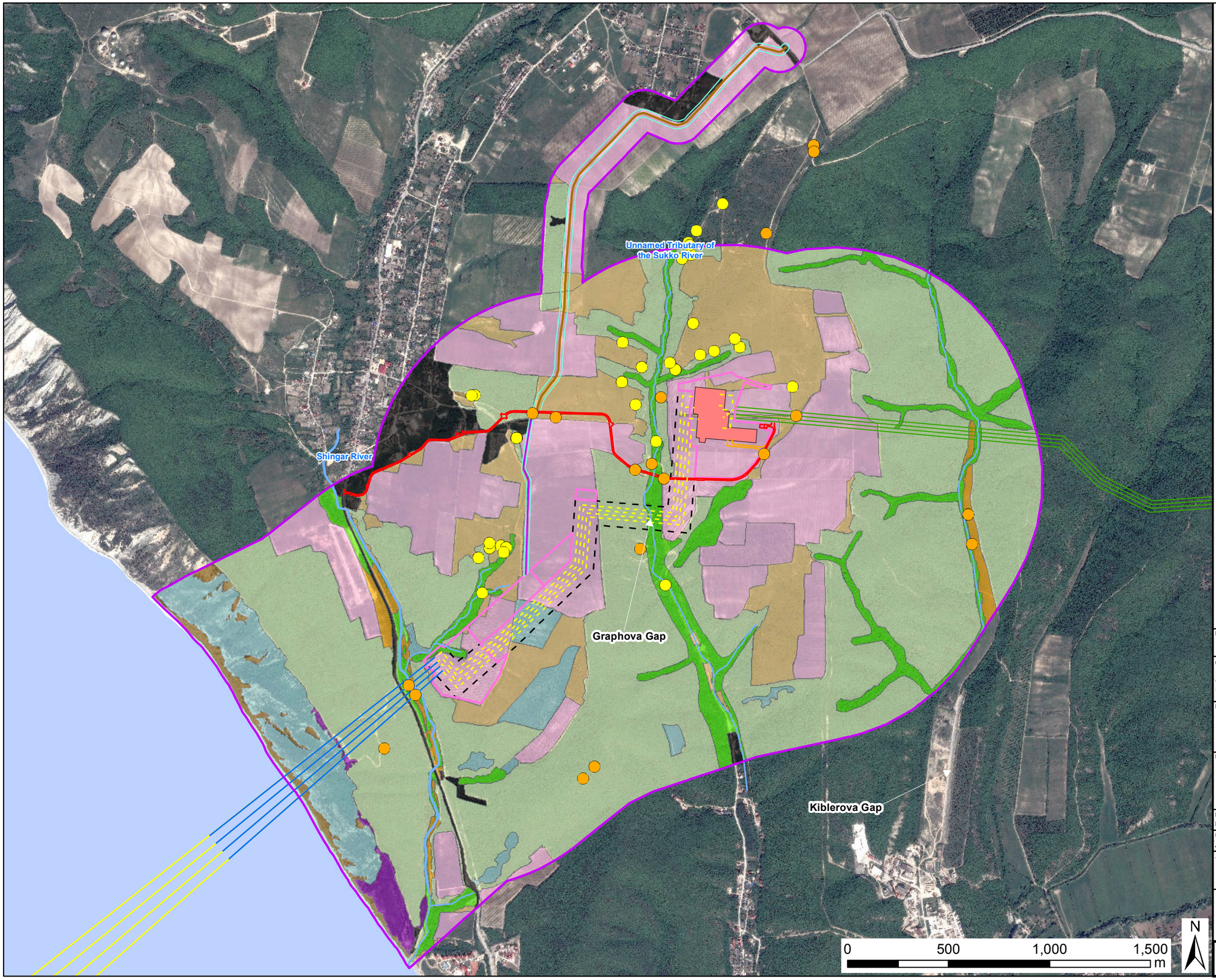
Habitat	Area of Habitat within Study Area	Published density for similar habitat type	Estimated Number of Individuals
Juniper woodlands	56	1.95 – 2.85	109.2 – 159.6
Shiblyak / mesophilic woodland	489	0.1 – 1.6	48.9 – 782.4
Open habitats (includes meadow and tomillyar)	111	2.2	279.4
Other (includes rocky outcrops and coastal shingle)	11	Unknown	Unknown
Total			**438 – 1221**

Therefore, based on the density data published by Pestov and Leontyeva (2011), the Project Study Area has the potential to support between 437 and 1220 individual tortoises.

The late autumn 2013 survey by Dr. Leontyeva was undertaken to refine the tortoise population estimate for the Study Area (see Section 11.4.4.1). This survey recorded a total of 51 individuals within the Tortoise Survey Area; taking into consideration the seasonal limitations of the survey (see Section 11.4.5.2), it is likely that larger numbers of individuals would be recorded during more suitable survey conditions.

Moreover, the vast majority of the adult individuals recorded (24 of the individuals recorded were juveniles) during the survey were female (21 of 27). Considering that the sex ratio within Nikolski's tortoise populations has generally been shown to be 1:1 (Ref. 11.19), it can be inferred that at least another 21 males are likely to be present within the Tortoise Survey Area. Therefore, the minimum density of tortoises within the Tortoise Survey Area (130 ha) is likely to be 0.55 individuals per hectare. Extrapolated to the entire Study Area (taken to include approximately 556 ha of suitable habitat) would provide an estimate population size of approximately 350 individuals. However, further survey is recommended to refine this estimate (see Section 11.6.9.4).

The population of Nikolski's tortoise within the Abrau peninsula has been estimated by Dr. Leontyeva to be in the region of 7000 individuals (Ref. 11.20). If the Study Area is assumed to support a population of 150 to 350 individuals (and potentially more), then the Study Area would support approximately 2 to 5% of total population of the Abrau peninsula; ecologically, this is considered to be a significant portion of the regional population).



LEGEND

Fauna survey results

- Pre-October 2013 Survey Records
- October 2013 Survey Records
- Study area
- Rivers

Russian Sector of South Stream Offshore Pipeline

- Proposed landfall section pipelines
- Landfall facilities
- Proposed microtunnels
- Proposed offshore pipelines
- Construction corridor
- Temporary construction area for road construction
- Construction sites
- Permanent access road to be constructed by SSTTBV
- Temporary access road constructed by SSTTBV
- Varvarovka bypass road (used by Project during construction only)

United Gas Supply System

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

Projection: Lambert Conformal Conic

Purpose of Issue: For Information

Client: South Stream Offshore Pipeline — ENERGISING EUROPE

Project Title: SOUTH STREAM OFFSHORE PIPELINE

Drawing Title: STUDY AREA FAUNA SURVEY RESULTS NIKOLSKI'S TORTOISE RECORDS

Drawn	Checked	Approved	Date
DH	RW	MW	05 Mar 2014

URS Internal Project No.	Scale @ A3
46369082	1:18,000

This document has been prepared in accordance with the scope of URS' appointment with its client and is subject to the terms of that appointment. URS accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided. Only written dimensions shall be used.
© URS Infrastructure & Environment UK Limited

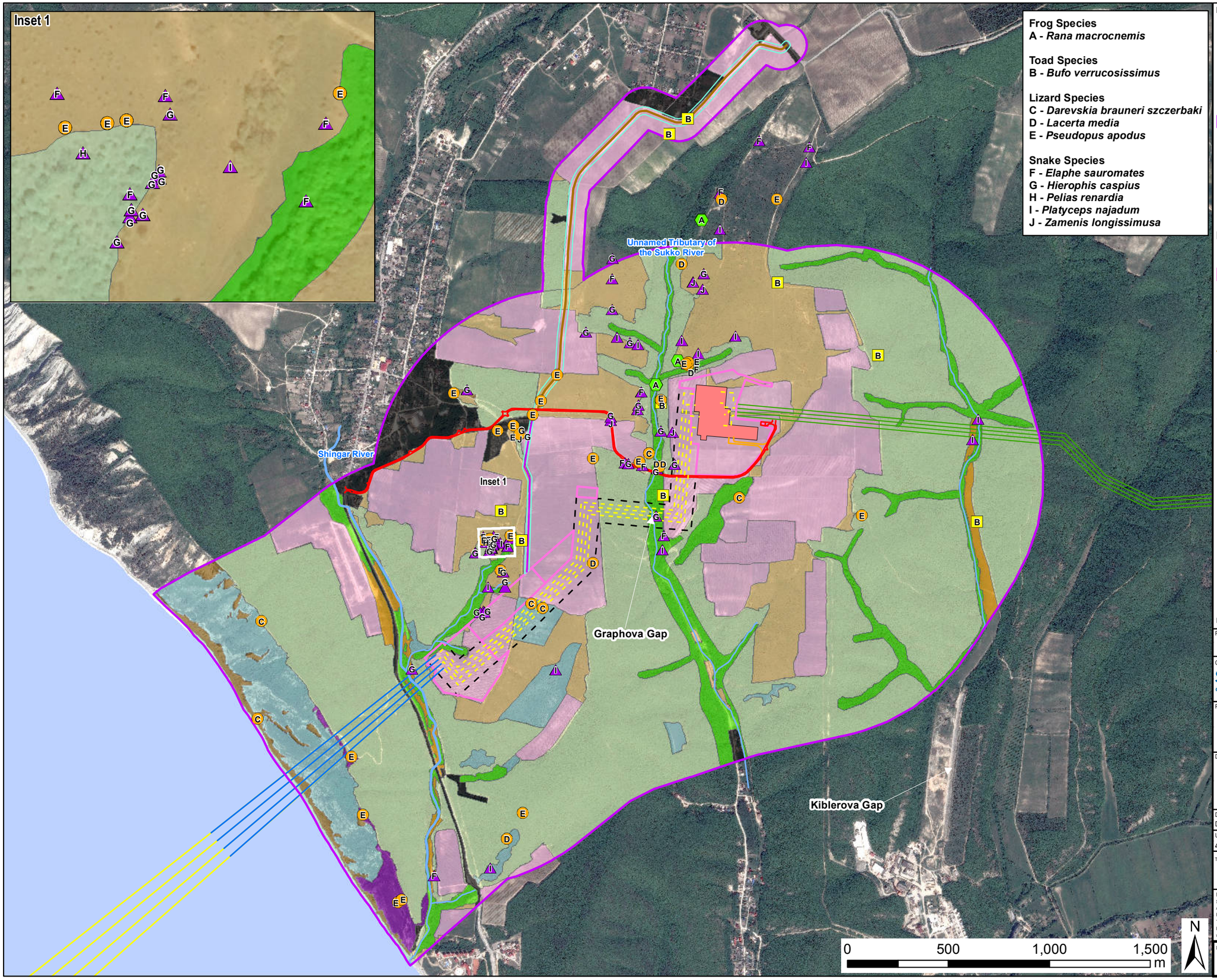
URS Infrastructure & Environment UK Limited
Scott House
Alençon Link, Basingstoke
Hampshire, RG21 7PP
Telephone (01256) 310200
Fax (01256) 310201
www.ursglobal.com

Drawing Number: Figure 11.9

Rev:

Plot Date: 05 Mar 2014
File Name:I:\5004 - Information Systems\46369082_South_Stream\MXDs\Report Maps - Russia\Russian ESIA v2\Chapter 11 Ecology\Figure 11-9 Landfall Study Area Nikolskis Tortoise Records.mxd

This page has been left intentionally blank



Frog Species
A - *Rana macrocnemis*

Toad Species
B - *Bufo verrucosissimus*

Lizard Species
C - *Darevskia brauneri szczerbaki*
D - *Lacerta media*
E - *Pseudopus apodus*

Snake Species
F - *Elaphe sauromates*
G - *Hierophis caspius*
H - *Pelias renardia*
I - *Platyceps najadum*
J - *Zamenis longissimusa*

LEGEND

Fauna survey results
- Frogs
- Toads
- Lizards
- Snakes
- Study area
- Rivers

Russian Sector of South Stream Offshore Pipeline
- Proposed landfall section pipelines
- Landfall facilities
- Proposed microtunnels
- Proposed offshore pipelines
- Construction corridor
- Temporary construction area for road construction
- Construction sites
- Permanent access road to be constructed by SSTTBV
- Temporary access road constructed by SSTTBV
- Varvarovka bypass road (used by Project during construction only)

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

Projection: Lambert Conformal Conic

Purpose of Issue: For Information

Client: South Stream Offshore Pipeline / South Stream Energising Europe

Project Title: SOUTH STREAM OFFSHORE PIPELINE

Drawing Title: STUDY AREA FAUNA SURVEY RESULTS RED DATA BOOK HERPETILES

Drawn	Checked	Approved	Date
DH	RW	MW	05 Mar 2014

URS Internal Project No.	Scale @ A3
46369082	1:18,000

This document has been prepared in accordance with the scope of URS' appointment with its client and is subject to the terms of that appointment. URS accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided. Only written dimensions shall be used.
© URS Infrastructure & Environment UK Limited

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 11.10

Rev:

Plot Date: 05 Mar 2014
File Name:I:\5004 - Information Systems\46369082_South_Stream\MXDs\Report Maps - Russia\Russian ESIA v2\Chapter 11 Ecology\Figure 11-10 Landfall Study Area Red Book Herpiles.mxd

This page has been left intentionally blank

Birds

The Study Area consists of a range of habitats that between them support a diverse assemblage of birds. In total, 137 species were recorded during the 2011, 2012 and 2013 bird surveys.

The species are classified by the following ecological status:

- Resident (R) – these species are present all year round and breed within the Study Area;
- Breeding Migrant (BM) – these species migrate to and breed within the Study Area during the summer months (indicatively April – September); and
- Non-breeding Migrant (NBM) – these species do not breed within the Study Area but migrate through the area. These species can be present at any point during the year but the majority would are present during spring (April / May) and autumn (July to October) passage.

None of the species recorded within the Study Area are considered likely to be present during the winter months only. A full species list of birds recorded and their ecological status is included in Table 11.13 below.

Table 11.13 Species recorded during the 2011, 2012 and 2013 survey and their ecological status on site

Species	Scientific Name	R	BM	NBM
Mute swan	*Cygnus olor*			+
Whooper swan	*Cygnus cygnus*			+
White-fronted goose	*Anser albifrons*			+
Greylag goose	*Anser anser*			+
Common quail	*Coturnix coturnix*		+	
Grey partridge	*Perdrix perdrix*	+		
Common pheasant	*Phasianus colchicus*	+		
Little bittern	*Ixobrychus minutus*			+
Black-crowned night-heron	*Nycticorax nycticorax*			+
Squacco heron	*Ardeola ralloides*			+
Great egret	*Egretta alba*			+

Continued…

Species	Scientific Name	R	BM	NBM
Little egret	*Egratta garzetta*			+
Grey heron	*Ardea cinerea*			+
Purple heron	*Ardea purpurea*			+
European honey buzzard	*Pernis apivorus*		+	+
Black kite	*Milvus migrans*			+
Egyptian vulture	*Neophron percnopterus*			+
Short-toed nnake-eagle	*Circaetus gallicus*		+	
Western marsh-harrier	*Circus aeruginosus*		?	+
Hen harrier	*Circus cyaneus*			+
Montagu's harrier	*Circus pygargus*		?	+
Northern goshawk	*Accipiter gentilis*		+	
Eurasian sparrowhawk	*Accipiter nisus*	+		
Steppe buzzard	*Buteo buteo vulpinus*		+	
Booted eagle	*Hieraaetus penatus*		+	
Common kestrel	*Falco tinnunculus*	+		
Red-footed falcon	*Falco vespertinus*		+	+
Eurasian hobby	*Falco subbuteo*		+	
Peregrine falcon	*Falco peregrinus*	+		
Common crane	*Grus grus*			+
Little bustard	*Tetrax tetrax*			+
Eurasian oystercatcher	*Haematopus ostralegus*			+
Grey plover	*Pluvialis squatarola*			+
Northern lapwing	*Vanellus vanellus*			+

Continued...

Species	Scientific Name	R	BM	NBM
Little ringed plover	*Charadrius dubius*		+	
Broad-billed sandpiper	*Limicola falcinellus*			+
Common sandpiper	*Actitis hypoleucos*		+	+
Eurasian woodcock	*Scolopax rusticola*			+
Rock pigeon	*Columba livia*	+		
Common wood-pigeon	*Columba palumbus*		+	
Eurasian collared dove	*Streptopelia decaocto*	+		
European turtle dove	*Streptopelia turtur*		+	
Common cuckoo	*Cuculus canorus*		+	
Eurasian scops owl	*Otus scops*		+	
Little owl	*Athene noctua*	+		
Tawny owl	*Strix aluco*	+		
Long-eared owl	*Asio otus*	+		
Eurasian nightjar	*Caprimulgus europaeus*		+	
Common swift	*Apus apus*		+	
Alpine swift	*Apus melba*		+	
Common kingfisher	*Alcedo atthis*			+
European bee-eater	*Merops apiaster*		+	
European roller	*Corcacias garrulous*		+	
Eurasian hoopoe	*Upapa epops*		+	
Eurasian wryneck	*Jynx torquilla*		+	
Black woodpecker	*Dryocopus martius*	+		
Eurasian green woodpecker	*Picus viridis*	+		

Continued...

Species	Scientific Name	R	BM	NBM
Great spotted woodpecker	*Dendrocopos major*	+		
Middle spotted woodpecker	*Dendrocopos medius*	+		
White-backed woodpecker	*Dendrocopos leucotos*	+		
Lesser spotted woodpecker	*Dendrocopos minor*	+		
Eurasian golden oriole	*Oriolus oriolus*		+	
Red-backed shrike	*Lanius collurio*		+	
Lesser grey shrike	*Lanius minor*		+	
Black-billed magpie	*Pica pica*	+		
Eurasian jay	*Garrulus glandarius*	+		
Rook	*Corvus frugilegus*	+		
Hooded crow	*Corvus cornix*	+		
Common raven	*Corvus corax*	+		
Goldcrest	*Regulus regulus*		+	
Blue tit	*Cyanistes caeruleus*	+		
Great tit	*Parus major*	+		
Coal tit	*Periparus ater*	+		
Marsh tit	*Parus palustris*	+		
Calandra lark	*Melanocorypha clanadra*		+	
Crested lark	*Galerida cristata*		+	
Wood lark	*Lullula arborea*		+	
Sky lark	*Alauda arvensis*		+	
Barn swallow	*Hirundo rustica*		+	
House martin	*Delichon urbica*		+	

Continued…

Species	Scientific Name	R	BM	NBM
Red-rumped swallow	*Cecropis daurica*		+	
Long-tailed tit	*Aegithalos caudatus*	+		
Green warbler	*Phylloscopus nitidus*		+	
Wood warbler	*Phylloscopus sibilatrix*		+	
Common shiffchaff	*Phylloscopus collybita*		+	
Willow warbler	*Phylloscopus trochilus*		+	
Blackcap	*Sylvia atricapilla*		+	
Garden warbler	*Sylvia borin*		+	
Barred warbler	*Sylvia nisoria*		+	
Lesser whitethroat	*Sylvia curruca*		+	
Common whitethroat	*Sylvia communis*		+	
Icterine warbler	*Hippolais icterina*		+	
Marsh warbler	*Acrocephalus palustris*		+	
Eurasian reed warbler	*Acrocephalus scirpaceus*		+	
Wood nuthatch	*Sitta europaea*	+		
Eurasian treecreeper	*Certhia familiaris*	+		
Winter wren	*Troglodytes troglodytes*	+		
Common starling	*Sternus vulgaris*		+	
Rosy starling	*Sturnus roseus*			+
Eurasian blackbird	*Turdus merula*	+		
Song thrush	*Turdus philomelos*		+	
Mistle thrush	*Turdus viscivorus*		+	
Spotted flycatcher	*Muscicapa striata*		+	

Continued...

Species	Scientific Name	R	BM	NBM
European robin	*Erithacus rubecula*		+	
Common nightingale	*Luscinia megarhynchos*		+	
Bluethroat	*Luscinia svecica*		?	+
Red-breasted flycatcher	*Ficedula parva*		+	
Collared flycatcher	*Ficedula albicollis*		+	
European pied flycatcher	*Ficedula hypoleuca*			+
Black redstart	*Phoenicurus ochruros*		+	
Common redstart	*Phoenicurus phoenicurus*		+	
Rufous-tailed rock-thrush	*Monticola saxatilis*		+	
Whinchat	*Saxicola rubetra*		+	
Common stonechat	*Saxicola torquatus*		?	+
Isabelline wheatear	*Oenanthe isabellina*			+
Northern wheatear	*Oenanthe oenanthe*		+	
Pied wheatear	*Oenanthe pleschanka*		+	
Black-eared wheatear	*Oenanthe hispanica*			+
House sparrow	*Passer domesticus*	+		
Eurasian tree sparrow	*Passer montanus*	+		
Blue-headed wagtail	*Motacilla flava flava*		?	+
Black-headed wagtail	*Motacilla flava feldegg*		?	
White wagtail	*Motacilla alba alba*		+	
Tawny pipit	*Anthus campestris*		+	
Tree pipit	*Anthus trivialis*		+	
Eurasian chaffinch	*Fringilla coelebs*		+	

Continued...

Species	Scientific Name	R	BM	NBM
European greenfinch	*Chloris chloris*		+	
European goldfinch	*Carduelis carduelis*	+		
Eurasian linnet	*Carduelis cannabina*	+		
Red crossbill	*Loxia curvirostra*		+	
Common rosefinch	*Carpodacus erythrinus*	+		
Eurasian bullfinch	*Pyrrhula pyrrhula*		+	
Hawfinch	*Coccothraustes coccothraustes*	+		
Yellowhammer	*Emberiza citrinella*	+		
Rock bunting	*Emberiza cia*	+		
Ortolan Bunting	*Emberiza hortulana*		+	
Corn bunting	*Emberiza calandra*	+		

Complete.

Breeding Birds

A total of 107 species were recorded which are considered to breed or possibly breed within the Study Area (Ref. 11.9). Of these, 39 species are thought to be present all year-round and do not migrate. The remaining 68 species breed during the spring and summer months and over-winter in other regions. Species were recorded breeding within all habitats surveyed and the large recorded assemblage is as a result of the diversity of habitats present within the Study Area.

In 2011, comprehensive bird surveys were completed which aimed to record the densities of breeding birds within each terrestrial habitat type. Those species that could be affected by the Project are shown in Table 11.14. Densities of breeding birds recorded within settlements, rocky outcrops and along the shoreline are not shown as these habitat types will not be affected by the Project, although species of conservation concern recorded within these areas are discussed.

Table 11.14 Densities of Breeding Bird by Habitat Type (pairs / km^2)

Species	MF	S	SSM	MM	JW	AH
Common quail			8.37	7.50		
Grey partridge			2.28	3.75		3.09
Common pheasant	1.50		4.94		0.94	
European honey buzzard	**					
Short-toed snake-eagle	0.50					
Western marsh-harrier			*			
Montagu's harrier			*			
Northern goshawk	1.50					
Eurasian sparrowhawk	*					
Steppe buzzard	6.50					
Booted eagle	0.50					
Common kestrel	1.50		0.76			
Common wood-pigeon	10.00	2.40			3.14	
European turtle dove	11.50	23.98			6.29	4.76
Common cuckoo	10.00	5.52	3.42			3.57
Scops owl	6.50	0.72				
Tawny owl	7.00					
Long-eared owl	6.50	2.40				3.57
Eurasian nightjar	3.00	1.44				
Eurasian wryneck	5.00					

Continued…

Species	MF	S	SSM	MM	JW	AH
Black woodpecker	6.50					
Eurasian green woodpecker	5.00					
Great spotted woodpecker	18.00	5.52			3.14	
Lesser spotted woodpecker	6.50	3.12				
Middle spotted woodpecker	5.50					
Eurasian golden oriole	5.00					
Red-backed shrike	5.00		22.81			6.19
Lesser grey shrike			3.80		12.58	
Black-billed magpie		2.40	3.80		3.14	4.76
Eurasian jay	6.50	5.52			3.14	3.57
Hooded crow	1.50					
Common raven	3.00					
Blue tit	6.50	4.80				3.57
Great tit	45.00	29.26			6.29	5.48
Coal tit	8.00	6.98				
Marsh tit	6.50					
Calandra lark			4.94			6.19
Wood lark	5.00		7.60			10.31
Sky lark			10.65	5.00		11.34
Long-tailed tit	5.00					
Green warbler	13.00	8.63				

Continued…

Species	MF	S	SSM	MM	JW	AH
Wood warbler	4.50	4.80				
Common chiffchaff	24.50	14.39			7.23	7.14
Blackcap	16.50	10.31				7.14
Garden warbler	8.00	3.84	3.80			4.76
Barred warbler	5.00	4.80	4.94			
Lesser whitethroat	3.00					
Common whitethroat			30.42	16.25		3.57
Marsh warbler			4.94	3.75		
Wood nuthatch	10.00	9.35				
Eurasian treecreeper	5.00					
Winter wren	14.50	7.19				
Common starling	3.00					
Eurasian blackbird	35.00	16.79			6.29	3.57
Song thrush	10.00	4.80				
Mistle thrush	5.00					
Spotted flycatcher	5.00					
European robin	8.00	7.19				
Common nightingale	15.00	6.24				
Red-breasted flycatcher	11.50					
Collared flycatcher	6.50					
Black redstart						6.19
Common redstart	13.00	6.24			10.38	13.40
Whinchat			4.94	3.75		

Continued…

Species	MF	S	SSM	MM	JW	AH
White wagtail						3.09
Tawny pipit	6.50		3.80			3.09
Tree pipit		5.52	6.08	5.00		9.28
Eurasian chaffinch	41.50	45.56			8.18	11.90
European greenfinch	6.50	7.19	4.94		19.81	10.71
European goldfinch	10.00	14.39	7.60		10.38	14.29
Eurasian linnet	5.00	9.59	8.75			7.14
Common rosefinch	5.00	6.24			7.23	4.76
Hawfinch	8.00					
Yellowhammer	5.00	4.80	8.75			3.57
Rock bunting			3.80			
Ortolan bunting		4.80	26.62	7.50		7.14
Corn bunting			32.70	12.50		3.09

MF – Mesophilic Forest, S – Shiblyak, SSM – Steppefied Secondary Meadow, MM – Mesphilic Meadow, JW – Juniper Woodland (with tomillares), AH – Agricultural Habitats (vineyards and orchards).* - Recorded in 2012 only – density uncertain,** - Recorded in 2013 only – density uncertain.

Complete.

Mesophilic Forest

The greatest diversity of breeding birds was recorded within the mesophilic forest. However, the assemblage consists largely of fairly widespread and ubiquitous species of woodland and woodland edge birds. Mesophilic woodland in the region is known to support seven species of breeding raptor, of which three: short-toed snake-eagle, booted eagle and red-footed falcon, are of conservation concern (Table 11.14). All three of these species are considered to have the potential to breed in this woodland habitat, although no nests of these species were confirmed on mature trees within the Study Area. All of these species have been confirmed as hunting over the Study Area. Another species of conservation concern, wood lark, breeds within the mesophilic forest. Wood larks were confirmed as breeding within this habitat and are associated with the woodland edges.

Shiblyak

Shiblyak supports the second most diverse breeding bird assemblage within the Study Area, with 34 species recorded. However, all of the species recorded are widespread and ubiquitous

and are typical for this habitat type. No red list species were recorded breeding within this habitat type. The species with the greatest breeding densities were European turtle doves, thrushes and finches. This habitat also provides nesting opportunities for Eurasian nightjar, and two species of bunting: yellowhammer and ortolan bunting.

Secondary Steppefied Meadow

Twenty-six species are considered to have nested within this habitat type of which one species: wood lark is of regional conservation concern and listed on the RDB KK. The remaining breeding species are widespread and ubiquitous, typical for this habitat type. The assemblage consists of species that prefer more open habitats with associated scrub and includes: larks, pipits, shrikes, warblers, finches and four species of bunting (corn bunting, yellowhammer, rock bunting and ortolan bunting).

Two species of raptor are considered to have possibly bred within this habitat: western marsh harrier and Montagu's harrier. A female and juvenile of both species were recorded in this suitable breeding habitat in August 2012, although it is possible that all individuals seen were on migration.

Mesophilic Meadow

Out of the nine species considered to breed in this habitat type, wood lark is a red list species. The remaining species are widespread and ubiquitous.

Juniper Woodland with Tomillyar

Fifteen species were confirmed as breeding within the stands of juniper woodland within the Study Area, although none are red list species. The breeding assemblage consisted of lesser grey shrike, corvids and finches, all of which are widespread and typical for this habitat type.

Agricultural Habitats

These consist of vineyards and orchards and associated human habitation and consequently a diverse assemblage of breeding bird species is supported by these habitats. One of these species, wood lark, is listed on the RDB KK. All other birds are common species.

Other Habitats

Other habitats surveyed within the Study Area included rocky outcrops, cliff and the coastal strip. These areas supported three red list species: peregrine falcon, European roller, and rufous-tailed rock-thrush. One of these species, European roller, is listed as Near Threatened by the IUCN. All of these species are also listed on the RDB RF and RDB KK.

These habitats do not support aggregations or communities of nesting seabirds (e.g. gulls) as the cliff areas within the Study Area do not contain suitable habitat for these species. Impacts on nesting seabirds are therefore not considered further within this chapter.

Red Listed Breeding Birds

Seven of the bird species that are considered potentially to have bred within the Study Area are listed on the IUCN RL, RDB RF, and / or RDB KK. In addition, a further five species are listed on the appendix 3 of the RDB KK, which are species that are recommended for further research in the region. Table 11.15 includes a summary of their conservation status and their preferred habitats.

Table 11.15 Red list species considered potentially to have bred or potentially bred in the Study Area in 2011, 2012 and 2013.

Species	Habitat	IUCN RDL	RDB RF	RDB KK
Common quail	Mesophilic and steppefied meadow	LC	App 2	Not Listed
European honey buzzard	Tall trees within the mesophilic forest	LC	Not Listed	App 3
Short-toed snake-eagle	Tall trees within the mesophilic forest	LC	2	1A
Booted eagle	Tall trees within the mesophilic forest	LC	App 2	1B
Red-footed falcon	Trees within the mesophilic forest	NT	App 3	App 2
Peregrine falcon	Rocky outcrops and cliff habitats	LC	2	7
Little ringed plover	Coastal Shingle	LC	Not Listed	App 3
European roller	Rocky Outcrops	NT	Not listed	Not Listed
White-backed woodpecker	Mesophilic forest. Breeding status unknown	LC	Not Listed	App 3
Calandra lark	Mesophilic and steppefied meadow	LC	Not listed	App 3
Wood lark	Mesophilic forest, steppefied meadow and agricultural habitats	LC	Not Listed	1B
Rufous-tailed rock-thrush	Rocky outcrops and cliff habitats	LC	Not Listed	2
Pied wheatear	Rocky outcrops and cliff habitats	LC	Not Listed	App 3

Non-breeding Migratory and Overwintering Birds

The Black Sea coast is a major migration corridor where birds move in a north-west direction in spring and in a south-east direction during autumn. The majority of migrants follow estuarine valleys of rivers flowing into the Black Sea, where they stop to feed along the coast (Ref. 11.6).

Spring migration starts in the second or third week of February with spring migration ending in late June. Some species of birds will merely pass over the Study Area for more northerly breeding grounds whilst others migrate to the area to breed. Autumn migration begins from the second week of July and finishes in the second half of November.

A range of species were observed migrating over the Study Area in both spring and autumn. However, the Study Area is not used as a stop-over site for large numbers of birds. Migrating raptors, European bee-eaters and hirundines will feed over the site during migration and it is also probable that the site also supports migrating passerine species (e.g. warblers, thrushes, skrikes, pipits, larks and buntings). The site is not a recognised bottleneck migration site and it does not support large aggregations of staging birds. Wildfowl and wading birds, divers, grebes, gulls and terns were recorded migrating over, and over-wintering on the sea. However, these are discussed further in **Chapter 12 Marine Ecology**.

Red Listed Non-breeding Migratory and Overwintering Birds

Five non-breeding migrants of conservation concern were recorded flying over the Study Area. These are shown in Table 11.16.

Table 11.16 Red Listed Non-breeding Migrants

Species	Habitat	Conservation Status		
		IUCN RDL	RDB RF	RDB KK
Squacco heron	Non Breeding Migrant	LC	App 2	App 2
Egyptian vulture	Non Breeding Migrant	EN	3	1B
Red-footed falcon	Non Breeding Migrant	NT	App 2	App 3
Common crane	Non Breeding Migrant	LC	3	3
Little bustard	Non Breeding Migrant	NT	2	3

The Project Area does not contain habitats that would support significant aggregations of red listed migratory bird species. The Project Area is not identified as a bottleneck migration site or a significant stop over site. The wintering bird assemblages supported by the terrestrial habitats of the Study Area consist of widespread and ubiquitous species of passerine birds. The terrestrial habitats of the Study Area do not offer suitable foraging or roosting opportunities for large aggregations of wintering birds.

Terrestrial Mammals

Secondary data indicates that the Study Area has the potential to support at least 48 species of mammal (Ref. 11.9). These include species from six orders, comprising six species of insectivore, one species of lagomorph, seven species of rodent, 17 species of bat (Chiroptera), 10 species of carnivore and three species of artiodactyla (Ref. 11.9). Table 11.17 presents these species and provides their classifications on the relevant IUCN RL and RDBs.

Table 11.17 Terrestrial Mammals Potentially Present within the Study Area

Species	Latin	Conservation Status		
		IUCN	RDB RF	RDB KK
Insectivora				
Northern white-breasted Hedgehog	*Erinaceus roumanicus*	LC	Not listed	Not listed
Caucasian mole	*Talpa caucasica*	LC	Not listed	Not listed
Caucasian pygmy shrew	*Sorex volnuchini*	LC	Not listed	Not listed
Caucasian shrew	*Sorex caucasica*	LC	Not listed	Not listed
White-toothed shrew	*Crocidura leacodon*	LC	Not listed	Not listed
Lesser shrew	*Crocidura suaveolens*	LC	Not listed	Not listed
Chiroptera				
Savi's pipistrelle	*Hypsugo savii*	LC	Not listed	5
Common pipistrelle	*Pipistrellus pipistrellus*	LC	Not listed	Not listed
Nathusius' pipistrelle	*Pipistrellus nathusii*	LC	Not listed	Not listed
Barbastelle	*Barbastella barbastellus*	NT	Not listed	2
Brown big-eared bat	*Plecotus auritus*	LC	Not listed	Not listed
Lesser horseshoe bat	*Rhinolophus hipposideros*	LC	3	3
Natterer's bat	*Myotis nattereri*	LC	Not listed	3
Whiskered bat	*Myotis mystacinus*	LC	Not listed	3
Lesser mouse-eared Myotis	*Myotis blythii*	LC	2	7

Continued…

Species	Latin	Conservation Status		
		IUCN	RDB RF	RDB KK
Steppe whiskered bat	*Myotis aurascens*	LC	Not listed	5
Daubentons' bat	*Myotis daubentonii*	LC	Not listed	Not listed
Brandt's bat	*Myotis brandtii*	LC	Not listed	7
Pond bat	*Myotis dasycneme*	NT	Not listed	2
Bechstein's bat	*Myotis bechsteinii*	NT		2
Noctule	*Nyctalus noctula*	LC	Not listed	Not listed
Giant noctule	*Nyctalus lasiopterus*	NT	Not listed	3
Lesser noctule	*Nyctalus leisleri*	LC		2
Serotine	*Eptesicus serotinus*	LC	Not listed	Not listed
Particoloured bat	*Vespertilio murinus*	LC	Not listed	Not listed
Rodentia				
Greater blind mole rat	*Spalax microphthalmus*	LC	Not listed	Not listed
Edible dormouse	*Glis glis*	LC	Not listed	Not listed
Forest dormouse	*Dryomys nitedula*	LC	Not listed	Not listed
Brown rat	*Rattus norvegicus*	LC	Not listed	Not listed
Lesser wood mouse	*Sylvaemus uralensis*	LC	Not listed	Not listed
Striped field mouse	*Apodemus agrarius*	LC	Not listed	Not listed
Common vole	*Microtus arvalis*	LC	Not listed	Not listed
House mouse	*Mus musculus*	LC	Not listed	Not listed
Lagomorpha				
European rabbit	*Oryctolagus cuniculus*	NT	Not listed	Not listed
European hare	*Lepus europaeus*	LC	Not listed	Not listed

Continued…

Species	Latin	Conservation Status		
		IUCN	RDB RF	RDB KK
Carnivora				
Gray wolf	*Canis lupus*	LC	Not listed	Not listed
Golden jackal	*Canis aureus*	LC	Not listed	Not listed
Red fox	*Vulpes vulpes*	LC	Not listed	Not listed
Raccoon dog	*Nyctereutes procyonoides*	LC	Not listed	Not listed
Northern raccoon	*Procyon lotor*	LC	Not listed	Not listed
Caucasian wildcat	*Felis silvestris*	LC	3	7
Least weasel	*Mustela nivalis*	LC	Not listed	Not listed
European pine marten	*Martes martes*	LC	Not listed	Not listed
Stone marten	*Martes foina*	LC	Not listed	Not listed
Eurasian badger	*Meles meles*	LC	Not listed	Not listed
Artiodactyla				
Wild boar	*Sus scrofa*	LC	Not listed	Not listed
European roe deer	*Capreolus capreolus*	LC	Not listed	Not listed
Red deer	*Cervus elaphus*	LC	Not listed	Not listed

Complete.

Insectivora

During the course of surveys in 2011, only the Caucasian common shrew was recorded. However during 2012, signs of both Caucasian mole and northern white-breasted hedgehog were noted.

Densities for Caucasian shrew were determined, with the species recorded within the shiblyak and mesophilic forest at densities of 20 individuals per ha, and 59 individuals per ha, respectively.

Signs of the Caucasian mole and northern white-breasted hedgehog were only recorded during the 2012 surveys. Evidence (droppings) of hedgehog was found along the cliff-top path and adjacent to shiblyak. This species is likely to occur throughout the Study Area, but at relatively

low densities. Evidence (footprints and mounds) of Caucasian mole were found throughout the agricultural habitat and also along streambed within mesophilic forest.

The absence of all other insectivora from the Study Area cannot be absolutely ruled out, although considering that they have not been recorded during the 2011, 2012 and 2013 surveys, it is assumed that these species are either likely absent from the Study Area or present in low numbers.

Chiroptera

Commuting and foraging bats were observed in the evening during both the 2011 and 2012 field survey. However, as no trapping or ultra-sound survey methods were employed during the survey, the majority of bats could not be identified to genus or species level. One common pipistrelle was however caught in the hand near to the settlement of Sukko during the 2011 surveys.

Suitable foraging and commuting habitat for bats exists across the majority of the Study Area, with the mesophilic forest, shiblyak, vineyards and meadow areas providing excellent opportunity for a variety of bat species to forage. The edges of these habitats and linear features within the landscape, including rivers, tree lines, and hedgerows, provide suitable commuting routes for bats. Bats have the potential to commute up to 20 km (e.g. barbastelle) from a roost site whilst foraging and commuting (Ref. 11.23).

Suitable habitat for supporting roosting bats is present within the Study Area and includes mature trees within the areas of mesophilic forest and buildings within the areas of human settlement. During the 2012 field surveys, bat droppings were found within a disused concrete building located along the valley to the south of the Study Area (see legend labelled "Chiroptera" on Figure 11.8). In addition, other disused vineyard buildings were assessed as being suitable for roosting bats.

The 2012 surveys observed approximately nine trees present within the mesophilic forest which exhibited some, albeit relatively low potential for supporting roosting bats. The potential for these trees to support roosting bats was assessed as low as they lacked favourable features such as deep hollows, cracks, or crevices within which significant number of bats could roost. These trees were considered to be suitable as transient summer roosts, supporting individuals or low numbers of bats during the summer months. Due to the lack of favourable features, the trees were unlikely to be used as hibernation or maternity roosts by bats.

All threatened mammal species potentially present within the Project Area are bats. These include: barbastelle (RDB KK (2)), lesser noctule (RDB KK (2)), pond bat (RDB KK (2)) and Bechstein's bat (RDB KK (2)).

Rodentia

The 2011, 2012 and 2013 surveys recorded seven species of rodent within the Study Area: greater blind mole rat, forest dormouse, brown rat, house mouse, lesser wood mouse, striped field mouse and common vole. Evidence of brown rat and house mouse were recorded within the settlement areas in 2012. None of the Rodentia recorded are red list species.

The 2011 survey, which employed small mammal traps to assess species density within the Study Area, recorded and determined the density of four species of rodent. These results of presented in Table 11.18 below.

Table 11.18 Densities of Rodentia Recorded within the Study Area (Individuals / Ha)

Species	MF	S	SSM	MM	JW	AH
Lesser wood mouse	72	56	0	0	16	0
Striped field mouse	40	24	16	32	0	16
Common vole	0	0	80	48	0	8
Forest dormouse	0	8	0	0	0	0
Total	***112***	***88***	***96***	***80***	***16***	***24***

MF – Mesophilic Forest, S – Shiblyak, SSM – Steppefied Secondary Meadow, MM – Mesophilic Meadow, JW – Juniper Woodland, AH – Agricultural Habitats

The 2011 surveys recorded greater blind mole rat within the secondary steppefied meadow where, in places, individuals were recorded at densities of 1 – 1.3 individuals per m^2. Relatively large numbers of individuals were also recorded within the mesophilic meadow and steppefied agricultural habitats.

The presence of other rodents potentially present within the Study Area, but not recorded during field survey, cannot be ruled out with absolute certainty. However, as they were not recorded during the 2011, 2012 and 2013 surveys, these species are likely to be either present in low numbers or absent from the Study Area.

Lagomorpha

Evidence of European hare was recorded only during the 2012 surveys, where droppings were noted throughout the agricultural habitats. European rabbit was recorded within the 2013 Study Area with droppings and warrens noted along all of the possible access tracks as well as in the juniper woodland. Adult animals were recorded twice during the 2013 survey work.

Carnivora

None of the carnivores potentially present within the Study Area are classified as threatened by the IUCN, RDB RF, or RDB KK, although Caucasian wildcat is listed as Rare (3) on the RDB RF.

The 2011, 2012 and 2013 surveys recorded nine species of carnivore within the Study Area; grey wolf, golden jackal, red fox, raccoon dog, common racoon, least weasel, pine marten,

beech marten, and Eurasian badger. Evidence of these animals was generally restricted to signs (e.g. bones, footprints and faeces).

Definitive evidence of the Caucasian wildcat was not recorded during any of the field surveys and this species is considered to be likely absent from the Study Area.

Artiodactyla

Evidence of wild boar was recorded during the 2013 surveys, with tracks of a single adult and 2 – 3 yearlings recorded within the mesophilic forest. This species is common within the forest areas on the slope of ravines and gullies located to the east of Varvarovka village.

Evidence and sightings of roe deer and red deer were recorded during the 2011 surveys. A roe deer skull was found during the 2012 survey in addition to droppings and prints in areas of the vineyards, woodlands and along the access tracks. Evidence of deer was not noted during the 2013 surveys.

11.5.2 Baseline Summary

No protected sites designated due to nature conservation interest occur within the Study Area. However, Utrish SPNA is located approximately 3.8 km to the south-east of the nearest boundary of the Pipeline construction corridor. In addition, all forest or woodland habitats in the Study Area are classified as 'protective forests' under the Forest Code of the Russian Federation.

A range of natural and modified habitats occur within the Study Area. Natural Habitats include shiblyak, mesophilic forest, juniper woodland, mesophilic meadow, tomillyar, rocky outcrops and coastal shingle. Of these, shiblyak covers the greatest land area (431 ha), whereas mesophilic meadow, tomillyar, rocky outcrops, coastal shingle are all limited in extent (all less than 10 ha). Modified habitats present include steppefied meadow (111 ha), as well as urban and agricultural habitats (273 ha). Agricultural habitats are dominated by areas of vineyards.

The habitats in the Study Area support a range of species that have been assessed by the IUCN RL as well as species included with the RDB RF and 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 have been assessed by the IUCN to be Vulnerable at an international level;
- A notable assemblage of herpetofauna, including twelve species included within the RBD KK. This includes Nikolski's tortoise, which has been assessed by the IUCN as Critically Endangered;
- Six species of bird listed within the RDB KK that may have bred within the Study Area, of which two species, European roller and red-footed falcon have been 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 receptors such as aquatic invertebrates, fish, phytoplankton and zooplankton are present within the Study Area, but not thought to be of notable conservation value.

Critical Habitat Summary

In addition to undertaking an evaluation of the ecological receptors present at the locations described above, for the purposes of undertaking an impact assessment, the IFC PS(6) emphasises the need for there to be particular attention to areas which qualify as 'critical habitat'. The key practical implication of the presence of critical habitat is that any proposed mitigation measures for impacts upon these areas should be designed to result in a net gain in biodiversity.

Appendix 11.1 provides an assessment of critical habitat applicable to the landfall section of the South Stream Offshore Pipeline – Russian Sector. Critical habitat is defined by IFC Performance Standard 6 (PS6) (Ref. 11.11) as areas with high biodiversity value. This includes areas that meet one or more of following criteria:

- Criterion 1: Critically Endangered (CR) and / or Endangered (EN) species;
- Criterion 2: Endemic and / or restricted-range species;
- Criterion 3: Migratory and / or congregatory species;
- Criterion 4: Highly threatened and / or unique ecosystems; and
- Criterion 5: Key evolutionary processes.

The discrete management unit (DMU) (see Appendix 11.1 for description) has been assessed against these criteria in accordance with PS6 and associated guidance notes (see Table 11.19).

The Project footprint and the Study Area are located within critical habitat defined under Criteria 1 and 2 (see Appendix 11.1 for a description of the DMU) due to the presence of four endangered and endemic species: the plants *Rindera tetraspis* and fern-leaved speedwell, the butterfly Levantine skipper and Nikolski's tortoise. The presence of two specific habitat types also triggers critical habitat under Criterion 4 (mesophilic forest and tomillyar).

Impacts on key biodiversity values of critical habitat will be afforded particular consideration with regard to mitigation and monitoring protocols, with the aim of demonstrating that there will be a net gain in biodiversity once the proposed measures have been implemented (see mitigation section).

Table 11.19 List of Critical Habitat Features within the DMU

Criterion	Feature	Rationale	Critical Habitat
Criterion 1: Critically Endangered (CR) and/or Endangered (EN) species	Rindera tetraspis	DMU represents >10 percent of the species' AOO within the Krasnodar Krai region	Yes - Tier 2
Criterion 1: Critically Endangered (CR) and/or Endangered (EN) species	Levantine Skipper	DMU represents >10 percent of the species' AOO within the Krasnodar Krai region	Yes - Tier 2
Criterion 1: Critically Endangered (CR) and/or Endangered (EN) species	Nikolski's tortoise *Testudo graeca nikolskii*	DMU supports the regular occurrence of a single individual of a CR species	Yes - Tier 2
Criterion 2: Endemic and/or restricted-range species	Fern-leaved speedwell *Veronica filifolia*	DMU supports > one percent of the global population of this endemic species	Yes - Tier 2
Criterion 2: Endemic and/or restricted-range species	Nikolski's tortoise *Testudo graeca nikolskii*	DMU supports ≥ one percent of the global population of a restricted-range species.	Yes - Tier 2
Criterion 4: Highly threatened and/or unique ecosystems	Mesophilic forest	Ecosystem structure and function unfavourable in approximately 80 percent of European range.	Yes
Criterion 4: Highly threatened and/or unique ecosystems	Tomillyar	Coastal region un-protected and under pressure from tourism and therefore at risk of significant reduction in next 50 years.	Yes

11.6 Impact Assessment

This section identifies and describes the potential impacts of the Project on terrestrial ecology receptors (see Section 11.6.6) and presents mitigation measures. The approach to the impact assessment is outlined below:

- Following the identification of potential terrestrial ecology receptors, the sensitivity of each receptor is evaluated according to their resilience and value;
- Impacts that could potentially affect receptors are identified and their nature described. The magnitude of potential impacts (negligible, low, moderate or high) resulting as a consequence of the Project is assessed. Measures that have been incorporated into the Project design to minimise or avoid impacts are described and are taken into account in the impact assessment;

- The likely significance (not significant, low, moderate or high) of these impacts on receptors are then assessed, and where possible quantified;
- Mitigation measures to avoid or reduce any moderate or high significance impacts are then described in conjunction with other elements of the design (including mitigation for other environmental disciplines). If necessary, specific measures to compensate for effects on features of nature conservation importance are identified;
- Mitigation measures for impacts to features which result in IFC critical habitat status are presented with the aim of leading to a gain in biodiversity; and
- The significance of potential residual effects is assessed.

11.6.1 Impact Assessment Criteria

The construction of the Project involves a wide range of activities that have the potential to affect the terrestrial environment, primarily during the Construction Phase. The relevant activities of the Project likely to give rise to impacts on receptors are summarised in Table 11.20.

Table 11.20 Project Activities Timings

Phase	Activity
Design and Development	Clearance of vegetation
	Creation of access tracks and surveys pads
Construction / pre-commissioning	Preparation of access roads / upgrades to junctions of existing roads
	Pipeline installation using open-cut method - from the microtunnel exit pits to the landfall facilities and from the landfall facilities to the tie-in with the United Gas Supply System approximately 100 m upstream of the landfall facilities.
	Construction of landfall facilities
	Establishment of temporary construction sites and construction of microtunnels
Operation	Maintenance of the RoW area
	Movement of people and machinery related to the operation of the Pipeline and its maintenance in good working condition
Decommissioning	Construction of access roads / repair of existing facilities
	Excavation works for taking out pipes if option of removal is selected
	Dismantling technical facilities accompanying the construction of the Pipeline
Unplanned Events	Possibility of accidents and accidental bursts of pollution
	Increased risk of fire

11.6.2 Defining Receptor Sensitivity

As noted in **Chapter 3 Impact Assessment Methodology**, receptor sensitivity is a combination of receptor 'resilience' (i.e. its vulnerability) and its 'value'. There are no universal and standardised methodologies for assigning resilience and value to ecological receptors. This is partly due to the very large number of factors that can influence any assessment. Within this chapter, the sensitivity of habitats and species has been assessed using surrogate measures of sensitivity that combine elements of both resilience and value.

For species, sensitivity has been defined according to conservation status within the IUCN RL, RDB RF and RDB KK. This is based on the assumption that a species with increased extinction risk is likely to have inherently lower resilience to a range of stressors. This is not an assessment of resilience to Project specific impacts, as these are considered within the impact assessment itself. The level of rarity of a species is a significant part of the assessment of extinction risk. Rarity is also a key factor in assigning value to a species, as partially demonstrated by its degree of protection through legal instruments, either at international, national or regional levels. This is the case in Russia, where wildlife protection legislation is driven by RDB status, either at local or national level. Table 11.22 presents the derived scale of species sensitivity.

Habitat sensitivity has been defined on the level of naturalness of a particular habitat (Table 11.21). This is based on the general relationship between naturalness and value, with natural pristine habitats valued higher than modified and artificial habitats. It can also be argued that natural habitats are less resilient than artificial habitats as they are often easier to damage and harder to restore than habitats that are already modified to some extent. This is reflected within IFC PS6 which distinguishes between natural and modified habitats. It is also partially reflected by protective legislation, which tends to apply to areas of natural habitat.

The concept of 'critical habitat' according to the IFC PS6 is not incorporated as a separate element into the determination of habitat sensitivity. This is due to the definition of critical habitat deriving from a number of different criteria that depend on both species and habitat criteria which do not fully align with the hierarchy of 'high, moderate and low' sensitivity used within this chapter. The definition of critical habitat and compliance with IFC PS6 is therefore considered as a separate, but parallel, procedure. A separate critical habitat assessment has been undertaken and is presented in Appendix 11.1. Notwithstanding this, where relevant, individual receptors are identified as being component of critical habitat within the chapter. Impacts on such receptors are also highlighted in relation to IFC PS6. For such receptors, mitigation proposals have been formulated in the context of IFC PS6 requirements. The chapter also presents a summary that demonstrates to what extent IFC PS6 requirements are complied with, following the implementation of appropriate mitigation measures.

Table 11.21 Defining Habitat Receptor Sensitivity

Sensitivity and Value	Description	Applicable Standards
High (D)	An area which has designated conservation status categories Ia to IV under the IUCN Classification. Sites designated as Specially Protected Natural Areas (SPNAs).	Russian: Habitats designated under Russian law on "On Specially Protected Natural Areas" No. 33-FZ
Moderate (C)	A site or habitat that has designated conservation status at a National scale. Undesignated habitats which are unmodified by human activity and comprise native species forming assemblages consistent with the prevailing environmental conditions (Natural habitats according to IFC PS6)	None applicable
Low (B)	Habitats occurring outside of any designation which are subject to active management or alteration through human activity, but with an assemblage of species which is predominantly native in origin (Modified Habitats according to IFC PS6).	None applicable
Negligible (A)	Habitats which are either appreciably degraded/disturbed by human activity or have high proportions of invasive/non-native species (Modified Habitats according to IFC PS6).	None applicable

Table 11.22 Defining Species Receptor Sensitivity

Sensitivity and Value	Description	Applicable Standards
High (D)	A species assessed as Endangered or Critically Endangered either at an international or national level.	Russian: Government Enactment 'On the Red Data Book of the Russian Federation' (Ref. 11.26)
Moderate (C)	A species assessed as Vulnerable either at an international or national level. A species assessed as Vulnerable or Endangered at a regional level	Russian: Government Enactment 'On the Red Data Book of the Russian Federation' (Ref. 11.26) The Decree of the Head of the Administration for Krasnodar Krai, 'On the Red Data Book of Krasnodar Krai', dated 21.12.2010 No.1202 (Ref. 11.30)
Low (B)	A species assessed at 'Near Threatened' internationally. A species assessed as rare at a National or Regional level.	Government Enactment 'On the Red Data Book of the Russian Federation' (Ref. 11.26) The Decree of the Head of the Administration for Krasnodar Krai, 'On the Red Data Book of Krasnodar Krai', dated 21.12.2010 No.1202 (Ref. 11.26)
Negligible (A)	Non- red list species	None applicable

11.6.3 Defining Impact Magnitude

The key potential impacts associated with the Project that have been considered in this chapter are:

- Direct land take, temporary (during Construction Phase) and permanent (during Construction and Operational Phases), resulting in loss or fragmentation of habitats;
- Direct impacts on protected species;
- Indirect noise, vibration and visual disturbance;
- Changes in air quality due to dust generation, site plant emissions and road traffic;
- Changes in hydrology due to changes in drainage regime;
- Increased risk of pollution; and
- Changes in floristic assemblages following completion of construction.

The frameworks for defining the magnitude of impacts on habitats and species are presented in Table 11.23 and Table 11.24 respectively.

Table 11.23 Impact Magnitude - Habitats

Magnitude	Description
High (4)	The impact has the potential to adversely affect the integrity of an area/region, by substantially changing in the long term its ecological features, structures and functions, across its whole area, that enable it to sustain the habitat, complex of habitats and/or population levels of species that makes it important.
Moderate (3)	The area/region's integrity is predicted to not be adversely affected in the long term, but the project is likely to affect some, if not all, of the area's ecological features, structures and functions in the short or medium term. The area/region may be able to recover through natural regeneration and restoration.
Low (2)	Neither of the above applies, but some minor impacts of limited extent, or to some elements of the area, are evident but easy to recover through natural regeneration.
Negligible (1)	Indiscernible from natural variability.

Table 11.24 Impact Magnitude – Species

Magnitude	Description
High (4)	Impact on a species that affects an entire population to cause a decline in abundance and/or change in distribution beyond which natural recruitment (reproduction, immigration from unaffected areas) would not return that population or species, or any population or species dependent upon it, to its former level within several generations6, or when there is no possibility of recovery.
Moderate (3)	Impact affects a portion of a population and may bring about a change in abundance and/or a reduction in the distribution over one or more generations*, but does not threaten the long-term integrity of that population or any population dependent on it. The size and cumulative character of the consequence is also important. A moderate magnitude impact multiplied over a wide area would be regarded as a high magnitude impact.
Low (2)	A low magnitude impact on a species affects a specific group of localized individuals within a population over a short time period (one generation or less), but does not affect other tropic levels or the population itself.
Negligible (1)	Indiscernible from natural variability.

[6] These are generations of the animal / plant species under consideration not human generations

11.6.4 Determining Impact Significance

As outlined in **Chapter 3 Impact Assessment Methodology** of this ESIA Report, the significance of an impact on a receptor is determined as a relationship between the sensitivity of the receptor and the magnitude of the predicted impact. The relationship between receptor sensitivity and impact magnitude, along with the resultant significance of an impact (beneficial or adverse) is presented in Table 11.25 below.

Table 11.25 Impacts 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

* Allows technical discipline author to decide if impact significance is Not Significant or Low.
† Allows technical discipline author to decide if impact significance is Low or Moderate.

11.6.5 Applicable Standards

The terrestrial ecology assessment has considered relevant Russian federal (national) and regional legislation, applicable standards and guidelines for international finance, and international agreements to which the Russian Federation is a signatory. All applicable standards relevant to the ESIA are presented in **Chapter 2 Policy, Regulatory, and Administrative Framework**, with those of particular relevance to ecology and biodiversity summarised below.

Federal and Regional Legislation

Table 11.26 presents the federal laws of the Russian Federation which are applicable to biodiversity and conservation.

Table 11.26 Russian Federal Legislation Relevant to Biodiversity and Conservation

Legislation	Date and Reference Number	Relevance to Project
Federal Law 'On Environmental Protection' (Ref. 11.24)	10.01.2002, No. 7-FZ	This is the overarching law on environmental protection. This law states that an environmental review will be undertaken to verify that Project documentation complies with environmental requirements set by the technical regulations and environmental legislation preventing activities that could cause adverse environmental impact.
Federal Law 'On Wildlife' (Ref. 11.7)	24.04.1995, no. 52-FZ	This law regulates wildlife protection, as well as, conservation and restoration of wild habitats. It promotes the conservation of biodiversity, sustainable use of all the wildlife components, creation of conditions for sustainable livelihood, conservation of generic resources of wild animals and other protection of wildlife as an integral element of the natural environment.
Federal Law 'On Specially Protected Natural Areas' (Ref. 11.25)	14.03.1995, no. 33-FZ	This law establishes a system of specially protected natural areas, specifies conditions of their use and protection of natural resources. The protected area 'Utrish' is located approximately 4 km south-east of the landfall and offshore section of the Project.
Forest Code of the Russian Federation (Ref. 11.13)	04.12.2006, No. 200-FZ	The Forest Code establishes the regulatory basis of efficient use, protection, security and reproduction of forests, as well as increasing their environmental and resource potential.

Other national legislation relevant to biodiversity and the ESIA includes:

- Government Enactment 'On the Red Data Book of the Russian Federation' (Ref. 11.26);
- Government Enactment 'On measures for enforcement of obligations arising from the Conservation on the Wetlands of International Importance (Especially as Wildlife Habitats dated 02.02.1971)' (No. 1050 of 13.09.1994) (Ref. 11.27);
- Government Enactment 'On the adoption of requirements for the prevention of wildlife loss' (No.997 of 13.08.1996) (Ref. 11.28) This enactment sets out requirements to regulate operating activities in order to manage and prevent loss of wildlife species and habitats (as a result of changing habitat and migration paths). It covers: water intake facilities; production equipment units; mobile transport and agricultural machines; construction of production and other facilities; extraction, processing and transportation of raw materials; and technological processes of cattle breeding and plant growing; and
- Order 'On the adoption of rules of using forests for construction, upgrade and operation of line facilities' (Ref. 11.29).

The ESIA takes account of Krasnodar regional legislation, including Krasnodar Region Laws such as the Decree of the Head of the Administration for Krasnodar Krai, 'On the Red Data Book of Krasnodar Krai', dated 21.12.2010 No.1202 (Ref. 11.30) which outlines protection principles for the Red Data Book of Krasnodar Krai, as well as, its contents, the procedure for keeping records and the protection categories of the listed species.

International Financial Institution standards and guidance

The Project is undertaken in accordance with the standards and guidelines of relevant International Financial Institutions, including the IFC Performance Standards (PS) (Ref. 11.11), Equator Principles (Ref. 11.31) and OECD Common Approaches (Ref. 11.32). However the IFC PS, including IFC PS6 Biodiversity Conservation and Sustainable Management of Living Natural Resources, sets out an approach to protect and conserve biodiversity including habitats, species and communities, ecosystem diversity, and genes and genomes, all of which have potential social, economic, cultural and scientific importance. It also sets out definitions of natural, modified and critical habitat types, stating that there should be no net loss of biodiversity in natural habitats. In critical habitat, mitigation measures should result in a net gain of those biodiversity values for which the critical habitat was designated. Such measures should be described in a Biodiversity Action Plan (BAP).

International Agreements

The Russian Federation is a signatory of the following conventions of relevance to biodiversity and conservation:

- Convention on Biological Diversity, 1992 (Ref. 11.33) - The Convention promotes conservation of biological diversity and sustainable use of its components, and the Project Pipeline corridor and temporary facilities will affect habitats; and
- Convention on Wetlands of International Importance, especially as Waterfowl Habitat (Ramsar), 1971 (Ref. 11.34) - The Ramsar Convention promotes the importance of the ecological functions of wetlands, and the Project onshore facilities may impact on wetlands.

11.6.6 Ecology Receptor Identification and Sensitivity

The section below identifies the receptors within the Wider Study Area to be included in the impact assessment and discusses their sensitivity in line with the criteria presented in Section 11.6.2 above.

11.6.6.1 Designated Sites

Utrish SPNA

Utrish is a statutory protected site which is designated for its conservation and biodiversity value. The site is known to contain a wide range of red list species and habitats which are notable at the regional, national, and international level. It is also considered to be of particular importance to Nikolski's tortoise. The site is therefore assessed as being of high sensitivity.

Protective Forest Areas

The areas designated as 'protective forest' include areas of shiblyak woodland, mesophilic forest, and juniper woodland. These areas of habitat have been assigned sensitivity individually in Table 11.27 below.

11.6.6.2 Habitats and Flora

Habitats

Table 11.27 describes each habitat type in relation to the criteria used to determine sensitivity for habitats.

Table 11.27 Habitat Sensitivity Appraisal

Habitat Type	Evaluation
Shiblyak	Designation
Juniper woodland	These habitats are defined as a 'Protective Forest' under the Forest Code of Russia.
	Naturalness
	The habitat is largely natural with relatively little evidence of artificial disturbance or anthropogenic transformation.
	Sensitivity
	This habitat is assessed as being of moderate sensitivity.
Mesophilic forest	Designation
	These habitats are defined as a 'Protective Forest' under the Forest Code of Russia.
	Naturalness
	The habitat is largely natural with relatively little evidence of artificial disturbance or anthropogenic transformation.
	Sensitivity
	This habitat is assessed as being of moderate sensitivity. This habitat fulfils critical habitat criteria (see Appendix 11.1).

Continued…

Habitat Type	Evaluation
Steppefied secondary meadow	Designations This habitat type receives no formal designation or statutory protection. Naturalness The habitat has been subject to modification in the past although the habitat is now reverting to a more natural state. Sensitivity The habitat receives no formal designation and has been subject to a degree of human modification in the past, although it is recovering. It is however not considered pristine habitat. The habitat is therefore assessed as being of low sensitivity.
Mesophilic meadow	Designation This habitat type receives no formal designation or statutory protection. Naturalness The habitat is largely natural with relatively little evidence of artificial disturbance or anthropogenic transformation. Sensitivity This habitat is assessed as being of moderate sensitivity.
Tomillyar	Designation This habitat type receives no formal designation or statutory protection. Naturalness The habitat is largely natural with relatively little evidence of artificial disturbance or anthropogenic transformation. Sensitivity This habitat is assessed as being of moderate sensitivity. This habitat fulfils critical habitat criteria (see Appendix 11.1).
Rocky outcrops	Designation This habitat type receives no formal designation or statutory protection. Naturalness The habitat is largely natural with relatively little evidence of artificial disturbance or anthropogenic transformation. Sensitivity This habitat is assessed as being of moderate sensitivity.

Continued…

Habitat Type	Evaluation
Coastal shingle	Designation This habitat type receives no formal designation or statutory protection. Naturalness The habitat is largely natural with relatively little evidence of artificial disturbance or anthropogenic transformation. Sensitivity This habitat is assessed as being of moderate sensitivity.
Urban and agricultural habitats	Designation This habitat type receives no formal designation or statutory protection. Naturalness These habitats have been altered through human activity and are considered to be significantly altered from their original state. Sensitivity This habitat is assessed as being of negligible sensitivity.
Running Water	Designation This habitat type receives no formal designation or statutory protection. Naturalness The habitat is largely natural with relatively little evidence of artificial disturbance or anthropogenic transformation. Sensitivity This habitat is assessed as being of moderate sensitivity.

Complete.

Urban and agricultural habitats are assessed as being of negligible sensitivity. These habitats are therefore considered to be of insufficient ecological value to warrant further consideration in the impact assessment. These habitat types are therefore not discussed further within this assessment.

Flora

The species listed below have been recorded within the Study Area during field survey (Table 11.28).

Table 11.28 Flora Sensitivity Appraisal

Name of Species	Conservation Status			Sensitivity
	IUCN	*RDB RF*	*RDB KK*	
Fern-leaved speedwell	Not assessed	1	1	High and fulfils critical habitat criteria (Appendix 11.1)
Pyramidal orchid	Not assessed	3	2	Moderate
Colchicum umbrosum	Not assessed	2	2	Moderate
Siderites euxina	Not assessed	Not listed	2	Moderate
Etruscan honeysuckle	Not assessed	3	1	Moderate
Phlomis taurica	Not assessed	Not listed	2	Moderate
Dwarf flag iris	Not assessed	3	2	Moderate
Sea kale	Not assessed	Not listed	2	Moderate
Bladdernut	Not assessed	3	2	Moderate
Golden feather grass	Not assessed	3	2	Moderate
Campanula komarovii	Not assessed	3	2	Moderate
Linum hirsutum	Not assessed	Not listed	2	Moderate
Stinking juniper	Least Concern	2	1	Moderate
Greek juniper	Least Concern	2	1	Moderate
Jurinea stoechaedifolia	Not assessed	Not listed	2	Moderate
Goldendrop	Not assessed	3	2	Moderate
Paeonia caucasica	Not assessed	3	2	Moderate
Red helleborine	Not assessed	3	2	Moderate
Chamaecytisus wulffii	Not assessed	Not listed	2	Moderate

Continued…

Name of Species	Conservation Status			Sensitivity
Rindera tetraspis	Not assessed	Not listed	1	Moderate and fulfils critical habitat criteria (Appendix 11.1)
Fibigia eriocarpa	Not assessed	Not listed	2	Moderate
Mt. Atlas mastic tree	Not assessed	3	1	Moderate
Salvia ringens	Not assessed	Not listed	2	Moderate
Early purple orchid	Not assessed	3	2	Moderate
Monkey orchid	Not assessed	3	2	Moderate
Astragalus subuliformis	Not assessed	Not listed	3	Low
All other plants	LC / Not assessed	Not listed	Not listed	Low

Complete.

11.6.6.3 Fauna

Invertebrates

A notable assemblage of red list invertebrate species is potentially present within the Study Area. This includes 10 species likely to occur within the mesophilic forest, 20 within the areas of meadow habitat and one near riparian and aquatic environments (Table 11.28 above and Table 11.29 below for further detail).

Table 11.29 Invertebrate Sensitivity Appraisal

Species	IUCN	RDB RF	RDB KK	Sensitivity
Beetles – Coleoptera				
Ground beetle sp. *Carabus caucasicus*	Not assessed	2	2	Moderate
Greater capricorn beetle	VU	Not listed	7	Moderate
Cerambyx nodulosus	Not assessed	2	2	Moderate

Continued…

Species	IUCN	RDB RF	RDB KK	Sensitivity
Rosalia longicorn	VU	2	2	Moderate
Flower beetle	Not assessed	Not listed	2	Moderate
Jewel beetle	Not assessed	Not listed	2	Moderate
Stag beetle	Not assessed	2	7	Moderate
Necydalis ulmi	Not assessed	Not listed	3	Low
Forest caterpillar hunter	Not assessed	2	7	Moderate
Chrysochares asiaticus	Not assessed	Not listed	3	Low
Weevil sp. *Lixus canescens*	Not assessed	Not listed	1B	Moderate
Moths and Butterflies – Lepidoptera				
Yellow-banded skipper	Not assessed	Not listed	1B	Moderate
Levantine skipper	Not assessed	Not listed	1B	Moderate and fulfils critical habitat criteria (Appendix 11.1)
Tesselated skipper	Not assessed	Not listed	2	Moderate
Southern festoon	Not assessed	Not listed	2	Moderate
Caucasian spring copper	Not assessed	Not listed	2	Moderate
Eastern baton blue	Not assessed	Not listed	2	Moderate

Continued…

Species	IUCN	RDB RF	RDB KK	Sensitivity
Zephyr blue ssp	Not assessed	Not listed	2	Moderate
Dalmatian ringlet	Not assessed	Not listed	2	Moderate
Large blue	NT	Not listed	2	Moderate
Clouded Apollo	Not assessed	2	7	Moderate
Moth sp. *Jordanita chloros*	Not assessed	Not listed	1B	Moderate
Moth sp. *Lemonia ballioni*	Not assessed	Not listed	1B	Moderate
Feathered footman	Not assessed	Not listed	3	Low
Brown tiger moth	Not assessed	Not listed	5	Low
Purple tiger moth	Not assessed	Not listed	3	Low
Death's-head hawkmoth	Not assessed	Not listed	3	Low
Bees and Wasps – Hymenoptera				
Bee sp. *Bombus zonatus*	Not assessed	Not listed	2	Moderate
Carpenter bee sp. *Xylocopa valga*	Not assessed	2	7	Moderate
Solitary wasp sp. *Scolia hirta*	Not assessed	Not listed	7	Low
Solitary wasp sp. *Scolia maculate*	Not assessed	Not listed	7	Low

Continued…

Species	IUCN	RDB RF	RDB KK	Sensitivity
Other: Leaf Hoppers Hemiptera, Flies Diptera, Crickets Orthoptera, Mantids Mantidae, and Dragonflies Odonta				
Leafhopper sp. *Fieberiella lugubris*	Not assessed	Not listed	3	Low
Fly sp. *Neorhynchocephalus tauscheri*	Not assessed	Not listed	2	Moderate
Predatory bush cricket	VU	2	7	Moderate
Leafhopper sp. *Liguropia juniper*	Not assessed	Not listed	3	Low
Blue emperor dragonfly	LC	2	7	Moderate
Mantis sp. *Empusa fasciata*	Not assessed	Not listed	2	Moderate
Mantis sp. *Bolivaria brachyptera*	Not assessed	Not listed	7	Low

Complete.

Herpetofauna

Five amphibian and seventeen species of reptile have been recorded or are potentially present within the Study Area. This includes four species which are listed as threatened on the IUCN RL, RDB RF and / or RDB KK (Table 11.30).

Table 11.30 Sensitivity of Herpetofauna

Name of Species	Conservation Status			Sensitivity
	IUCN	RDB RF	RDB KK	
Caucasian toad	NT	2	7	Moderate
Nikolski's tortoise	VU	1	1B, EN	High and fulfils critical habitat criteria (Appendix 11.1)
European glass Lizard	Not assessed	Not listed	1B, EN	Moderate
Aesculapian ratsnake	LC	2	2	Moderate

Continued…

Name of Species	Conservation Status			Sensitivity
	IUCN	RDB RF	RDB KK	
Combined reptile and amphibian assemblage (all other species)	Not Listed			Low

Complete.

Fish

None of the fish present within the Study Area are listed as species of conservation concern on the IUCN RL, RDB RF, or RDB KK. Individuals and the freshwater fish assemblage present within the Study Area are therefore assessed as being of negligible sensitivity and are considered to be of insufficient ecological value to warrant further consideration in the impact assessment.

Birds

Breeding Birds

Seven of the bird species that are considered to have bred within the Study Area are red list species (Table 11.31). In addition, a further five species are listed on appendix 3 of the RDBKK, which are species that are recommended for further research in the region. The sensitivity of the latter species are not assessed individually, but included as part of the breeding bird assemblage. The combined breeding bird assemblage largely consists of a wide range of common and ubiquitous species which are typical for the habitats present in the Project Area. This combined assemblage is assessed as being of low sensitivity.

Non-breeding Migratory and Overwintering Birds

Five non-breeding migrants of conservation concern were recorded flying over the Study Area; however, the Project Area does not contain habitats that would support significant aggregations of red list migratory bird species. In addition, the Project Area is not identified as a bottleneck migration site or a significant stop over site. It is not anticipated that the Project will result in a direct or indirect impact on migratory bird species of ecological importance and these are not considered further in this assessment.

The wintering bird assemblage supported by the terrestrial habitats of the Study Area consists of widespread and ubiquitous species of passerine birds. The terrestrial habitats of the Study Area does not offer suitable foraging or nesting opportunities for large aggregations of wintering birds and therefore impacts on wintering bird species within the Study Area are not considered further.

Table 11.31 Sensitivities of Birds

Name of Species	Conservation Status			Sensitivity
	IUCN	RDB RF	RDB KK	
Breeding				
Wood lark	LC	Not Listed	1B	Moderate
Short-toed snake-eagle	LC	2	1A	Moderate
Booted eagle	LC	App 2	1B	Moderate
Red-footed falcon	NT	App 2	App 3	Low
Rufous-tailed rock-thrush	LC	Not Listed	2	Moderate
Peregrine falcon	LC	2	7	Moderate
European roller	NT	Not listed	Not Listed	Low
Combined breeding bird assemblage	LC / Not assessed	Not listed	Not listed	Low
Migratory				
Negligible				
Wintering				
Negligible				

Terrestrial Mammals

Thirteen species of red list mammal species are potentially present within the Study Area. This includes five species which are listed as threatened on the IUCN RL, RDB RF and / or RDB KK (Table 11.32).

Table 11.32 Sensitivity of Mammals

Species	Conservation Status			Sensitivity
	IUCN	RDB RF	RDB KK	
Lesser mouse-eared bat	LC	2	7	Moderate
Barbastelle	NT	Not listed	2	Moderate
Pond bat	NT	Not listed	2	Moderate
Bechstein's bat	NT		2	Moderate
Lesser noctule	LC		2	Moderate
Lesser horseshoe bat	LC	3	3	Low
Natterer's bat	LC	Not listed	3	Low
Whiskered bat	LC	Not listed	3	Low
Steppe whiskered bat	LC	Not listed	5	Low
Brandt's bat	LC	Not listed	7	Low
Savi's pipistrelle	LC	Not listed	5	Low
Giant noctule	NT	Not listed	3	Low
Caucasian wildcat	LC	3	7	Low
All other mammals	LC / Not assessed	Not listed	Not listed	Low

11.6.7 Assessment of Potential Impacts: Design and Development

Geotechnical surveys were undertaken in 2012 to inform the design and layout of the Project. Some geotechnical surveys were undertaken along a section of the sea cliff, located to the west of the proposed microtunnel entry shafts. The surveys were undertaken in compliance with Russian regulations.

To facilitate the geotechnical surveys, four strips, each approximately 4 m wide and 120 m long, were cleared of vegetation from the top of the cliff, down the western face and to the shoreline. Various access roads and drill pads were also constructed to facilitate access for the geotechnical surveys.

The drill pads and their associated access roads were constructed within areas of shiblyak (largely within the drill pad access road areas), juniper woodland and tomillyar habitats (located along the top of the cliff).

The impact of the site preparation works for the design and development works resulted in loss of natural terrestrial habitat along the cliff tops as well as down the cliff itself. Additional habitats were removed to accommodate the drill pads and associated roads. The total area of habitat lost was approximately 0.39 ha of shiblyak, 0.03 ha of tomillyar and 0.32 ha of juniper woodland. In addition to the loss of habitat, the access track is being used by people to access the area. During a site visit made in September 2013, signs of fly tipping and fire lighting were evident. Increased access could also lead to increased disturbance of threatened species.

It was agreed with the Forestry Department that the main access track up to the cliff top will not be reinstated as this track will be used by the Forestry Department for forestry maintenance works. Due to the presence of habitats of a moderate sensitivity, and presence of flora species of up to high sensitivity (including fern-leaved speedwell and *Rindera tetrapsis*), the impact within this area could be of up to high adverse significance in the absence of any mitigation or successful reinstatement of lost or damaged habitats.

In order to mitigate for these impacts, a re-instatement plan has been devised to mitigate for the impact of the geotechnical works. This mitigation has been incorporated in to a Cliff Area Habitat Reinstatement Plan which is included in Appendix 11.2. All works stipulated in this plan will be completed by the client and the works will result in the re-establishment of a significant proportion of the original habitats, both through planting and natural re-colonisation. The Cliff Area Habitat Reinstatement Plan will be implemented as part of the BAP.

As tomillyar, fern-leaved speedwell and *Rindera tetrapsis* confer critical habitat status, a BAP will be developed to deliver net gains in these biodiversity features. The BAP will provide a robust long-term biodiversity monitoring and evaluation programme as well as engagement with relevant stakeholders.

Taking in to consideration the planned reinstatement works and monitoring plan (refer to Appendix 11.2) it is likely that the residual impacts of the design and development works within the cliff area will be of no more than **Low** adverse significance. Any impact on tomillyar or the populations of fern-leaved speedwell and Rindera tetrapsis would constitute an effect on critical habitat (see Appendix 11.1). However, following implementation of the Cliff Area Habitat Reinstatement Plan, it is considered that there would be no net loss of these components.

11.6.8 Assessment of Potential Impacts: Construction and Pre-Commissioning

This section presents and discusses the impacts and mitigation measures of the Construction and Pre-Commissioning Phase of the Project on the identified terrestrial ecology receptors within the Study Area (see Section 11.6.6). The Project has been designed to reduce a number of impacts at source. Design measures have been incorporated to reduce the potential impacts from a given Project activity. Potential Construction and Pre-Commissioning Phase impacts are assessed on this basis. Additional mitigation and monitoring measures are then identified that can further reduce impacts, and the residual impact is identified.

Design measures are presented in **Chapter 5 Project Description.** Those of particular relevance to terrestrial ecology include the following:

- Microtunnelling below the Shingar River;
- Drainage to manage surface run-off, which will be constructed along access roads and at the landfall facilities;
- The use of geotextiles in the construction of permanent and temporary access roads;
- Stripping and stockpiling topsoil (stockpiles will normally be less than 2 m in height) for later use during reinstatement;
- Backfilling of trenches, which will normally occur immediately after the Pipeline has been lowered;
- Reinstatement of the Pipeline corridor, which will include restoration of original land contours as closely as possible, except grading of slopes at the Graphova Gap to manage slope stability;
- Dedicated mobile plant and refuelling areas. Fuel storage tanks will be double-walled. Secondary containment by bunding will surround the tanks;
- Provision of wastewater collection systems and offsite disposal by licensed waste management operators; and
- Chemical storage areas, which will be constructed on hard standing with bunding.

11.6.8.1 Designated Sites

Project activities have the potential to affect designated sites directly (through land-take, whether temporary or permanent) and / or indirectly (through degradation due to changes in air quality, introduction of pollutants (aerial or otherwise), invasive species and potentially damage due to fire).

Utrish SPNA

Utrish SPNA is located approximately 3.8 km to the south of the landfall section. Land-take within the SPNA will therefore not occur. Due to the distance between the site and construction activities, damage or degradation to the SPNA due to dust is not anticipated. The potential for NOx and SO_2 to degrade the habitats contained within the Utrish (predominantly the forest habitats) has been considered. Air quality modelling has determined that, during the course of construction, the change in the atmospheric concentrations of NOx and SO_2 within the vicinity of the SPNA will be minimal (a change of less than approximately two percent, when compared to the relevant criteria / standards) (see **Chapter 9 Air Quality**). Furthermore, considering that the impact will last only for the duration of construction (approximately 1 year), and will cease following completion of construction, changes in NOx and SO_2 concentrations are unlikely to affect the habitats contained within the Utrish SPNA. In the absence of mitigation, the impact is assessed as being of negligible magnitude resulting in a **Not Significant** effect.

In the absence of appropriate controls, there is the potential for the introduction of invasive fauna and flora during construction. Invasive species have the potential to significantly alter the

ecology of the SPNA and affect its overall integrity in the long term. Although of a relatively low probability, it is potentially a high magnitude impact on a receptor of high sensitivity resulting in an effect of **High** significance.

Protective Forests

The assessment for the areas of habitat within the Study Area designated as 'protective forest' are considered in the relevant habitat sections below (see assessments for shiblyak, mesophilic forest and juniper woodland).

11.6.8.2 Habitats and Flora

Habitats

Direct impacts due to landtake will occur within the juniper woodland, mesophilic forest, shiblyak, and secondary steppefied meadow all of which fall within the Project's construction corridor. Table 11.33 presents the area of each habitat that will be removed during construction.

In addition to the above, there is the potential for indirect effects due to changes in air quality, introduction of pollutants (aerial or otherwise) and invasive species.

Table 11.33 Direct Habitat loss within the Study Area

Habitat Type	Area of Habitat Within the Study Area Subject to Habitat Loss (ha)
Juniper woodlands	2.6
Mesophilic forest	1.4
Steppefied secondary meadow	4.1
Shiblyak	3.5
Rocky outcrops	0
Mesophilic meadow	0
Tomillyar	0
Coastal shingle	0

Juniper Woodland

Approximately 2.6 ha of juniper woodland will be cleared during construction. Approximately 1.9 ha of this loss will be permanent due to the requirement for a permanent RoW along the Pipeline route. The remaining 0.7 ha has the potential to be reinstated post-construction

although the habitat would be likely to only return to its pre-clearance state in the long term (20 years or more).

The loss of 2.6 ha constitutes approximately 4.6 percent of the juniper woodland within the Study Area. The loss of this woodland is unlikely to affect the ability of this habitat type to persist within the region. The impact is assessed as being of a moderate adverse magnitude on a receptor of moderate sensitivity resulting in **Moderate** significance effect.

There is the potential for degradation to juniper woodland (which has not already been affected by land take) due to dust and adverse changes in air quality. The impact on vegetation will be temporary (lasting for approximately one year) and for this reason is unlikely to alter the structure or composition of affected juniper woodland in the long term (see **Chapter 9 Air Quality**). The impact is assessed as a low magnitude impact resulting in an effect of **Low** significance.

There is the potential for the introduction of invasive fauna and / or flora during construction. Invasive species have the potential to significantly alter the ecology of juniper woodland and affect its overall integrity in the long term. Although of a relatively low probability, it is potentially a high magnitude impact on a receptor of moderate sensitivity resulting in an effect of **High** significance.

Mesophilic Forest

Approximately 1.4 ha of mesophilic forest will be cleared during construction. Approximately 0.8 ha of this loss will be permanent while the remaining 0.7 ha has the potential to be reinstated post-construction. As with juniper woodland, this would likely only occur in the long term. The loss of this habitat is also likely to fragment remaining mesophilic woodland habitat to the north and south within the Graphova Gap.

The proportion of mesophilic forest directly affected is approximately 2.2 percent of this habitat type recorded within the Study Area. The loss of a relatively small proportion of this woodland is unlikely to affect the ability of this habitat type to persist within the region.

In the absence of mitigation, the impact is assessed as being of a moderate adverse magnitude on a receptor of moderate sensitivity resulting in an effect of **Moderate** significance.

There is the potential for degradation to mesophilic woodland (which has not already been affected by land take) due to dust and adverse changes in air quality. The impact on vegetation will be temporary (lasting for approximately one year) and for this reason is unlikely to alter the structure or composition of affected mesophilic forest in the long term (see **Chapter 9 Air Quality**). The impact is assessed as a low magnitude impact resulting in an effect of **Low** significance.

There is the potential for the introduction of invasive fauna and / or flora during construction. Invasive species have the potential to significantly alter the ecology of mesophilic forest and affect its overall integrity in the long term. Although of a relatively low probability, it is potentially a high magnitude impact on a receptor of moderate sensitivity resulting in an effect of **High** significance.

The impact on mesophilic forest constitutes an effect on critical habitat (see Appendix 11.1)

Shiblyak

Approximately 3.5 ha of shiblyak will be cleared during construction. Approximately 2.4 ha of this loss will be permanent due to the requirement for a permanent RoW. The remaining 1.1 ha has the potential to be reinstated post-construction although, as with juniper woodland, the habitat would only return to its pre-clearance state in the long term.

The proportion of shiblyak directly affected is approximately 0.8 percent of the habitat type recorded within the Study Area. The relatively small loss of this woodland is unlikely to affect the ability of this habitat type to persist within the region. In the absence of mitigation, the impact is assessed as being of a moderate adverse magnitude on a receptor of moderate sensitivity resulting in an effect of **Moderate** significance.

There is the potential for degradation to shiblyak (which has not already been affected by land take) due to dust and adverse changes in air quality. The impact on vegetation will be temporary (lasting for approximately one year) and for this reason is unlikely to alter the structure or composition of affected shiblyak in the long term (see **Chapter 9 Air Quality**). The impact is assessed as a low magnitude impact resulting in an effect of **Low** significance.

There is the potential for the introduction of invasive fauna and / or flora during construction. Invasive species have the potential to significantly alter the ecology of shiblyak and affect its overall integrity in the long term. Although of a relatively low probability, it is potentially a high magnitude impact on a receptor of moderate sensitivity resulting in an effect of **High** significance.

Secondary Steppefied Meadow

Approximately 4.1 ha of secondary steppefied meadow will be cleared during construction. This includes permanent habitat loss along the Pipeline RoW, and temporary loss associated with the construction of the temporary access roads. There is therefore the potential for the majority of this habitat to be reinstated and a large proportion of the loss (up to 90% of the cleared habitat) is therefore considered to be in the short term (within 1 – 2 years following completion of construction).

The loss of approximately 3.7 percent of the habitat within the Study Area is therefore assessed as being an impact of low adverse magnitude on a receptor of low sensitivity. This equates to an effect of **Low** significance.

There is the potential for degradation to other habitats due to dust and adverse changes in air quality. The impact on vegetation will be temporary (lasting only for the duration of construction). It is therefore unlikely that the structure or composition of these habitats will be affected in the long term. The impact is assessed as a low magnitude impact resulting in an effect of **Low** adverse significance.

There is the potential for the introduction of invasive fauna and / or flora during construction. Although of a relatively low probability, it is potentially a high magnitude impact on a receptor of low sensitivity resulting in an effect of moderate significance.

Tomillyar and Mesophilic Meadow

There is the potential for degradation to other habitats due to dust and adverse changes in air quality. The impact on vegetation will be temporary (lasting only for the duration of construction). It is therefore unlikely that the structure or composition of these habitats will be affected in the long term. The impact is assessed as a low magnitude impact resulting in an effect of **Low** adverse significance.

There is the potential for the introduction of invasive fauna and / or fauna during construction. Although of a relatively low probability, it is potentially a high magnitude impact on a receptor of moderate sensitivity resulting in an effect of **High** significance.

Running Water

The Pipeline crosses two watercourses (the Shingar River and an unnamed tributary of the Sukko) on one occasion each (please see Figure 11.7 for further detail). The effect of the Project on the soils and hydrological regime of these watercourses is discussed in **Chapter 8 Soil, Groundwater and Surface Water**.

The Shingar River will be crossed with the use of micro-tunnelling (see **Chapter 5 Project Description**) and impacts to this watercourse during its crossing are therefore anticipated to be limited. However, there is the potential for other construction activities within the RoW and at the microtunnel construction site to cause runoff and increased sediment to enter the watercourse. The impacts associated with construction in the catchments of the Shingar River are likely to be medium term and of moderate magnitude and **Moderate** significance prior to mitigation.

With regards the crossing of the unnamed tributary in the Graphova Gap, open cut trenching is proposed at this location. Open cut trenching across the river will temporarily alter the flow during the works at the crossing and potentially result in flows during a flood event being diverted onto the surrounding floodplain. Given the nature of the topography at the crossing site with relatively steep valley sides, the impacts on the flow regime are likely to be local to the crossing. The crossing may also affect the sediment load and quality of the water at the crossing and along the downstream stretch of the watercourse. It is anticipated that the construction be undertaken in the low rainfall season when there is little to no flow in the ephemeral watercourse, which will reduce the likelihood of impacts. However, based on the worst case assumption that there are flows in the watercourse due to rainfall at the time of crossing construction, the impacts on the tributary in the Graphova Gap are medium term and is of moderate magnitude and **Moderate** significance (see **Chapter 8 Soils, Groundwater and Surface Water**).

The proposed Gazprom Invest permanent access road route crosses the Graphova Gap. Depending on the timing of the construction works, there could be impacts on the surfacewater flow regime, water quality and the hydromorphology of the river channel. Construction details are not currently available; however, construction of the stream crossing could temporarily alter the flow route during the works and potentially result in flood flows being diverted onto the surrounding floodplain. Given the nature of the topography at the crossing site with relatively steep valley sides, the impacts on the flow regime are likely to be local to the crossing. The

crossing may also affect the sediment load and quality of the river at the crossing and along the downstream stretch of the watercourse. The impacts of the construction works will be temporary and the watercourse will recover through natural processes. It is recommended that the construction be undertaken in low rainfall season when there is little to no flow in the ephemeral watercourse. Based on the worst case assumption that there are flows in the watercourse due to rainfall at the time of crossing construction, the impact on the tributary in the Graphova Gap is medium term and is of moderate magnitude and **Moderate** significance.

Flora

There is the potential for the direct loss and damage of flora of ecological value during the Construction Phase of the Project. There is also potential for indirect effects on to flora located adjacent to the construction corridor due to dust and other construction related emissions.

Of the 26 notable plant species recorded within the Study Area, four have been recorded within the Pipeline construction corridor: Greek juniper, stinking juniper, pyramidal orchid and Kavakh peony. These species have the potential to be directly affected during construction.

Greek and Stinking Juniper

Greek and stinking juniper have been recorded within the juniper woodland and shiblyak habitats that will be directly affected during construction. Approximately 2.6 ha of juniper woodland and 3.5 ha of shiblyak will be cleared, resulting in the loss of specimens within these areas.

As is discussed above, the proportion of juniper woodland and shiblyak habitat lost is approximately 4.6 percent and 0.8 percent of each resource within the Study Area, respectively. The loss of this amount of habitat is not considered of sufficient magnitude to significantly affect the persistence of these species within the local area (within the Wider Study Area).

Construction is therefore expected to have a localised direct long term impact on Greek and stinking juniper. This is assessed as an impact of moderate adverse magnitude on a receptor of moderate sensitivity resulting in an effect of **Moderate** significance.

There is potential for dust and adverse changes in air quality to damage or degrade Greek and stinking juniper (see **Chapter 9 Air Quality**). Based on the temporary nature of construction activities (approximately 1 year), it is not anticipated that dust and air quality impacts would significantly affect the ability of these species to persist within the affected habitats. The degraded habitats would also be likely to recover to their original state in the short term (1 - 2 years) following cessation of the impact. It is assessed as an impact of low adverse magnitude on receptors of moderate sensitivity resulting in an effect of **Low** significance.

Pyramidal Orchid, Campanula komorovii, Salvia ringens, and Linum hirsutum

Four RDB plant species have been recorded in meadow habitats either within or in close proximity to the construction area for the Varvarovka bypass road. Clearance of this habitat during construction could therefore result in the loss of individuals or possibly a sub-population of these species within the construction area. As discussed above, approximately 4.1 ha of secondary steppefied meadow will be temporarily lost during construction; approximately 3.7

percent of the resource within the Study Area. The loss of this amount of habitat is not considered of sufficient magnitude to significantly affect the persistence of this species within the local area (within approximately 15 km of the Pipeline).

In the absence of mitigation, construction is therefore expected to have a localised, direct impact on these species. The impact is however considered reversible within the short – medium term (2 – 3 years) as the secondary steppefied meadow habitats are reinstated. The impact is therefore assessed as being of up to moderate adverse magnitude on receptors of moderate sensitivity resulting in an effect of **Moderate** significance.

The species may also be affected by dust and changes in air quality (discussed above for Greek and stinking juniper). The impact is assessed as an impact of low adverse magnitude on receptors of moderate sensitivity resulting in an effect of **Low** significance.

Kavakh Peony

Kalakh peony was recorded within the mesophilic forest within the construction corridor of the Pipeline. Clearance of this habitat during construction will result in the loss of all specimens within the construction corridor.

The proportion of mesophilic forest which will be cleared is approximately 2.2 percent of the resource within the Study Area. The loss of this amount of habitat is not considered of sufficient magnitude to significantly affect the persistence of this species within the local area (within approximately 15 km of the Pipeline).

Construction is therefore expected to have a localised direct long term impact on Kavakh peony. This is assessed as an impact of moderate adverse magnitude on a receptor of moderate sensitivity resulting in an effect of **Moderate** significance.

The species may also be affected by dust and changes in air quality (discussed above for Greek and stinking juniper). The impact is assessed as an impact of low adverse magnitude on receptors of moderate sensitivity resulting in an effect of **Low** significance.

All Other Notable Flora

No other notable plant species were recorded within the construction corridor and they are therefore considered to be either absent from the zone of direct impact of the Project or present in very low numbers. It is therefore very unlikely that the Project would affect the integrity of the local population of these species.

Therefore, as a worst case assessment, construction could potentially have direct and long term impact on a small population of these species. This is assessed as an impact of low adverse magnitude on receptors of low to moderate sensitivity resulting in an effect of no more than **Moderate** significance.

These species may also be affected by dust and changes in air quality (discussed above for Greek and stinking juniper). The impact is assessed as an impact of low adverse magnitude on receptors of up to moderate sensitivity resulting in an effect of **Low** significance.

Any impact on fern-leaved speedwell and *Rindira tetraspis* would constitute an effect on critical habitat (see Appendix 11.1). However neither species have been recorded within the construction corridor. Both species appear to be restricted to the coastal cliffs which will be micro-tunneled and therefore no impacts to either species would occur.

11.6.8.3 Fauna

Invertebrates

The potential impact pathways to invertebrates may be direct or indirect. Direct impacts may occur due to loss and fragmentation of habitats, as well as changes in the character of habitats. Indirect impacts may occur due to a decrease in floral species diversity resulting in a decrease in food availability, light pollution from construction works or changes in air quality.

Invertebrates of ecological importance are potentially relatively abundant within the Study Area, comprising beetles (nine species), weevils (one species), moths and butterflies (14 species), bees and wasps (two species), leaf hoppers, flies (one species), crickets (one species), mantids (one species) and dragonflies (one species). The majority of these species are most likely to be found within areas of meadow and woodland habitats (including the steppefied and mesophilic meadow, mesophilic forest, juniper woodland, and shiblyak).

The loss of relatively small proportions of suitable invertebrate habitat contained within the Study Area (mesophilic forest (2.2 percent), shiblyak (0.9 percent), steppefied meadow (4.1 percent), juniper woods (4.6 percent) and no loss from within the mesophilic meadow, tomillyar, coastal shingle or residential / ruderal habitats) will be partially mitigated by the availability of similar habitat adjacent to the Pipeline route where land take will occur.

Degradation to adjacent habitats may occur as a result of light, dust and emission of air pollutants during construction. If left unmitigated, this could potentially result in larger areas of suitable invertebrate habitat being affected. However, this impact would be of short duration (restricted to approximately one year).

Considering the relatively limited extent of habitat loss, availability of other suitable habitat within the local area, the impact on invertebrates is assessed as being of low adverse magnitude. The effect of construction on invertebrates is assessed as considered to be of up to **Moderate** significance, due to the sensitivity of the receptor (up to moderate) and magnitude of the impact (adverse moderate).

Any impact on Levantine skipper populations would constitute an effect on critical habitat (see Appendix 11.1). This species is associated with dry open grassland habitats. The loss of such habitat as a result of the Project is limited in extent and unlikely to adversely affect the population of this species. Due to the operational requirement for open habitats to replace lost woodland, the likely available habitat for this species will increase in extent as a result of the Project.

Herpetofauna

Potential impacts on reptiles during the Construction and Pre-Commissioning Phase include the loss and fragmentation of habitats, direct mortality or injury to individuals, disturbance to individuals during the breeding and hibernation period, and obstruction of movement.

Nikolski's tortoise

Habitat loss: Works occurring during the species' active period will affect areas of shiblyak (3.5 ha), juniper woodland (2.6 ha), mesophilic forest (1.4), and secondary steppefied meadow (4.1 ha); all of which are important to the tortoise for foraging, shelter and breeding. Areas of agricultural habitat which are less important, but are a potential foraging resource for the species, will also be cleared.

A proportion of this loss will be reversible, as the cleared habitats will be reinstated following completion of construction. However recovery of these habitats could take from 2-5 years (in the case of the steppefied secondary meadow and vineyard) to over 20 years (in the case of the woodland habitats) (see the Habitats assessment above for further detail).

Disturbance impacts: In addition to direct habitat loss during construction, tortoises could also be impacted through disturbance. A number of studies have recorded disturbance effects on tortoises from roads. Both Nafus et al., (2013) and Boarman and Sazaki, (2006) recorded declines in the apparent densities of tortoises within 400 m of roads; Nafus et al., (2013) reported a decline in tortoise signs of over 40% between low and medium/high traffic roads, although a large proportion of this may have been due to road kill (Ref. 11.21 and Ref. 11.22).

Direct mortality impacts: In the absence of mitigation, direct mortality to tortoises could occur due to plant or vehicle collisions, damage during trenching activities, harm by humans or introduced animals (e.g. dogs). Tortoises hibernating in the ground could be directly affected by works undertaken during the hibernation period.

Habitat severance and fragmentation: Construction of the Pipeline and of the access roads, could affect seasonal migrations of the tortoise (i.e. from the hill areas or open habitats (shiblyak and juniper woodland and meadow) to the valley floors within the mesophilic woodland). In particular, the route of the Pipeline crosses the Graphova Gap, fragmenting two significant areas of habitat located to the north and south. This would affect the species during the construction period (for approximately 24 months), with the impact within the Pipeline route ceasing on completion of construction.

The effect of habitat loss and fragmentation, as well as the potential for direct mortality and disturbance of tortoises, has the potential to affect not only the population of tortoises within the Study Area (currently estimated 150 - 350 individuals) (Ref. 11.14), but potentially may also affect the population beyond the Study Area due to the effects of reduced fecundity and population fragmentation. The Project therefore has the potential to affect the integrity of a

significant[7] population of tortoises (150 – 350 individuals or approximately 2 - 5% of population of the Abrau peninsula).

In the absence of mitigation, the impacts arising at the Construction Phase therefore have the potential to affect the integrity of a globally significant population of a critically endangered species of tortoise in the medium – long term. The impact magnitude is assessed as being moderate adverse on a receptor of high sensitivity, resulting in an effect of **High** significance.

Any impact on Nikolski's tortoise would constitute an effect on critical habitat (see Appendix 11.1).

European Glass Lizard and Aescalupean Ratsnake

European glass lizards were recorded at various locations within the Study Area and are considered a frequently occurring species. Aesculapean ratsnake was also recorded at various locations within the Study Area although at lower densities. The species is therefore considered either likely absent or present in relatively low numbers within the Study Area.

Both species forage, shelter, breed and hibernate within habitats that will be directly impacted during construction: including shiblyak, juniper woodland, mesophilic forest and steppefied secondary meadow. They are also potentially present foraging within the agricultural habitats although these areas are considered sub-optimal. When viewed within the context of the local area (within the Wider Study Area), the proportion of habitat lost and fragmented is not anticipated to be sufficient to significantly affect the ability of the local species populations to survive in the long term. It is also likely that the majority of habitat which will be directly affected during construction will be reinstated post-construction (see Habitats assessment above). The impact is therefore assessed as being of low adverse magnitude on a receptor of moderate sensitivity resulting in an effect of **Low** significance.

As discussed above, the construction of the Varvarovka bypass access road will occur when reptile species are potentially hibernating. There is the potential for both European glass lizard and Aescalupean ratsnake to be present within the open habitats (such as the secondary steppefied meadow). Therefore, habitat removal during the hibernation period could result in the direct mortality of a number of these species.

There is also the potential for the killing and injury of these species outside of the hibernation period (as discussed above for Nikolski's tortoise). The deaths of individuals will reduce the size of the local population and potentially the pool of breeding adults. This could have a long term adverse impact on the local population of these species. The impact is assessed as being of up to moderate adverse magnitude resulting in an effect of **Moderate** significance.

There is some potential for construction activities to restrict the movement of these species. European glass lizards generally have a relatively limited range and the severance effect is unlikely to be of a magnitude which would affect the population within the Study Area.

[7] Significant in this context refers to greater than 1% of a regionally important population (i.e. the Abrau peninsula population).

Construction related severance may restrict the movement of Aesculapean snake slightly, although it is unlikely to stop the species from accessing sufficient foraging, sheltering hibernation or breeding habitat within the Study Area. It will also only persist for the duration of the construction period. The impact is assessed as being of low magnitude resulting in an effect of **Low** significance.

All Other Common Reptiles

The effects on common reptiles are anticipated to be the same as for glass lizard and Aesculapean snake, discussed above. This includes habitat loss, killing of individuals (including during the hibernation period) and creation of barriers to the dispersal of species.

The Project is anticipated to have a medium term localised impact on terrestrial habitats used by reptiles during the Construction Phase, resulting in a temporary loss of habitat and biota along the alignment. It is assessed that this is a negative impact of low to moderate magnitude on species of low sensitivity resulting in an effect of up to **Moderate** significance.

Amphibians

Amphibians are potentially sheltering and foraging within habitats which will be directly impacted during construction, including the shiblyak, juniper woodland, mesophilic forest, secondary steppefied meadow and agricultural habitats. Suitable breeding habitat, adjacent to watercourses within the mesophilic forest, and within ephemeral waterbodies which are not location specific, are also likely to be subject to direct loss. This loss is not anticipated to be sufficient to significantly affect the ability of the local amphibian population to survive in the long term as sufficient habitat remains within the Study Area to support these species. The impact is therefore assessed as being of low adverse magnitude on a receptor of low to moderate sensitivity resulting in an effect of up to **Moderate** significance.

Construction activities also have the potential to kill and injure species potentially present within the aforementioned habitats (including during the hibernation period, as discussed above for reptiles). This has the potential to affect the amphibian population, including the RDB listed Caucasian toad, within the Study Area in the medium term. This impact is assessed as being of up to moderate magnitude, as it will affect the local amphibian population in the medium term. It is therefore assessed as an effect of **Moderate** significance.

Construction activities may restrict the movement of amphibians, particularly during the breeding season when these species need to access waterbodies for breeding. This has the potential to fragment and interrupt the breeding of the population of amphibians within the Study Area. This impact is likely to persist for only one breeding season as construction is predicted to last for 16 months. The impact is assessed as being of moderate magnitude resulting in an effect of up to **Moderate** significance.

Birds

Potential impacts on birds during the Construction Phase include the direct loss of breeding habitat. Breeding bird habitat with the potential to be directly affected during construction includes shiblyak (3.5 ha will be lost), juniper woodland (2.6 ha will be lost), mesophilic forest (1.4 ha will be lost), and steppefied secondary meadow (4.1 ha will be lost). There is also the

potential for individual birds which are nesting within these habitats to be killed or injured and for their nests to be damaged.

Breeding birds may also be affected by noise and visual disturbance from construction activity. Noise modelling has been undertaken at four locations to predict the likely noise levels associated with construction experienced at various locations within the Study Area (see **Chapter 10 Noise and Vibration**). The noise modelling predicts that within woodland, grassland, and vineyard areas close to the Pipeline route, during construction, noise levels will be experienced of between 39 - 59 dB depending on the activities being undertaken, compared to an ambient background levels of between 43 - 53.2 dB (noise modelling locations 9 to 12).

Short-toed Snake-eagle and Booted Eagle

Short-toed snake-eagle and booted eagle do not breed within areas of woodland which are likely to be directly or indirectly affected by the Project. Loss of potential breeding habitat, killing or injury of individuals, and damage to nests is therefore not anticipated.

Impacts on these species of raptor will therefore be limited to loss of suitable foraging habitat. Given the large amount of suitable hunting habitat for all species outside the Project area and as the population of breeding raptors is limited to one pair of each species this impact is considered to be of **Low** significance.

Wood Lark

Wood lark have been recorded breeding within the mesophilic woodland, steppefied secondary meadow, and agricultural habitats. Based on the population density surveys completed in 2011 the potential reduction in the number of wood lark in the Project Area is shown in Table 11.34.

Table 11.34 Potential Reduction in Breeding Pairs of Species of Ecological Importance as a Result of Habitat Loss

Species	Habitat Preference	Population Density (breeding pairs/km^2)	Amount of Habitat Loss (km^2)	Potential Reduction of Breeding Pairs
Wood lark	Mesophilic Woodland	5	0.0739	0.37
	Steppefied secondary meadow	7.6	0.0372	0.28
	Agricultural habitats	10.31	0.2268	2.34
			Total	**3 pairs**

In addition to the loss of breeding habitat and potential for the killing or injury of individual wood lark, impacts will occur in a wider area due to increases in noise and visual disturbance so the 'loss' of breeding pairs is likely to be slightly higher. However, there are large areas of natural habitat that should be able to support some of these displaced breeding birds.

Therefore, the loss of 3 pairs is probably a reasonable estimate. The temporary loss of 3 breeding pairs would represent 1-1.5 percent of the total estimated breeding population of wood larks in the Krasnodar Krai (200-300 pairs), which would represent an impact of low magnitude. Post construction, the Pipeline route will be allowed to periodically re-vegetate (allowed to grow for 2 to 3 years and then cut). This area will therefore develop in to a more open edge type habitat which is favoured by wood larks as well as many of the commoner breeding bird species breeding in the Project Area. In the long-term, this will allow all these species to breed in this area and it is therefore predicted that the Project will not result in a long-term decrease in breeding species.

In absence of mitigation, the impact on woodlark is therefore assessed as being of **Moderate** significance.

Breeding Bird Assemblage

As has been discussed above for the threatened breeding bird species, construction activities will result in the loss of potential breeding bird habitat, potential killing, injury and disturbance to individuals, potential damage to nests, and potential loss of foraging habitat. The proportion of habitat affected when compared to the amount of available habitat within the Study Area is unlikely to be sufficient to affect the ability of the breeding bird assemblage to breed and survive within the local area, either during construction or in the long term. The impact is therefore considered to be temporary and of a relatively low magnitude resulting in an impact of **Low** significance.

Mammals

Potential impacts on mammals during the Construction Phase include the loss and fragmentation of habitats and direct mortality or injury to individuals. Mammals may also be affected by noise and temporary lighting, which may result in disruption to foraging, breeding and migration.

Bats

Twelve species of bat are potentially present within the Study Area. This includes species assessed as being of low to moderate sensitivity.

Within the construction corridor, there are limited roosting opportunities for bats. Potential roost sites are restricted to 9 trees assessed as having low roost potential. These trees will be removed during construction and there is therefore potential for a small proportion of relatively low quality roosting habitat for bats to be lost. This is assessed as a low magnitude impact on a receptor of low to moderate sensitivity resulting in an effect of no more than **Moderate** significance.

There is potential for construction noise, vibration and construction related light pollution to disturb roosting bats (see **Chapter 10 Noise and Vibration** and 'Birds' Section above for further detail). This impact is likely to be restricted to works within the vicinity of the mesophilic woodland where potential roosting habitat exists. Construction activities within this area will be of a relatively short duration (approximately 1 year) and restricted in extent. Furthermore, other roosting habitat is available (including buildings and other trees) within the Study Area which

bats could use to roost. Temporary disturbance within areas of low roost potential is a low magnitude impact on a receptor of low to moderate sensitivity resulting in an effect of no more than **Moderate** significance.

In terms of foraging bats, habitats within the Study Area, including the woodland, meadow, rivers and agricultural habitats are likely to support foraging bats. The loss of these habitats and potential disturbance to foraging bats are unlikely to affect the ability of the local bat population to persist within the Study Area, as sufficient habitat of a similar quality remains. The impact is assessed as a low magnitude resulting in an effect of no more than **Moderate** significance.

Bats favour linear features such as rivers, forest edges and tree lines, which they use for navigation when commuting. The Graphova Gap which contains the unnamed tributary of the Sukko River flows is a potentially important commuting corridor for bats. Works within this area, if undertaken at night and during the bat activity season, have the potential to disturb bats commuting along this flight line. Light and noise disturbance are not anticipated to be of a scale which would result in the total severance of this route, although some disturbance to bats is possible. Low numbers of commuting bats have the potential to be temporarily disturbed although no commuting routes are likely to be completely severed during the Construction Phase. The impact is therefore assessed as a low magnitude impact of no more than **Moderate** significance.

Other Mammals

The following may be present both within the Study Area and along the Pipeline route: insectivores (confirmed sightings of hedgehog, Caucasian mole-rat, Caucasian common shrew); rodents (confirmed sightings of greater mole-rat, forest dormouse, field mouse); lagomorphs (sightings of brown hare and European rabbit); carnivores (including sightings of wolf, common jackal, red fox, common racoon, common marten, rock marten, and badger) and artiodactyls (including sightings of roe deer). Thus, construction of the Project has the potential to result in the loss of foraging and breeding habitat for these species, as well as to disturb them at various stages in their lifecycle (e.g. breeding and hibernation).

Construction will result in the loss of suitable foraging, sheltering, and breeding habitat for mammals. This includes areas of shiblyak, juniper woodland, mesophilic forest, secondary steppefied meadow, and vineyard. When viewed within the context of the local area (within approximately 5 km of the Project), the proportion of habitat lost is not anticipated to be sufficient to affect the ability of mammals supported within the Study Area to survive. Habitat loss is therefore a low magnitude impact on receptors of low sensitivity resulting in an effect of **Low** significance.

There is the potential for killing and injury of individuals during construction (particularly the subterranean dwelling species such as mole-rats and smaller burrowing rodents). The other mammal species are have greater mobility and are likely to be able to quickly leave affected areas of habitat during the Construction Phase. In the absence of mitigation, construction activities could result in the deaths of relatively low numbers of mammals within the Study Area. The impact is potentially of moderate adverse magnitude resulting in an effect of **Low** significance.

Mammals are likely to be indirectly affected by noise (see **Chapter 10 Noise and Vibration**) and / or light disturbance during the Construction Phase. The impact is likely to be short term and reversible i.e. mammals will return to affected areas once construction ceases. This could affect a relatively small number of mammals within the vicinity of the construction corridor. It is assessed as an impact of low magnitude on a receptor of low sensitivity resulting in an effect of **Low** significance.

11.6.9 Mitigation and Monitoring: Construction and Pre-Commissioning

Where the likely impacts on ecological receptors are assessed to be of high or moderate significance, mitigation measures are proposed to lower the overall magnitude of impact on a particular receptor and to avoid or reduce significant impacts on habitats and protected species. Additional mitigation measures are required where there are potential impacts to component features of critical habitats so that the requirements of IFC PS6 are met.

The mitigation approach comprises a number of elements:

- General mitigation measures, including provision for an Ecological Clerk of Works (ECoW), training of construction personnel and implementation of a Construction Management Plan (CMP);
- Herpetile Mitigation Strategy that covers: firstly the construction period and details the measures to be undertaken to protect key ecological receptors such as the Nikolski's tortoise, particularly during initial site clearance works (Appendix 11.3);
- A Habitat Reinstatement Plan (RP) (also referred to in the Proekt as the 'Technical and Biological Recultivation Plan') will provide detailed specifications for the restoration of habitats post-construction. Management and monitoring requirements for an appropriate length of time for each activity will also be specified; and
- A BAP will be developed to describe how the Project will meet IFC PS requirements for no net loss of biodiversity within natural habitats, and net gain requirements for components of critical habitat. Therefore, the BAP will provide a framework for a long-term biodiversity monitoring and evaluation programme. Development of the BAP will take into consideration relevant industry guidance, and will allow for adaptive management and consultation with stakeholders on topics of conservation related to the Project's biodiversity interests.

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

11.6.9.1 General Mitigation Measures

Ecological Clerk of Works

A suitably qualified ECoW will be appointed by South Stream Transport, independent of the construction site contractor, for the duration of the onshore Construction Phase of the Project. The ECoW will be tasked with overseeing onshore construction activity and with ensuring that all mitigation measures are implemented in accordance with the CMP and associated documentation. Furthermore, the ECoW will be given the responsibility of compiling weekly /

monthly reports on issues such as non-compliance and on modification or supplementation of the CMP, and these reports will be submitted to South Stream Transport and to the construction contractor.

Due to the scale of the Project, the ECoW will be supported by specialists (e.g. botanists, zoologists) as necessary to assist with monitoring the implementation of the CMP and assisting with mitigation where necessary.

Site Personnel Training

Information on the ecological sensitivity of the habitats and species within the construction corridor will be included within a site induction package for all site personnel. This will ensure that all personnel working on site are aware of the sensitivities of the protected sites, habitats and species and are aware of the mitigation measures that need to be employed to minimise any adverse effects of the Project. These measures are described below in respect of terrestrial ecological receptors.

Construction Management Plan

A CMP will detail general mitigation measures to be applied for the Project during construction, and will include the following:

- Strict limitation of construction workers, materials and machinery to the defined construction areas to avoid impacts to surrounding habitats;
- Project workers will not be allowed to bring any live animals or plants into the construction site to avoid the risk of pest or invasive species establishing in the Project Area;
- Once quarries and disposal sites are confirmed by the contractor, South Stream Transport will conduct an invasive species risk assessment. If the findings indicate there is a significant risk of introducing alien invasive species then appropriate mitigation will be implemented. Such measures may include the washing or spraying of all incoming machinery at a demarcated 'washing site' to ensure that any mud or soil which may be carrying seeds is removed;
- The construction site will be monitored by the ECoW for the presence of alien invasive species. Where stands of alien invasive weeds that are known habitat transformers are found to occur within the construction site, such stands should be demarcated so that vehicles do not pass through these stands (and thus potentially spread seeds and other propagules of these species) and that the soils associated with these stands are not transported. An appropriate remediation strategy for alien invasive species will be implemented on-site, where these species are found to occur;
- In-line with GIIP, all construction sites will have appropriate sediment and erosion control practices applied. This will minimise the potential for seed dispersal and noxious weed establishment potentially associated with disturbance at construction areas and limit the likelihood of any effects on receptors remote from the immediate vicinity of the works;
- Storage areas shall only be placed in areas of low ecological importance (e.g. cultivated agricultural land);

- Project workers will be trained in litter / waste control procedures and fire emergency response procedures. This will aim to minimise the risk of accidental fires in surrounding vegetation. Suitable equipment will be made available on site. Emergency response plans will be developed and coordinated with the relevant national authorities;
- Waste management (see **Chapter 18 Waste Management**) includes recycling activities, for example vegetation removed from site will be used where possible for habitat improvement or composted;
- The lighting of fires will be strictly prohibited at all times during construction;
- Project workers will be forbidden from hunting or collecting wild plants and animals;
- The use of herbicides will be forbidden on-site;
- Any artificial lighting will be carefully located and directed to avoid light spill into adjacent areas;
- A detailed soil management strategy to ensure that topsoil from cultivated areas is not mixed with topsoil from non-cultivated areas. In addition, topsoil and subsoil will be stored separately. This is to retain integrity of seed banks and soil microbial composition;
- Measures to reduce the potential for soil run-off and scouring of bare soil following vegetation clearance; and
- Only the designated access roads shall be used to access the landfall section construction areas. Machinery shall not be allowed to move outside these access roads and construction areas. Traffic during the Operational Phase shall travel along designated routes, marked with clear and lasting markings.

The CMP will cross reference relevant measures contained within Appendix 11.3 Herpetile Mitigation Strategy that will require implementation throughout the construction period such as maintenance and protection of reptile exclusion fencing.

11.6.9.2 Designated Sites

The general mitigation measures (see Section 11.6.9.1) should be adhered to in order to avoid significant effects on designated sites (as described in Section 11.5.1.1).

11.6.9.3 Habitats and Flora

Habitats

The general mitigation measures shall be implemented to avoid significant effects on habitats during construction. This section on terrestrial habitats should be read in conjunction with Section 11.6.9.4 on fauna and Nikolski's tortoise in particular.

Within areas of shiblyak, juniper woodland, mesophilic forest, and secondary steppefied meadow, habitats will, where possible, be reinstated to their pre-construction condition, with mitigation weighted in favour of 'like for like or better' habitat reinstatement. A habitat Reinstatement Plan will detail specifications for the restoration of different habitat types within the construction footprint. It will also include provisions for post-construction monitoring of

habitats, and will include adaptive mechanisms that allow modification of practices to ensure the objectives of the plan are met.

It will not be possible to allow deep-rooted trees and shrubs to establish over the Right of Way (RoW). The de-forested construction corridor will therefore be seeded with a native grass species, with the aim of creating a habitat similar to the existing steppefied meadows. It may be feasible to propagate and establish red-list species of plant within the area.

Consequently, it will not be possible to reinstate all shiblyak, juniper woodland, and mesophilic forest habitat subject to direct loss during construction. Table 11.35 below presents the areas of residual habitat loss (permanent loss) following implementation of the restoration and reinstatement mitigation measures presented above.

Table 11.35 Areas of Residual Habitat Loss After Implementation of Mitigation

Habitat Type	Temporary Loss (ha)[8]	Permanent loss (residual loss) (ha)	Total
Juniper woodlands	0.52	1.87	2.39
Mesophilic forest	0.64	0.78	1.42
Shiblyak	1.1	2.36	3.46
Total	**2.26**	**5.01**	

Relevant IFC PS Requirements

Paragraph 15 of IFC PS6 states that '*In areas of **natural habitat**, mitigation measures will be designed to achieve no net loss of biodiversity where feasible'*. It has been established that natural habitats within the Project Area include shiblyak and juniper woodland.

Paragraph 17 of IFC PS6 states that no project activities will be implemented in areas of **critical habitat** unless *inter alia* '*The project does not lead to measurable adverse impacts on those biodiversity values for which the critical habitat was designated'*. It has been established that, in terms of ecosystems within the Project Area, mesophilic forest is a threatened habitat type that confers critical habitat status under Criterion 4 (see Appendix 11.1). Based on the residual effect of habitat loss presented in Table 11.35 above, it is apparent that, despite the implementation of avoidance, minimisation, restoration, and reinstatement mitigation measures, the Project would not initially meet the requirements for no-net loss within the natural and critical habitats impacted. Additional mitigation is therefore proposed to comply with the requirements of IFC PS6.

[8] Temporary loss in this context refers to areas of habitat where it will be possible to reinstate habitat following completion of construction. It is recognised that it could take these habitats many years (more than 20 in the case of woodland) following reinstatement to reach their pre-construction condition.

Indeed, further to this under Paragraph 18 of PS6, a net gain in mesophilic forest is needed as the mitigation measures listed above are not expected to result in net gains. Options to mitigate residual loss of natural habitat and critical habitat will be explored and detailed in a BAP (which is specifically required by IFC PS6 Paragraph 18 when critical habitat is being considered).

Freshwater Habitats

Direct impacts to the Shingar River during construction will be avoided as the pipelines will be installed by micro-tunneling under the watercourse. It is also anticipated that significant impacts to the watercourse in the Graphova Gap will be avoided during construction by completing the works during the dry season. Despite this, unplanned incidents of pollution or an increase in silt or run-off within the river channels could potentially result in adverse impacts within the aquatic environment. Strict pollution control measures will therefore be employed at both locations; re-fueling operations shall be restricted to dedicated areas located at a distance greater than 50 m away from the watercourse. Spill kits, including floating booms will be available adjacent to the working area and all spills will be cleared up immediately. In addition to spill kits, silt trapping kits will be stored and available for use at the tributary location should rainfall occur during the construction period. Silt traps will be employed to ensure that the scheme does not result in an increase of greater than 20% above up-stream levels in suspended solids within the water column down-stream of the works area resulting in an adverse impact.

Further measures for the protection of watercourses are detailed in **Chapter 8 Terrestrial Soils, Groundwater and Surface Water**.

Flora

Where necessary, prior to the commencement of construction, RDB plant species within the construction area will be identified, and their location recorded using GPS. RDB species that have been recorded in the area include:

- Greek and stinking juniper;
- Pyramidal orchid;
- *Campanula komorovii*;
- *Salvia ringens*;
- *Linum hirsutum*; and
- Kavach peony.

In line with Russian statutory requirements, all protected plant species within the construction footprint will be moved to suitable alternative habitat outside the construction corridor and away from any potential effects. Translocation will be undertaken in accordance with measures to be contained within a detailed flora layout plan (to be produced). This document will be produced in association with local botanical experts.

Preservation of the seed bank through appropriate topsoil and subsoil storage during the Construction Phase will facilitate natural regeneration of the native species. Translocation of individuals back into the restored area will also be undertaken where appropriate, supplemented by propagation of seeds and cuttings.

Monitoring of the regeneration of these species will be included in the monitoring plan for the Project.

Rehabilitation of vegetation following completion of construction will be undertaken with due consideration to the existing natural vegetative assemblages in the wider local area. Native species of local provenance will be sourced as appropriate. The Habitat Reinstatement Plan will detail the appropriate restoration of the construction site.

11.6.9.4 Fauna

Invertebrates

The ESIA Report has identified potential negative effects of moderate significance on invertebrates resulting from the construction of the Project. Although it will be difficult to avoid impacts during construction, measures to reduce degradation to habitats adjacent to the construction sites will be employed to safeguard invertebrates supported within these areas (including Levantine skipper, which is a component of critical habitat). This will include:

- Restriction of the working corridor to limit the loss of invertebrate habitat; and
- Measures detailed within the CMP should be adhered to in order to avoid loss and / or degradation to invertebrate habitat adjacent to the construction corridor.

Furthermore, upon completion of the construction of the Project, continued implementation of the BAP to replace lost habitat and provide biodiversity enhancements to benefit invertebrates will be implemented. In particular, measures to address potential impacts to Levantine skipper will be incorporated to include a baseline survey to confirm presence or absence in the Study Area, provision of suitable habitats and a post-construction monitoring programme.

Nikolski's Tortoise and All Other Amphibian and Reptile Species

This ESIA has identified the potential for the Project to result in negative impacts of high significance on Nikolski's tortoise, and up to moderate significance on other species of herpetiles. Mitigation is therefore proposed to avoid impacts on these species. The mitigation measures described are incorporated into a detailed mitigation strategy (see Appendix 11.3) which provides a specification for mitigation measures to ensure that the Project does not result in a significant adverse impact on Nikolski's tortoise, as well as on all other species of amphibians and reptiles. A summary of the mitigation strategy is given below:

Construction Activity Prior to a Programme of Translocation Being Undertaken (the Varvarovka bypass road, only)

- Should any construction activities to be undertaken during the herpetiles hibernation period dependent on annual climatic variation), such activities will be restricted to essential areas only;
- Prior to the commencement of construction of the temporary access roads, all areas of habitat which will be directly affected by construction will be fenced off using one way permanent reptile proof fencing; and

- All clearance activities within areas to be constructed during the hibernation period will be undertaken under a watching brief of the ECoW to maintain the strict observance to the working corridor.

Construction Activity after a Programme of Translocation Has Been Undertaken

- Prior to the commencement of construction, all areas of habitat which will be directly affected by construction and the habitat reinstatement areas will be fenced off using one way permanent reptile proof fencing;
- Pit-fall traps, artificial refuges and temporary internal fences will also be installed at this stage and all non-protected plant species, shrubs and trees will be removed by hand to a height of approximately 100 mm. All works will be completed under an ecological watching brief;
- On completion of the fencing works, a period of translocation will be completed in which the fenced area, traps and artificial refuges will be checked twice a day by ecologists and all reptiles and amphibians caught will be placed in areas of suitable alternative habitat outside the fenced areas. Any tortoises caught will be subject to full bio-metric measurement and all or a proportion of the population will be marked using a radio transmitter to assist with further population monitoring. The exact type of tag will be determined over the winter 2013 / 2014 to ensure the chosen technology will generate the most useful monitoring data as well as ensure that any system used will not have any adverse effect on the ecology or behaviour (including mating behavior) of the tortoise. All other animals caught during the translocation period will be recorded; and
- At the end of the movement, all internal fences, pit-fall traps and artificial refuges will be removed and the permanent fence maintained to ensure that no animals can enter the working area during the construction period. On completion of construction and all post-works and habitat reinstatement, all permanent fencing will be removed. Post-construction monitoring of the tortoise population will be undertaken as part of the ecological monitoring plan for the Project.

Under-road Tunnels

In order to mitigate against the impact of habitat severance and fragmentation, under-road tunnels will be constructed at appropriate locations along the alignment of both access roads to allow for the movement of tortoises and other herpetiles. The precise location and specification of these tunnels will be discussed and agreed with the Project's contractors, but will conform to the following general principles:

- In accordance with good industry practice and published guidelines, the tunnels will be spaced at an appropriate distance and location (adjacent to suitable habitat along the Varvarovka bypass road) to ensure that there is a sufficient number and that they meet conservation objectives; and
- There will be fencing or barriers along the road to exclude tortoises from the working area.

No additional mitigation measures are expected, but would be subject to tunnel use which will be included as part of the tortoise monitoring programme.

Mitigation

The mitigation measures described above for Nikolski's tortoise, a critically endangered species and component of critical habitat, are anticipated to substantially reduce the effect of the Project on this species. However, the long term effect remains uncertain. There is the potential for Project related mortality, disturbance (including to the breeding and hibernation cycle), long-term habitat loss (see impacts to shiblyak, juniper woodland, and mesophilic forest), and habitat severance, to affect the integrity of the local tortoise population (estimated to be in region of 2% – 5% of the population within the Abrau Peninsula). Furthermore, there is a risk that, if the integrity of the local tortoise population is affected, then this could also affect the regional (i.e. Abrau Peninsula) population.

Paragraph 17 of IFC PS6 requires a project to meet the following requirements before it can be implemented:

- '*The project does not lead to measurable adverse impacts on those biodiversity values for which the critical habitat was designated*'; and
- '*The project does not lead to a net reduction*[9] *in the global and/or national/regional population of any Critically Endangered or Endangered species over a reasonable period of time*'.

Paragraph 18 of IFC PS6 goes on to state (in relation to critical habitat) that a project's mitigation strategy must be designed to achieve net gains[10] for the values which it has been designated (in this case, Nikolski's tortoise).

Given the anticipated residual impacts, and high sensitivity of Nikolski's tortoise, the Project would not be able to meet the requirement under paragraph 17 (i.e. the project will have an adverse impact which needs to be addressed), which would then lead to following paragraph 18 under which a net-gain would be required. A programme of biodiversity offsets may need to be proposed to ensure that the Project meets the requirements of paragraph 17 and paragraph 18 of IFC PS6 and would be determined through the BAP and after results of further studies as described below.

A population survey for Nikolski's tortoise will therefore be undertaken in spring 2014. This survey will be a continuation of the study undertaken between October and November 2013 and will be undertaken in conjunction with local species specialists (this is likely to include Dr. Olga Leontyeva).

[9] Net reduction defined as a singular or cumulative loss of individuals that impacts on the species' ability to persist at the global and / or regional / national scales for many generations or over a long period of time. The scale (i.e. global and / or regional / national) of the potential net reduction is determined based on the species' listing on either the (global) IUCN Red List and/or on regional/national lists. For species listed on both the (global) IUCN Red List and the national/regional lists, the net reduction will be based on the national/regional population.

[10] Net gains are additional conservation outcomes that can be achieved for the biodiversity values for which the critical habitat was designated.

The requirement is provided below in two interlinked parts primarily to ensure 'no net reduction' and a monitoring research and conservation programme designed to ensure 'net gain'. Based on the monitoring and knowledge requirements outlined above and in Appendix 11.3 Herpetile Mitigation Strategy, a potential strategy is outlined below:

- A BAP will be produced, with a significant component concerning the conservation of Nikolski's tortoise. The BAP will be subject to periodic change based on monitoring and research results and the success of habitat management actions. The BAP will be independently peer reviewed;
- In order to demonstrate 'net gain' to the species, a monitoring programme of will be applied (i.e. have practical and research value). It is expected that the continuity in the management of this monitoring programme be maintained so that its data can be collated and applied to the activities described within the BAP;
- Research into the ecology and behaviour is crucial for any offset design and habitat management, especially in relation to hibernation, breeding, dispersal and mortality;
- Surveys of tortoise populations in adjacent habitats will be undertaken to gather further data on population density and define habitat suitability parameters;
- A robust, appropriately designed, and long-term biodiversity monitoring and evaluation programme will be integrated into the client's environmental and social management plan. This will include key performance indicators on a higher level to ensure that the mitigation strategy and BAP is achieving its targets; and
- The longer-term monitoring and research programme should be designed in consultation with relevant international, national and local expertise, e.g. IUCN Species Survival Group, or an academic institute with relevant expertise.

Birds

This ESIA has identified potential negative impacts of low/moderate significance on breeding birds resulting from the construction of the Project. Mitigation is therefore proposed to minimize the magnitude of impact on breeding birds. The mitigation measures described will be incorporated into a detailed method statement for breeding birds prior to the commencement of construction, with advice from statutory nature conservation bodies as appropriate:

- Removal of nesting habitat will be undertaken prior to the breeding bird season (which is considered to be between March and September) to minimize the risk to breeding species. If this is not possible, a suitably experienced ecologist will check vegetation prior to removal for evidence of nests. If active nests of species of ecological importance are identified, an appropriate exclusion zone (approximately 5 to 10 m) will be established around the nest site until any young have fledged;
- Post-construction monitoring for the presence/ absence of nesting birds within the working area should be undertaken as part of the ecological monitoring plan for the Project. These surveys would be robust enough to calculate population densities;
- Adherence to the CMP for Biodiversity and associated working method statements to avoid loss and degradation to habitats adjacent to the working corridor; and

- Development of a post-construction habitat management plan which will include timings for management operations along the Pipeline route (i.e. vegetation management will only be completed outside of the breeding bird season).

Mammals

Bats

The following measures are recommended to safeguard bats potentially roosting within the trees present within the mesophilic woodland:

- Construction-related lighting should be minimised as far as is possible and directed to avoid illumination of adjacent habitat;
- If the trees within the mesophilic forest are to be removed during the bat activity season (March – October), clearance works will be preceded by bat roost survey to determine bat presence / likely absence of roosting bats. If bats are found to be present, a soft felling process will be implemented where the trees are felled carefully under supervision of a suitably qualified ecologist. The section of tree containing the bat roost would be left in-situ over-night to enable bats to leave of their own accord; and
- A post construction plan will be implemented to replace lost habitat and provide biodiversity enhancements for bats.

11.6.10 Residual Impacts: Construction and Pre-Commissioning

11.6.10.1 Designated Sites

Assuming the general mitigation measures described above are implemented, the residual effect of the Project on designated sites will be **Not Significant**.

11.6.10.2 Habitats and Flora

Habitats

It is not possible to restore the lost habitat in its entirety post-construction given the requirement for the maintenance of a permanent de-forested way leave along the entire Pipeline route. However, where appropriate, the reinstatement of habitats and provision of compensatory planting is likely to reduce the magnitude of the impact on habitats from low to negligible in the medium to long term. Assuming these mitigation measures are successful, the residual effect of land take on habitats is assessed as being of no more than **Not Significant** significance due to a negligible impact on a receptor of up to moderate sensitivity.

Flora

Mitigation to implement targeted movement of red list plants will lower the magnitude of the impact to negligible. The sensitive storage of topsoil, subsoil and coastal sand to preserve the natural seed bank will also maximize opportunities for natural recolonization by notable flora. It is assessed that the residual impact on notable species is **Not Significant**.

11.6.10.3 Fauna

Invertebrates

Mitigation measures aimed at reducing impacts on invertebrate habitat, as well as the proposed habitat reinstatement plan (aimed at benefiting invertebrates), are likely to reduce the impact of land take on invertebrates to negligible in the medium to long term. It is therefore considered that the residual effect of the Project on invertebrates will be **Not Significant**.

Herpetofauna

Mitigation measures will safeguard the tortoise during its active (non-hibernating) phase and reduce the impact magnitude of the Project activities on Nikolski's tortoise (and other herpetiles) during this period from high to negligible.

Works undertaken during the hibernation period will potentially result in the mortality of a small number of tortoises and other herpetiles. In order to compensate for this loss and enhance the overall population in the long term, offsetting may be required. Assuming that monitoring demonstrates that mitigation measures undertaken are successful, it is assessed that the Project will result in a **Not Significant** residual impact on Nikolski's tortoise and other herpetiles species in the long term.

Mammals

Bats

Mitigation measures will reduce the impact magnitude of the Project on roosting and foraging bats from low to negligible. It is therefore assessed that the Project will result in residual impacts on roosting bats of **Not Significant**.

All Other Mammals

Adherence to the general mitigation measures described above is likely to be sufficient to avoid significant effects on other mammals present within the Study Area. No additional mitigation for impacts on other mammals is considered necessary and the residual impact is assessed to be **Not Significant**.

Birds

Breeding Birds and Spring / Summer Migratory Birds

Habitat manipulation and sensitive timing of works to avoid breeding and migratory periods will reduce the impact magnitude of the Project on breeding birds from low to negligible. It is therefore anticipated that that the Project will result in residual effects on breeding birds of no more than **Low**.

Migratory and Over-wintering Birds

No mitigation for impacts on migratory and over-wintering birds is considered necessary and therefore the residual impact on these species is, as previously assessed, **Low**.

11.6.11 Assessment of Potential Impacts: Commissioning and Operational Phase

11.6.11.1 Designated Site, Habitats and Flora

Operational impacts resulting from the Project are limited given that all of the significant impacts on habitats will have occurred at the Construction Phase. During the Commissioning and Operational Phase many of the mitigation measures for the impacts of construction (such as vegetation replanting) will occur. The overall impact of the Commissioning and Operational Phase will therefore be considerably lower than those during construction.

The overall impact on habitats during operation will be **Not Significant** due to the lack of any significant ground-works or other major works. The only activities that will be undertaken during this Project phase will be related to land remediation and maintenance of the RoW.

There is some potential for impacts on flora (including potentially red list species) as a result of maintenance to keep the RoW free of large trees and deep-rooted shrubs for the lifespan of the Project. However, considering that the worst case scenario of habitat and species loss for flora of conservation importance has been assessed for construction, the effect of operational activities is likely to be **Not Significant** (Table 11.36).

Table 11.36 Assessment Summary Table of Potential Impacts: Construction and Pre-Commissioning

Activity	Potential Impact	Receptor(s)	Receptor Sensitivity	Pre-mitigation Impact Magnitude	Pre-mitigation impact significance	Mitigation measures	Residual impact significance
Preparation of access roads / upgrades to junctions of existing roads Open trench pipe laying activities Construction of landfall facilities Establishment of microtunnel construction site Establishment of microtunnel construction site Increased construction related traffic Increased site population	Habitat degradation Introduction of invasive species	Designated Sites	High	Up to high	Up to High Adverse	Adherence to general mitigation measures and CMP.	Not Significant

Continued...

Activity	Potential Impact	Receptor(s)	Receptor Sensitivity	Pre-mitigation Impact Magnitude	Pre-mitigation impact significance	Mitigation measures	Residual impact significance
Preparation of access roads / upgrades to junctions of existing roads Open trench pipe laying activities Construction of landfall facilities Establishment of temporary construction sites Increased construction related traffic Increased site population	Habitat loss Habitat degradation Damage to flora	Habitats and flora	Up to high	Up to moderate	Up to Moderate Adverse	Adherence to general mitigation measures and CMP. Pre-construction surveys to identify the presence of rare plants within construction areas. Species of ecological importance will be moved to suitable receptor sites. Production of a BAP. Production and implementation of a post construction BAP.	Not Significant

Continued…

Activity	Potential Impact	Receptor(s)	Receptor Sensitivity	Pre-mitigation Impact Magnitude	Pre-mitigation impact significance	Mitigation measures	Residual impact significance
Preparation of access roads / upgrades to junctions of existing roads Open trench pipe laying activities Construction of landfall facilities Establishment of temporary construction sites Increased construction related traffic Increased site population	Killing and injury to species Disturbance to species Loss of species habitat Habitat severance / fragmentation	Invertebrates	Up to high	Up to moderate	Up to Moderate Adverse	Adherence to general mitigation measures and CMP. Restriction of the working corridor (where possible) to reduce loss of invertebrate habitat. Production and implementation of a post construction BAP.	Not Significant

Continued...

Activity	Potential Impact	Receptor(s)	Receptor Sensitivity	Pre-mitigation Impact Magnitude	Pre-mitigation impact significance	Mitigation measures	Residual impact significance
Preparation of access roads / upgrades to junctions of existing roads Open trench pipe laying activities Construction of landfall facilities Establishment of temporary construction sites Increased construction related traffic Increased site population	Killing and injury to species Disturbance to species Loss and degradation of species habitat Habitat severance / fragmentation	Herpetiles	Up to high	Up to moderate adverse	Up to High Adverse	Adherence to general mitigation measures and CMP. Exclusion of herpetiles from construction areas with the use of herpetile fencing. Production of a BAP with a strategy to determine measures for loss of habitat caused by construction. Movement of species from construction areas into undisturbed habitats. Installation of under-road tunnels to allow for animal movement within the local environment. Post-construction monitoring. Implementation of a post construction BAP.	Not Significant

Continued...

Activity	Potential Impact	Receptor(s)	Receptor Sensitivity	Pre-mitigation Impact Magnitude	Pre-mitigation impact significance	Mitigation measures	Residual impact significance
Preparation of access roads / upgrades to junctions of existing roads Open trench pipe laying activities Construction of landfall facilities Establishment of temporary construction sites Increased construction related traffic Increased site population	Killing and injury to species Disturbance to species Loss and degradation of species habitat Habitat severance / fragmentation	Mammals (including bats)	Up to moderate	Low	Up to Moderate Adverse	Adherence to general mitigation measures and CMP. Trees with the potential to support roosting bats will be surveyed prior to removal to determine roosting bat presence / likely absence. Implementation of a post construction BAP.	Not Significant

Continued...

Activity	Potential Impact	Receptor(s)	Receptor Sensitivity	Pre-mitigation Impact Magnitude	Pre-mitigation impact significance	Mitigation measures	Residual impact significance
Preparation of access roads / upgrades to junctions of existing roads Open trench pipe laying activities Construction of landfall facilities Establishment of temporary construction sites Increased construction related traffic Increased site population	Killing, injury and disturbance of nesting birds during construction if undertaken during the breeding season (typically between March and September). Loss of breeding and foraging habitat	Birds	Up to moderate	Low	Up to Moderate Adverse	Adherence to general mitigation measures and CMP. Removal of nesting habitat (trees, scrub, tall grassland areas) outside of the breeding bird season (therefore removal between October and February inclusive). Implementation of a post construction BAP.	Low

Continued...

Activity	Potential Impact	Receptor(s)	Receptor Sensitivity	Pre-mitigation Impact Magnitude	Pre-mitigation impact significance	Mitigation measures	Residual impact significance
Preparation of access roads / upgrades to junctions of existing roads Open trench pipe laying activities Construction of landfall facilities Establishment of temporary construction sites Increased construction related traffic Increased site population	Killing and injury to species Disturbance to species Loss and degradation of species habitat Habitat severance / fragmentation	Freshwater ecology receptors	Moderate	Moderate	Moderate	Adherence to general mitigation measures and CMP. Implementation of a post construction BAP.	Not Significant

Complete.

11.6.11.2 Fauna

Invertebrates

During maintenance activities small scale works, machinery movements will occur. However, the location and scale of such disturbance will have no effect on invertebrates. The overall impact on invertebrates during operation will therefore be **Not Significant**.

Herpetiles

During maintenance activities small scale works and machinery movements will occur. There is potential for herpetiles, including Nikolski's tortoise, to be present within habitats along the RoW during the Operational Phase. There is therefore some potential for killing and injury to these species during routine maintenance and inspection works. In the absence of mitigation, this could result in the death of individuals. This is assessed as a low magnitude impact on receptors of up to high sensitivity (Nikolski's tortoise) resulting in an effect of **Moderate** significance.

Several species of herpetile will benefit from the creation of new open habitats (grassland) and habitat mosaics (interactions between open habitats and the woodland edges). For these species, replacement of woodland and forest with grassland at the Pipeline easement and its maintenance by removal of shrubs and trees is a creation of new suitable habitat and an ecological corridor for connection between patches of other open habitats.

Mammals

During maintenance activities small scale works, machinery movements and noise will occur. However, due to the localised nature and scale of activity the disturbance effects on mammals (including bats) are considered to be of a negligible magnitude, resulting in a **Not Significant** effect.

During operation, there will be some illumination during the hours of darkness. Lighting controls to minimize light spillage will be implemented. Any additional impacts of lighting are considered to be of negligible magnitude resulting in **Not Significant** effect.

Birds

There is some potential for breeding birds to be affected if vegetation clearance along the RoW is undertaken during the bird breeding season. Impacts would however be limited given that all of the significant impacts on species of conservation importance as a result of habitat loss will have occurred at the Construction Phase. The loss of this habitat and / or disturbance to these species would therefore be of no more than **Low** significance.

During operation, disturbance to birds will be limited due to the lack of any significant groundwork or other major construction works. There will be limited lighting at the landfall facilities which may disturb surrounding local habitat areas at night. Noise pollution will be limited to that generated by the presence of workers, vehicles and equipment during Pipeline inspection and RoW maintenance. Such impacts will be temporary and localised in nature.

The impacts will be limited to the Project footprint and are not predicted to result in disturbance to any additional areas. As a result, disturbance will occur in less than one percent of the available habitat within the local area and is considered to be of negligible magnitude. As a result, disturbance impacts during operation are considered to be **Not Significant**.

11.6.12 Mitigation and Monitoring: Commissioning and Operational Phase

11.6.12.1 Designated Sites, Habitats and Flora

As no significant effects are anticipated at the Operational Phase, no mitigation or monitoring is recommended.

11.6.12.2 Fauna

Herpetiles

Any Operation Phase vegetation management works (i.e. periodic cutting of vegetation along the Pipeline corridor) will be undertaken in the winter period only (between November and February) when the tortoises (and other amphibian / reptile species) are hibernating. Low-impact hand-held machinery will be used to complete this vegetation management. Vegetation will be cut to no lower than 100 mm and no ground should be broken during these works.

During the operation of the Pipeline, any maintenance / project vehicles will adhere to a strict on-site speed limit of 10 km/h and drivers must be mindful that tortoises could be present along any of the access tracks. For good practice, if an animal is observed and in immediate danger, it should be moved off the track. Any casualties observed will need to be recorded and reported to the project manager.

Birds

Vegetation clearance along the RoW should be undertaken outside of the breeding bird season (which is approximately between March and September) to avoid impacts on breeding birds.

All Other Fauna

As no significant effects are anticipated at the Operational Phase, no mitigation or monitoring is recommended.

11.6.13 Residual Impacts: Commissioning and Operational Phase

Assuming the mitigation measures described above for herpetiles and birds are implemented, residual impacts (Table 11.37) at the Commissioning and Operational Phase are expected to be **Not Significant**.

Table 11.37 Assessment Summary Table of Potential Impacts: Commissioning and Operation

Activity	Potential Impact	Receptor(s)	Receptor Sensitivity	Pre-mitigation impact significance	Mitigation measures	Residual impact type and significance
Maintenance of the RoW area Movement of people and machinery related to the operation of the Pipeline and its maintenance in good working condition.	Habitat loss Habitat degradation Damage to flora	Designated sites, habitats, and flora.	Up to high	Not significant / low	None Required	Not significant
Maintenance of the RoW area Movement of people and machinery related to the operation of the Pipeline and its maintenance in good working condition.	No impacts anticipated	Invertebrates	Up to high	Not significant / low	None required	Not significant

Continued…

Activity	Potential Impact	Receptor(s)	Receptor Sensitivity	Pre-mitigation impact significance	Mitigation measures	Residual impact type and significance
Maintenance of the RoW area Movement of people and machinery related to the operation of the Pipeline and its maintenance in good working condition.	Killing or injury of species	Herpetiles	Up to high	Up to moderate adverse	Sensitive timing of works during operational phase. Vegetation clearance should be undertaken outside the herpetile active period (undertaken between November and February) Low-impact machines will be used to complete this vegetation management. Vegetation will be cut to no lower than 100 mm and no ground should be broken during these works A site speed limit of no more than 10 km/hour should be enforced to avoid collisions with species (particularly Nikolski's tortoise	Not significant

Continued…

Activity	Potential Impact	Receptor(s)	Receptor Sensitivity	Pre-mitigation impact significance	Mitigation measures	Residual impact type and significance
Maintenance of the RoW area Movement of people and machinery related to the operation of the Pipeline and its maintenance in good working condition	No impacts anticipated	Mammals (including bats)	Low - Moderate	Negligible	None required	Not significant
Maintenance of the RoW area Movement of people and machinery related to the operation of the Pipeline and its maintenance in good working condition	Potential damage / disturbance to nesting birds	Birds	Moderate	Negligible	Sensitive timing of works. Vegetation clearance should be undertaken outside the herpetile active period (undertaken between November and February)	Not significant
Maintenance of the RoW area Movement of people and machinery related to the operation of the Pipeline and its maintenance in good working condition	No impacts anticipated	Aquatic receptors	Low	Negligible	None required	Not significant

Complete.

11.6.14 Assessment of Potential Impacts: Decommissioning

The South Stream transportation system is designed to operate for 50 years, although its life may be extended subject to close monitoring. The decommissioning program will be developed during the Operational Phase, and it is likely that the technological options and preferred methods for decommissioning of such transportation systems will be different in 50 years' time.

Under the worst case scenario, whereby the Pipeline is removed from the ground (as opposed to being left in place), and activities associated with the Decommissioning Phase are likely to include the following:

- Construction of access roads / repair of existing facilities;
- Excavation works for the removal of pipes; and
- Dismantling and removal of the landfall facilities.

It is anticipated that the impacts associated with these activities; including habitat damage or degradation, killing, injury or disturbance to species, are unlikely to be of a magnitude greater than those reported for the Construction Phase (assessed and presented in Section 11.6.13 above). The significance of effects on ecological receptors is therefore not anticipated to be greater than those which have been reported for the Construction Phase.

11.6.15 Mitigation and Monitoring – Decommissioning Phase

As the impacts and effects are anticipated to be similar to those identified during the Construction Phase, the mitigation proposed for decommissioning will be the same as is proposed for the Construction Phase.

11.6.16 Residual Impacts: Decommissioning

Assuming the mitigation measures as are described in Section 11.6.3 are implemented appropriately no significant adverse effects are anticipated on terrestrial ecology receptors during construction. Impacts are therefore not anticipated to be of greater than **Not Significant** or **Low** adverse significance.

11.7 Demonstrating Compliance with IFC Performance Standard 6

The above sections have presented the baseline ecology present within the Landfall Project Area which has identified certain ecological receptors as contributing to the determination of critical habitat. These receptors are further discussed in Appendix 11.1. The assessment of residual impacts of construction, operation and decommissioning the Project on valued ecological receptors has taken in to consideration likely adverse impacts of the Project as well committed mitigation measures to avoid, reduce or mitigate for these impacts. The residual impact assessment has concluded that construction, operation and decommissioning of the Project will result in low / negligible adverse impacts on all ecological receptors, including those

which are components of critical habitats. Accordingly, it has been demonstrated that the Project will fulfil the requirement of Paragraph 17 of Performance Standard 6, which states the client will not implement any Project activities unless the following are demonstrated:

Test 1 – no other viable alternatives within the region exist for development of the project on modified or natural habitats that are not critical

Reasons for site selection and consideration of the alternative are presented and discussed in full in **Chapter 4 Analysis of Alternatives** of this document where it is clearly demonstrated that there are no viable alternative sites for this facility.

Test 2 – the project does not lead to measurable impacts on those biodiversity values for which the critical habitat was designated, and on the ecological processes supporting those biodiversity values

The residual impact assessment, which takes in to consideration all committed mitigation, has concluded that the Project will not result in any measureable impact on all identified and valued ecological receptors including those which are components of critical habitat. Mitigation including translocation of valued receptors, habitat reinstatement and development of areas of natural habitat as well as a long-term monitoring plan will ensure the Project will not result in impacts on valued receptors or ecological processes.

Test 3 – the project does not lead to a net reduction in the global and / or national / regional population of any Critically Endangered or Endangered species over a reasonable period of time

A robust monitoring plan will be developed by the client that will detail long-term monitoring ecological receptors, including those identified as components of critical habitat. The monitoring and management plan will also detail further measures to be completed if the monitoring demonstrates that targets set within this document are not being met (e.g. if the rate of establishment of planted trees is not met additional supplementary planting or additional aftercare will be completed to ensure robust reinstatement of habitats).

Test 4 – a robust, appropriately designed, and long-term biodiversity monitoring and evaluation programme is integrated in to the client management programme

As detailed in Test 3 this document will be developed and will detail long-term monitoring and management that will also include measurable targets against which to assess the mitigation and habitat reinstatement works. This plan will also include committed measures should the monitoring programme indicate that these targets are not being met.

11.8 Unplanned Events

The potential impacts associated with unplanned events are discussed in **Chapter 19 Unplanned Events**.

Unplanned events in the landfall section may occur during the Construction Phase from the use of construction plant, power generation equipment and from vehicular traffic in conjunction with equipment malfunction or human error. The resultant effects of these unplanned events will be limited to accidental pollution incidents involving fuel and oils, which could result in a significant

(major) adverse ecological impact especially if these pollutants enter watercourses. Fire is also a potential hazard and this could result in a significant (major) adverse impact on areas of terrestrial habitat outside the working area; especially in the forest areas. The design controls that will be in place to reduce the risk of occurrence of the above potential events, as well as the mitigation measures that will be enforced to minimise the consequences associated with the events, are discussed in **Chapter 19 Unplanned Events**.

During the Operations Phase, unplanned events are similar to those listed above for construction and would therefore be limited to isolated pollution risks associated with site inspection vehicles or maintenance tasks. Control measure for possible pollution incidents will be as detailed for construction. It is not anticipated that operational inspections, maintenance or habitat management will pose a significant fire risk.

11.9 Cumulative Impacts

The cumulative impacts associated with the Project relating to terrestrial ecology are assessed in **Chapter 20 Cumulative Impact Assessment**.

11.10 Conclusion

In the absence of impact avoidance and mitigation measures, the Project has the potential to affect a range of ecology receptors, including designated sites (Utrish SPNA, Kuban River Delta Ramsar, Delta of the Kuban River IBA, and Protective Forests), various natural habitats, and a number of red listed species (including the internationally Critically Endangered species, Nikolski's tortoise). In the absence of mitigation, the effect on receptors has the potential to be of up to **High** significance.

The Construction and Pre-Commissioning Phase of the Project has the greatest potential to affect terrestrial ecology receptors. The key impacts relate to habitat loss and fragmentation, habitat degradation, direct mortality and injury to species, and severance. Impacts to habitats and species have been avoided through project design and, where appropriate, through a suite of mitigation measures which have reduced the magnitude of all impacts to low or negligible levels. The residual impacts on all species, regardless of their sensitivity, has therefore been assessed as being either **Not Significant** or of **Low** significance.

The chapter has also assessed the potential for the Project to have significant effects on terrestrial ecology receptors during the Commissioning and Operational Phase of the Project. Impacts at this phase are anticipated to be limited given that all of the significant impacts (such as habitat loss and fragmentation) on habitats and species will have occurred during the Construction and Pre-Commissioning Phase. In the absence of mitigation, there is the potential for the Project to have impacts of **Moderate** significance, largely due to the potential for routine maintenance activities to cause mortality or injure Nikolski's tortoise and other herpetiles. Mitigation measures have been proposed which will reduce the magnitude of all impacts at the Operational Phase to negligible to low magnitudes. The residual effects on all receptors are therefore anticipated to be either **Not Significant** or of **Low** significance.

While it is not possible to fully assess decommissioning impacts at this stage, the ESIA has considered two scenarios: in situ abandonment and pipeline recovery. The ESIA has concluded that the former generates impacts broadly similar to those of the Pipeline's Operational Phase, while the latter generates impacts broadly similar to the construction phase, and are thus amenable to similar mitigation strategies.

The assessment has been mindful of the requirements of IFC PS (6), particularly in relation to the identification and consideration of critical habitat. A critical habitat assessment has been undertaken which has identified a number of ecological receptors which qualify as components of critical habitat. In accordance with IFC PS (6), mitigation measures (including provision of a BAP) have been designed and will be implemented to achieve a net biodiversity gain for these receptors.

The chapter has also assessed the potential for the Project to have cumulative impacts with other schemes within the vicinity of the landfall section. The cumulative impact assessment has identified a number of areas where adverse cumulative effects could occur due to the construction of the Project and the Russkaya CS development. Although the Project is not anticipated to make a significant contribution to cumulative effects, the importance of South Stream Transport engaging with Gazprom Invest to align Gazprom Invest's mitigation measures with those of the Project has been highlighted. This communication and alignment is considered to be important to avoid adverse cumulative effects on terrestrial ecology receptors within the wider environment.

References

Number	Reference
Ref. 11.1	Giprospecgaz (2010), Feasibility Study for the Offshore Section of the "South Stream" Project Pipeline, Volume 17 of the Environmental Impact Assessment (Russian Sector), Second Part of the Environmental Impact Assessment on Alternative Route Options for Pipeline (land area), Archive number: 6976.101.003.11.14.17.02-1 (replacement for 6976.101.003.11.14.17.02, St. Petersburg.
Ref. 11.2	Red Data Book of the Russian Federation (plants). Moscow. KMK, 2008. 854 p
Ref. 11.3	Red Data Book of the Russian Federation (animals). Moscow. AST; Astrel. 2001. 863 p
Ref. 11.4	Red Data Book of Krasnodar Krai. Plants and mushrooms. Krasnodar, 2007b. 640 p
Ref. 11.5	Red Data Book of Krasnodar Krai. Animals. Krasnodar, 2007a. 480 p
Ref. 11.6	IUCN (2012), The IUCN Red List of Threatened Species. Version 2012.2. <http://www.iucnredlist.org>. Downloaded on 17 October 2012.
Ref. 11.7	Federal Law 'On Wildlife'. 24.04.1995, no. 52-FZ
Ref. 11.8	Marine Gas Design LLC, Environment Protection Measures - Environmental Impact Assessment for the Facilities of II Stage of Construction Onshore Facilities: Onshore Maintenance Base at the Port of Temryuk. 6976.211.002.21.14.07.18.04..
Ref. 11.9	Peter Gaz (2011), 'Complex Engineering Surveys at the Phase 'Design Documentation' within the Framework of the South Stream Gas Pipeline Marine Sector Project Implementation. Volume 5 Environmental Survey and Archaeological Studies. Part 1 Environmental survey. The Russian sector. Book 3 Technical report. Text part. P. 1-817, 'LLC PGAZ', 2011 (Ref. No. 6976.101.004.21.14.05.01.03-02)
Ref. 11.10	Hundt L (2012), Bat Surveys: Good Practice Guidelines, 2nd edition, Bat Conservation Trust. ISBN-13: 9781872745985
Ref. 11.11	IFC (2012), Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources. http://www1.ifc.org. Downloaded on 17 October 2012
Ref. 11.12	Chestin, E.L. (2009), Environmental and Economic Justification for State Natural Reserve "Utrish" Development, World Wildlife Fund (WWF), Moscow
Ref. 11.13	Forest Code of the Russian Federation. 04.12.2006, No. 200-FZ
Ref. 11.14	Leontyeva, O. (2013). Targeted Nikolski's tortoise population survey. Unpublished.
Ref. 11.15	Inozemtsev, A. A. and Pereshkolnik S.L. (1985) Status and conservation prospects of Testudo graeca L. inhabiting the Black Sea coast of the Caucasus. Vozdejstvije.

Number	Reference
Ref. 11.16	Lukina and Sokolenko (1991) referenced by Mazanaeva, L. F., Orlova, V. F., Iljina, E. V., and Starkov, V. G. (2009). Distribution and status of mediterranean tortoise (Testudo graeca linnaeus, 1758) in Russia. In N. Zazanashvili and D. Mallon (Eds.), Status and Protection of Globally Threatened Species in the Caucasus. (pp. 143–150). Tbilisi: CEPF, WWF. Contour Ltd.
Ref. 11.17	Pestov, MA and Leontyeva, O. (2011). Evaluation of the current population state of Testudo graeca nikolskii in the State Nature Reserve Utrish.
Ref. 11.18	Leontyeva, O.A., Pereshkolnik, S.L., Pestov, M.V. and Sichevskij, Je. A. (2012), Status and problems of protection of Testudo graeca Nikolskii at the Abrau Peninsula.
Ref. 11.19	Leontyeva, O.A., Pereshkolnik, S.L., Pestov, M.V. and Sichevskij, Je. A. (2012), Status and problems of protection of Testudo graeca Nikolskii at the Abrau Peninsula.
Ref. 11.20	Leontyeva, O.A., Pereshkolnik, S.L., Pestov, M.V. and Sichevskij, Je. A. (2012). Status and problems of protection of Testudo graeca Nikolskii at the Abrau Peninsula.
Ref. 11.21	Nafus, M.G., Tuberville, T.D., Buhlmann, K.A., and Todd, B.D. (2013), Relative abundance and demographic structure of Agassiz's desert tortoise (*Gopherus agassizii*) along roads of varying size and traffic volume. Biological Conservation 162 (2013) 100–106.
Ref. 11.22	Boarman, W.I., Sazaki, M., (2006). A highway's road-effect zone for desert tortoises (Gopherus agassizii). J. Arid Environ. 65, 94–101.
Ref. 11.23	Boye, P. and Dietz, M. (2005), Research Report No 661: Development of good practice guidelines for woodland management for bats. English Nature, Peterborough.
Ref. 11.24	Federal Law 'On Environmental Protection'. 10.01.2002, No. 7-FZ.
Ref. 11.25	Federal Law 'On Specially Protected Natural Areas'. 14.03.1995, no. 33-FZ.
Ref. 11.26	Government Enactment 'On the Red Data Book of the Russian Federation'.
Ref. 11.27	Government Enactment 'On measures for enforcement of obligations arising from the Conservation on the Wetlands of International Importance (Especially as Wildlife Habitats dated 02.02.1971)'.
Ref. 11.28	Government Enactment 'On the adoption of requirements for the prevention of wildlife loss'.
Ref. 11.29	Order 'On the adoption of rules of using forests for construction, upgrade and operation of line facilities'.
Ref. 11.30	Decree of the Head of the Administration for Krasnodar Krai, 'On the Red Data Book of Krasnodar Krai', dated 21.12.2010 No.1202.
Ref. 11.31	Equator Principles (June 2013), available from:

Number	Reference
	http://www.equator-principles.com/resources/equator_principles_iii.pdf. Accessed 18 June 2013.
Ref. 11.32	OECD (2008), Guidelines for Multinational Enterprises. In particular Section V, Environment, and Section VIII, Science and Technology. Organisation for Economic Co-operation and Development, Paris. www.oecd.org/investment/guidelinesformultinationalenterprises/1922428.pdf [Accessed on 20 November 2012].
Ref. 11.33	Convention on Biological Diversity 1992, available from: http://www.cbd.int/convention/text/.Accessed on 18 June 2013.
Ref. 11.34	Convention on Wetlands of International Importance, especially as Waterfowl Habitat (Ramsar), 1971, available from: http://www.ramsar.org/cda/en/ramsar-documents-texts-convention-on/main/ramsar/1-31-38%5E20671_4000_0__. Accessed on 18 June 2013.

Secondary References cited in Ref. 11.9
A.G. Voronov. Geobotanics. Moscow: Vyschaya schkola, 1973, p. 384
S.I. Kosenko. Guide to higher plants of North-West Caucasus and Ciscaucasia. Moscow, Kolos, 1970, p. 614.
A.S. Zernov. Guide to vascular plants of the Russian Black Sea northern coast. Moscow. Scientific publishing partnership KMK, 2002. p. 283
Braun-Blanquet, J. 1965. Plant Sociology: The Study of Plant Communities. London: Hafner
G.A. Novikov. Field surveys on ecology of terrestrial fauna. Moscow. Sovetskaya nauka, 1953. p. 502
Yu. A. Pesenko. Principles and methods of quantitative analysis of faunal studies. Moscow. Nauka, 1982, p. 288
N.N. Shcherbak. Guide to study amphibians and reptiles. Kiev, 1989. p. 163
N.G. Chelintsev. Mathematical basics of reptiles accounting route // Bulletin of Moscow Society of Naturalists, Department of biology. 1996. Vol. 101, No. 2. p. 38-47
M.V. Pestov. Ecological-faunistic characteristics and problems of conservation of amphibians and reptiles of Nizhny Novgorod region. Abstract of dissertation for the degree of candidate of biological science, Nizhny Novgorod, 2004. p. 20
Hayman Peter, Hum Rob. Birdwatchers Pocket Guide to Britain and Europe. London, 2008. 272 p.
Elphick J., Woodward J. Pocket Birds. London, 2003. 224 p.
V.M. Khrabry. Birds of St. Petersburg (fauna, accommodation, security) / Ed. by V.A. Payevsky. St. Petersburg, 1991. Vol. 236. p. 275.
V.P. Belik. Habitat distribution and ecological classification of animals // Readings in Memory of Professor V.V. Stanchinsky, Smolensk, 1992a. p. 13-16
E.S. Ravkin, N.G. Chelintsev. Methodological recommendations on route censuses of birds in nature reserves // Organization of scientific research in nature reserves and national parks. Moscow, 1999, p. 143-155
Yu.S. Ravkin, S.G. Livanov. Factor zoogeography: principles, methods and theoretical concepts. Novosibirsk: Nauka, 2008, p. 205
A.N. Lipin. Fresh water and their lives. Moscow, 1950, p. 347
V.I. Zhadin. Method of studying the benthic fauna of reservoirs and ecology of benthic invertebrates // Life of fresh waters. Moscow, 1956. Vol. 4. p. 279-382

Secondary References cited in Ref. 11.9
T.S. Russ, I.I. Casanova. Methodological guidance on collection of eggs, larvae and fry. Moscow. Food Industry, 1966. p. 42
Pravdin I.F. Manual on fish study. Moscow. Pischevaya prom-st. 1966. p. 376.
A.F. Koblitskaya. Guide to freshwater fish fry. Moscow, 1981, p. 208
L.S. Berg. Freshwater fishes of the U.S.S.R. and adjacent countries. Moscow. USSR Academy of Sciences, 1948–1949. 4.1–3.1. p. 1-1382.
S.K. Troitsky, E.P. Tsunikova. Fish of basins of the Lower Don and Kuban: Guide to species identification. Rostov-on-Don, 1988, p. 112
S.I. Kosenko. Guide to higher plants of North-West Caucasus and Ciscaucasia. Moscow, Kolos, 1970, p. 614
A.P. Tilba. Vegetation of Krasnodar Krai. Krasnodar: Book house, 1981, p.84
M.D. Altukhov, S.A. Litvinskaya. Protection of vegetation in the North-West Caucasus. Krasnodar: Book house, 1989, 208 p
A.P. Tilba, V.Ya. Nagalevsky. Flora of the Black Sea ecosystem. Transformations of vegetation cover of the Black Sea coast // Actual problems of ecology and nature protection of the Black Sea ecosystem. Krasnodar, 1991, p. 7-14.
S.A. Litvinskaya. Vegetation of the Black Sea coast of Russia (Mediterranean enclave). Krasnodar, 2004. p. 120
A.S. Zernov. Guide to vascular plants of the Russian Black Sea northern coast. Moscow. Scientific publishing partnership KMK, 2002. p. 283
S.B. Krivorotov, V. Ya. Nagalevsky. Concerning study of lichen flora of forests of the southern slope of the Markoth ridge // Actual problems of ecology and nature protection. Ecosystems of the Black Sea coast. Krasnodar, 1991, p. 33-36
S.B. Krivorotov. Lichens and lichen groups of North-West Caucasus and Ciscaucasia (floristic and ecological analysis.) Krasnodar: KubGU publishing, 1995, p. 203.
E.V. Melnikova, V.V. Sergeyeva. Taxonomic structure of bryophyte flora of the Northwest Caucasus and Ciscaucasia // Actual problems of ecology and protection of ecosystems of the southern regions of Russia and adjacent territories. Krasnodar, 2002, p. 79-81
A.F. Flerov, V.A. Flerov. Vegetation of the North Black Sea coast. Part 1. Vegetation of the Abrau peninsula and the coast of Anapa-Novorossiysk // Proceedings of North Caucasus Association of Scientific research institutes 1926. Vol. 8. p. 1-94.

Secondary References cited in Ref. 11.9
V.P. Maleev. Vegetation of the area of Novorossiysk - Mikhailovsky Pass and its relation to the Crimea // West Nikitsky garden. 1931. V. 13, no. 2. p. 71-174
V.A. Povarnitsyn. Forest Types of the Black Sea coast between the Sukko and Pshada rivers // Proceedings of USSR AS Botanic Institute. Ser. 3. Geobotany. 1940. No. 4. p. 633–709
S.V. Ostrovskikh, A.E. Chushkin. Herpetofauna of the southern slope of Markoth ridge near Gelendzhik // Actual problems of ecology and protection of ecosystems of regions of Russia and adjacent territories: Theses of reports of 11th inter republic research and practical conference, Krasnodar, 1998. p. 116-119
S.V. Ostrovskikh, G.K. Plotnikov. Herpetofauna of Tuaphat Ridge // Problems of conservation and sustainable use of biodiversity in the Caspian Sea and adjacent regions. Proceedings of fifth International part-time research conference, Elista, 2006. p. 47-49.