Appendix 11.2: Outline Cliff Reinstatement Plan

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1 Outline Cliff Reinstatement Plan

1.1 Introduction

This reinstatement plan forms part of a Biodiversity Action Plan (BAP) for the Russian Landfall section of the South Stream Project. **Chapter 11 Terrestrial Ecology** identified that impacts to natural habitats occurred during the Design and Development phase of the Project. This document should be used as guide to inform the production of a detailed cliff-reinstatement plan, which will contain prescriptive measures to reinstate habitats within the affected area[1].

The impact of the site preparation works for the design and development works resulted in loss of natural terrestrial habitat along the coastal cliff tops, as well as down the cliff itself. Additional habitats were removed to accommodate the geological drill pads and associated access 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 flytipping and fire lighting were evident. Increased access could also lead to increased disturbance of threatened species.

An analysis of these habitats according to International Finance Corporation (IFC) Performance Standard 6 (PS6)[2] criteria for Critical Habitat was completed and presented in full in Appendix 11.1 of the ESIA. Annex A identifies that the tomillyar habitat qualifies as Critical Habitat under PS6 Criterion 4: Highly threatened and/or unique ecosystems. This habitat also supports *Rindera tetraspis* which qualifies as Tier 2 Critical Habitat under Criterion 1 Critically Endangered (CR) and/or Endangered (EN) species, as well as fern-leaved speedwell *Veronica filifolia*, which qualifies as Tier 2 Critical Habitat Criterion 2: Endemic and/or restricted-range species.

The aim of this reinstatement plan is to restore the impacted habitats, with particular focus on providing no net loss to Critical Habitats.

1.2 Background

Peter Gaz, on behalf of Giprospetzgaz, undertook geotechnical surveys in 2012 to inform the design and layout of the South Stream Offshore Pipeline. The geotechnical surveys in question were undertaken along a section of the sea cliff, located to the west of the proposed pipeline's landfall section.

To facilitate the geotechnical surveys, four strips, each approximately 3 meters (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.

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[1] This document will be produced by a suitably experienced contractor.

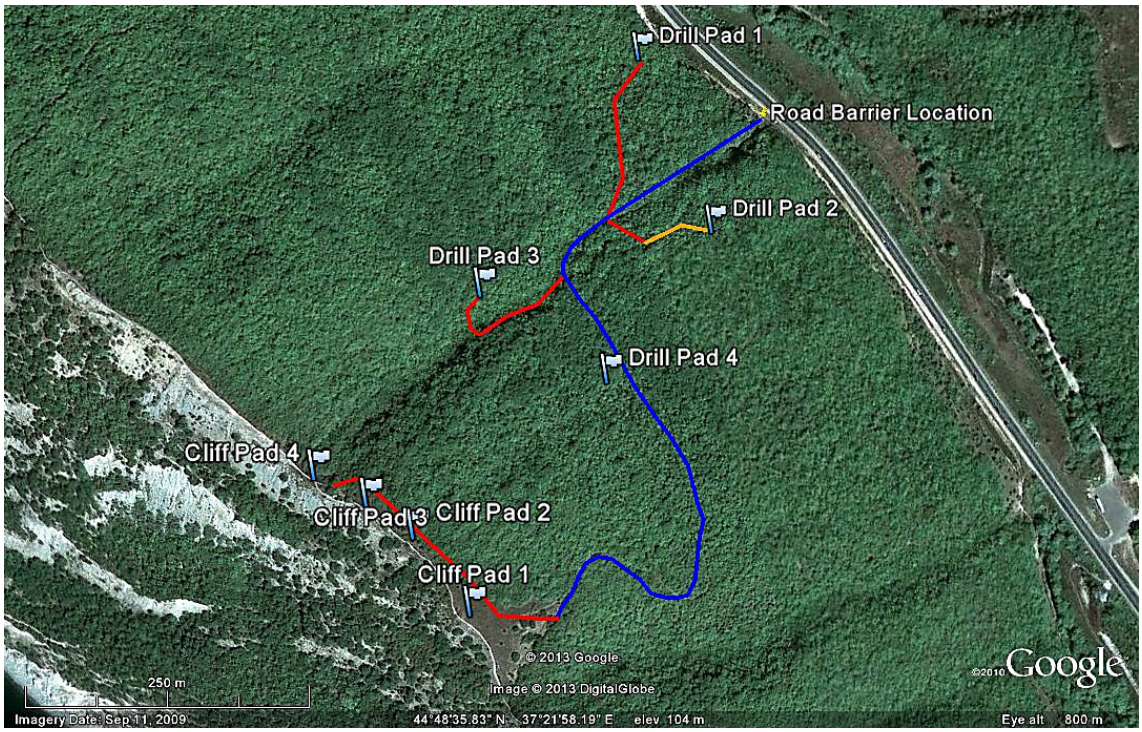
[2] IFC (2012) Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

For the purpose of this outline reinstatement plan, the cleared and constructed areas for the geotechnical works have been grouped into the following components (see Figure 1):

1. Geotechnical survey strips (this includes the four cleared strips located along the western face of the sea cliff);
2. Drill pads and access road at the top of the cliff;
3. Drill pads and access road on eastern slope (this includes roads extending at various angles from main access road); and
4. The primary access road leading from the main road and winding up the eastern slope.

According to Peter Gaz, the Forestry Department have requested that the primary access road (Component 4) leading from the main road not be reinstated as they would like to use it for their management activities. Erosion control and measures to improve the access track's drainage are however required.

Figure 1 Access routes for drill and cliff pads



Legend:
Blue – Primary access road
Red – Drill pad access routes requiring restoration
Orange – Drill pad access route with existing natural regeneration

1.3 Geotechnical Survey Strips (Component 1)

The vegetation on the cliffs along the affected shoreline naturally varies according to the steepness of the slope. On steep sections, the vegetation comprises sparse Tomillyar with a

high proportion of bare ground. Sections of more shallow slopes have developed juniper woodland, which predominantly comprises three species: red juniper *Juniperus oxycedrus*, high juniper *Juniper excelsia*, and stinking juniper *Juniper foetidissima*. Two of these species, high juniper and stinking juniper, are classified as threatened on the Red Data Books of the Krasnodar Krai and Russian Federation.

Since the clearance of the survey stripes, natural regeneration on the less steep slopes has generally been good, including natural establishment of juniper seedlings. On some of steeper slopes, soil erosion has prevented vegetation from re-establishing, although this has been variable.

Figure 2 Aerial Photograph showing cliff vegetation prior to clearance

Legend: Yellow line for bank stabilisation with GEOJUTE and brush bundles, Orange line for bank stabilisation with brush bundles only.

The following sections describe two restoration prescription to be employed to aid natural regeneration of vegetation:

1. Stabilisation of the cleared area and the installation of erosion control measures; and
2. The replanting of juniper within the geotechnical survey strips once the bank has been stabilised.

1.3.1 Bank Stabilisation and Erosion Control

On steep sections of cliff (below cliff pads 1 and 2, marked yellow on Figure 2) a biodegradable erosion control product, such as GEOJUTE (see Annex A), will be installed to control erosion and

stabilise the cliff face. Installation of GEOJUTE will provide surface stability, slow water run-off, and promote silt / topsoil collection which will also assist in the long term natural regeneration of vegetation on the cliff face.

The proposed method for the installation of GEOJUTE is as follows (see Annex B):

1. GEOJUTE should be secured at the top of the cliff area using steel pins or timber pegs;
2. The GEOJUTE should then be rolled down the slope so that complete coverage of the cleared area is achieved;
3. The GEOJUTE should be laid loosely and evenly, without tension or stretch. Care will be taken to ensure that areas of vegetation which have already become established through natural colonisation will be retained, either through cutting voids within the mesh, or by leaving gaps along the edge of the mesh run;
4. At the top of the cliff should be buried and pegged in a 150 mm deep slit trench, then fastened with a further five pegs;
5. Down-channel ends (at the base of the cleared strips) should be folded under by 150 mm and secured with five staples;
6. If required, additional row of pins / pegs can be fixed at 1 m centres down each strip; and
7. Small plants and seedlings may be planted through the GEOJUTE mesh.

To further reduce erosion and encourage the accretion of silt and topsoil, it is recommended that brush bundles are created from the juniper arisings which were left behind after the geotechnical clearance works. The bundles should be created by tying together cut trees and branches to form 20-30 mm wide and between 1-2 m long bundles. The specific dimensions should be varied according to fit the specific ground conditions at the fixing point. Each bundle should be secured (with the use of pins / pegs) across the slope of the cleared strip, at a shallow angle which will direct surface flow of water away from centre of the strip and into the areas of surrounding vegetation. Bundles should primarily be located in areas already subject to soil erosion. If necessary, soil and other surface material that has already been eroded may require relocating behind the installed bundles to reinstate the original slope profile. This should be completed on all strips including those below cliff-top pads 3 and 4 (marked orange on Figure 2).

Annex B provides a schematic plan presenting the proposed stabilisation and re-vegetation strategy.

The installation of the GEOJUTE and creation of brush piles will stabilise the cliff face and reduce erosion. This will assist in the long term restoration and natural recolonisation of the area by juniper woodland and Tomillyar vegetation.

Photograph 1 Steep cliff section below Cliff-top Pad 1 with poor natural regeneration and requiring bank stabilisation

Photograph 2 Steep cliff section below Cliff-top Pad 2 with effects of soil erosion visible

Photograph 3 Cliff section below Cliff-top Pad 3 with good covering of tomillyar vegetation

1.3.2 Juniper Planting and Re-vegetation of Cliff Area

1.3.2.1 Sourcing Plants

Germination times for juniper are generally long and variable; it can take up to four years to produce viable planting stock from seed. It is therefore recommended, following the stabilisation process detailed above, that where natural regeneration is not already taking place, that the strips should be re-vegetated with juniper saplings which are no less than one year old. The re-vegetation will take place as a rolling programme, over a three or four year period.

It is important that the juniper seedlings are sourced from a local genetic material (species including red, high, or stinking juniper) which has been responsibly collected (e.g. from a local nursery which can guarantee the provenance of the parent material). The supply of juniper will be secured in the first year and grown on, over subsequent years, allowing increasingly developed plants to be introduced to the slope over time.

Peter Gaz have indicated that 913 juniper were removed during the clearance works. Due to likely high mortality rates of young seedlings, there will be a need to source a larger supply of plants than has been lost. Failure rates are higher with younger specimens, and so the first years planting will be the most intensive, with replacement and supplementary planting of increasingly mature specimens occurring each subsequent session.

If sourcing juniper from a commercial source does not prove to be viable, propagation from cuttings can be undertaken although this can take up to two years to produce viable planting stock.

1.3.2.2 Horticultural Works

A successional planting regime should be used, whereby one year old individuals are planted in the first year. Where individuals have not survived after one year, these should be replaced and planted with two year old specimens in the second year. This process should be repeated into years three and four.

Juniper will be planted into a planting pit which will be cut into the into the GEOJUTE matting. Plants should be planted at an appropriate density in order to achieve the aim of a net-gain in the number of species reinstated (i.e. greater than the 913 individuals that were removed during clearance).

Soil Conditions

Planting should be undertaken during suitable whether conditions to ensure that the soil is as moist and as friable as possible.

Times of Year of Planting

Juniper should be planted during October / November (prior to the cold winter period) or March / April (just before the spring growing season).

Climatic Conditions

Planting should not be carried out during periods of frost or strong winds or any other climatic condition deemed to be inclement (e.g. extended dry periods).

Planting Depth

Plants should be planted upright, to the original nursery mark or deep enough to ensure that all roots are fully buried on sloping ground.

Cultivation

For each planting pit the following protocol should be implemented, when weather and ground conditions are suitable:

- Pits shall be dug with vertical sides with the base sloping gently with the direction of the slope at approximately 1:50. Each pit shall be excavated to accommodate the size and depth of each plant root-ball to be planted;
- The bottom of each pit shall then be broken up and material loosened a further 150 mm to facilitate root establishment;
- The sides of each pit shall be scarified; and
- The backfilling material will be a previously prepared mixture of topsoil excavated from pit and additional compost if required. When backfilled, planting pits shall be finished flush to the existing slope.

After Planting

Watering will take place immediately after planting, thoroughly and without damaging or displacing plants or soil. The soil will then be lightly firmed around plants, without damaging roots, with no hollows.

1.3.2.3 Maintenance and Monitoring Works

Maintenance shall be undertaken for one full growing season from the date of planting.

Following planting, each pit shall be monitored to assess the health of plants and success of the planting effort.

Within the first six months after planting, the reinstated area should be checked once a month to ensure that conditions for the development of the planted specimens are appropriate. If required, watering should be undertaken to ensure the continued growth of plants.

Six months after planting, the area should be monitored once every two months for the following six months. If required, watering should be undertaken.

One year after the original planting, and prior to the planting of the two year old specimens (in accordance with successional planting regime described above), a survey of the reinstatement area should be undertaken to assess the success of the reinstatement measures.

1.4 Drill Pads and Associated Access Roads (Components 2 and 3)

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

The juniper woodland, as has been stated above, is comprised predominantly of red, high, and stinking juniper.

Shiblyak woodland is relatively diverse in structure and is dominated by woody species including pubescent oak *Quercus pubescens*, oriental hornbeam *Carpinus orientalis* and juniper.

Areas containing tomillyar habitat comprise herbaceous plant communities with the majority of species associated with dry, hot environments. Dominant species include those within the Labiatae family; including species such as felty germander *Teucrium polium*, Marshall's thyme *Thymus marschallianus*, sage-leaf mullein *Phlomis tuberosa*, and goldendrop *Onosma polyphyllum*. Grass species include melic grasses *Melica spp.*, cock's-foot *Dactylus glomerata*, and golden feather grass *Stipa pulcherrima*.

It is unlikely that these areas will be reinstated to their pre-clearance landform profiles as the area has been altered significantly in places. The measures below are therefore aimed at reinstating a significant proportion of the original habitats, both through planting and natural recolonisation and creating a mosaic of habitats that will be ecologically beneficial to a range of species, including fern-leaved speedwell and *Rindera tetraspis.*

1.4.1 Topsoil Reinstatement and Preparation

Where appropriate, the topsoil removed during construction of the access roads and drill pads should be reinstated. Care should however be taken to ensure that reclamation and replacement of this topsoil does not cause further damage surrounding habitats.

The compacted earth along the access tracks and on the drill pads should be loosened (either by hand or with the use of machinery) to create a suitable growing medium for plants. It is recommended that approximately 6 inches of loose soil is created within which plant plugs can be planted.

This should be completed on sections of track marked red in Figure 1 (also see Photographs 4 to 8). The lower section of track leading to drill pad 2 already has good level of naturally regenerating trees and shrubs and therefore does not require topsoil reinstatement (marked orange in Figure 1, see also Photograph 9).

Photograph 4 Access track to Drill Pad 1 (red arrow denotes recoverable soil)

Photograph 5 Drill Pad 4 located adjacent to the Permanent Access Track

Photograph 6 Cliff-top Pad 1 (red arrow denotes recoverable soil)

Photograph 7 Cliff-top track adjacent to Cliff-top pad 2 (red arrow denotes recoverable soil)

Photograph 8 Cliff-top track adjacent to Cliff-top pad 4 (red arrow denotes recoverable soil)

Photograph 9 Lower section of access track to drill pad 2 which good natural regeneration

To reduce runoff and erosion and assist in the stabilisation of the topsoil, brush piles should be created from the arisings from the previous clearance works. These should be scattered throughout the access road reinstatement areas as appropriate. This will reduce runoff and erosion and promote the accretion of silt and soil within these areas. The access track to drill pad 3, runs up a small gully which leads onto the lower section of the Permanent Access track. Therefore, water running off the drill pad access track increases the water flowing down the Permanent Access track. To reduce this run off, grips should be excavated across the drill pad access track leading to soak-aways (Photograph 10).

Photograph 10 Access track to drill pad 3 (facing downhill) (blue arrow denotes suggested location of grips)

1.4.2 Vegetation Reinstatement

1.4.2.1 Sourcing Plants

Woody species (pubescent oak and oriental hornbeam) should be sourced from a local nursery. It is likely that oak and hornbeam, relatively common species, will be readily available from local retailers.

As is described above, juniper should either be sourced from a local nursery or, if not possible / feasible, could be sourced through propagation of cuttings.

1.4.2.2 Horticultural Works

Within areas of shiblyak habitat (largely within Component 3), once the soil has been loosened and sufficient soil for planting is present (approximately 6 inches), the area should be planted with pubescent oak, oriental hornbeam, and juniper at 2 metre spacing. Planted specimens should be at least one year old.

The access road and drill pad sites at the top of the cliff (Component 2) previously supported a mosaic of shiblyak, tomillyar, and juniper woodland. It is recommended that woody species (such as juniper, pubescent oak and oriental hornbeam) and herbaceous plants (containing species characteristic of the tomillyar habitats) should be planted as appropriate to recreate the mosaic of habitats which existed prior to the clearance and construction works.

Planting of Woody Specimens (Juniper, Oak, and Hornbeam)

As described above, a successional planting regime should be used, whereby one year old individuals are planted in the first year. Where individuals have not survived after one year, these should be replaced and planted with two year old specimens in the second year. This process should be repeated into years three and four.

Horticultural practices for the planting of juniper, oak, and hornbeam saplings should adhere to the methods as are described in Section 1.3.2.2 above.

Juniper, oak, and hornbeam should be planted into planting pits as appropriate and spaced no closer than 1 m centre spacing.

Soil Conditions, Times of Year of Planting, Climatic and Conditions

As described in Section 1.3.2.2 above.

Cultivation

For each planting pit the following protocol will be implemented, when weather and ground conditions are reasonably dry:

- Pits shall be dug with vertical sides with the base sloping gently with the direction of the slope at approximately 1:50. Each pit shall be excavated to accommodate the size and depth of each plant rootball to be planted;
- The bottom of each pit shall then be broken up and material loosened a further 150 mm to facilitate root establishment;
- The sides of each pit shall be scarified;
- Cultivation will be carried out to aerate and break up soil particles to 2-8 mm size;
- Cultivation shall be undertaken within a few days before planting;
- The surface will be left regular and even and shall marry in with adjacent levels;

- Undesirable material will be brought to the surface and removed, including weeds, stones, and clods larger than 50 mm in any dimension, tufts of grass and foreign matter; and
- The backfilling material will be a previously prepared mixture of topsoil excavated from pit and additional compost if required. When backfilled, planting pits shall be finished flush to the existing slope.

After Planting

Watering will take place immediately after planting, thoroughly and without damaging or displacing plants or soil. The soil will then be lightly firmed around plants, without damaging roots, with no hollows.

General Measures

Maintenance shall be undertaken for one full growing season from the date of planting. Each area of planting shall be kept clear of weeds around each shrub by hand pulling.

Planting of Herbaceous Vegetation (Tomillyar)

It is recommended that, following the soil reinstatement and preparation works described above, herbaceous species should be introduced to the restoration areas through the cutting and strewing of nearby herbaceous vegetation, cut in the autumn (late September / October), once the majority of herbaceous plants have set seed. Due to the sparse nature of the tomillyar vegetation, much off this will need to be completed by hand.

To ensure that the newly restored areas are colonised by both fern-leaved speedwell and *Rindera tetraspis*. Seed of these species will be collected separately and propagated off-site. Standard horticultural techniques will be used to produce well established plant in pots that can be transplanted into the restored areas during the early spring.

Maintenance and Monitoring of Woody Species (Juniper, oak, and hornbeam)

Maintenance and monitoring for the planting of juniper, oak, and hornbeam saplings should follow to the methods as are described in Section 1.3.2.3 above.

Maintenance of Herbaceous Species (Typical of Tomillyar)

Maintenance within areas of herbaceous planting will be minimal as these areas will largely be allowed to self-seed and propagate during the growing season (April – September).

1.5 Permanent Access Road (Component 4)

As is stated above, it is understood that the primary access track will not be reinstated as it will be used by the Forestry Department for maintenance. In its current state, the road is currently subject to high levels of storm water runoff and associated erosion. The road is further degraded and eroded by public vehicles (non-Forestry Department) which are using the road.

1.5.1 Storm-water and Erosion Control Measures

Some soil erosion is currently taking place on two sections of the Permanent Access Track:

- From the road to the intersection with the access track to drill pad 3 (Photograph 11); and
- From the cliff down to the second corner.

The erosion appears to be the result of rain falling on the track itself rather than from runoff from surrounding slopes. Therefore, ditches at the edge of the track are unlikely to be effective. It is recommended that grips are inserted across the Permanent Access Track at appropriate intervals.

Photograph 11 Soil erosion on Permanent Access Track

1.5.2 Access Restriction

Vehicle access to these areas should be restricted. This could be achieved through the erection of a boom or blockade at the junction where the access track meets the main road to the east (see Figure 1 for location). Secondary barriers should also be installed at the junctions with the access tracks to the drill pads to prevent vehicle access damaging regeneration of vegetation in these areas.

Signs stating that the area is currently being subject to reinstatement should be erected to discourage members of the public (hikers / dog walkers) from accessing these areas (see Figure 1 for location). Photograph 12 shows the type of barrier currently being employed within Utrish State Park.

Photograph 12 Barrier type currently being employed within Utrish State Park

1.6 Monitoring

The progress of reinstatement will be monitored following completion to assess the success of each of the measured outlined above. If any measures are deemed unsuccessful, corrective measures may be devised and implemented. In particular, the monitoring will focus on the following:

- Signs of on-going soil erosion;
- Establishment of planted or naturally regenerating trees; and
- Establishment of tomillyar, fern-leaved speedwell and *Rindera tetraspis*.

This monitoring requirement will be implemented through the Project's Environmental and Social Management System (ESMS).

1.7 Conclusion

Following the implementation of this reinstatement plan, the majority of the natural habitat habitats impacted during the design and development phase of the Project will be restored into a favourable ecological condition. In particular, areas of tomillyar critical habitat will be restored, and no measurable significant negative impacts to the populations of either fern-leaved speedwell and *Rindera tetraspis*.

There will be a residual low adverse impact of a net loss of 0.17 ha of shiblyak due to the creation of the permanent access track. Any appropriate compensation requirements will be dealt within the Project's BAP.

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Annex A – GEOJUTE Specification Document

gt specifier

GEOJUTE 500

Fabric Type	Flat fabric made of jute with extra loose coiled yarn
Durability	1 - 2 Years
Weight	500 g/m²
Packaged	Rolls
Width	1.22m
Lenght	68.55m
Area	83.54m²
Weight/Roll	42Kg
Ends per 10cm	6.5
Pick per 10cm	4.5
Mesh size	Approx 15mm x 22mm
Thread tensile strength (ends) - warp	Approx 750 daN/m
Thread tensile strength (picks) - weft	Approx 450 daN/m
Open Area	60 - 65%
Absorption of water in % of dry weight	485%

- Provides surface stability to steep and aggressive applications, such as water courses, high wind exposure, etc.
- Slows water run off and provides excellent silt collection to water course embankments which aids natural vegetation and long term embankment regeneration.
- Simple to install and allows for planting through the mesh matrix.
- Provides shade and protection from the sun and drying effect of the winds to assist in the establishment of grasses and to reinforce the root system until it has reached full bio-mass.

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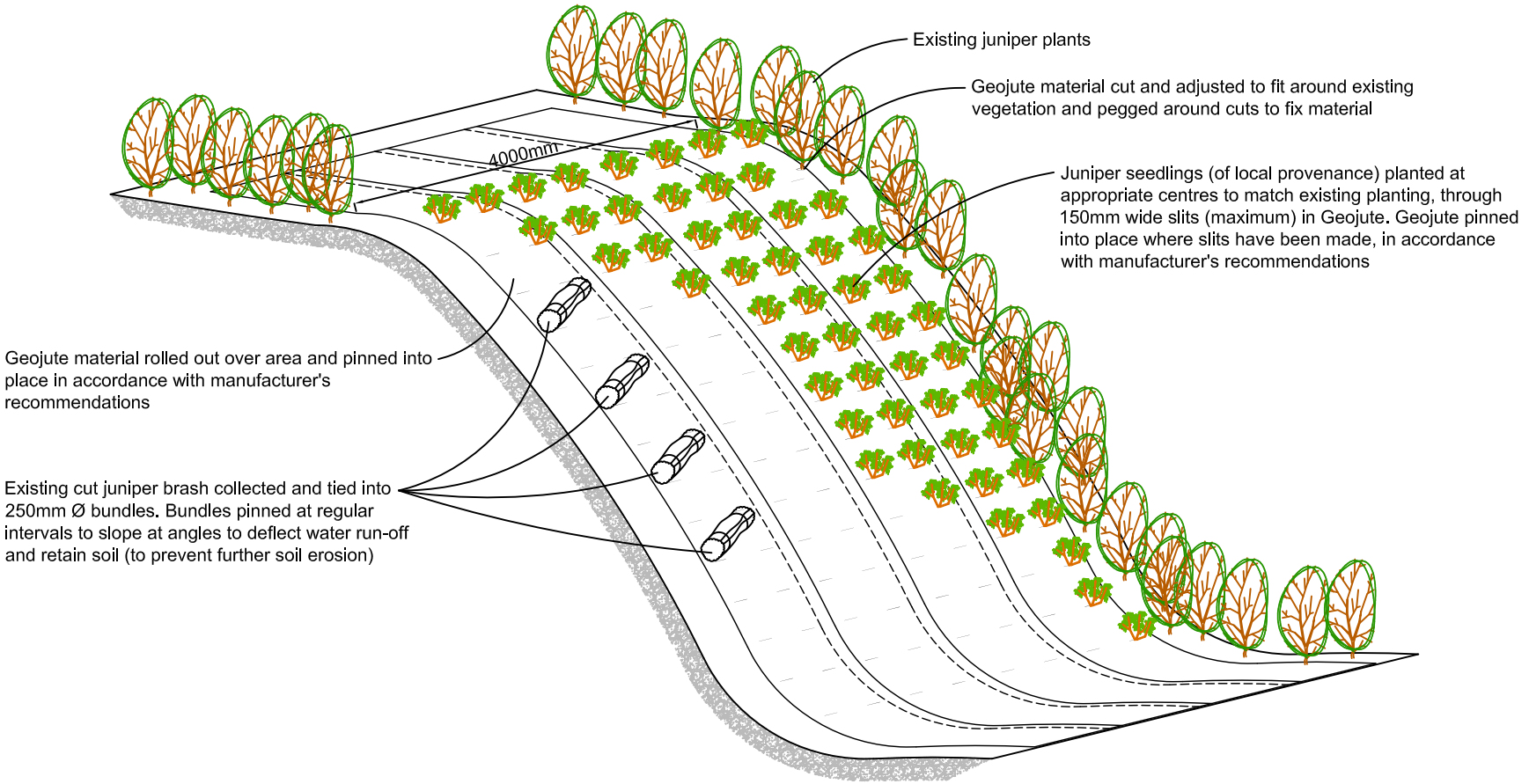
Annex B – Schematic plan presenting the proposed stabilisation and re-vegetation strategy

Vegetation Reinstatement

1. Geojute laid and installed to manufacturer's recommendations to cover area to be reinstated.
2. Slits (150mm wide maximum) cut in geojute at at appropriate centres to achieve re-vegetation to match existing vegetation density.
3. Planting pits to be prepared in accordance with specification at each slit location.
4. Juniper seedlings (plants to be of local provenance) planted through slits.



Shore to be re-vegetated

For illustrative purposes only. Restoration subject to detailed design.

South Stream, Offshore Pipeline - Shore Re-vegetation Sketch SK002
URS Project No.46369088.00111. 27.03.2014

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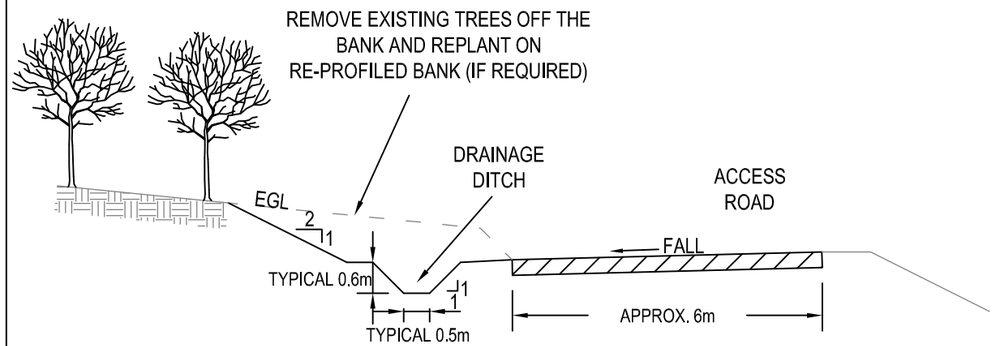
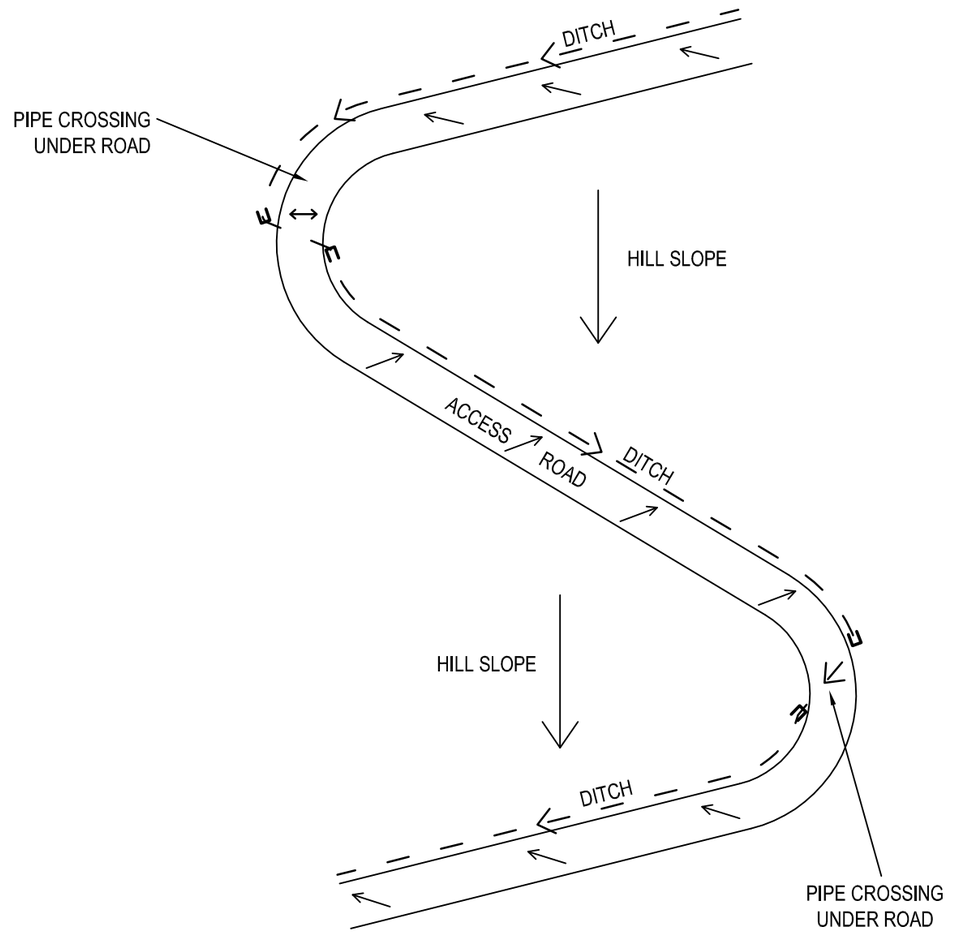
Annex C – Schematic plan presenting the proposed storm-water management measures for the permanent access road

TYPICAL X-SECTION (NTS)



TYPICAL PLAN VIEW (NTS) OF ACCESS ROAD



Notes

This drawing is for preliminary purposes only and is subject to amendment during design development. UNDER NO CIRCUMSTANCES MUST THIS DRAWING BE USED FOR CONSTRUCTION PURPOSES

Revision Details	By / Check	Date	Suffix

Project Title: VARVAROVKA RUSSIA

Client: GIPROSPETZGAZ

Drawing Title: ACCESS ROAD CONCEPTUAL DRAINAGE DESIGN PLAN AND SECTION

Purpose of issue: PRELIMINARY

Designed	Drawn	Checked	Approved	Date
CPB	AT	CPB	CPB	30.08.13

URS Internal Project No.: 46369086

Suitability:

Scale @ A3: NTS

MOU:

Drawing Number: 46369086/SK/01

Rev:

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