

## **Gas interconnector North Macedonia - Greece**

**CBA, Feasibility Study update,  
Environmental and Social Impact  
Assessment, Basic (detailed) Design  
and Tender Dossier**

**Supplementary ESIA Report**

**Appendix to Addendum I  
Biodiversity Action Plan  
Draft Final Report**

**August 2022**

**Technical Assistance to connectivity in the Western Balkans  
EuropeAid/137850/IH/SER/MULTI**



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## Executive Summary

This document provides the Biodiversity Action Plan (BAP) for the Gas interconnector North Macedonia -Greece Project. It is informed by, and should be read alongside, the Project ESIA and associated Biodiversity and Critical Habitat Assessment Report. These documents have identified the following species and habitats that require special conservation measures to be put in place for them:

- Designated sites: IBA Tikves, IBA Demir Kapija and IBA lower Vardar
- Two critical habitats 91AA\* Eastern white oak woods and 6220\* Pseudo-steppe with grasses and annuals of the Thero-Brachypodietea
- Significant Biodiversity features Rivers Vardar, Doshnica and Boshava
- *The Egyptian vulture (Neophron percnopterus); European turtle dove (Streptopelia turtur); eastern imperial eagle (Aquila heliaca) and some nesting species*
- Notable mammals including: European Otter (*Lutra Lutra*), Grey Wolf (*Canis lupus*) and Bats
- Notable Reptians including *Herman's turtle (Testudo hermani)*
- Notable Amphibians including *Bombina variegata* (Balkan endemic)
- Notable Fish: *Barbus balcanicus* (EN)

The document includes a set of actions that together will help ensure the conservation or enhancement of these habitats and species. As such it builds on the key mitigation and compensation measures developed as part of the Project ESIA process and is intended to help the Project comply with both national legislation/policy requirements and international environmental requirements, including the EBRD Performance Requirements (PR6).

This BAP focuses on those species and habitats that need special management and is based on the use of the "Mitigation Hierarchy". As such impact avoidance is prioritised, followed by reduction and mitigation, with measurable offsets (and/or additional conservation actions) only applied as a last resort where residual impacts are unavoidable. The BAP includes a series of management measures to mitigate residual impacts, that will be used by the Project, to achieve no net loss of these notable habitats and species. Monitoring targets, responsible parties and a time frame are also included.

## 1. Introduction

This Biodiversity Action Plan (**BAP**) has been prepared for the North Macedonia section of the Greece-North Macedonia Gas Interconnector Project. BAP includes a set of actions that together can help ensure the conservation or enhancement of potentially affected habitats and species. They build on the key mitigation measures developed as part of the Project supplementary ESIA process and Biodiversity Assessment addendum (BAA) and are intended to help the Project comply with both national legislation/policy requirements and international environmental requirements.

It describes the strategy the Project will employ to fulfill its commitments on the long-term preservation of "notable" species and habitats with local or global conservation importance that are found within and close to its immediate "Project Zone of Influence". The Project Environmental and Social Impact Assessment (ESIA), supplemental ESIA, and accompanying Critical Habitat Assessment Report, which are supplied separately, have been used to inform this document and should be read in conjunction with it. The level of detail required for a BAP is commensurate with the level of impact to the biodiversity values present in a Project area as a result of the Project activities.

### 1.1 Project Overview

The European Bank for Reconstruction and Development (hereafter "EBRD" or the "Bank") are considering providing finance to the National Energy Resources ("NER" or the "Borrower"), to finance the North Macedonia section of the Greece-North Macedonia Gas Interconnector (the "Project"). EBRD have provisionally determined the Project as Category A. The Project involves the construction of gas pipeline in the North Macedonian part of the Interconnector North Macedonia (MK)-Greece (GR). This part of the gas pipeline runs in a northern direction of Mk-Gr border, from municipality of Gevgelija and runs through Bogdanci, Demir Kapija and ends in municipality of Negotino. The Interconnector section North Macedonia – Greece is 67+193,98 km long with a diameter of Ø 700 (Figure 1).



Figure 1. The Project Location

In order to construct the main gas pipeline, first the area needs to be cleared i.e. adequate pipeline right-of-way (ROW) needs to be built along the gas pipeline. Clearing of the area and building the pipeline ROW can be done on several sections simultaneously depending on the accessibility of the area, the regulation of the property and legal relations (Expropriation) and the contractor's capacities (Availability of machinery). In the work area (25 meters, 12.5 m left and right of the axis of the pipe), the access road and staging area for the construction machinery such as trenchers, bulldozers, loaders, side booms, etc. are located. The planned corridor of the project runs through various complexes of habitats that can be divided into five sections:

- First section (Greek border – village of Prdejci): lowland area (46-80m altitude) agricultural arable land, fields and farmlands (KM 0+000 up to KM 16+000)

- Second section (between the villages of Prdejci and Davidovo): hilly area (80-470m altitude) dominated by kermes oak pseudomaquis, plane-tree covered zones appear along the streams (KM 16+000 up to KM 34+500).
- Third section (between the villages of Davidovo and Demir Kapija): hilly area (400-950m altitude) dominated by well-developed oak-hornbeam forest, plane-tree and willow-covered zones appear along the streams (KM 33+500 up to KM 53+000).
- Fourth section, the areas between the villages of Chiflik and Demir Kapija: alder community along the river Bosava (130m altitude), (KM 53+000).
- Fifth section (village of Demir Kapija – town of Negotino): hilly area (130-300m altitude) degraded oak forests, hilly pastures with sparse shrubs and agricultural land (KM 53+000 up to KM 67+140).

## 1.2. Needs and purpose of BAP

Since the Project is located in an area that supports a number of notable species and habitats that are considered threatened, endemic or otherwise of conservation importance, specific habitat/species measures are needed. As a result, the Project has the potential to impact upon areas that could be considered either “Critical Habitat” (CH) and/or “Priority Biodiversity Features” (PBF) as defined by EBRD Performance Requirement 6. Following a Critical Habitat Assessment (CHA) of the scheme, the following habitats or species of notable conservation value have been identified as requiring specific action plans:

- Designated sites: IBA Tikves, IBA Demir Kapija, IBA Lower Vardar
- Aquatic and riparian habitats around the Rivers Vardar, Boshava and Doshnica
- A number of notable species are potentially present including mammals (European Otter *Lutra lutra*, Grey wolf and Bats); amphibians (*Bombina variegata* and others); reptiles (such as *Testudo hermanni* and other)
- Eastern white oak woods; CH
- Pseudo-steppe with grasses and annuals of the Thero-Brachypodietea; CH

The BAP is intended to focus on those species and habitats that need special management, and are based on the use of the Mitigation Hierarchy, with impact avoidance prioritised, followed by reduction and mitigation in severity, with measurable offsets (and/or additional conservation actions) only applied as a when residual impacts are unavoidable. A number of Action Plans have been prepared for the above to help ensure that the Project results in “no net loss”, or where Critical Habitat has been identified, “net gain” to the conservation value of these habitats and species.

Biodiversity Action Plans have therefore been prepared for each of the above to help ensure that the Project results in “no net loss” with regards to the conservation value of these habitats and species. For other habitats and species, use of GIP (Good International Practice) during construction works will prevent or reduce impacts wherever practical.

## 1.3 Legal Basis for the BAP

The Project ESIA provides a concise summary of the key regulatory requirements that determine the Project’s obligations regarding biodiversity in general and this BAP in particular.

## 1.4 Document Objectives

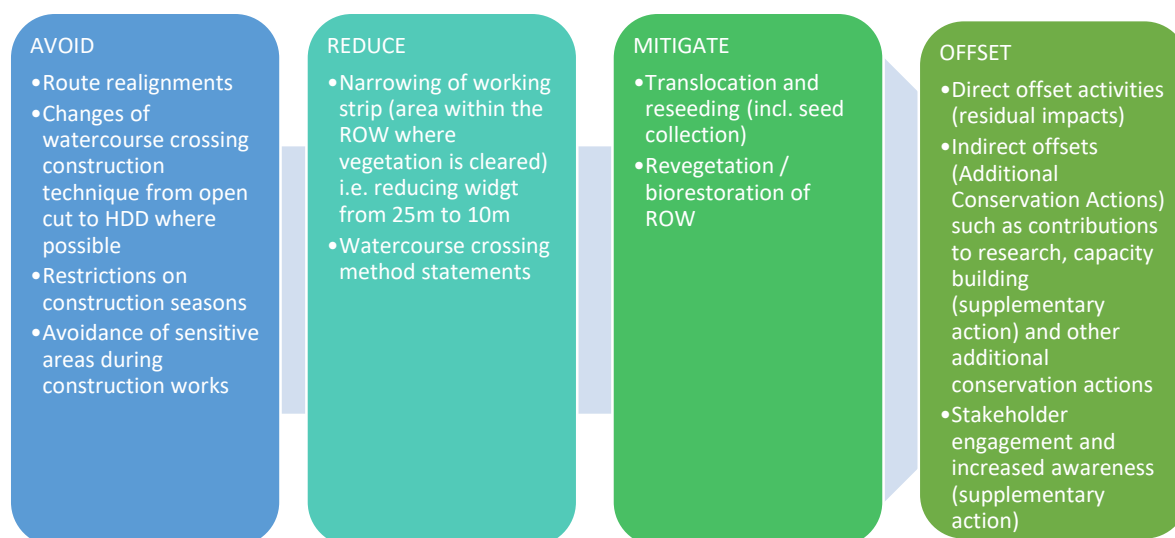
The plans contained within this document include a set of actions that together will help support the long-term conservation of the specific habitat or species of concern. The actions build on, the general

biodiversity mitigation and compensation measures included within the Project ESIA and associated Environmental and Social Management Plans (ESMPs)

To enable the Project to mitigate lingering impacts and achieve no net loss, each specific action plan comprises information on objectives, project activities, impacts, management measures, resources, and monitoring (or net gain where required). The EBRD PR6 Guidance Note and others BAP have been taken into consideration when developing them.

## 1.5 Application of the Mitigation Hierarchy

The ultimate objective of a BAP is to **achieve no net biodiversity loss** or, if Critical Habitat is triggered, **net biodiversity gain** as a result of the Project. To achieve this, the “Mitigation Hierarchy” is applied to potential impacts identified as shown in the figure below.



Using this approach avoidance has been prioritised, followed by reduction and mitigation, with measurable offsets only applied as a last resort where residual impacts are unavoidable, or as an additional conservation measure.

### ■ AVOID

NER selected the pipeline route aimed at ensuring that, wherever possible, biodiversity sensitive areas were avoided. Route adjustment was made- in the central part of the corridor, the route turns towards south whereby it avoids Monument of nature MN Demir Kapija, Important Plant Area IPA Demir Kapija Canyon and the eponymous Emerald Area. Thus, the impact, primarily on the rare species of birds of prey, as well as on rare and endemic plants, has been avoided-minimized in this region. Also, a horizontal directional drilling (HDD) trenchless water crossings will be carried out under three largest watercourses in the PZI (rivers Vardar, Dosnica and Boshava) in order to avoid impacting sensitive species and habitats especially the European otter population.

### ■ REDUCE

Where some impact could not be avoided, efforts will be made to reduce/minimise them through mitigation strategies. These have included enforcing seasonal work restrictions to reduce the impact on the lifecycle of certain fauna, reducing working width to the minimum area possible in identified natural habitats. NER will implement seasonal work restrictions in various areas in during the sensitive species breeding seasons.

## ■ MITIGATE

NER is dedicated to promptly and accurately restoring the vegetation's original composition, density, and state along the pipeline ROW. Deep-rooted trees cannot be planted in the limited ownership zone for operational and safety reasons, therefore that is the only exemption to this rule. For the forest(s) that predated construction on the pipeline right of way, reforestation will take place. Every tree that is cut down for construction will be effectively replaced. Due to the limits in the restricted ownership zone, not all trees will be restored in the exact spot from which they were taken. All re-vegetation processes will be regularly monitored and progress is assessed against a set of pre-agreed targets. These include tangible evidence that NER's environmental and social commitments and mitigation measures are being fulfilled. Restoration of vegetation to a similar density and diversity to that of pre-construction will also be monitored. All reforestation works will be agreed to and are monitored by the competent forest authorities. NER's long-term bio-restoration monitoring programme will follow the success of actions over the course of the pipeline's lifetime to ensure no net losses to biodiversity.

## ■ OFFSET

In some cases, impacts have been unavoidable. In these instances, NER will use biodiversity offsets to compensate for any loss in biodiversity value. An offset strategy will be developed to address any residual impacts on biodiversity, focusing on species and habitats identified as priority biodiversity features or critical habitat. Biodiversity offsets will be implemented in the years to come and monitored over the pipeline's lifetime to ensure NER achieves its commitment of no net losses to biodiversity.

## 2. BAP implementation process

### 2.1 Overview

As described earlier, the Project will avoid impacts to notable species and habitats by:

- Use of the mitigation hierarchy
- Design of the route to avoid sensitive habitats wherever practical
- Commitment to the use Good Industry Practice (GIP) during construction works to further prevent or reduce impacts as far as practical. This includes appropriate timings of works (e.g. to enable work in river beds when they are dry; timing works to avoid impacts to nesting birds or hibernating/nursing bats).
- Commitment to apply the mitigation measures elaborated in the project ESIA.
- Application of species and habitat-specific Biodiversity Action Plans

Together these are intended to ensure "no-net loss" or even "net gain" of biodiversity as a result of the proposed gas pipeline construction and operation. Implementation of these approaches will be based around two key roles, namely the:

- Owners Engineer Environmental Specialist (OEES) responsible for monitoring the works. The OEES will develop and implement a Biodiversity Monitoring and Evaluation Plan (BMEP). Resources will be nominated by NER and Supervision Engineer. BMEP shall be developed by Supervision Engineer prior commencement of construction phase based on BAP and Biodiversity and Critical Habitat Assessment to ensure proper and timely implementation of all mitigation and monitoring measures. Adequately, prior operational phase NER will consider it within BMEP.
- Biodiversity Ecological Clerks of Work (ECOW) responsible for managing the works. Appropriate personnel nominated by the Contractor i.e. Biodiversity Expert.



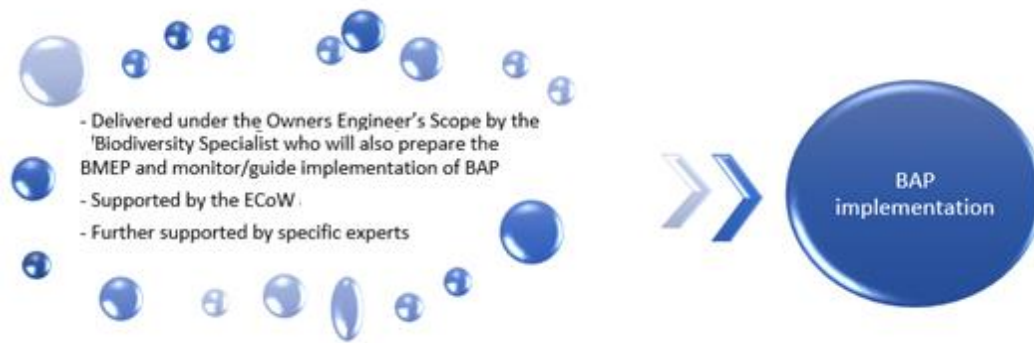
Actual BAP activities on the ground will be undertaken by the Contractor, either through physical works or completion of surveys and it is expected that the Works Contractor will sub- contract these Biodiversity specialist surveys to relevant universities, NGOs or specialised consultants.

## 2.1 Responsibilities

The Owners Engineer responsibilities	<ul style="list-style-type: none"> <li>• ensure compliance of construction works with the ESIA and BAP commitments;</li> <li>• monitoring of implementation of Project EMPs through the Contractors Site Environmental Management Plans (SEMPs);</li> <li>• nominate Biodiversity Specialist to ensure that the Contractor is compliant with his environmental obligations;</li> <li>• prepare and manage implementation of the Biodiversity Action Plan and Biodiversity Monitoring and Evaluation Plan (BMEP);</li> <li>• conduct site visits in order to supervise compliance of Contractor's activities with contract requirements in regards of biodiversity;</li> <li>• conduct environmental training (for NER and Supervision Project staff) and briefings to provide environmental awareness on EBRD safeguards and regulatory environmental requirements and standard operating procedures in conformity with project obligations;</li> <li>• preparation of Monthly, Quarterly And Annual reports on compliance with ESIA including biodiversity requirements;</li> <li>• review all documents and reports regarding the integration of environmental and biodiversity issues including contractor's ESIA plans.</li> </ul>
Ecological Clerk of Works (ECoW) in terms of biodiversity (Contractors resources)	<ul style="list-style-type: none"> <li>• nominate skilled Biodiversity Expert;</li> <li>• build on the work undertaken to date to identify any specific areas of particular ecological sensitivity (e.g. supporting protected or notable habitats or species) that may need to be avoided, moved (e.g. plants/amphibians), disturbed later in the year (e.g. if birds are nesting there) or invasive species locations;</li> <li>• translate mitigation requirements written in the SEMP and its sub-plans (including relevant elements of the Biodiversity Action Management and Monitoring Plans) into practical measures on the ground;</li> <li>• advise in a timely manner as to how best to address changeable and less predictable situations on the ground from a biodiversity perspective (e.g. should new species or populations be encountered);</li> <li>• ensure that all staff are fully aware of the biodiversity sensitivities of the site and their responsibilities, as outlined in the management plans (e.g. via practical toolbox talks ahead of the construction) and ensure they are appropriately trained in the requirements of the Biodiversity and Critical Habitat Assessment, BAP and BMP;</li> <li>• take field notes and photo documentation to demonstrate compliance with the biodiversity requirements;</li> <li>• undertake pre-construction/enabling surveys a couple of weeks ahead of the site clearance teams;</li> <li>• produce hazard maps to show the location of particularly sensitive habitats and species that are to be avoided e.g. by changing timing of works, amendments to construction methods statements, invasive species location etc.</li> <li>• working with the workforce during clearance work in forests and riparian habitats to identify sensitive habitats and species present on site, in particular nests with eggs/chicks, dens, burrows, hibernacula and other places of shelter to prevent direct mortality.</li> </ul>

Supervision Engineer/ NER will record details about the actions performed in order to demonstrate limited impact upon biodiversity (date, species, measures that were implemented, means that were used). These records will be made available to EBRD, upon request. In summary, implementation of BAP will be:





*Figure 2. Summary BAP implementation process*

### 3. Specific Biodiversity Actions

#### 3.1 Action Plan for the Designated Area “IBA Demir Kapija Gorge”

Situated East-South-East of the town of Demir Kapija in southern part of RNM, the site includes about a half (upper part) of the longest gorge of the Vardar River (in total ca. 20 km long). The border runs along the last houses of Demir Kapija, turns south towards Čiflik and Dren villages, then follows the Drenska Reka (a tributary of the Vardar) to the east to the Stefan ridge, where it turns north. Main morphological characteristic is the gorge, which is in certain parts a typical canyon with walls of over 200 m high. Part of the site is protected as a Nature Monument, but the protected site does not include some of the key localities. The Demir Kapija Gorge is one of the richest ornithological reserves in Europe by the presence of rare birds of prey: griffon vulture (*Gyps fulvus*), Egyptian vulture (*Neophron percnopterus*), golden eagle (*Aquila chrysaetos*), short-toed snake eagle (*Circaetus gallicus*), long-legged buzzard (*Buteo rufinus*), various falcons (*Falco peregrinus*, *F. naumanni*), as well as some less common species of birds such as *Hieraaetus pennatus*, *Milvus migrans*, *Falco biarmicus*, *Cerchotrichas galactotes* etc. The gas pipeline corridor intersects the IBA area between KM 47+250 to KM 48+800 and from KM 50+800 to KM 52+250, in the total length of 3 KM (fig.3).

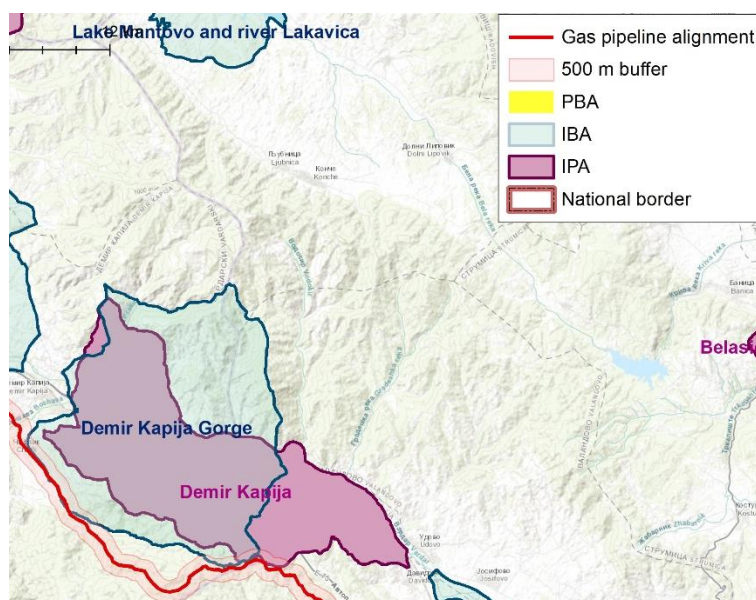


Figure 3. IBA Demir Kapija George and gas pipeline route

The BAP goes on to state that a Habitat Directive Annex I and II habitats are present and that several Birds Directive Annex I species have also been recorded here. Despite ecological significance, the area is also said to have significant social, economic, cultural and recreational significance (ecosystem services). The area itself represents a complex of freshwater, terrestrial and karst habitats which together support a number of notable species considered unique in the central region of North Macedonia. For the purposes of this BAP the site is considered as designated for conservation protection, as a critical habitat a (CH).

A range of habitats have been recorded within 1000m of the centreline of the pipeline in this area, including rivers and river vegetation. Detailed habitat maps of these areas is prepared and provided as an Annex of the Biodiversity and Critical Habitat Assessment, along with the results of additional site biodiversity surveys performed in 2022.

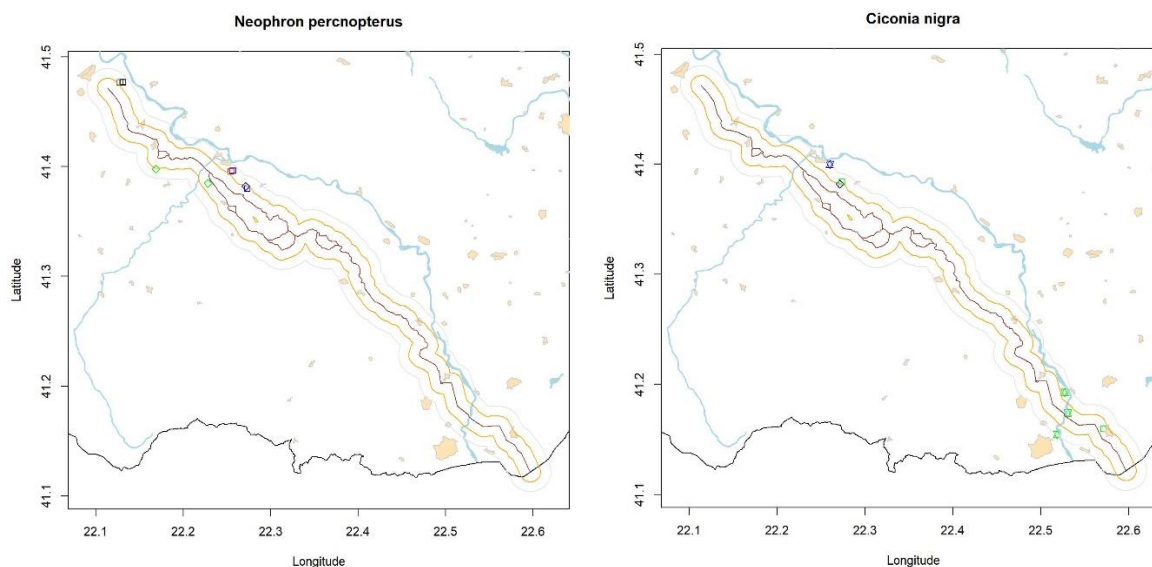
The following habitats can be found in Demir Kapija region (including IBA Demir Kapija):

- 6220\* Pseudo-steppe with grasses and annuals of the Thero-Brachypodietea -between Negotino and Demir Kapija and between the village of Przhdevo and the village of Besvica, a hilly pasture of marl.
- 23F5 Shrubs and low woods of kermes oak (*Quercus coccifera*) -above Dren village, in the *Quercus coccifera* belt
- 92C0 *Platanus orientalis* and *Liquidambar orientalis* woods (*Platanion orientale*)- near the Aqua Park, along river Boshava.
- 91EO Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)- along river Bosava, in the vicinity of Demir Kapija

The following bird species could be found:

### ***Neophron percnopterus***

One pair of Egyptian vultures has been found breeding in Demir Kapija Gorge, in the wider area of the pipeline (outside the 2 km corridor), but it uses the project area for foraging. No significant impact is expected on this breeding pair. Five additional historically known territories are present in the wider region of Demir Kapija, which are now all unoccupied.

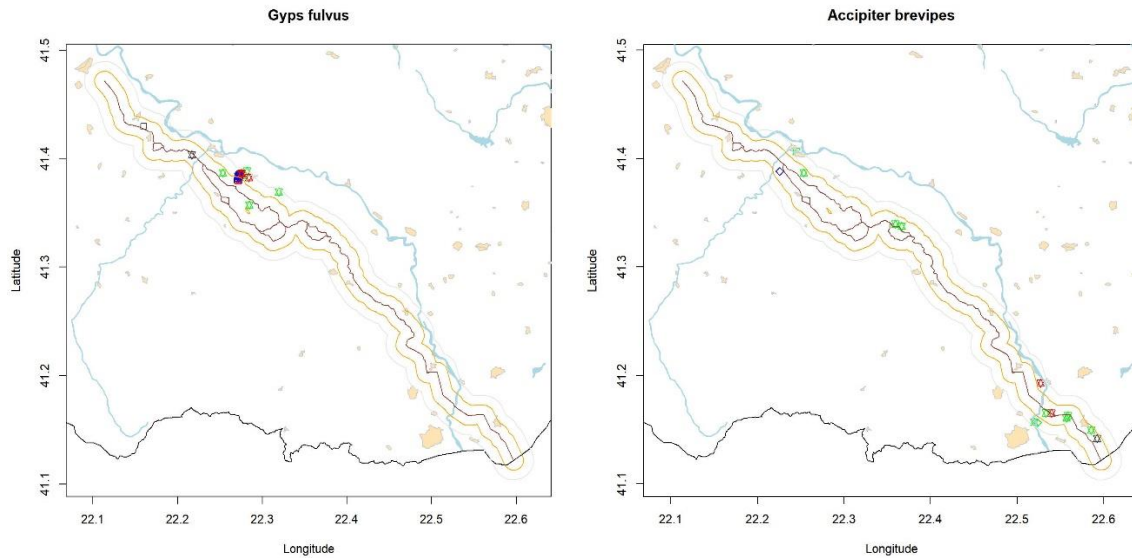


### ***Ciconia nigra***

The black stork breeds in Demir Kapija Gorge, and it uses the Vardar River and its tributaries for foraging. During migration it can be expected along the entire corridor. It is highly sensitive to disturbance and habitat loss, but no nest is known in the vicinity of the corridor.

### ***Gyps fulvus***

A colony of the griffon vultures exists near the project corridor (above Klisura village, Demir Kapija), and one of the pipeline alternatives passes very close to the colony (at the locality Vrvot). This alternative is to be avoided. Due to the topography of the terrain, the other alternative will not affect the colony. Although birds from the colony rarely use the corridor area for foraging, they will not be significantly affected by habitat loss and disturbance.

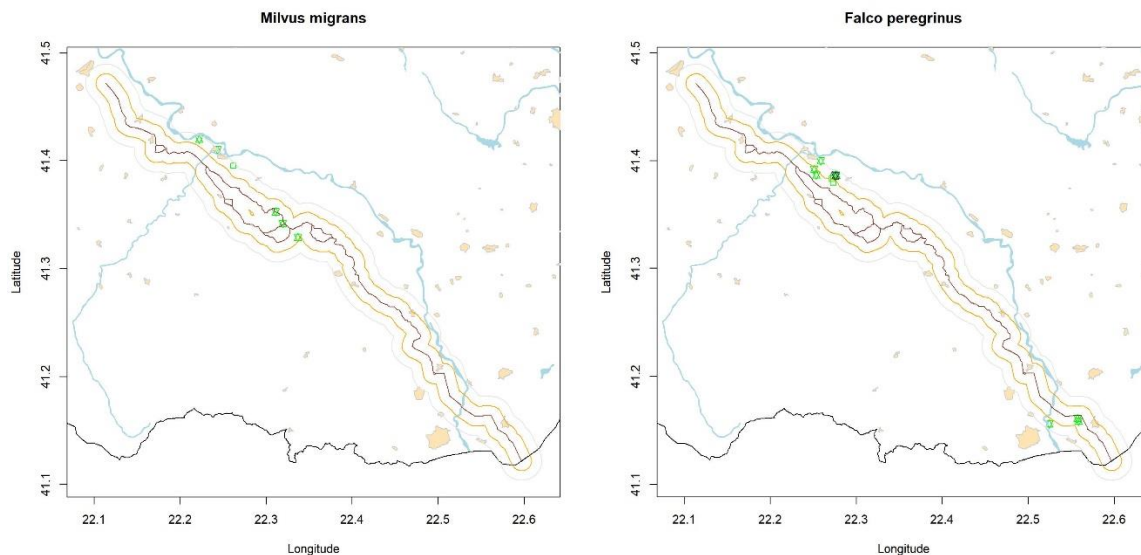


### ***Accipiter brevipes***

The levant sparrowhawk is a typical bird of prey for the Lower Vardar region (both Demir Kapija and Gevgelija), and this area is the core of its population in North Macedonia. The national population is small, possibly no more than 60 pairs. It breeds in the riparian forests, and some pairs will likely be affected by habitat loss and disturbance. Therefore, minimal destruction of the riparian forest should be secured throughout the construction, both along Bosava-Dosnica rivers and at the Lower Vardar.

### ***Milvus migrans***

One or two pairs of the extremely rare black kite breed in the wider region of Demir Kapija, but they will unlikely be affected by the project implementation as they are related to the preserved forest stands which are not to be found along the project corridor. Nonetheless, they forage in sections of the pipeline corridor; hence, some negative effect is still expected.



### ***Falco peregrinus***

One pair of peregrines breed in the wider area of the pipeline, in Demir Kapija Gorge, and individual birds are observed in the fields of Gevgelija in the breeding season. It will not be significantly impacted by the project implementation.

Despite ornithological values, Demir Kapija is significant also for other species such as:

- Presence of Eurasian otter (*Lutra lutra*) was recorded at a number of locations along the rivers Vardar, Boshava, Doshnica and Stara Reka.
- Schreiber's bent-winged bat (*Miniopterus schreibersii*), European free-tailed bat (*Tadarida teniotis*) and Soprano pipistrelle (*Pipistrellus pygmaeus*) were recorded at one location in Demir Kapija; Common pipistrelle (*Pipistrellus pipistrellus*) has been recorded at three locations near v. Bogorodica, v. Gjavato and Demir Kapija.

Action Plan for IBA Demir Kapija Gorge				
Approach	Avoid	Reduce	Mitigate	Offset
Objectives	No net-loss in area (or quality) of habitats of conservation value in the site as a result of Project activities. Specific protection of notable species in particular birds.			
Location	The gas pipeline corridor intersects the area between KM 47+250 to KM 48+800 and from KM 50+800 to KM 52+250, in the total length of 3 KM			
Project activity	Site / ROW preparation (including vegetation removal, topsoil stripping)			
Potential Impacts	-Direct loss /degradation/ fragmentation of habitat -Disturbance of bird species -Spread of invasive species			
Mitigation measure	<ul style="list-style-type: none"> <li>• Reduce vegetation clearance / working width (where possible);</li> <li>• No laydown areas or camps will be allowed in this area, working areas will be clearly marked and contractors will be fully informed as to the ornithological sensitivity of the site in general;</li> <li>• Construction work to be done from <b>September till March</b> (to avoid birds breeding period);</li> <li>• No entering of any forested areas except those strictly necessary for construction of the permanent works;</li> <li>• Avoid the felling of significant tree, such as tall poplar and plane trees in riparian habitats. All efforts should be made to minimise removal of mature trees especially if there is nest;</li> <li>• Educate workforce on bird species and to preventing bush/forest fires;</li> <li>• No clearing any forest vegetation except within the working corridor;</li> <li>• No excavating any material for fill or aggregate, or any other purpose except within the corridor of the permanent works;</li> </ul> For all bird species, the following actions are forbidden: <ul style="list-style-type: none"> <li>• Deliberately killing or capturing birds, regardless of the method;</li> <li>• Deliberately damaging, destroying and/or gathering nests and/or eggs;</li> <li>• Deliberate disturbance, especially during reproduction, breeding and migration periods;</li> <li>• Owning individuals of the species for which hunting and capturing are forbidden;</li> <li>• Trading, owning and/or transporting live or dead birds or any easily identifiable parts or production order to be traded.</li> <li>• All works within 20 m of known nests or regularly used winter roosts should be supervised by the Biodiversity Specialist or appropriate buffer areas marked where no construction activity.</li> <li>• Constant supervision by an expert – ornithologist – during the activities along the area boundaries;</li> <li>• Pollution prevention measures and GIP will be strictly applied.</li> <li>• <i>Additional measures are given for other notable species and habitats in this BAP.</i></li> </ul>			
Summary of approach	The project will primarily avoid impacts to this designated area, through route selection (with lowest impact on IBA Demir Kapija Gorge) and, the use of HDD (river Bosava and Doshnica) and through the use of the ECoW to demarcate areas of particular sensitivity. Additional measures will also put in place to reverse current habitat succession and specific approaches will be put in place for birds.			
Monitoring	Monitoring will be conducted by both the ECoW as well as the Owners Engineer. A specific monitoring plan will be put in place for notable birds			

Action Plan for IBA Demir Kapija Gorge	
Responsibility	Contractor biodiversity ECoW to undertake pre-clearance surveys, clearly demarcate sensitive areas and supervise any translocation/restoration works to be undertaken as early as practical within the construction schedule. Owners Engineer to implement BAP and manage additional studies as well as supervise contractor. Bird monitoring to be subcontracted to specialist- experienced ornithologist.
Timing	Work to be carried out during relevant stages of Project construction. Monitoring will continue over a 5-year period to ensure its effectiveness.

### 3.2 Action Plan for the Designated Area “IBA Lower Vardar”

Starting from the right bank of the Vardar River along the Macedonian - Greek border, the IBA Lower (South) Vardar boundary follows the state border eastwards to the Sermenska Reka stream, from where it turns NW and via Mala Čuka (196 m a.s.l.) descends towards the village of Stojakovo, including it into the site, and along a dirt road continues NW to include the village of Gjavato. From there it continues north, passing close to the left bank of the Vardar, leaving the greenhouses at Grčište village outside the site. Then it continues north along the local road till it reaches the E-75 Demir Kapija– Gevgelija motorway, passes through the Šopka and Lagovo localities until reaching the Anska Reka River, follows it east to the motorway, and then runs along it north to just south of Udovo village. The boundary crosses the Vardar and turns north to Udovo.

The IBA Lower (South) Vardar has been identified as an important area for nesting of two species of storks (*Sterna hirundo* and *Sternula albifrons*), as a nesting area of almost 10% of the national white stork population (*Ciconia ciconia*) and as a potential bottleneck for migration of large floating species of birds (birds of prey, storks, etc.) In addition, the flood meadow of the Gjol area (in the vicinity of the village of Bogorodica) is an important stop-over site for many wintering species in this part of North Macedonia. This includes several species of duck and egret families, and the greater flamingo (*Phoenicopterus roseus*) has been spotted on several occasions. Also, this locality is crucial in the feeding of the breeding non-resident species such as the large nesting populations of white storks in the villages of Stojakovo and Bogorodica. The line gas pipeline corridor intersects the area between KM 0+000 and KM 9+500 and KM 10+500 and KM 13+000, in the total length of 12 KM.



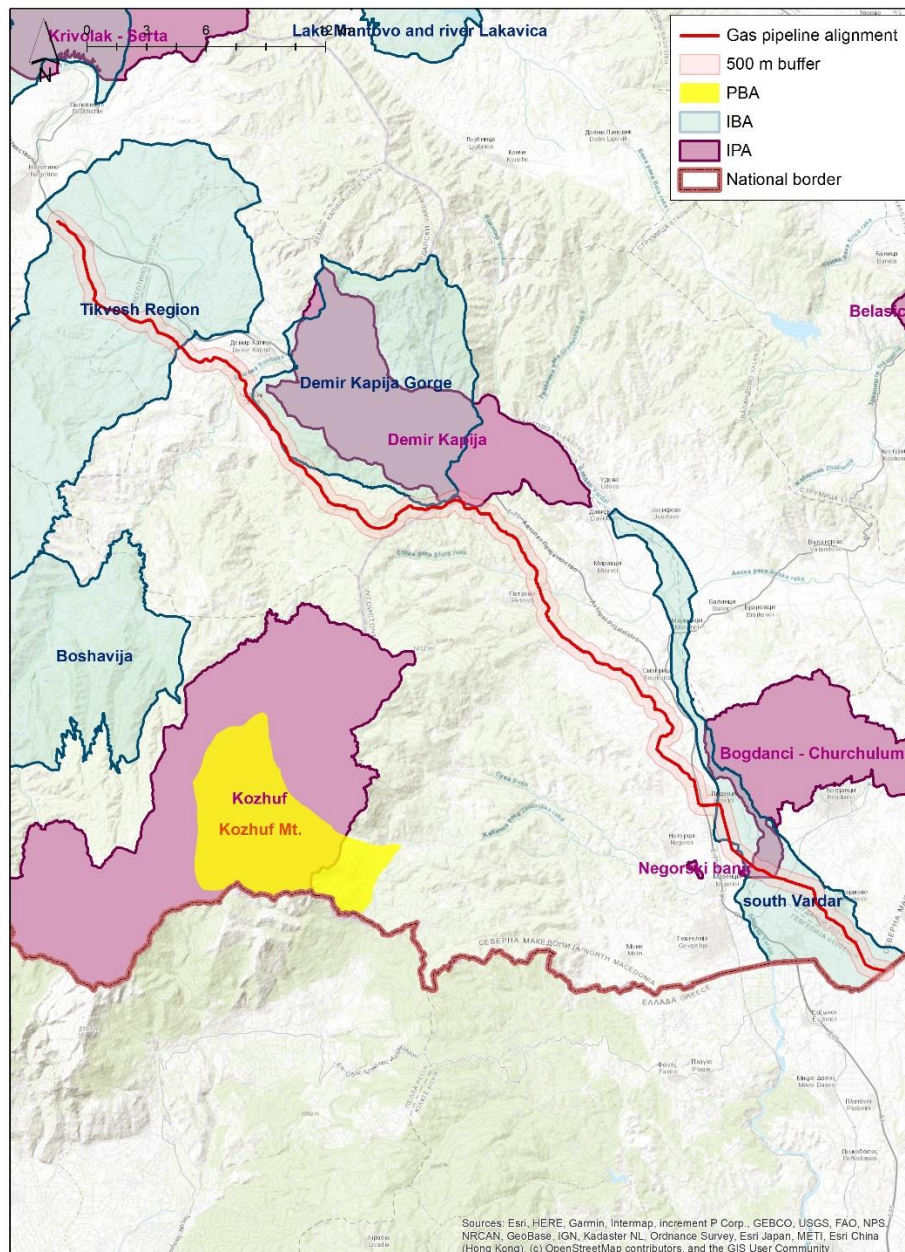


Figure 4. IBA Lower (South) Vardar and gas pipeline

The area itself represents a complex of freshwater and terrestrial habitats which together support a number of notable bird species. A range of habitats have been recorded within 1000m of the centreline of the pipeline in this area, including rivers and river vegetation. Detailed habitat maps of these areas are prepared and provided as an Annex of the BCHA along with the results of additional site biodiversity surveys performed in 2022. The BAP goes on to state that a Habitat Directive Annex I and II habitats are present and that several sensitive bird species have also been recorded here. Despite ecological significance, the area is also said to have significant socio-economic (agricultural) significance. For the purposes of this BAP the site is considered as designated for conservation protection, as a critical habitat (CH).

The following habitats can be found in Lower Vardar region:

- 3260 Water courses of plain to montane levels with *Ranunculus fluitantis* and *Callitriche* - Batrachion vegetation - Bogdanci: Gjavato vill., along the river Vardar, riparian vegetation.



- 3280 Constantly flowing mediterranean rivers with paspalo agrostidion species and hanging curtains of *Salix* and *Populus alba*- Gevgelija: Mrzenci vill.- the Sermeninska River, in the riverbed and along the river
- 6220\* Pseudo-steppe with grasses and annuals of the Thero-Brachypodietea - in Gevgelija Miravci, hilly pasture of silicate Smokvica v., hilly pastures of silicate in the belt of *Quercus coccifera*, in Bogdanci: Stojakovo v., hilly pasture, of silicate, abandoned fields in succession
- 23F5 Shrubs and low woods of kermes oak (*Quercus coccifera*). Gevgelija: Miravci, in the forest belt of *Quercus coccifera*, silicate, Smokvica v., in the *Quercus coccifera* belt, silicate, between the villages of Smokvica and Prdejci, in the forest belt of *Quercus coccifera*.
- 92A0 *Salix alba* and *populus alba* galleries- Gjavato vill., along the river Vardar, riparian vegetation

The Vardar riverbed between Udovo and Gevgelija is morphologically characterized by the monochannel's transition into a braided river type. This is the area with best-preserved natural river dynamics in Macedonia. The entire site is part of the Gevgelija-Valandovo valley, of tectonic origin. Alluvial deposits are found on both sides of the Vardar, but are most characteristic in western parts of the valley (the Miravci field). Aeolian sands are also found in the vicinity of Gjavato village. The sandy habitats around the river Vardar and the riparian habitats with tamarix are important for birds. The largest colony of sand martin (*Riparia riparia*) in the country can be found along the riverbed, and the only nesting site of the little tern *Sterna albifrons* is located on the river island, which is nesting in a mixed colony with the common tern, *Sterna hirundo*. The area is located approximately 700 metres from the nearest point of the gas pipeline route (Figure 5). These islands are artificial, created during construction of oil pipeline.

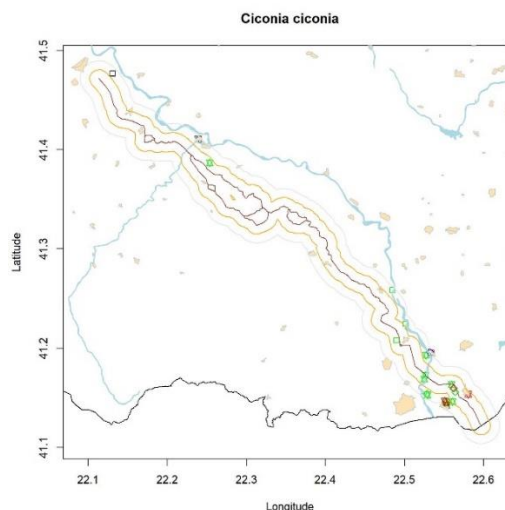
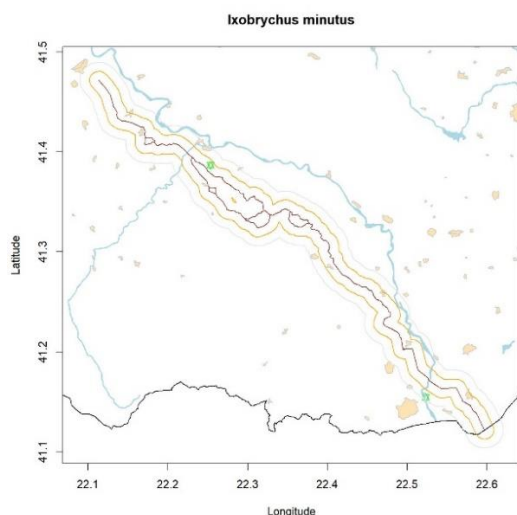


Figure 5. Aeolian sand in river Vardar

The following bird species could be found in this region:

### ***Ixobrychus minutus***

A few pairs of the little bitter might be breeding in the sections of the Lower Vardar river where reed-beds exist. It will not be significantly affected by the construction of the pipeline.

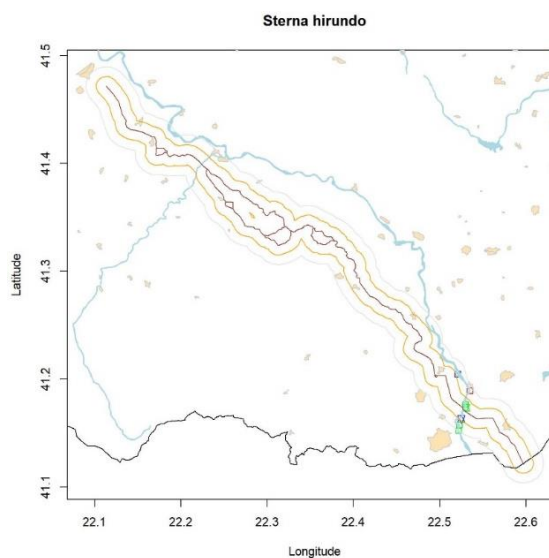
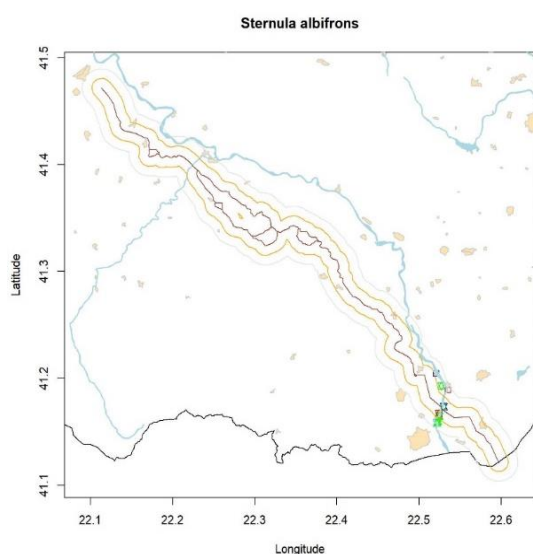


### ***Ciconia ciconia***

The white stork is one of the triggering species for identification of the IBA Southern Vardar, and it has good populations in the villages of Bogorodica and Stojakovo in Gevgelija region (about 60 pairs breed in this region, (PutilinStamkoska et al. 2020). The pipeline is foreseen to traverse one of the main feeding areas near Stojakovo (Gevgelija), and there is a risk that the construction will alter the hydrological regime of this wet meadow. Therefore, a slight route change is proposed.

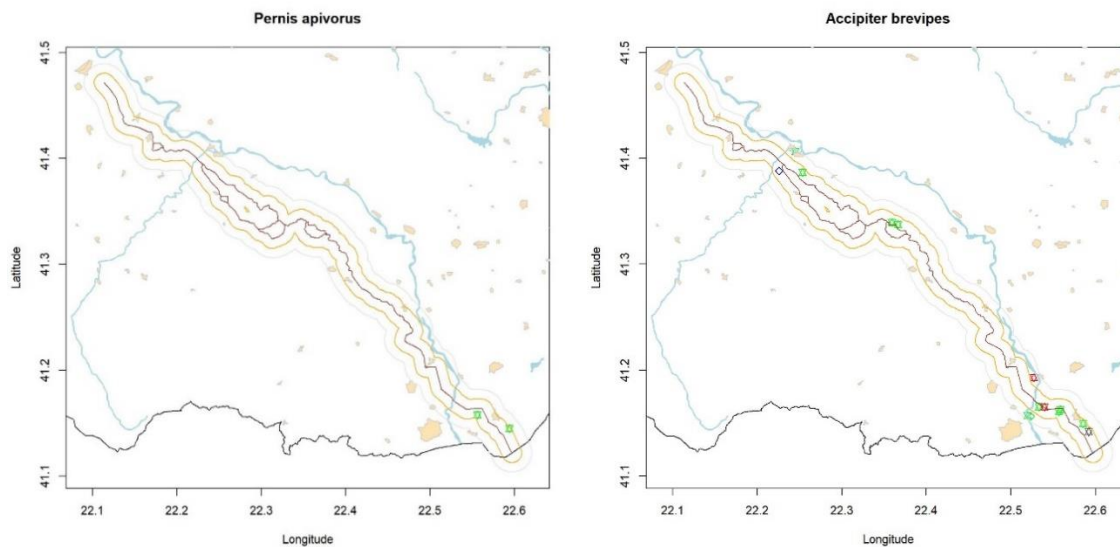
### ***Sternula albifrons* and *Sterna hirundo***

The Lower Vardar region is the only known breeding site for these Annex I species - the little tern and the common tern in North Macedonia; therefore, they will require protection. A mixed colony is located on a small island near Gjavato village, about 2 km from the foreseen project pipeline. The colony is about 30 pairs in total, equally divided between both species. Construction will cause foraging habitat loss and disturbance. **Ideally, construction activities should be implemented in the period between August and March so as to avoid any impact upon the colony.** Breeding on other river islands cannot be excluded. Therefore, no alterations in the river bed are to be made with the construction works.



### ***Pernis apivorus***

One pair of the honey buzzard probably breeds in the Lower Vardar region, and it will likely be unaffected by the construction works.

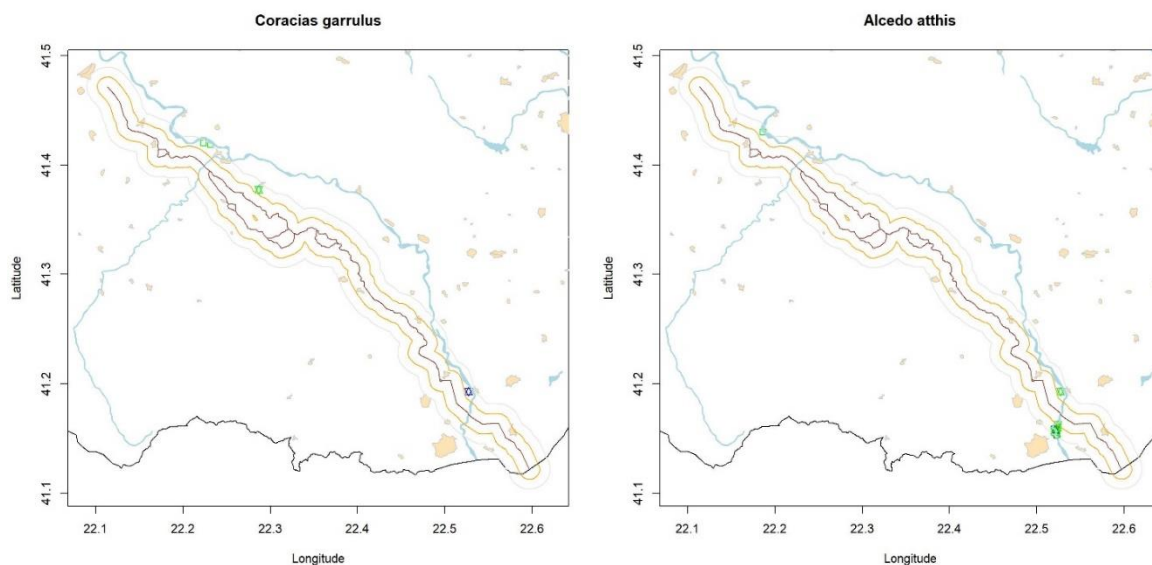


### ***Accipiter brevipes***

The levant sparrowhawk is a typical bird of prey for the Lower Vardar region (both Demir Kapija and Gevgelija), and this area is the core of its population in North Macedonia. The national population is small, possibly no more than 60 pairs. It breeds in the riparian forests, and some pairs will likely be affected by habitat loss and disturbance. Therefore, minimal destruction of the riparian forest should be secured throughout the construction, both along Bosava-Dosnica rivers and at the Lower Vardar.

### ***Coracias garrulus***

A few pairs of rollers scarcely breed in the riparian forests in the Lower Vardar section. The species might be affected only locally, near Gevgelija, **if large poplar or plane trees are felled** for the sake of project implementation. Therefore, as a mitigation measure, this practice should not be allowed (which will have a positive impact for other species, too).



### ***Alcedo atthis***

A few pairs possibly breed along the Vardar river in Gevgelija region, and they might be affected locally via disturbance. Destruction of steep banks along the river, where this species breeds (and where the sand Martin *Riparia riparia* have colonies) should not be allowed during project implementation.

### **Other species**

- The Eurasian (***Lutra lutra***) otter inhabits most of the existing major water bodies in N. Macedonia. The population size is estimated at 350-400 individuals. Otters are strongly dependent on riparian vegetation and availability of denning sites (holts). Most otter activity occurs in a narrow strip along the water's edge but they may be found up to 1 km away from water. In the broader area of the pipeline corridor, presence of Eurasian otter was recorded at a number of locations along the rivers Vardar, Boshava, Doshnica and Stara Reka.
- Forest dormouse (***Dryomys nitedula***) is widespread in western parts of N. Macedonia and along Vardar valley. The species mainly prefers forested areas, but also found in rocky areas, evergreen shrubland (including Mediterranean-type shrubland) and wood-steppe. Along the pipeline corridor, the species has been recorded at one location on the right bank of Vardar, near Gevgelija.
- Whiskered bat (***Myotis mystacinus***) the species has been recorded at one location near v. Prdejci.
- Savi's pipistrelle (***Hypsugo savii***) has been recorded at two locations between v. Stojakovo and v. Bogorodica.

### **Invasive species**

An invasive plant species *Amorpha fruticosa* is distributed along river Vardar at the crossing with the gas pipeline (8+500). Also, the muskrat *Ondatra zibethicus* which is invasive fauna species is found in river Vardar on 8+500.

	Action Plan for IBA Lower Vardar			
Approach	Avoid	Reduce	Mitigate	Offset
Objectives	No net-loss in IB area (or quality) of habitats of conservation value in the site as a result of Project activities. Specific protection of notable birds.			
Location	The line gas pipeline corridor intersects the area between KM 0+000 and KM 9+500 and KM 10+500 and KM 13+000, in the total length of 12 KM.			
Project activity	Site / ROW preparation (including vegetation removal, topsoil stripping)			
Potential Impacts	-Direct loss/disturbance/degradation/ fragmentation of habitat -Spread of invasive species			
Mitigation measure	<ul style="list-style-type: none"> <li>• Reduce vegetation clearance / working width (where possible);</li> <li>• No laydown areas or camps will be allowed in the area, working areas will be clearly marked and contractors will be fully informed as to the sensitivity of the site in general;</li> <li>• Construction work to be done from September till March i.e. avoid sensitive bird species breeding period (marked with yellow):</li> </ul>			

Action Plan for IBA Lower Vardar													
Species	location	jan	Feb	mar	apr	may	jun	jul	aug	sept	oct	nov	dec
<i>Ciconia ciconia</i>	Stojakovo												
<i>Sternula albifrons</i> and <i>Sterna hirundo</i>	small island in river Vardar near Gjavato village												
<i>Hieraaetus pennatus</i>	between Dren and Gabrovo villages, and one to two more around Stojakovo village												
<i>Circus pygargus</i>	field near Gevgelija												

- No construction in the period from Mar-Aug in the villages of Stojakovo and Bogorodica will avoid disturbance of the large nesting populations of white storks who use this area for feeding;
- No entering of any forested areas or riparian area except those strictly necessary for construction of the permanent works;
- Avoid the felling of significant tree, such as tall poplar and plane trees in riparian habitats.
- Educate workforce on species and to preventing bush fires;
- No clearing any forest vegetation except within the working corridor;
- No excavating any material for fill or aggregate, or any other purpose except within the corridor of the permanent works;

For all bird species, the following actions are forbidden:

- Deliberately killing or capturing birds, regardless of the method;
- Deliberately damaging, destroying and/or gathering nests and/or eggs;
- Deliberate disturbance, especially during reproduction, breeding and migration periods;
- Owning individuals of the species for which hunting and capturing are forbidden;
- Trading, owning and/or transporting live or dead birds or any easily identifiable parts or production order to be traded.
- All works within 20 m of known nests or regularly used winter roosts should be supervised by the Biodiversity Specialist or appropriate buffer areas marked where no construction activity.
- No disturbance of birds that nest on steep banks along the river Vardar (and where the sand *Martin Riparia riparia* have colonies)
- At the end of construction works for the Temporary Construction Compound and pipeline route, the original configuration of the micro- relief should be reinstated in line with the Soil, Waterbody Crossing and Reinstatement Management Plans. In this way, the floodable areas near Stojakovo will be kept and they will serve as feeding area for white Storks.
- Constant supervision by an expert – ornithologist – during the activities along the area boundaries.
- Pollution prevention measures and GIP will be strictly applied.
- Contractor to develop procedures to avoid, monitor and control invasive species, as appropriate. See Invasive Species Management Plan (for more detail). Work to be supervised by a Biodiversity Specialist.
- Additional measures are given for other notable species and habitats in this BAP.



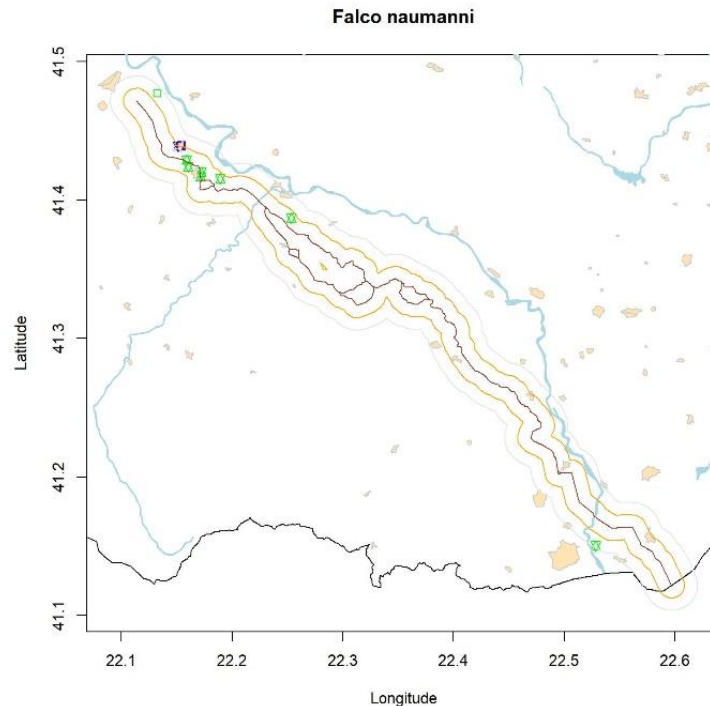
Action Plan for IBA Lower Vardar	
Summary of Approach	<p>The project will primarily avoid impacts to this designate area through the use of the ECoW to demarcate areas of particular sensitivity, but also through HDD crossing at river Vardar. Additional measures will also put in place to reverse current habitat succession and specific approaches will be put in place for notable species, especially birds.</p> <p>The process of vegetation clearance will be agreed with, and monitored by, the Public Enterprise (PE) "Macedonian Forests" in accordance with the provisions of the Law on Forests (Official Gazette of RM No.64/09, 24/11, 53/11, 25/13, 79/13, 147/13, 43/14, 160/14, 33/15 and 44/15), which is in accordance with the respective EU Directives. These regulations envisage compensatory planting at the ratio 1:3, with the allowed species to be advised by MoEPP and PE "Macedonian Forests", in accordance with local ecosystems and upon agreement with PE Macedonian Forests. The Law on Forests also requires that PE "Macedonian Forests" ensures further maintenance of the compensatory plantation sites, and envisages monetary payments to PE 'Macedonian Forests for the loss of timber.</p>
Monitoring	The project will primarily avoid impacts to this designated area, through the use of the ECoW to demarcate areas of particular sensitivity. Additional measures will also put in place to reverse current habitat succession and specific approaches will be put in place for birds.
Responsibility	Any habitat that is translocated or recreated will be monitored throughout the Contractors Environmental Consultant warranty period and over at least a 5-year period to ensure that it survives. Monitoring will be conducted by both the ECoW as well as the Owners Engineer. A specific monitoring plan will be put in place for notable birds
Timing	Contractor ECoW to undertake pre-clearance surveys, clearly demarcate sensitive areas and supervise any translocation/restoration works to be undertaken as early as practical within the construction schedule. Owners Engineer to implement BAP and manage additional studies as well as supervise contractor. Bird monitoring to be subcontracted to specialist- experienced ornithologist.

### 3.3 Action Plan for the Designated Area "IBA Tikves"

IBA Tikves region is located in the south-central part of North Macedonia, south of the city of Negotino, on a surface area of 18.696 ha. The area is important because of the presence of two Egyptian vultures (*Neophron percnopterus*) in its southern part, and also because of the presence of 230 to 250 nesting pairs of the lesser kestrel (*Falco naumanni*), which is nesting only in the villages and it is present in the northern part of the area. In the northern part of the area, 1-2 pairs of eastern imperial eagle (*Aquila heliaca*) are nesting, as well as at least one pair of lanner falcon (*Falco biarmicus*). Also, the largest colony (60 to 90 pairs) of grey heron (*Ardea cinerea*) exists in this region. the villages of Stojakovo and Bogorodica. The gas pipeline corridor penetrates more than 10 KM in the area (point KM 57+000).

#### ***Falco naumanni***

The lesser kestrel is one o the trigger species for the IBA Tikves Region. Its population in the pipeline corridor still seems to be strong (estimated at about 40 pairs), it and will be affected negatively by habitat destruction (loss of foraging areas). This will lead to a decline in the breeding success. Mitigation measures should include **avoidance of construction works in the pastures between April 1st and July 15th**, and also reduction of other threats, such as the likely electrocution on dangerous electricity poles in the region, which might be insulated as a compensatory measure.



Action Plan for IBA Lower Vardar				
Approach	Avoid	Reduce	Mitigate	Offset
Objectives	No net-loss in IB area (or quality) of habitats of conservation value in the site as a result of Project activities. Specific protection of notable birds.			
Location	From 57+000 till the end of gas pipeline corridor			
Project activity	Site / ROW preparation (including vegetation removal, topsoil stripping)			
Potential Impacts	-Direct loss/disturbance/degradation/ fragmentation of habitat			
Mitigation measure	<ul style="list-style-type: none"> <li>• Reduce vegetation clearance / working width (where possible);</li> <li>• No laydown areas or camps will be allowed in the area, working areas will be clearly marked and contractors will be fully informed as to the sensitivity of the site in general;</li> <li>• Avoidance of construction works in the pastures between April 1st and July 15th i.e. avoid lesser kestrel breeding period;</li> <li>• Avoid the felling of significant tree, such as tall poplar and plane trees in riparian habitats. All efforts should be made to minimise removal of mature trees and maintain connectivity between areas of forest habitats;</li> <li>• Educate workforce on species and to preventing bush fires;</li> <li>• No excavating any material for fill or aggregate, or any other purpose except within the corridor of the permanent works;</li> </ul> <p>For all bird species, the following actions are forbidden:</p> <ul style="list-style-type: none"> <li>• Deliberately killing or capturing birds, regardless of the method;</li> <li>• Deliberately damaging, destroying and/or gathering nests and/or eggs;</li> <li>• Deliberate disturbance, especially during reproduction, breeding and migration periods;</li> <li>• Owning individuals of the species for which hunting and capturing are forbidden;</li> <li>• Trading, owning and/or transporting live or dead birds or any easily identifiable parts or production order to be traded.</li> <li>• All works within 20 m of known nests or regularly used winter roosts should be supervised by the Biodiversity Specialist or appropriate buffer areas marked where no construction activity.</li> </ul>			



	Action Plan for IBA Lower Vardar
	<ul style="list-style-type: none"> <li>Constant supervision by an expert – ornithologist – during the activities along the area boundaries.</li> <li>Pollution prevention measures and GIP will be strictly applied.</li> <li><i>Additional measures are given for other notable species and habitats in this BAP.</i></li> </ul>
Summary of Approach	The project will primarily avoid impacts to this designated area through the use of the ECoW to demarcate areas of particular sensitivity. Additional measures will also put in place to reverse current habitat succession and specific approaches will be put in place for notable species, especially birds.
Monitoring	The project will primarily avoid impacts to this designated area, through the use of the ECoW to demarcate areas of particular sensitivity. Additional measures will also put in place to reverse current habitat succession and specific approaches will be put in place for birds.
Responsibility	Monitoring will be conducted by both the ECoW as well as the Owners Engineer. A specific monitoring plan will be put in place for notable birds
Timing	Contractor ECoW to undertake pre-clearance surveys, clearly demarcate sensitive areas and supervise any translocation/restoration works to be undertaken as early as practical within the construction schedule. Owners Engineer to implement BAP and manage additional studies as well as supervise contractor. Bird monitoring to be subcontracted to specialist- experienced ornithologist.

### 3.4 Action plan for rivers

Some of watercourses in the Project Area will be affected at least to some extent by the proposed project. The project area belongs to the lower catchment area of the river Vardar. Based on additional biodiversity surveys in the project Aol, these are the finding:

Table 1. Rivers and streams crossed by the gas pipeline

	Habitat type	Crossings with Infrastructure	Coordinates	Comments
The Disanska Reka	Intermittent stream	Crossing with the gas pipeline	22.129859 41.451748	Completely dry during the spring of 2022 (the situation was the same in August 2020).
<b>The Bosava</b>	Hyporhithral stream	Crossing with the gas pipeline	22.223257 41.398571	Fish ponds and cascades constructed on the river.
<b>The Dosnica</b>	Hyporhithral stream	Crossing with the gas pipeline	22.224277 41.398143	Inflows into the Bosava at 70 m from the crossing with the gas pipeline.
The Kopriska Reka	Metarhithral stream	Crossing with the gas pipeline	22.251602 41.362152	About 250m downstream from the reservoir used for irrigation; a very low waterflow during spring 2022, almost no water in summer/autumn periods in previous years.
The Drenska Reka	Metarhithral stream	Crossing with the dirt road	22.283075 41.354025	Gravel bank and weak Alnus belt.
The Stara Reka	Hyporhithral stream	Crossing with the gas pipeline	22.399685 41.302861	The oil pipeline is visible.
The Gabreska Reka	Hyporhithral stream	Crossing with the gas pipeline	22.405735 41.292394	Very close to the asphalt road (under the bridge).
The Zuica	Intermittent stream	Crossing with the motorway	22.491515 41.227644	Heavily modified due to the construction of the motorway with an artificial (concrete) bottom. Few ponds were present in April 2022.
The Kovanska Reka	Metarhithral stream	Crossing with the gas pipeline	22.492264 41.210313	Torrential flow during the spring and almost no water during the other seasons.
<b>The Vardar</b>	Epipotamal river	Crossing with the gas pipeline (oil pipeline is visible 80m upstream).	22.531444 41.172262	The width of the river Vardar is 98m. The riparian vegetation is very poor.

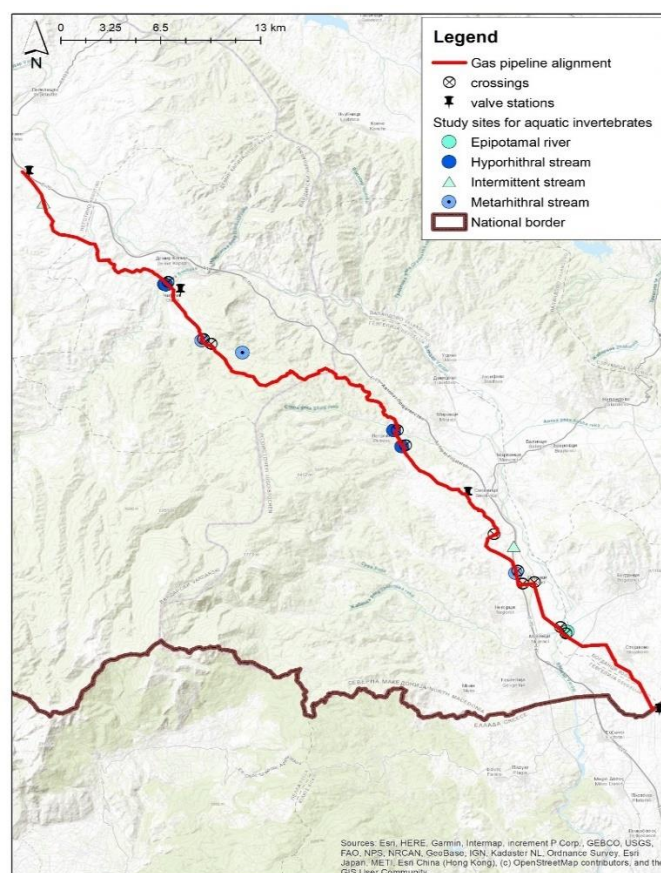


Figure 6. Study area for aquatic habitats

The affected watercourses are considered as significant biodiversity features. They are vital for farming, water supplies, and supporting flora, fauna, and culture. The following sections provide a brief summary of the watercourses, with additional information provided within the main and supp. ESIA.

Table 2. Faunistic composition of aquatic fauna at sampling points

	Dragonflies	Ephemeroptera	Plecoptera	Trichoptera	Fish
Disanska Reka	<i>Onychogomphus forcipatus</i> , <i>Sympetrum depressiusculum</i>	/	/	/	/
Boshava	<i>Calopteryx splendens</i> , <i>Platycnemis pennipes</i> , <i>Onychogomphus forcipatus</i> , <i>Orthetrum brunneum</i> , <i>Crocothemis erythraea</i>	<i>Baetis rhodani</i> , <i>Baetis vernalis</i> , <i>Epeorus assimilis</i> , <i>Rhithrogena semicolorata</i>	<i>Nemoura marginata</i> , <i>Perlodes dispar</i>		Fish community in this part is dominated by <i>Alburnoides bipunctatus</i> , <i>Barbus peloponnesius</i> and <i>Leuciscus cephalus</i> .
Doshnica	<i>Calopteryx splendens</i> , <i>Platycnemis pennipes</i> , <i>Onychogomphus forcipatus</i> , <i>Orthetrum brunneum</i>				
Koprishka Reka	<i>Calopteryx splendens</i> , <i>Orthetrum brunneum</i> , <i>Libellula depressa</i>				
Drenska Reka	<i>Calopteryx splendens</i> , <i>Orthetrum brunneum</i> , <i>Platycnemis</i>			<i>Rhyacophila obtusa</i> , <i>R. polonica</i> ,	Juvenile specimens of <i>Leuciscus</i>

	Dragonflies	Ephemeroptera	Plecoptera	Trichoptera	Fish
	<i>pennipes, Cordulegaster sp.</i>			<i>Micropterna sequax</i>	cephalus were observed.
Stara Reka	<i>Epallage fatime, Calopteryx splendens, Ischnura elegans, Pyrrhosoma nymphula, Onychogomphus forcipatus, Orthetrum brunneum</i>			<i>Glossosoma conformis, Hydropsyche incognita, Plectrocnemia conspersa,</i>	
Gabreshka Reka	<i>Ischnura elegans, Onychogomphus forcipatus, Orthetrum brunneum</i>			<i>Philopotamus montanus, Hydropsyche incognita, Micropterna sequax</i>	
Zuica	<i>Onychogomphus forcipatus, Orthetrum brunneum</i>				Alburnoides bipunctatus, Barbus peloponnesius, Cobitis vardarensis, Gobio sp., Chondrostoma vardarensis
Kovanska Reka	<i>Onychogomphus forcipatus, Orthetrum brunneum</i>		<i>Brachyptera seticornis, B. macedonica</i>	<i>Drusus discolor, Micropterna sequax, Stenophylax meridiorientalis</i>	
Vardar	<i>Caloperys splendens, C. virgo, Erythromma lindenii, Onychogomphus forcipatus, Orthetrum brunneum, O. coerulescens</i>		<i>Brachyptera graeca, B. macedonica, Taeniopteryx stankovici, Capnioneus balcanica, Isoperla oxylepis, I. submontana,</i>		Fish fauna is dominated by Rhodeus amarus, Alburnoides bipunctatus, Barbus peloponnesius and Pseudorasbora parva.

This additional biodiversity surveys (please see BCHA for more details) comprises the results of field observations and literature review pertaining to fish fauna composition on several locations of the proposed pipeline alignment. It contains validated lists of species, characterisation of their distribution as well as significance on a local and regional level. Data on fish fauna from the upper watercourse of the river Vardar accompanied by description of fish and other biological features are presented in the papers by Grupce & Dimovski (1973), Georgiev et al (1991), Kostov et al (1998, 2000, 2001a). Fish fauna in the area of interest belongs to the Vardar watershed. The following fish species are known for the river Vardar and its tributaries: *Eudontomyzon hellenicus* Vlad., Ren., Kott & Econ., 1982, *Salmo trutta* Linnaeus, 1758, *Zingel balcanicus* (Karaman, 1936), *Vimba melanops* (Heckel, 1837), *Gobio banarescui* Dimovski & Grupce, 1974, *Chondrostoma vardarensis* Karaman, 1928, *Pachychilon macedonicus* Steindachner, 1892, *Sabanejewia balcanicus* Karaman, 1922, *Cobitis vardarensis* Karaman, 1928, *Barbus peloponnesius* Valenciennes, 1842.

Among the fish species, *Barbus balcanicus* (Kotlik, Tsigenopoulos, Rab&Berrebi, 2002) – the Danube barbel is part of Annex II to the Habitat Directive and Appendix III to the Bern Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979). In the past, in the Republic of Macedonia, a few subspecies of the current species used to be defined, including the Danube barbel – an inhabitant of the river Vardar watershed.



Figure 7. Global distribution of *Barbus balcanicus*.

**River Vardar** is the most important water flow. It is the largest and the only river, which, although it has variable water levels, it never dries up. The water level is the highest in spring, when the snow melts and in autumn when the rains are more frequent. The water levels are the lowest during the summer months, July and August.

Based on biodiversity surveys, the riparian corridor of the rivers Vardar, Doshnica and Boshava were identified as an important habitat for mammals, insects, aquatic species and sensitive riparian habitats. So, the part where the gas pipeline is crossing the river Vardar (figure 5) and the mouth of the rivers Doshnica and Boshava (Figure 8) passing directly in front of their junction, needs special measures.

Due to the social aspects -vicinity of recreational area of municipality of Demir Kapija (camps site and fishponds Akvatika) and technical (designers), it was not possible to re-route the gas pipeline to cross only river Boshava. In order to avoid impacts to the aquatic and riparian habitats, a HDD will be used for rivers crossing. HDD brings some major advantages when it comes to river crossings. Avoiding the detrimental environmental effects of trenching, a well-planned and designed HDD river crossing allows the pipeline to be drilled and installed under the river without disturbing water or riverbanks at all. And by drilling the pipeline deep underground (and underwater), it's less likely to be damaged by human disturbance or events such as natural disaster, providing a long-term, cost-effective solution for years to come.

Crossings through other rivers and streams will be built basically based on the underground method, below the water surface. There are several ways to construct underground crossings: • Building a temporary dam in the excavation with embankment; • Digging with an excavator at the bottom of the water body; • Diverting the water elsewhere during the construction and installation works; • Building an embankment, so as to enable lowering the gas pipeline, by diverting the water through flume pipes; • Work with an excavator from the shore.



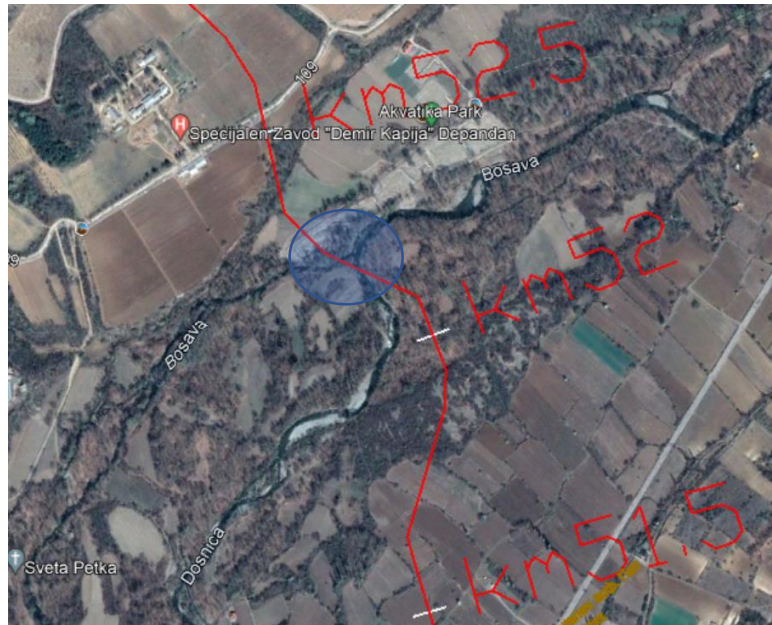


Figure 8. Crossing rivers of Boshava and Doshnica at km 52+200

The proposed Project is going to result in the impact of some 0.275 ha of natural habitat in total of which a limited amount is expected to be within the rivers described above. This includes up to 0.275 ha of Water courses of plain to montane levels with Ranunculus fluitantis and Callitriche-Batrachion vegetation and Constantly flowing mediterranean rivers with Paspalo Agrostidion species and hanging curtains of Salix and Populus alba).

Some small areas of 0.3 ha of Salix alba galleries near rivers may also be affected as described in the BCHA. With regards impacts on fish and aquatic invertebrates, impacts during construction may include the following:

- temporary loss of aquatic habitats, including riverbank habitat;
- impacts on water quality due to changes of morphology and pollution (including turbidity);
- disturbance by noise and vibration;
- inadvertent introduction of invasive alien plant and animal species;
- degradation of the existing habitats as a result of changes in hydrodynamic conditions;
- Accidental spillage of harmful chemical substances into the environment;
- Loss of connectivity between the upstream and downstream habitats;
- Degradation of the surrounding vegetation.

Whilst such impacts are generally expected to be local and temporary in nature (with natural regeneration expected once works cease) impacts that could affect notable species are considered of greater importance. During operation no impacts are expected.

	Action Plan for water crossings			
Approach	Avoid	Reduce	Mitigate	Offset
Objectives	This plan is designed to ensure that the Project has no net impact on the conservation value of the rivers/streams. In addition, it specifically seeks to ensure no adverse impacts on the aquatic organism and riparian habitats			
Location	All river crossing points			
Project activity	-Site / ROW preparation (including vegetation removal, topsoil stripping) -temporary water diversion -Movement of vehicles and construction plant -Working in the riverbed			

	Action Plan for water crossings
Potential Impacts	<ul style="list-style-type: none"> <li>- Degradation/ fragmentation / of aquatic habitat</li> <li>-Water pollution</li> <li>- disturbance of aquatic species</li> <li>-Spread of invasive species</li> </ul>
Mitigation measure	<ul style="list-style-type: none"> <li>• Minimisation of working areas near watercourses, and specific attention to be paid to pollution prevention;</li> <li>• Water crossing to be undertaken in the dry season (mid-June-mid October). Provision of temporary site drainage channels to avoid erosion and environmental impacts;</li> <li>• No excavating any material for fill or aggregate, or any other purpose except within the corridor of the permanent works;</li> <li>• The construction materials or excavated land depots are to be located far away from any water streams;</li> <li>• Any change of the course of water streams should be as close as possible to the natural water stream;</li> <li>• Strictly forbidden to kill, capture or disturb any animal or deliberately damage, destroy and/or collect nests and/or eggs;</li> <li>• Reduce vegetation clearance / working width in riparian habitats (where possible);</li> <li>• No access roads crossing through riparian habitat</li> <li>• No laydown areas or camps will be allowed in the area, working areas will be clearly marked and contractors will be fully informed as to the sensitivity of the site in general;</li> <li>• Pollution prevention measures and GIP will be strictly applied.</li> <li>• Contractor to develop procedures to avoid, monitor and control invasive species, as appropriate. See Invasive Species Management Plan (for more detail). Work to be supervised by a Biodiversity Specialist.</li> <li>• Once the construction works in the river channels are complete, the areas should be rehabilitated by the placement of soil, willow/poplar trees to allow regrowth of natural vegetation. Assistance from botanical specialists and forestry expert should be sought to guide the rehabilitation works.</li> <li>• The area should be monitored quarterly following site handover, to establish whether regrowth of vegetation is occurring. If not, additional measures – seeding, transplanting of saplings, import of additional topsoil, etc. – should be taken to encourage regrowth of riverine vegetation.</li> <li>• Afforestation activities to be performed in line with the No net loss principle, i.e. preparation of Land Restoration Plan. Riparian vegetation along the rivers to be restored to achieve No Net Loss.</li> <li>• Re-planting of the PBF riparian habitats will take place within and around the EAAAs (cannot be re-planted directly on top of the pipeline for safety reasons). The materials required for replanting will be included in the Bill of Quantities. The land required for replanting will be secured by the NER, and will be maintained as the specified habitat type in the long-term (i.e. for the lifetime of the Project), through commitments secured from the landowners by NER. The Detailed Design will include sufficient land for revegetation at a minimum of 2:1 revegetation ratio. This includes Priority Biodiversity Feature species.</li> <li>• <i>Additional measures are given for other notable species and habitats in this BAP.</i></li> </ul>
Summary of Approach	<p>The project will primarily avoid impacts to these significant biodiversity features through the use of the ECoW to demarcate areas of particular sensitivity, but also through HDD crossing. Additional measures will also put in place to reverse current habitat succession and specific approaches will be put in place for notable species, especially birds.</p> <p>The process of vegetation clearance will be agreed with, and monitored by, the Public Enterprise (PE) “Macedonian Forests” in accordance with the provisions of the Law on Forests (Official Gazette of RM No.64/09, 24/11, 53/11, 25/13, 79/13, 147/13, 43/14, 160/14, 33/15 and 44/15), which is in accordance with the respective EU Directives.</p>
Monitoring	<p>The project will primarily avoid impacts to this significant biodiversity features, through the use of the ECoW to demarcate areas of particular sensitivity. Additional measures will also put in place to reverse current habitat succession and specific approaches will be put in place for birds.</p>

	Action Plan for water crossings
Responsibility	Any habitat that is translocated or recreated will be monitored throughout the Contractors Environmental Consultant warranty period and over at least a 5-year period to ensure that it survives. Monitoring will be conducted by both the ECoW as well as the Owners Engineer. A specific monitoring plan will be put in place for notable species including birds
Timing	Contractor ECoW to undertake pre-clearance surveys, clearly demarcate sensitive areas and supervise any translocation/restoration works to be undertaken as early as practical within the construction schedule. Owners Engineer to implement BAP and manage additional studies (water quality monitoring) as well as supervise contractor.

### 3.5 Action plans for notable mammals

#### Action Plan for Otters



Figure 9. The Eurasian otter (*Lutra lutra*) (source: Macedonian Ecological Society).

The Eurasian Otter (*Lutra lutra*) is an IUCN GRL- NT, NRL – VU species. It is also a Habitats Directive Annex II species. The Eurasian otter inhabits most of the existing major water bodies in N. Macedonia. The population size is estimated to be 350-400 individuals. Otters are strongly dependent on riparian vegetation and availability of denning sites (holts). Most otter activity occurs in a narrow strip along the water's edge but they may be found up to 1 km away from water. Otters are present in several relatively undisturbed and vegetated areas along the rivers and streams of the Project Aol. They are also likely to breed here, using holes in the river bank, cavities among tree roots, piles of rock, wood or debris for this. Most otter activity is found in a narrow strip along the water's edge but they may be found up to 1km away from water. During the biodiversity surveys in the Project

Aol, evidence of otters has been found.

#### Otter tracks

Based on this evidence, the Project is adopting a precautionary approach for this species and it is assumed that the species is also present in other areas with suitable bankside vegetation. This is especially so as otters have large home ranges and may travel over 20 kilometres. Based on research, otters are highly territorial and territories can stretch for several kilometres dependent upon the availability of food. Territories of males tend to be larger than those of females and may overlap with those of several females. Otters use droppings (spraints) to mark their home ranges which are often left on in-stream boulders, bridge footings and grass tussocks. Otters also use resting sites (couches) and underground denning sites (holts) which maybe up to 1km from the nearest water. An individual otter may utilise a number of holts, which are generally located in natural crevices, or the roots of trees growing along river and lake banks. and they may use burrows made by other animals. Other resting sites are also used, frequently in dense vegetation and may be associated with frequently used runs and slides into the water.

Otters are vulnerable to removal of bank side vegetation, and persecution due to perceived depredation on fish. Numbers in RNM have reportedly been in decline following a decline in wild fish stocks and habitat destruction (e.g. removal of bank side vegetation). They can also be at risk from pollution from organochlorines, polychlorinated biphenyls and mercury. Fish typically makes up over 80% of their diet, but may be supplemented with aquatic insects, reptiles, amphibians, birds, small mammals, and crustaceans.



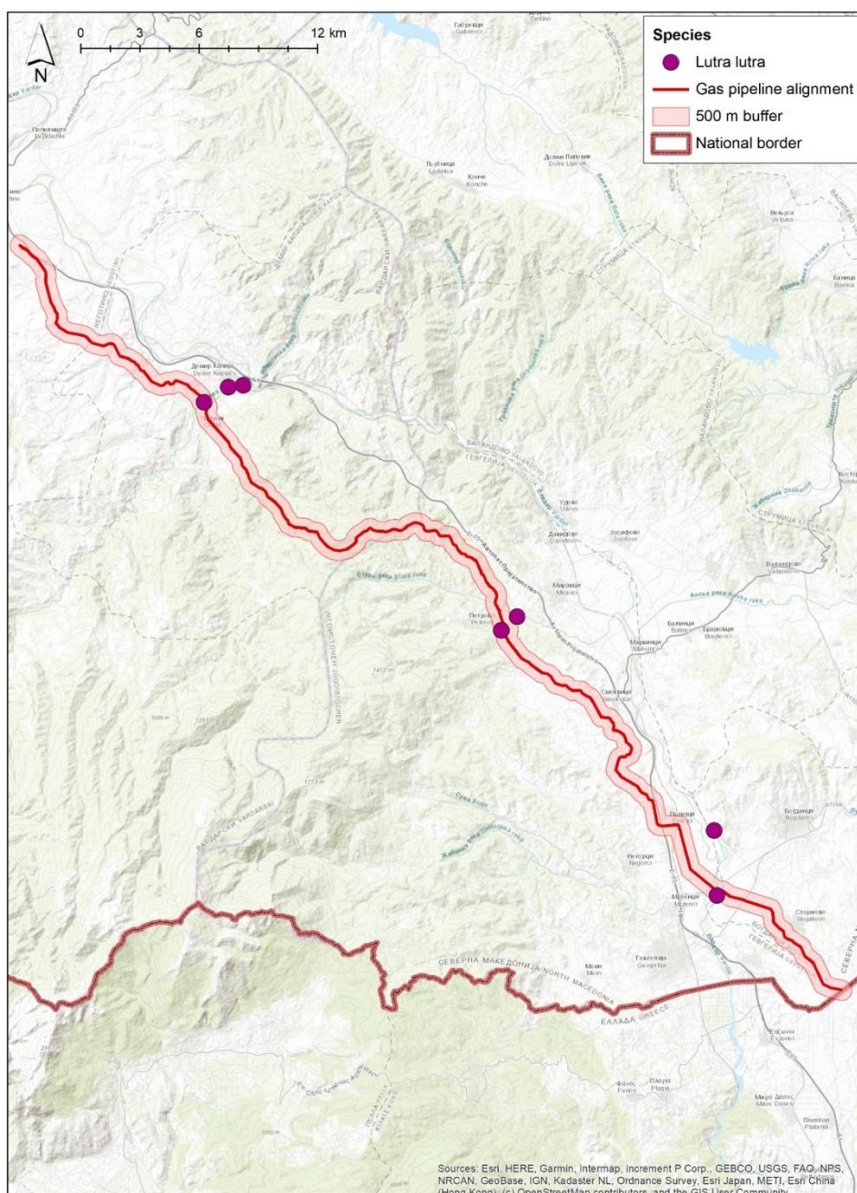


Figure 10. Distrubution of otter in Aoi

## Action plan

Status	Action Plan for Otters			
Approach	Avoid	Reduce	Mitigate	Offset
Objectives	No net loss of otters by avoiding project impacts to known otter locations, improving understanding of the local otter population (size and distribution) and working with local NGOs and regulators to raise awareness and develop an otter conservation plan for this species.			
Location	River habitats in the Aoi: River Vardar, Doshnica, Boshava and Stara Reka			
Project activities	<ul style="list-style-type: none"> <li>-Removal of bankside vegetation</li> <li>-Water crossing</li> <li>-Workers presence and viachle moving</li> </ul>			
Potential Impacts	<ul style="list-style-type: none"> <li>-Injury during construction</li> <li>- Habitat Loss and Fragmentation (including resting sites and feeding areas)</li> <li>- Creation of barriers to movement during construction</li> <li>- Disturbance / displacement of species during works period process</li> <li>- Water Pollution can affect both otters and their food supply</li> </ul>			

Status	Action Plan for Otters
	<ul style="list-style-type: none"> <li>- Hydrocarbons spills can also affect the thermo-regulation qualities of otter's coats.</li> </ul>
Proposed measures	<ul style="list-style-type: none"> <li>• Minimising works in or near rivers and streams and damage to river and stream banks.</li> <li>• Locating activities away from known otter habitat, including siting of works compounds, spoil storage and disposal, construction of embankments, access roads.</li> <li>• Specific surveys of all watercourses will be undertaken within 100m of the alignment (both upstream and downstream) for signs of otters including holts and couches. If any otter lying-up sites are found, mitigation will be adjusted as required. If breeding sites are found all works in that area will need to be suspended until the cubs have left.</li> <li>• Pre-clearance surveys will be conducted immediately prior to construction. For every river crossing or activity within a river there will be a pre-enabling dedicated survey to confirm absence of holts or other resting features within the direct zone of impact of the works. If features are found, exclusion of the features will be ensured prior to works commencing.</li> <li>• Stagger construction of the watercourse crossings to minimise potential for cumulative disturbance on species.</li> <li>• Undertake crossing during low-flow season to reduce impacts of sediment and pollution dispersal.</li> <li>• Contractors will be provided with an overview of otter ecology prior to works commencing. Any holts and couches identified will be informed to contractors in confidence to ensure that they are not accidentally disturbed and marked so that contractors must not enter.</li> <li>• Exit ramps (wooden boards) to be placed in the pipeline trench to allow otter easy access for travel</li> <li>• Implementation of Pollution Prevention Plan and an Erosion and Sediments Management Plan, including removal of contaminated sediments, control of river flow, etc.</li> <li>• Prevention measures for equipment entering rivers to be provided.</li> <li>• Apply Mitigation strategy</li> <li>• GIP measures</li> </ul>
Operational phase	<p>Habitat restoration. This will include planting of appropriate trees along riverbanks and encouraging dense scrub nearby, as well as fencing off of overgrazed areas near watercourses to encourage vegetation regrowth.</p> <p>-Appropriate and timely habitat restoration. This will include planting of appropriate trees along riverbanks and encouraging dense scrub nearby, as well as fencing off of overgrazed areas near watercourses to encourage vegetation regrowth. Potential disturbance will also be partially mitigated by planting of natural screens in any areas identified as used by otters to reduce noise and light disturbance.</p> <p>- Additional Habitat Creation (if needed). It is possible to build artificial holts to attract otters to use certain areas. Artificial holts can be built to resemble natural holts, with a resting compartment and multiple entrances, which may be particularly important if natural bank side vegetation has been removed. The Project will consider the creation of artificial holts should this be required to ensure no net loss of conservation status of this species.</p>
Approach	Work will involve a mixture of additional measures, surveys, additional habitat creation (if needed) and raising awareness.
Monitoring	If otters are found to be present, seasonal monitoring is proposed for five years after construction commences to confirm whether the mitigation measures have been effective or if any alterations and / or enhancements are necessary.
Responsibility	Owners Engineer responsible for resourcing and monitoring the work. Technical work to be contracted to an appropriate technical organisation.
Timing	The initial work will be undertaken in the beginig of work Further monitoring will be undertaken over a 5- year period from the start of project construction.

Status	Action Plan for Otters
Offset	<p>If its needed, build artificial holts to attract otters to use certain areas. Artificial holts can be built to resemble natural holts, with a resting compartment and multiple entrances, which may be particularly important if natural bank side vegetation has been removed. The Project will consider the creation of artificial holts should this be required to ensure no net loss of conservation status of this species.</p>

Table 3. Otter Mitigation Strategy

Sources of Impact	GIP Construction Mitigation	Bespoke Construction Mitigation
<b>Injury during construction</b>		
Otters are inquisitive animals and may be attracted onto construction sites to investigate machinery or spoil heaps. As a result they can become trapped in pits, piping, chemical containers, wire mesh etc. As nocturnal animals they can also be particularly susceptible to night time accidents.	Holes/pipes will be covered at night or mammal ramps positioned to allow any trapped animals to escape. Night working will not be permitted where the proposed scheme comes within 30m of any watercourse in which otters may be present to reduce the risk of otters being run over by construction traffic.	Otters to be excluded from dangerous areas by erecting temporary otter proof fencing where they are present (whilst avoiding otter commuting routes). Fencing may be e.g. chestnut paling fence with stakes at 25mm gaps or stiff plastic mesh that otters cannot scale.  Temporary fencing to be positioned to guide otter to safe routes through the working areas.
<b>Habitat Loss and Fragmentation (including resting sites and feeding areas)</b>		
Otters are secretive, and holts and couches are particularly important. Each otter knows where shelter is available in its home range. Loss of holts and other lying-up sites require animals to travel further to find suitable cover. Habitat loss results from direct land take, siting of works compounds and material. Impacts will be greatest where construction requires diversion and re- alignment of watercourses.	Compounds etc to be sited at least 30m away from watercourses and to avoid nearby areas of woodland, dense scrub and/or wetland. After temporary loss habitat to be returned to its former quality	Consider planting of trees such as willow, oak and ash along riverbanks and encouraging dense scrub nearby. Fence-off overgrazed areas of land near watercourses to encourage vegetation growth. Where mature trees along riverbanks need to be removed, retain the root systems, where practical, to provide potential holt sites.
<b>Pollution and Other Indirect Impacts</b>		
Water pollution could create long-term damage to the productivity and diversity of nearby habitats, affecting both otters and their food supply. Local rivers already have seasonally high sediment loads but construction works ( in-river works) can result in sediment deposition downstream. This can impact on both aquatic invertebrates and fish populations (and fish fry) that in turn would affect otter prey availability. Accidental spillages, e.g. from oil and diesel drums, would also impact on prey, and if chronic could lead to bio- accumulation of contaminants which could result in otter mortality. Pollutants such as oil and diesel can also affect water-regulation qualities of an otter's coat and cause mortality.	Contractors to adhere to pollution prevention GIP, as outlined in relevant guidelines on e.g.: Prevention of Water Pollution; Use and Design of Oil Separators; Works In, Near, or Liable to Affect Watercourses etc. Any chemical and oil storage tanks will be set back at least 10m from any watercourse and secondary containment must be provided. Construction vehicles will be prohibited from crossing watercourses and silt traps will be installed as appropriate. Disturbance to streambeds will generally be kept to a minimum to prevent erosion and siltation. During both construction and operation pollution control measures will include installation of drainage systems to divert runoff into drains, soak-aways and detention basins to avoid contamination of watercourses.	

## Action Plan for Grey Wolf



Figure 11. The grey wolf (*Canis lupus*) (source: Macedonian Ecological Society)

The wolf (*Canis lupus*) (GRL- LC; ERL – LC; NRL - NT); is a common and widely distributed species in N. Macedonia, with a population consisting of more than 400 individuals. The EC Habitats Directive lists the wolf in Annexes II and IV, while Bern convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979) included in Appendix II. It is a highly adaptable species that inhabits variety large array of habitats (forests, scrublands, grasslands, pastures etc.). Although its occurrence was confirmed only at two sites, the wolf is a common species in the Aol.

### Wolf tracks

Based on this evidence, the Project is adopting a precautionary approach for this species and it is assumed that the species is also present in other areas with suitable bankside vegetation. Wolves are highly adaptable and inhabit

a variety of habitats, including forests, shrublands, grasslands, pastures, inland waters and steppe-like areas. Occasionally, wolves can be found close to human settlements and in the grasslands. Most of the data collected on wolf presence throughout N. Macedonia confirm that wolves prefer forested areas with occasional sallies in lowland agricultural areas close to the villages.

Gray wolves are most often found in packs consisting of an adult pair and their offspring. The leader is normally the male who initiates activity, guides movements, and makes decisions. Males and females have distinct dominance hierarchies within the pack and only the most dominant pair mate. Depending on pack dynamics, subordinate but sexually mature wolves may leave their natal pack to find mates and establish new packs. Young wolves are whelped in the spring and reared in dens in rock crevices, hollow logs, overturned stumps, or burrows near water (Nowak, 1999). When the young become mobile, they move to rendezvous sites where their parents and other pack mates bring them food. Late in the fall they begin to join adults on hunts.

The gray wolf is predominately a predator of mammals larger than itself (Nowak, 1999), specializing on ungulates (hoofed mammals). A highly-developed sense of smell and sight aids them while hunting. Wolves use several different strategies to find their prey: chance encounters, direct scenting, or following a fresh scent trail. Prey are usually captured through a strategy of stalking as closely as possible to the intended target and then giving chase.

Commercial wolf hunting for foreign hunters is organized in some hunting grounds in the central-south RNM.



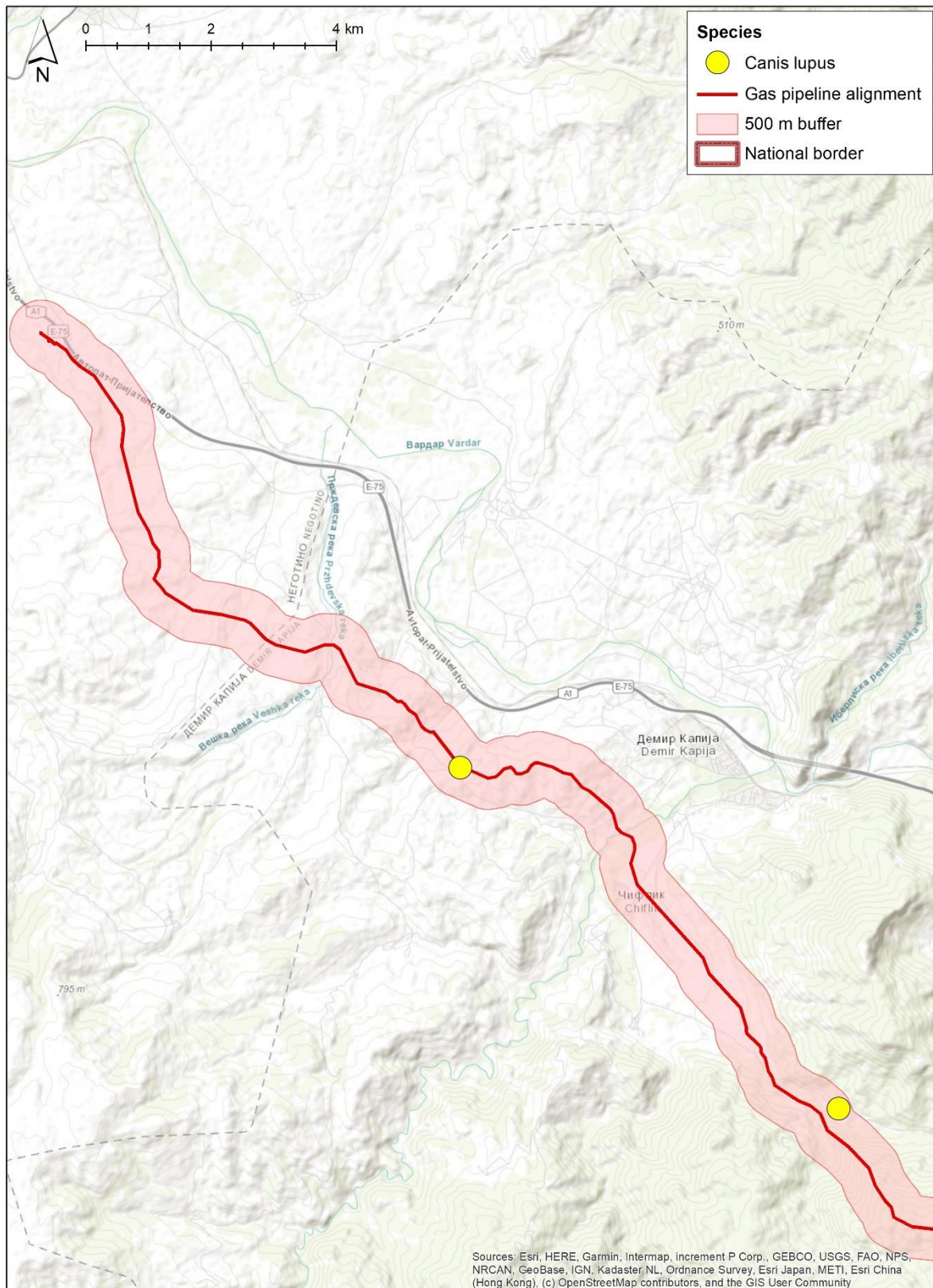


Figure 12. Distrubution of wolf in Aoi

## Action plan

Status	Action Plan for grey wolf			
Approach	Avoid	Reduce	Mitigate	Offset
Objectives	To ensure no net loss of grey wolf by avoiding project impacts to known locations			
Location	Marjanska mountain			
Project activity	<ul style="list-style-type: none"> <li>Site clearing and pipeline trenching (potentially including rock blasting in some areas)</li> <li>Movement of vehicles and construction plant</li> <li>Creation/upgrade of access roads</li> </ul>			
Potential Impacts	<ul style="list-style-type: none"> <li>Direct loss or conversion of habitat, including potential den sites</li> <li>Disturbance of wolves in general, and disturbance of wolves with young</li> <li>Injury or death of wolves due to vehicle strike</li> <li>Facilitated access for hunters</li> </ul>			
Mitigation measure	<ul style="list-style-type: none"> <li>Pre-clearance survey by Biodiversity Specialist;</li> <li><b>Avoidance should be made of blasting on Marjanska mt. during pup-rearing season for wolves (May-July)</b></li> <li>Reduction of a working width in areas of confirmed wolf habitat and restoration of habitat within the ROW.</li> <li>No entering of any forested areas except those strictly necessary for construction of the permanent works;</li> <li>No hunting of wolf prey species by construction staff</li> <li>Speed restrictions for construction vehicles</li> <li>Strict traffic management and vehicle access route selection through high suitability wolf habitat.</li> <li>Warning signs erected on project access roads</li> <li>Environmental education programme for construction workers and within local communities</li> <li>Forest roads reinstated to original condition</li> <li>GIP</li> </ul>			
Summary of Approach	Work will involve a mixture of additional surveys, implementation of mitigation as outlined below and, in the ESIA			
Responsibility	The Owners Engineer/ NER is responsible for resourcing and mitigation.			
Timing	Measures should begin in a pre-construction phase.			

## Action Plan for Bats

In the project area, there are 8 bat species in total (all are Annex IV species). Only Schreiber's bent-winged bat (*Miniopterus schreibersii*) trigger CH. There are no data about the precise distribution and population size in N. Macedonia, but it is deemed widespread. This species favors hardwood forest-rich habitats, and it mainly roosts in colonies in karst caves, mines and cellars with other cave-dwelling species. Along the pipeline corridor, the species was recorded at one location in Demir Kapija. There are no data about the precise distribution and population size of the Schreiber's bent-winged bat (*Miniopterus schreibersii*) in N. Macedonia, but it is deemed widespread. This species favors hardwood forest-rich habitats, and it mainly roosts in colonies in karst caves, mines and cellars with other cave-dwelling species. Along the pipeline corridor, the species was recorded at one location in Demir Kapija.



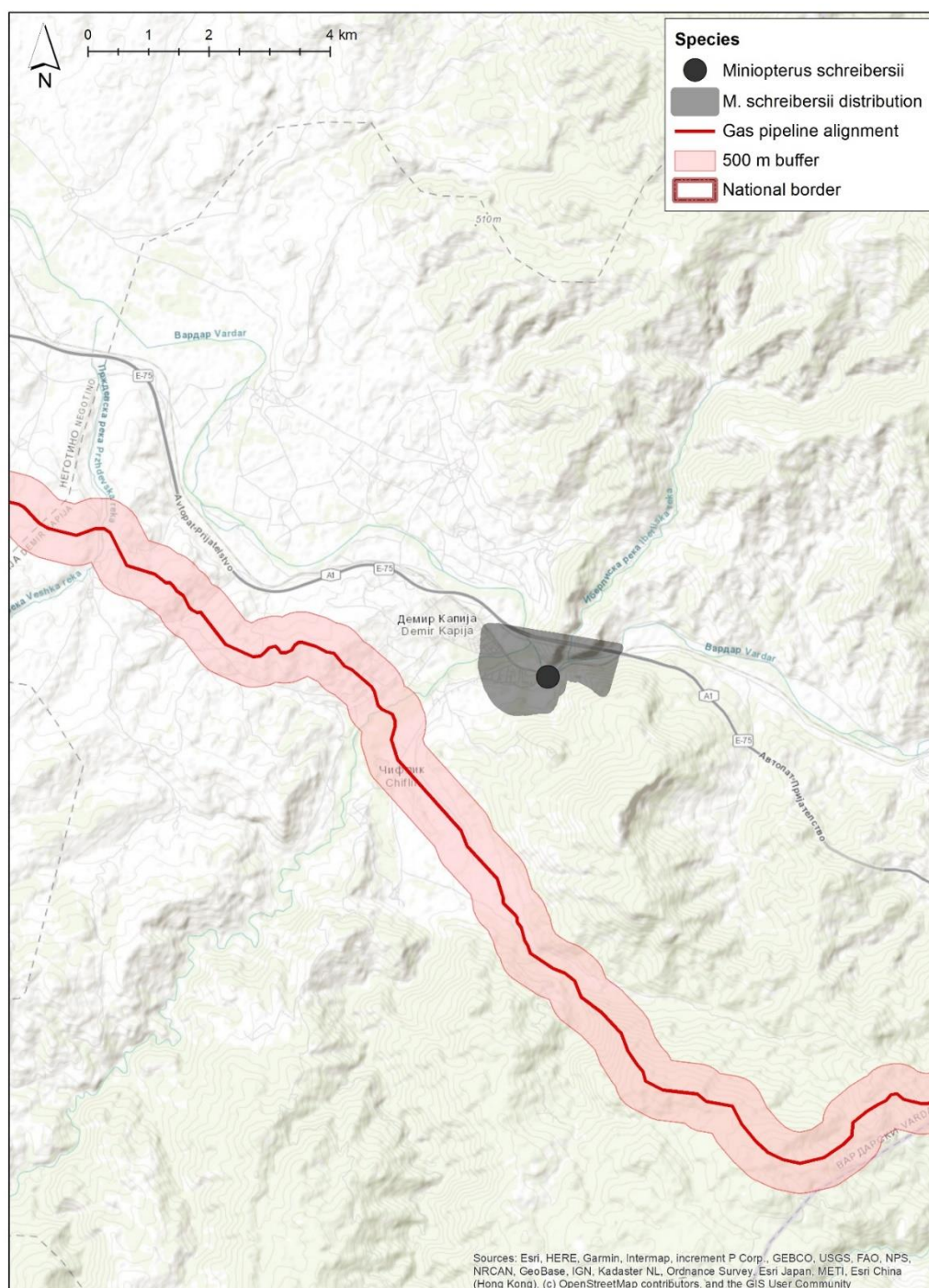


Figure 13. The Schreiber's Bent-winged bat distribution in the broader area of the pipeline corridor.

Status	Action Plan for bats			
Approach	Avoid	Reduce	Mitigate	Offset
Objectives	To ensure no net loss of bat by avoiding project impacts to known bat roosts, nurseries and hibernaculae			
Location	Project Aol, at 3km from Pzi, around the river Vardar near Demir Kapija george			
Project activity	<ul style="list-style-type: none"> <li>-Preparation of the working area</li> <li>-Pipeline trenching within adjacent habitat (potentially including rock blasting in some areas)</li> <li>-Movement of vehicles and construction plant within adjacent habitat</li> </ul>			

Status	Action Plan for bats
PotentialImpacts	-Disturbance/degradation of habitat (loss of roosting, hibernating and nursery sites) -Displacement of species during works period -Death / injury
Mitigation measure	<ul style="list-style-type: none"> <li>• Pre-clearance survey by biodiversity specialist</li> <li>• Any tree above 100mm in diameter to be checked by the Biodiversity Specialist for the potential of roosting bats prior to removal</li> <li>• All personnel to report wildlife sightings to the Biodiversity Specialist. Environmental awareness training to be delivered to all personnel.</li> <li>• Avoid blasting and other construction activities with the potential to generate significant noise and vibration (e.g. hydrotesting) shall not be carried out within 100m of any known roosts</li> <li>• All felled trees with evidence of roosting bats (i.e. with suitable cavities showing signs of occupation (droppings, feeding remains, grease markings), including those which could not be inspected by the Biodiversity Specialist will be left in situ (on the ground) for 24 hours to allow any bats to move. If possible, no trees will be felled in the <b>period March to August</b></li> </ul>
Monitoring	Seasonal monitoring is proposed for five years after construction commences to confirm whether the mitigation measures have been effective or if any alterations and/or enhancements are necessary.
Responsibility	NER is responsible for resourcing and monitoring the work. Technical work to be contracted to an appropriate technical organisation.
Timing	Monitoring will be undertaken over a 5-year period from the start of project construction.

### 3.6 Action plans for notable amphibians and reptiles

The complex of freshwater, terrestrial and karstic habitats with elevation ranges between 110 m (in the Maleolu locality near the village of Stojakovo) and 938 m (peak Studena Glava) in Marjanska Mt, with diversity of several types of habitats (such as agricultural arable land, orchards, hill pastures, riparian belts, oak forests, beech forests), provides good habitats for both amphibians and reptiles. Several notable species have been recorded during the field surveys were undertaken in 2022 (see BCHA for more details). Out of 14 species of amphibians documented from RNM (Sterijovski & Arsovski 2020), 8 were found during field research; hence, the findings from the projected pipeline area constitute 57.1% of all amphibian species recorded on a national level (figure 14).

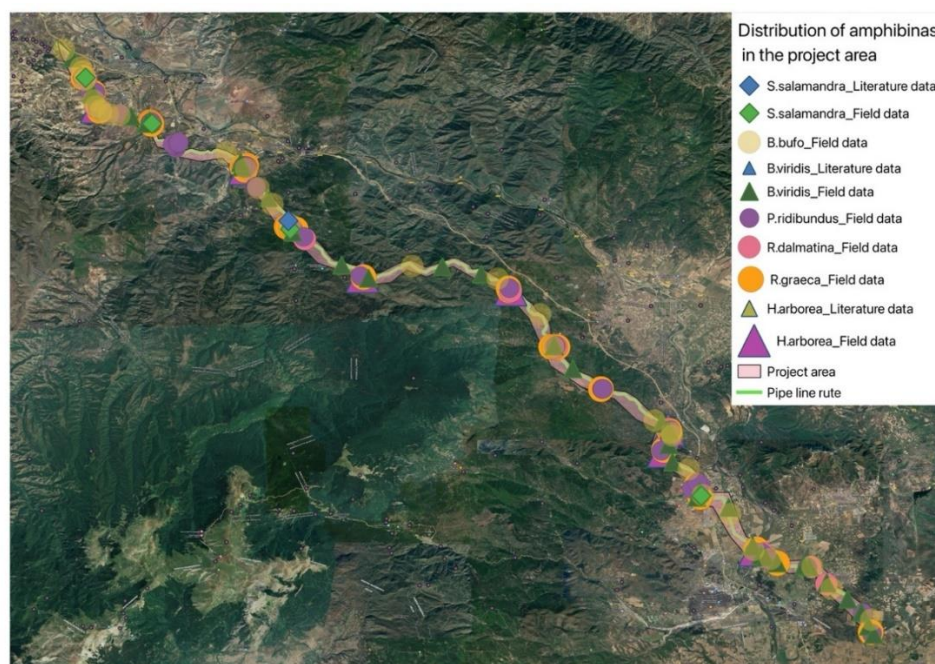


Figure 14. Distribution of aphibians in the project area



Bearing in mind that there are 32 species of reptiles recorded for the Republic of North Macedonia (Sterijovski et al. 2014), 62.5% of the total species recorded on a national level occur in the project area and its vicinity. Distribution from literature data and field work concerning tortoises, lizards and snakes is rendered in maps on figure 15 ,16 and 17 respectively.

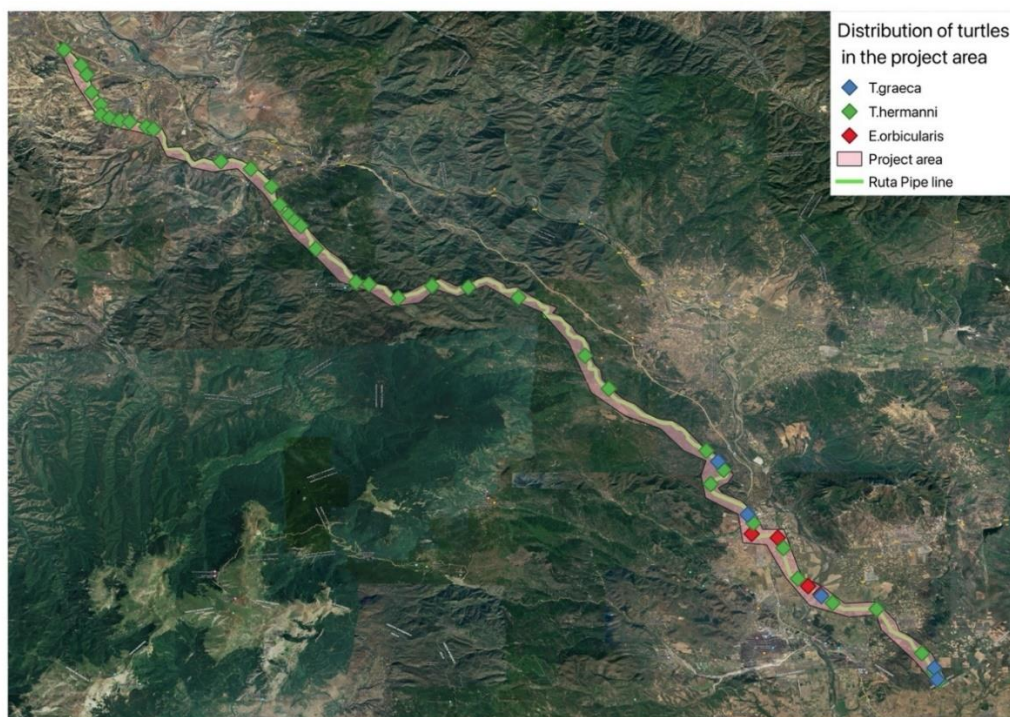


Figure 15. Distribution of turtles in the project area

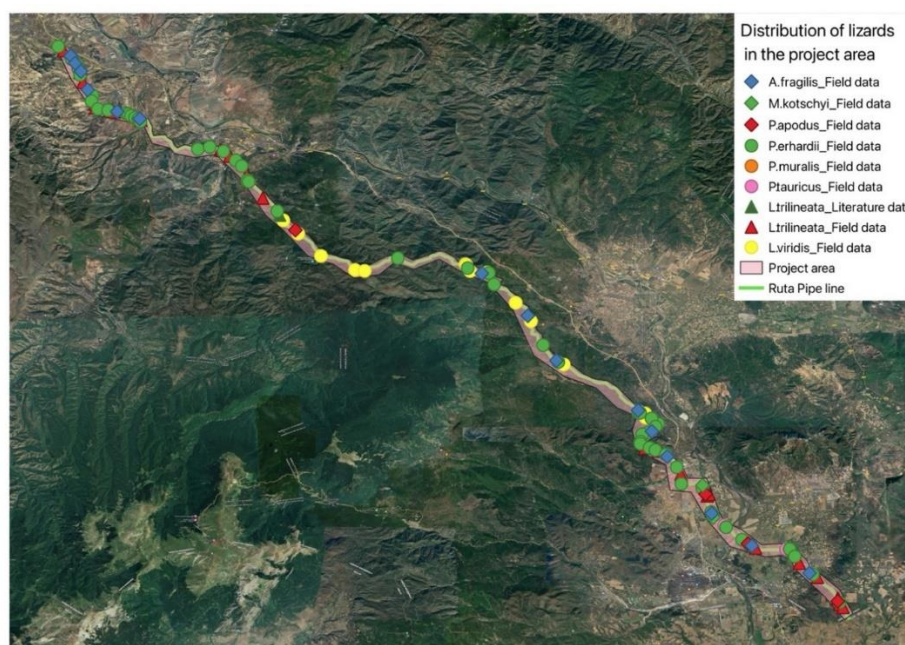


Figure 16. Distribution of lizards in the project area

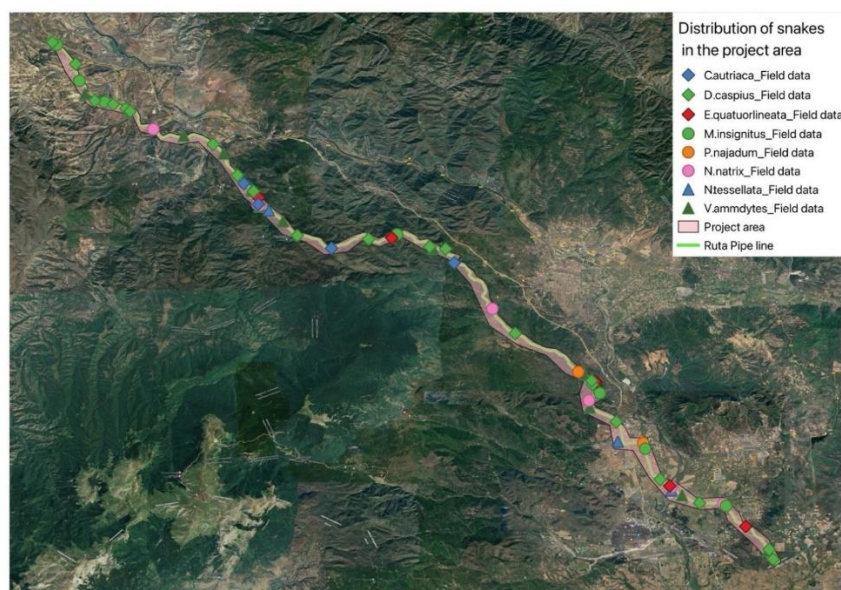


Figure 17. Distribution of snakes in the project area

The area is important for the Hermann's tortoise population (*Testudo hermanni* - NT), which is found across the region a. The species is listed in Annex II of the Habitats Directive, and has disappeared across much of Europe continent. Fires (including those used for land clearance) and impacts from infrastructure projects, threaten the locally found subspecies of Hermann's tortoise.

Status	Action Plan for amphibians and reptiles			
Approach	Avoid	Reduce	Mitigate	Offset
Objectives	<p>To ensure no net loss of :</p> <p>Herman's turtle (<i>Testudo hermanni</i>);Balkan green lizard (<i>Lacerta trilineata</i>);Green lizard (<i>Lacerta viridis</i>);Common wall lizard (<i>Podarcis muralis</i>);Caspian whip snake (<i>Dolichophis caspius</i>);Smooth snake (<i>Coronella austriaca</i>);Aesculapian snake (<i>Zamenis longissimus</i>);Dice snake (<i>Matrix tessellata</i>);Nose-horned viper (<i>Vipera ammodytes</i>).</p> <p>Yellow-bellied toad (<i>Bombina variegata</i>);Greek stream frog (<i>Rana graeca</i>);Agile frog (<i>Rana dalmatina</i>); European tree frog (<i>Hyla arborea</i>);Green toad (<i>Bufo viridis</i>).</p>			
Location	Whole route			
Project activity	<ul style="list-style-type: none"> <li>• Top soil removal, pipeline soldering and water crossing construction</li> <li>• Compounds, field working camps construction and operation, including the effects of the production of wastes and indirect pressure of workers' presence</li> <li>• Clearing of riparian vegetation</li> <li>• temporary water diversion</li> <li>• Movement of vehicles and construction plant</li> <li>• Pollution/hydrological impacts</li> </ul>			
Potential Impacts	<ul style="list-style-type: none"> <li>• Disturbance of species</li> <li>• Loss of refuges used for breeding, resting and hibernation from clearance works.</li> <li>• Loss, degradation and disturbance of aquatic habitats</li> <li>• Pollution of habitats through emission of dust, waste, excavated soil or other material along the riverbanks, creeks, or directly into the aquatic and swampy habitats</li> <li>• Potential for impacts from interactions between humans and wildlife.</li> </ul>			



Status	Action Plan for amphibians and reptiles
Mitigation measures	<ul style="list-style-type: none"> <li>The pipeline working corridor and temporary Construction Compound footprint will be surveyed before commencement of works in order to identify any amphibian and reptile individuals present. These will be undertaken in line with the vegetation clearance method statement (including check survey methods).</li> <li>Use of heavy machinery will be strictly limited to the Project RoW to avoid additional fragmentation and degradation of habitats, as well as subsidence of soil.</li> <li>Identification and mapping of areas occupied by species (i.e. ponds) prior to the commencement of clearance. If the ponds are to be destroyed, drainage should be conducted via pumping with a suitable pump filter (to prevent animals and debris being drawn into the pump. If possible pond drainage should be avoided April – September.</li> <li>Routes will be maintained properly in order to avoid creation of puddles capable of attracting amphibians. Conduct standard measures to limit water pollution and soil.</li> <li>-Individuals found will be translocated to a suitable receptor site outside the project footprint in line with the fauna translocation method statement).</li> <li>-Pits and excavations will be filled in as soon as possible following works. Any that need to remain open for longer than 48h periods will have appropriate ramps (soil and not more than 45°) to allow fauna to escape should they fall in. Morning checks for fauna will be conducted for excavations left open overnight.</li> <li>All site personnel to undertake driver awareness training on the species present in the area that may be affected by vehicle collisions.</li> <li>Speed limits will be imposed on site and construction traffic in order to reduce road collisions involving individual animals. Any collisions will be reported to the Biodiversity Specialist and documented to allow additional mitigation to be identified and implemented as necessary (e.g. use of speed bumps near areas identified as high risk, fencing, light reflectors).</li> </ul> <p>The provisions of national and international legislation will be observed in relation to the prohibition of the:</p> <ul style="list-style-type: none"> <li>gathering, capturing, killing, destroying or causing injury to such species in their natural environment, at any stage of the biological cycle;</li> <li>deliberate disturbance during reproduction, development, hibernation and migration; and</li> <li>damaging and/or destroying places for reproduction or for rest.</li> <li>At the end of construction works for the Temporary Construction Compound and pipeline route, the original configuration of the micro-relief should be reinstated in line with the Soil, Waterbody Crossing and Reinstatement Management Plans. In this way, the floodable areas will be kept and they will serve as breeding habitat for amphibians.</li> </ul>
Summary of Approach	Work will involve a mixture of additional measures, surveys, habitat restoration
Monitoring	Habitat restoration and notable species population numbers will be monitored for 5 years post commencement of operations and an adaptive management approach taken for additional mitigation should it be required.
Responsibility	Contractor ECoW to supervise works. OE to agree timing of works and monitor contractor.
Timing	Throughout construction and for 5 years after.

### 3.7 Action Plan to control invasive species

The principle measures for controlling invasive alien species are: prevention of their intentional and unintentional introduction; early detection and eradication and management to prevent their spread where they are already established. EU regulation 1143/2014 sets out requirements for member states and is accompanied by an official list of invasive alien species of Union concern. Clients in non-member countries should not intentionally introduce invasive alien species and should establish controls to prevent their unintentional introduction and/or spread where this is a risk, even if such an introduction is not forbidden by the host country regulatory framework.





The following are four principal strategies for invasive species control:

1. Minimize the extent and scope of invasive plant infestations that will have to be managed during the construction of the Project. This will be accomplished by first identifying the moderately to highly invasive plant species that occur along the Project's right-of-way through pre-construction surveys that should be treated before construction begins.
2. Avoidance of exotic and invasive species in materials brought on site during construction, should be taken into consideration. For example, equipment should be thoroughly cleaned prior to mobilization to the Project area.
3. Monitoring and selective spot treatment/eradication of any invasive species encountered during construction and post-construction. NER will monitor and record the success of revegetation for up to five growing seasons or until the area is 80% revegetated. Also, NER will conduct selective spot eradication of invasive species infestations or outbreaks that are identified along the right-of-way. Eradication measures will include hand cutting and the use herbicides. All herbicides should be applied by applicators appropriately licensed or certified by the RNM. In addition, all label instructions from the manufacturer will be followed while using herbicides. Vehicles entering for postconstruction monitoring purposes will be required to remain on existing roadways.
4. The fourth strategy to be used in this plan involves NER's commitment to using seed mixes during restoration that do not contain any invasive plant species. Along with implementing restoration measures, a commitment toward native restoration of the pipeline right-of-way using seed mixes tailored to meet construction specifications, budgetary targets, and stakeholder desires while also providing local wildlife with native habitat.

In addition to the strategies described above, the **following control measures** will be used to further minimize introduction and/or spread of these species:

- Prior to construction, NER will provide training to educate contractor(s) and subcontractor(s) with respect to the site-specific protocols for controlling transport of invasive plant species within or outside of the Project workspace limits.
- Pre-clearance surveys combined with the demarcation and treatment of non-native species will prevent their spread. Monitoring post-construction will ensure that newly restored areas are not inundated with non-native species from adjacent areas.
- Prior to mobilization to the Project area, contractors shall thoroughly clean all construction equipment with high-pressure washing equipment in order to limit the potential for the spread of noxious weeds, insects, or other soil-borne pests.
- Equipment cleaning stations will be established along the pipeline to ensure equipment is free of debris before being transported to a new construction spread. No equipment will be allowed to enter the protected area Demir Kapija until it has been inspected and approved by the supervisor.
- All disturbed areas will be reseeded promptly after final grading, weather and soil conditions permitting. Prompt reseeded will ensure that bare soil is not available for invasive species for an extended period of time.

	<p><b>In the riparian forest, in the valley of Vardar river, remove Indigobush (<i>Amorpha fruticosa</i>) - an exotic invasive to enhance the conservation status of the habitat</b></p>
<p>Location</p>	<p>Left side of river Vardar (41.170088°, 22.529608°) at chainage 8+500 where the gas pipeline crosses the Vardar River within expropriation area</p>
<p>Period of implementation</p>	<p><b>Before construction.</b> The shrubs should be cut (manual eradication) <b>mid-July to the end of December</b>. Application in late summer, early fall or the dormant season has proven effective. Avoid spring periods due to the possible disturbance of bird species. Avoid autumn period due to the possibility of the spread of its seeds. Also avoid using herbicides due to the vicinity of the river Vardar.</p>
<p>Non- chemical method Mechanical or manual (pulling, cutting)</p>	<p>Indigobush is difficult to control mechanically as it vigorously resprouts from crowns. It is not rhizomatous, however, so it can be controlled by repeated defoliation and digging and severing the root 3 to 4 inches below the crown. Repeat as necessary to control regrowth. In order to prevent the potential spread of the species it is necessary to eradicate all of the shrubs in a length of 100m (2x50m). Removal of branches in mid-summer can decrease seed production, and may therefore limit the spread of indigobush.</p>

	<b>In the riparian forest, in the valley of Vardar river, remove Indigobush (<i>Amorpha fruticosa</i>) - an exotic invasive to enhance the conservation status of the habitat</b>
Purpose	Stands of <i>indigobush</i> an invasive tree species, degrade the natural riparian habitat. Within the expropriation area (about 10 ha), all left individual trees and saplings will be located and cut, with the stumps killed.
Aim	Enhancing riparian habitat by reducing the colonization of indigobush
Responsible of the implementation	Contractor – Supervised by the Engineer
Technical details	<ul style="list-style-type: none"> <li>• Quick training about target-species recognition;</li> <li>• Marking of main stands.</li> </ul>
Note for the performers of the clearing work	-Chemical control techniques will not be conducted. After eradication,(planting of indigenous trees to participate to the indigobush elimination).The area should be replanted by willow seedlings ( <i>Salix alba</i> , <i>S. fragilis</i> , <i>S. amplexicaulis</i> ).
BoQ elements	Included in contractor proposal. Costs will be dependent upon degree of infestation, area to be treated.
Implementation indicators	Implementation on the field during construction works (photo documentation)
Performance indicators	Number of sections where preliminary clearings were not undertaken
Monitoring	On the whole project construction works area, supervision by Environmental Manager during all preconstruction phase

#### Plan to control other invasive species (if needed)

- Within the expropriation area, all individual trees and saplings of *Robinia pseudoacacia* will be located and cut, with the stumps killed. Fallen trunks and branches will not be removed, to provide micro-habitats to specialized species. This work will be overseen by a Biodiversity specialist. When cutting trees, the best season to do so is in August which gave the lowest volume of sprouts.
- Invasive *Ailanthus altissima* trees (including saplings) should be eliminated (uprooting all individuals) when clearing vegetation prior to construction works.
- Potential spread of *Arundo donax* can be stopped by hopping, cutting or mowing (rotary brush cutter, chainsaw, or tractor-mounted mower) can also be used to reduce giant reed infestations.
- Monitoring post-construction will ensure that newly restored areas are not inundated with non-native species from adjacent areas.

## 4. Achievement of No-Net Loss / Net Gain for Key Habitats

The proposed gas pipeline will result in the loss of ~6.5ha natural habitat (4.97ha CH and 1.57 PBF), including both areas that qualify as Critical Habitat (CH) and areas that qualify as Priority Biodiversity Features under PR6. To meet EBRD PR6 requirements the project must clearly demonstrate how it will enable “net gain” of CH or “No Net Loss” of PBF for each of the priority species/habitats. This section outlines the approach to achieving this and will be further developed once the detailed BAP is developed.

### 4.1 Net Gain of Critical Habitat

It is estimated that some 0.075 ha of **eastern white-oak woods** will be affected by the works and suitable areas for appropriate habitat extension/creation will be specifically identified by an appropriate expert. Such works may include creating improved conditions. All works will be done under the guidance of a species expert and at least 0.225 ha of new or improved habitat will be created.

**Habitat 91AA: eastern white-oak woods** have a priority status according to COUNCIL DIRECTIVE 92/43/EEC.



Figure 18. White oak–oriental hornbeam woods above Dren

‘Azonal white oak’ communities with sub-Mediterranean flora, occupying thermophilous oases in the sub-continental zones of the alliances *Quercion frainetto* and *Carpinion Illyricum*. Pubescent oak (*Quercus pubescens*) occurs as a dominant edificatory species in xerothermic oak forests on calcareous ground that are part of the remaining mixed oak forests. From vegetation perspective, these forests normally join the climate-zonal association of *Querco-Carpinetum orientalis* Rudski apud Ht., usually reaching up to 600 m of altitude. They are mostly fragmented, low-height forests (reaching 4-8 m in height), with copious species composition. It comprises the following important species:

- 3 nationally protected species of fungi (*Amanita caesarea*, *Boletus aereus*, *Craterellus cornucopioides*)
- 1 insect (ground beetle *Carabus convexus*) listed as Corine species;
- a number of nesting birds with unfavourable conservation status;
- 4 amphibians (*Rana dalmatina*, *Pelophylax ridibundus*, *Hyla arborea* and *Bufo viridis*);
- 7 reptile species (*Zamenis longissimus*, *Vipera ammodytes*, *Testudo hermani*, *Pseudopus apodus*, *Podarcis erhardii*, *Lacerta viridis*, *Dolichophis caspius*)
- 6 mammals EUHDA4 (*Dryomys nitedula*, *Myotis mystacinus*, *Pipistrellus pygmaeus*, *Miniopterus schreibersii*, *Canis lupus*, *Felis silvestris*).

It is possibly the most widespread habitat type in the country, which is largely cut and degraded in the project area. In the Aol, this habitat was recorded at one location in Demir Kapija: above Dren village (Coordinates 41,36452467 N; 22,25094963 E) .

Action Plan for * Eastern white oak woods				
Approach	Avoid	Reduce	Mitigate	Offset
Objectives	No net-loss in area (or quality) of this Critical habitat as a result of Project activities.			
Location	In Demir Kapija: above Dren village, forest of <i>Quercus pubescens</i> and <i>Carpinus orientalis</i> , silicate. 0.075ha of this white oak forest will be lost in the PZI.			
Project activity	Site / ROW preparation (including vegetation removal, topsoil stripping)			
Potential Impacts	<ul style="list-style-type: none"> <li>• Direct loss/disturbance/degradation/ fragmentation of habitat</li> <li>• Edge effects</li> <li>• Permanent conversion of habitat to grass and shrubland within 7m</li> </ul>			

Action Plan for * Eastern white oak woods	
Mitigation measure	<ul style="list-style-type: none"> <li>• Reduce vegetation clearance / working width (from 25 to 10m).</li> <li>• In accordance with applicable legal/permit requirements, it is strictly forbidden to undertake any of the following actions: <ul style="list-style-type: none"> <li>• Any type of gathering, capturing, killing, destroying or causing injury to species in their natural environment, at any stage of the biological cycle;</li> <li>• Deliberate disturbance during reproduction, development, hibernation and migration;</li> <li>• Damaging and/or destroying places for reproduction or for rest;</li> </ul> </li> <li>• Uncontrolled storage of waste resulting from administrative functions and from specific activities. It is mandatory to arrange a special place for waste storage and to ensure its transportation as soon as possible, so that it does not endanger the wildlife in the area.</li> <li>• Use of heavy machinery will be strictly limited to the Project RoW to avoid additional fragmentation and degradation of habitats, as well as subsidence of soil.</li> <li>• Inform construction and operation staff (including contractors) on the habitats of conservation value and protected and threatened plant and animal species</li> <li>• Undertake habitat restoration within laydown and former production well areas.</li> <li>• Prevent and reduce hunting and logging in areas opened up through the creation of new or improved access roads.</li> <li>• Methodical clearance of forested areas under ecological supervision.</li> <li>• Access roads to be sited on existing dirt roads where ever possible or existing access road for other projects in the project area (see cumulative impact for more details). Where new access roads are required, pre-construction biodiversity surveys will be carried out and all impacts to species/habitats of conservation importance will be managed in accordance with the BAP.</li> <li>• GIP</li> <li>• The habitats lost in construction areas will be progressively restored to minimise the time between habitat loss and restoration. Where relevant, NER will update the critical habitat assessment and BAP</li> </ul>
Summary of Approach	<p>The primary approach is reducing the impacts by minimising the ROW. Where the 0.075ha of Eastern oak woodland habitat will be lost where feasible, additional habitat will be created within the project footprint in these areas to supplement the trees removed. Planting of trees will be done on a 3 (new): 1 (old) ratio. Trees will be from local nurseries, suitably hardened and pest free.</p> <p>The process of vegetation clearance will be agreed with, and monitored by, the Public Enterprise (PE) "Macedonian Forests" in accordance with the provisions of the Law on Forests (Official Gazette of RM No.64/09, 24/11, 53/11, 25/13, 79/13, 147/13, 43/14, 160/14, 33/15 и 44/15), which is in accordance with the respective EU Directives. These regulations envisage compensatory planting at the ratio 1:3, with the allowed species to be advised by MoEPP and PE "Macedonian Forests", in accordance with local ecosystems and upon agreement with PE Macedonian Forests. The Law on Forests also requires that PE "Macedonian Forests" ensures further maintenance of the compensatory plantation sites, and envisages monetary payments to PE 'Macedonian Forests for the loss of timber.</p>
Monitoring	Post-construction monitoring to ensure habitats re-establish after pipeline construction.
Responsibility	Contractor's Biodiversity Specialist will undertake pre-clearance surveys and supervise restoration works to be undertaken as early as practical within the construction schedule. Supervisor Engineer to agree timing and monitor contractor.
Timing	Work to be carried out during relevant stages of Project construction. Monitoring of any habitat restoration will continue over a 5-year period to ensure its effectiveness. This work will start immediately as trees will require removal prior to site clearance. So the established offset site can start to be monitored within year 1, enabling a 5 year post planting monitoring period to have been completed.

#### Action Plan for Pseudo-steppe with grasses and annuals of the Thero-Brachypodietea

Pseudo-steppe with grasses and annuals of the Thero-Brachypodietea is listed in Annex 1 of the Habitat Directive and therefore qualify as Critical Habitat. This habitat type occurs in most of the sub-Mediterranean

countries, accompanied by the moderate zones of Europe, North Africa, and the Middle East where siliceous geological substrate is found in extensive areas. In N. Macedonia, the communities of the current habitat type develop in a large portion of its territory but first and foremost in the central, southern and south-western regions, which are profoundly influenced by the modified sub-Mediterranean climate (in pseudo-steppes, the regions of Gevgelija, Dojran, Strumica, Mariovo, Pelagonija). In the Aol, plant communities of the current habitat occur in Gevgelija (Bogorodica v., Negorci, Sermenin, Novo Konjsko, Gjavato v., Stojakovo v.) and the area between Negotino and Demir Kapija. A total of 4.9ha will be impacted due to the construction of gas pipeline.

Action Plan for pseudo-steppe with grasses and annuals of the Thero-Brachypodietea				
Approach	Avoid	Reduce	Mitigate	Offset
Objectives	No net-loss in area (or quality) of this Critical habitat as a result of Project activities.			
Location	In the area of interest, plant communities of the current habitat occur in Gevgelija (Bogorodica v., Negorci, Sermenin, Novo Konjsko, Gjavato v., Stojakovo v.) and area between Negotino and Demir Kapija			
Project activity	Site / ROW preparation (including vegetation removal, topsoil stripping)			
Potential Impacts	-Direct loss/disturbance/degradation/ fragmentation of habitat -Edge effects -Spread of invasive species			
Mitigation measure	<ul style="list-style-type: none"> <li>• Reduce vegetation clearance / working width (from 25 to 10m).</li> <li>• Ground levelling activities will be limited, in order to preserve as far as possible, the local topographic features.</li> <li>• Minimising the footprint of the works as far as is practicable. Minimising the soil storage footprint as far as practicable whilst meeting the requirements of the Soil, river- crossing and Reinstatement Management Plans.</li> <li>• Removal of turfs and the top most soil layer and depositing it separately from the filling soil in order to be reinstated for the revegetation of the habitat surfaces affected by pipeline installation.</li> <li>• Covering the turfs and top soil in order to prevent erosion and wind blow that can affect it and that can reduce the number of seeds and bulbs available for revegetation.</li> <li>• The habitat *6220 surface affected by works can be revegetated using bulbs preserved in the vegetal soil layer that was removed and stored separately; the voluntary or accidental use of species that are not native will be avoided under any situation.</li> <li>• No access roads crossing through critical habitat</li> <li>• Inform construction and operation staff (including contractors) on the habitats of conservation value and protected and threatened plant and animal species</li> <li>• Undertake habitat restoration within laydown and former production well areas.</li> <li>• Prevent and reduce hunting and logging in areas opened up through the creation of new or improved access roads.</li> <li>• GIP</li> <li>• Contractor to develop procedures to avoid, monitor and control invasive species, as appropriate. See Invasive Species Management Plan.</li> <li>• Work to be supervised by a Biodiversity Specialist.</li> </ul>			
Summary of Approach	Identification, detailed mapping and avoidance of this habitat will be managed by the Project Biodiversity specialist with the initial work to be undertaken prior to construction commencing. The primary approach is avoidance by clearly mapping and marking areas of habitat to be avoided during construction (including during soil disposal).  On flat areas once topsoil has been restored and after any reseeded pull cut scrub and vegetation back onto the area to stabilise the soil and to promote natural re seeding. Educate workforce on preventing bush fires.			
Monitoring	Monitoring during construction to ensure habitats are not affected.			
Responsibility	Contractor's Biodiversity specialist to undertake pre-clearance surveys.			
Timing	Work to be carried out pre-construction.			



## 4.2 No Net Loss of Priority Biodiversity Features

### 1. 92C0 Platanus orientalis and Liquidambar orientalis wood

Action Plan for * Platanus orientalis and Liquidambar orientalis woods				
Approach	Avoid	Reduce	Mitigate	Offset
Objectives	No net-loss in area (or quality) of Potential PBF triggers			
Location	Demir Kapija: near the Aqua Park, along the r. Boshava; Gevgelija: Miravci, in the forest belt of Platanus orientalis near the Stara Reka river.; Gevgelija: Prdejci v., along the Kovanska River, a degraded forest of Platanus orientalis; Gevgelija: Mrzenci v. – the Sermeninska River, in the riverbed and along the river (fouth location is outside of the PZI).			
Project activity	ROW preparation (including vegetation removal, topsoil stripping) within areas supporting this habitat			
Potential Impacts	<ul style="list-style-type: none"> <li>• Direct loss/disturbance/degradation/ fragmentation of habitat</li> <li>• Edge effects</li> <li>• Spread of invasive species</li> <li>• Permanent conversion of habitat to grass and shrubland within 7m</li> </ul>			
Mitigation measure	<ul style="list-style-type: none"> <li>• Reduce vegetation clearance / working width (from 25 to 10m).</li> </ul> <p>In accordance with applicable legal/permit requirements, it is strictly forbidden to undertake any of the following actions:</p> <ul style="list-style-type: none"> <li>• Any type of gathering, capturing, killing, destroying or causing injury to species in their natural environment, at any stage of the biological cycle;</li> <li>• Deliberate disturbance during reproduction, development, hibernation and migration;</li> <li>• Damaging and/or destroying places for reproduction or for rest;</li> <li>• Uncontrolled storage of waste resulting from administrative functions and from specific activities. It is mandatory to arrange a special place for waste storage and to ensure its transportation as soon as possible, so that it does not endanger the wildlife in the area.</li> <li>• No access roads crossing through riparian habitat</li> <li>• Inform construction and operation staff (including contractors) on the habitats of conservation value and protected and threatened plant and animal species</li> <li>• Undertake habitat restoration within laydown and former production well areas.</li> <li>• Prevent and reduce hunting and logging in areas opened up through the creation of new or improved access roads.</li> <li>• Water crossing to be undertaken in the dry season (mid-June-mid October). Provision of temporary site drainage channels to avoid erosion and environmental impacts;</li> <li>• No excavating any material for fill or aggregate, or any other purpose except within the corridor of the permanent works;</li> <li>• Methodical clearance of riparian Populus areas under ecological supervision.</li> <li>• Access roads to be sited on existing dirt roads where ever possible or existing access road for other projects in the project area (see cumulative impact for more details). Where new access roads are required, pre-construction biodiversity surveys will be carried out and all impacts to species/habitats of conservation importance will be managed in accordance with the BAP.</li> <li>• GIP</li> <li>• Avoid the felling of significant tree, such as tall poplar and plane trees in riparian habitats.</li> <li>• Once the construction works in the river channels are complete, the areas should be rehabilitated by the placement of soil, willow/poplar trees to allow regrowth of natural vegetation. Assistance from botanical specialists and forestry expert should be sought to guide the rehabilitation works.</li> <li>• The area should be monitored quarterly following site handover, to establish whether regrowth of vegetation is occurring. If not, additional measures – seeding, transplanting of saplings, import of additional topsoil, etc. – should be taken to encourage regrowth of riverine vegetation.</li> </ul>			

Action Plan for * <i>Platanus orientalis</i> and <i>Liquidambar orientalis</i> woods	
	<ul style="list-style-type: none"> <li>Afforestation activities to be performed in line with the No net loss principle, i.e. preparation of Land Restoration Plan. Riparian vegetation along the rivers to be restored to achieve No Net Loss.</li> <li>Re-planting of the PBF riparian habitats will take place within and around the EAAAs (cannot be re-planted directly on top of the pipeline for safety reasons). The materials required for replanting will be included in the Bill of Quantities. The land required for replanting will be secured by the NER, and will be maintained as the specified habitat type in the long-term (i.e. for the lifetime of the Project), through commitments secured from the landowners by NER. The Detailed Design will include sufficient land for revegetation at a minimum of 2:1 revegetation ratio. This includes Priority Biodiversity Feature species.</li> <li>Contractor to develop procedures to avoid, monitor and control invasive species, as appropriate. See Invasive Species Management Plan (for more detail). Work to be supervised by a Biodiversity Specialist.</li> <li>Additional measures are given for other notable species and habitats in this BAP.</li> </ul>
Summary of Approach	<p>The primary approach is reducing the impacts by minimising the ROW. Where the 1.275ha of <i>Platanus orientalis</i> and <i>Liquidambar orientalis</i> woods will be lost where feasible, additional habitat will be created within the project footprint in these areas to supplement the trees removed. Planting of trees will be done on a 3 (new): 1 (old) ratio. Trees will be from local nurseries, suitably hardened and pest free.</p> <p>The process of vegetation clearance will be agreed with, and monitored by, the Public Enterprise (PE) "Macedonian Forests" in accordance with the provisions of the Law on Forests (Official Gazette of RM No.64/09, 24/11, 53/11, 25/13, 79/13, 147/13, 43/14, 160/14, 33/15 и 44/15), which is in accordance with the respective EU Directives. These regulations envisage compensatory planting at the ratio 1:3, with the allowed species to be advised by MoEPP and PE "Macedonian Forests", in accordance with local ecosystems and upon agreement with PE Macedonian Forests. The Law on Forests also requires that PE "Macedonian Forests" ensures further maintenance of the compensatory plantation sites, and envisages monetary payments to PE 'Macedonian Forests for the loss of timber.</p>
Monitoring	Post-construction monitoring to ensure habitats re-establish after pipeline construction.
Responsibility	Contractor's biodiversity specialist will undertake pre-clearance surveys and supervise restoration works to be undertaken as early as practical within the construction schedule. Supervisor Engineer to agree timing and monitor contractor.
Timing	Work to be carried out during relevant stages of Project construction. Monitoring of any habitat restoration will continue over a 5-year period to ensure its effectiveness. This work will start immediately as trees will require removal prior to site clearance. So the established offset site can start to be monitored within year 1, enabling a 5 year post planting monitoring period to have been completed.

### 4.3 Programme of reforestation and reinstatement of vegetation cover

NER is committed to achieving No Net Loss (NNL) of Biodiversity Features (PBFs) & Net Gain (NG) of Critical Habitats. As so a programme of reforestation and reinstatement of vegetation cover (biorestation) within the pipeline ROW and beyond has been outlined. Biorestation is defined as restoration of flora and fauna and the establishment vegetation cover and species diversity to pre-construction conditions in non-cultivated land areas. A special Restoration and Revegetation Plan should be prepared.

#### Reinstatement and replanting

Reinstatement of vegetation cover, shall commence immediately following discontinuation of use of the land or individual facility, once it is no longer required for the construction/commissioning phases (after land reinstatement).

After the Reinstatement of the ROW, a replanting the ROW and other areas disturbed during construction, minus the 8m wide pipeline protection zone, 4m either side of the buried pipeline centre, in accordance with legislation. Reseeding of the 8m pipeline protection zone to ensure soil stabilisation.

#### Tree and Shrub Planting

When undertaking planting, the following requirements shall be adhered to:

- the debris (rocks and especially tree limbs) shouldn't be removed. Based on experience from other gas pipeline projects, the debris is very effective in facilitating new plant growth and will greatly accelerate the restoration process;
- the planting of tree and shrub species with deep roots that may compromise the integrity of the buried pipe will not be allowed within 4m of the pipeline;
- shrub planting is deemed necessary on sections with high precipitation and moderate slopes in order to prevent landslides;
- to the extent possible, planting shall be undertaken on cloudy, cool, humid days to avoid exposure of plants and roots to harsh micro climatic conditions such as excessive heat and drought;
- unhealthy plants shall be discarded; such material shall not be used as mulch;
- generally, stock lifted from nursery areas shall be planted on the same day as lifting. When this is not possible, lifted plants shall be temporarily heeled in to the ground at the planting site and kept watered;
- the roots of bare-rooted stock shall be soaked in water for a few hours before planting;
- spacing and arrangement of plants should provide a natural appearance (i.e. not uniform) and provide the required planting density of each species as indicated by prevailing conditions in the surrounding natural habitat;
- planting holes shall be backfilled and compacted to remove voids and allow good root contact with soil;
- trees, shrubs and plants shall be watered immediately after planting to facilitate establishment (unless planted during the rainy season);
- any waste associated with planting shall be collected and removed;
- when undertaking the planting of trees, the below additional requirements shall be considered:
  - at each planting location, a minimum of 1m diameter circle of land shall be cleared of vegetation; and
  - a hole shall be dug that is as deep and twice as wide as the root ball, and the soil loosened to a depth of 50cm.
- trees shall be removed from their pots or tubes, and the roots loosened carefully, without causing damage the tree shall be planted so that the roots are spread in the planting hole and the top of the root ball is level with the ground water and, if specified, fertilizer shall be placed in the hole before backfilling and consolidation to remove voids; and
- each tree shall be watered again after planting during backfilling, a 'well' will be left around the planted tree comprising a lip of soil that acts to promote water storage and direct infiltration to the tree roots during watering.

Individual trees or groups of plants shall be protected from disturbance (e.g. grazing, trampling, vehicles) and shall plan for repeated watering of plants during dry periods in the first year after planting, and for weed control for at least two years following planting.

### **Maintenance and Aftercare**

The care and maintenance of the trees and plants after their installation is key issues to a successful reforestation.

It is important to maintain the necessary moisture for the plant, especially during the summer season in the first years of plants life, so as to ensure their unobstructed development. The nutrient intake from the soil is also crucial for plants and the competitive effect of plants with native species should be minimized. The process of care and the maintenance of the reforestation areas should continue for the next three years.

After the first planting season, weeds grow around the plant, which affect negatively plant growth. The removal of weeds is considered necessary for the proper development of young trees. Of primary concern for the uninterrupted growth of plants is:

- Weeding
- Irrigation
- Fertilization.

Routine maintenance of revegetated areas shall be performed. In accordance with safety regulations and standards, NER will conduct routine maintenance of the 8m PPS to ensure deep rooting wooded trees do not establish and affect the integrity of the pipe. In general, maintenance and monitoring of revegetated areas is planned for 3 years. The first year, planting/seeding, fertilizer application and irrigation is foreseen.

- Replacement every year of the dead trees to reach 80% of the initial planting quantities, fertilizer application and irrigation will take place;
- Additional replanting/reseeding on herbaceous areas where the vegetation coverage is less than 50% after the first year; and
- Where ever encountered alien species on rehabilitated areas will be eradicated.

### **Irrigation**

Locations for planned irrigation shall be determined, irrigation at other locations may be required if a prolonged spell of dry weather follows germination of seeds or replanting. Irrigation water shall be supplied to the working strip by pump or bowser from the water source. A permit may be required for water abstraction and requirements of all such permits shall be complied with.

Annual monitoring completed by qualified foresters shall assess irrigation efficiency and identify corrective actions and agree cessation.

### **Fertilisation**

After the second year of plant installation, the soil will start to lose a certain amount of nutritional elements that are essential for the plant growth and survival. To combat this, fertilizer will be applied.

## 5. Biodiversity Monitoring

This section outlines the monitoring that will be put in place to ensure impacts to biodiversity are avoided / minimised, no net loss and net gain goals are achieved and the EBRD criteria for Projects in Natural and Critical Habitat are met.



Table 4. Biodiversity monitoring plan

Receptor	Monitoring	Period	Frequency/Duration	Responsible
Habitats	All habitats within the temporary project footprint (including pipeline route, temporary laydown areas and compounds, HDD compounds and access tracks) will be monitored. Pre- construction condition surveys and photographs will be undertaken to establish baseline conditions for habitat restoration. Post construction monitoring will be undertaken to monitor the success of habitat re-instatement using transect surveys, fixed point photography and habitat mapping.	Pre-construction, post construction/operation.	Three visits in spring, early summer and late summer. Undertaken for at least two years post construction. If satisfactory habitat reinstatement has not been completed after two years, monitoring will be continued and reviewed annually.	NER
	Monitoring of flora of conservation concern (critical and priority habitat species and qualifying features of designated sites) individuals replanted within the temporary project footprint.	Post construction/operation.	Three visits (one in spring, early summer and late summer). Undertaken for at least two years post construction. If satisfactory re-colonisation has not taken place after two years monitoring will be continued and reviewed annually.	NER
	Monitoring of flora of conservation concern (critical and priority habitat and qualifying features of designated sites) individuals translocated to suitable receptor sites.	Post construction/operation	Three visits (one in spring, early summer and late summer). Undertaken for at least two years post-construction. If satisfactory colonisation has not taken place after two years, monitoring will be continued and reviewed annually.	NER
All fauna groups	Pre-construction surveys to inform baseline for future monitoring. Transects will be used to provide representative coverage across different habitats affected by the Project.	Pre-construction	One visit prior to the start of construction activities	NER
Birds	Breeding bird surveys will be undertaken, including identifying breeding migrants and breeding resident species. Transect methods will be used, using a similar survey area and approach as the baseline studies undertaken to inform the ESIA so pre and post construction survey results are comparable.	Post construction/operation	Two visits (one in early breeding season, one mid-breeding season). Surveys will be undertaken for two years post-construction.	NER
	Wintering bird surveys will be undertaken using transect methods. A similar survey area and approach as used for the baseline studies undertaken to inform the ESIA will be used so pre	Post construction/operation	Three visits (one early winter, one mid-winter and one late winter). Surveys will be undertaken for two years post- construction.	NER

Receptor	Monitoring	Period	Frequency/Duration	Responsible
	and post construction survey results are comparable.			
	Migratory bird surveys will be undertaken using point based/vantage point methods. A similar survey area and approach as used for the baseline studies undertaken to inform the ESIA will be used so pre and post construction survey results are comparable.	Post construction/operation	Three visits (one early autumn, one mid-autumn and one late autumn). Surveys will be undertaken for two years post-construction.	NER
Mammals	Mammal surveys will be undertaken using transect methods, including both day time and night time transects. A similar survey area and approach as used for the baseline studies undertaken to inform the ESIA will be used so pre and post construction survey results are comparable.	Post construction/operation	Two visits (one in early summer and one in mid-summer). Surveys will be undertaken for two years post- construction.	NER
Reptiles and Amphibians	Amphibian and reptile surveys will be undertaken using day time transects, active searching, and evening transects to record vocalisations of amphibians.	Post construction/operation	Two visits (one in spring during the amphibian breeding season and one in summer). Surveys will be undertaken for two years post-construction.	NER
Invasive species	Monitor the eradication success of <i>Amorpha fruticosa</i> and re-establishment of Willow community	post construction/operation.	Three visits in spring, early summer and late summer. Undertaken for at least two years post construction. If satisfactory habitat reinstatement has not been completed after two years, monitoring will be continued and reviewed annually.	NER

## 5.1 Biodiversity Monitoring and Evaluation Programme

A **Biodiversity Monitoring and Evaluation Programme (BMEP)** will be designed and implemented to confirm that this BAP has both:

- i) been implemented by the responsible parties as expected; and
- ii) achieved the desired conservation outcomes.

The monitoring will also seek to confirm that no unexpected impacts are occurring to notable species and habitats as a result of the project (including associated cumulative or induced impacts) for which an “adaptive management” approach may be required. The Owners Engineer will be responsible for writing and implementing the BMEP, which will build on the tasks previously outlined.

In addition, given that the Project will take place in close proximity to a protected area and an area of designated international conservation importance, EBRD PR6 requires that the project implements a series of programmes to promote and enhance the conservation objectives of the affected protected areas. Such additional conservation actions is programme of reforestation and reinstatement of vegetation cover.

The BMP and ACAs will be the responsibility of the Owners Engineer but elements of it may be tendered out to suitable external organisation(s). As part of the BMEP the Project will monitor the nature, extent, quality and spatial configuration of notable habitats and species within both the direct project area, and the wider area.

## 5.2 Monitoring Methodologies

Monitoring will involve a combination of:

- Linking to existing recording systems such as “Pantlife”, “Observado”, “ebird”, and “inaturalist” to allow incorporation of data from other sources;
- Habitat Quality. Dominant plant species will be recorded at sample sites, along with species listed on the IUCN and national red lists, and endemic species. Non-native and invasive species will be also recorded. The relative abundance will be recorded for example using the DAFOR scale (D=dominant, A=abundant, F=frequent, O=occasional, R=rare). Plant species will be identified in the field or subsequently using detailed photographs or samples collected in the field. Habitat types and their boundaries will be confirmed or defined in the field using the preliminary habitat classification prepared by interpretation of satellite imagery. The actual habitat areas could be calculated in GIS after field surveys;
- Environmental disturbance. e.g. data will be collected on artificial barriers, pollution, overgrazing, timber extraction, trampling, drainage, burning and fishing. Associated management recommendation will also be collected: e.g. reducing grazing level, reducing fishing pressure, and invasive species control; and
- Fauna populations. Monitoring methodologies will be developed in conjunction with key specialists (bird, otter etc).

## 5.3 Monitoring Timescale and Reporting

An annual report will be prepared to include all sets of data, analysis, conclusions and recommendations for management interventions. The monitoring will continue up until the end of the defect liability period. At that point, the Owner’s Engineer will assess the situation and provide recommendations if necessary.

## 5.4 Resources

The Owner’s Engineer will prepare the full Terms of Reference (ToR) for the BMEP/ACAs. It is intended that implementation of the BMEP/ACAs will also receive additional local capacity and resources from other bodies as

available. Staff resources required to implement this plan will be assessed at the completion of the BMEP/ACAs ToR. At this stage they are expected to include appropriate resources for:

- Habitat ground truthing and quality assessment;
- Analysis of habitat field data and reporting;
- Any relevant ecosystem services surveys;
- GIS analysis (interpretation of satellite imagery, habitat classification, calculation of landscape areas and landscape indices).

The equipment needed to implement this plan should be available from the specialists to be engaged but is likely to include: fieldwork equipment, cameras, GPS, binocular, and computer with relevant GIS software. Costs of much of the work should be covered by the Owner's Engineer and by the EPC Contractor, although a full financial estimation will be carried out when the BMEP is fully developed. This will include: staff cost for fieldwork, data analysis and reporting cost of equipment (or hire) including maintenance, training and capacity building etc.

Involvement/engagement of local communities will be considered in the BMEP because:

- the plan will be more sustainable if communities are involved;
- local communities have useful information on the relationships between threats and effects; and
- stakeholder involvement can contribute to the development of a sense of ownership of the resource management regime and responsibility for biodiversity health.

The draft and final BMEP will need to be approved by the EBRD.

## 5.5 Inspection, Monitoring and Audit

Inspection and monitoring of the impacts of the Project activities on biodiversity will increase the effectiveness of BAP. NER will establish a schedule for BMP audits or inspections of the Contractors. Contractors will be required to establish a similar schedule for its activities and those of any subcontractors.

Through the process of inspection, monitoring and auditing, NER will seek to ensure that the conditions stipulated within this BAP and its applicable standards, procedures and guidelines are complied with filed activities. Inspections, monitoring and audits will be documented, and any corrective actions will be assigned owners and timescales for implementation. An action tracking database will be used to coordinate the close out of corrective actions in a timely manner.

Inspection, monitoring and audit findings, along with their respective improvement programmes, will be regularly reported to the HSSE Manager.

## 5.6 Reporting and Review

Given the biodiversity sensitivities identified in the project Aol, Contractors will report on Project performance against the commitments in the BAP on a monthly basis to NER management. Contractors will be required to report on their performance on a monthly basis during design and procurement. Daily and weekly reporting is expected upon commencement of construction works during pre-construction check surveys. Reports should be provided on a daily basis during periods when they are monitoring for fauna activity.

## 5.7 Performance Indicators

Performance indicators that will be used to assess the success of the BAP mitigation / management measures and monitoring include the following:

- No reported disturbance, injury or mortality to species of concern noted, in particular the reptiles, amphibians, mammals and birds during construction of the gas pipeline.
- Biodiversity offsetting achieved of Natural Habitat directly impacted either through on-site or offsite replanting or through funding to NGOs undertaking re-forestation programmes.

- No workers or members of the local community are caught poaching animals during the construction phase.
- Improved general awareness of the local community in regards to conservation status and importance of the euroasian otter

## **5.8 BAP Review and Amendment**

The BAP will be reviewed and updated as necessary. Changes may be based on the Project design, the environmental and social performance of the Project, or updated to reflect changes in planned activities, legislation, company standards, stakeholders' concerns, and project personnel.