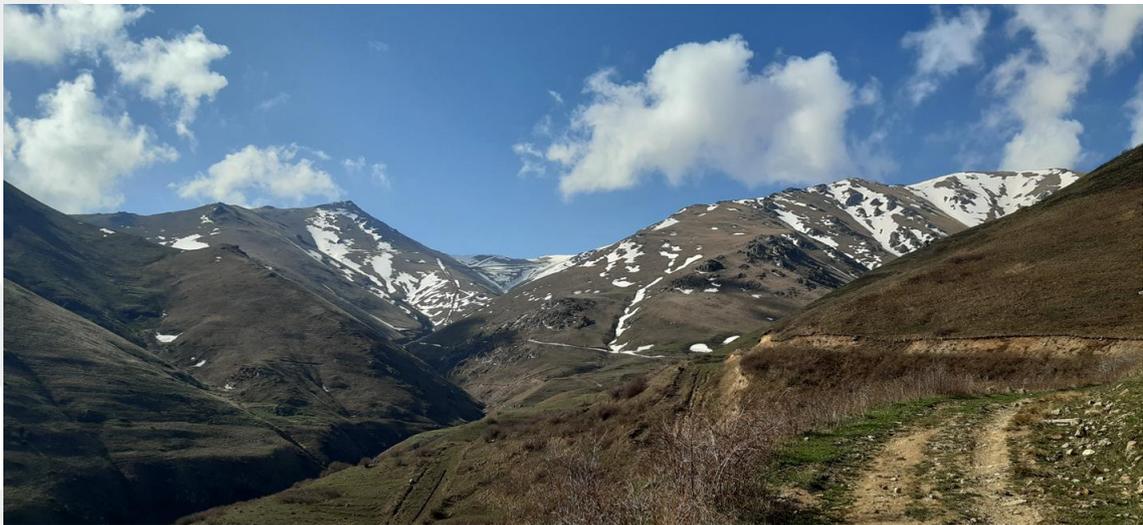




Ecoline  
International

ENVIRONMENTAL AND SOCIAL IMPACT  
ASSESSMENT (ESIA)  
SISIAN-KAJARAN  
(NORTH-SOUTH CORRIDOR)  
ROAD PROJECT,  
ARMENIA

**BIODIVERSITY ACTION PLAN**



Source: *Biotope*

**March 2024**

ENVIRONMENTAL AND SOCIAL IMPACT  
ASSESSMENT (ESIA)  
SISIAN-KAJARAN  
(NORTH-SOUTH CORRIDOR)  
ROAD PROJECT,  
ARMENIA  
**BIODIVERSITY ACTION PLAN**

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## DISCLAIMER

*This Biodiversity Action Plan (BAP) is part of the Environmental and Social Impact Assessment (ESIA) documentation prepared for the Sisian-Kajaran Road Project, Armenia, and draws on its results. An ESIA is necessarily predictive in that it gets completed well before the project being assessed is actually implemented. The information on which the assessment is based comes from multiple sources including the feasibility report, the detailed design document, reports on studies that were conducted as part of the feasibility investigations, records of meetings, other publications, various databases, data that is collected by the team conducting the ESIA, anecdotal information and others. It is extremely difficult to verify the information that is used other than through testing the logic of that information as well as that can be done. In preparing this document, care has been taken to ensure that whatever information has been available has been accurately reproduced in the ESIA. Should information be found in this document that is incorrect then it is respectfully requested that the incorrect information be brought to our attention so that the ESIA can be updated accordingly. We cannot be held accountable for information that we have accepted and reproduced in good faith regardless of the consequences of such information being incorrect. Anyone reproducing information contained in this ESIA does so entirely at their own risk.*

## LIST OF ABBREVIATIONS

AA	Appropriate Assessment
ADB	Asian Development Bank
ASCI	Area of Special Conservation Interest
BAP	Biodiversity Action Plan
BOMP	Biodiversity Offsetting Management Plan
CR	Critically Endangered
<i>cf.</i>	see also
CEPF	Critical Ecosystem Partnership Fund
CHA	Critical Habitat Assessment
DD	Data deficient
EAAA	Ecologically Appropriate Area of Analysis
E&S	Environmental and social
EBRD	European Bank for Reconstruction and Development
EIA	Environmental Impact Assessment
EN	Endangered
ES	Ecosystem services
LC	Least concern
m	metre
MOU	Memorandum of Understanding
MTAI	Ministry of Territorial Administration and Infrastructure
NG	Net gain
NNL	no net loss
NT	Near threatened
IBA	Important Bird Area
IBAT	Integrated Biodiversity Assessment Tool
KBA	Key Biodiversity Area
PBF	Priority Biodiversity Feature
PR	Performance Requirement (of EBRD)
PCBS	Pre-construction biodiversity survey
RA	Republic of Armenia
RD	Road Department Fund
SPA	Specially protected area
VU	Vulnerable

## TABLE OF CONTENTS

1. INTRODUCTION.....	6
1.1. Background.....	6
1.2. Purpose of and Need for the BAP .....	7
2. LEGAL AND REGULATORY FRAMEWORK REGARDING BIODIVERSITY .....	9
2.1. Armenian Legal Requirements .....	9
2.2. Applicable International Lenders' Requirements.....	11
2.3. Good International Practice (GIP) Guidelines .....	11
2.4. Applicable EU Directives .....	12
3. PROJECT DESCRIPTION .....	12
4. BIODIVERSITY VALUES .....	15
5. SUMMARY OF POTENTIAL IMPACTS.....	21
6. MITIGATION MEASURES AND KEY IMPLEMENTATION ROLES.....	24
7. RESIDUAL IMPACT ASSESMENT .....	29
8. OFFSETTING STRATEGY .....	34
8.1. Summary of NNL and NG Goals .....	34
8.2. Loss and gain calculation .....	34
8.3. Offsets and Principles of Biodiversity Net Positive Measures .....	36
9. BIODIVERSITY MONITORING .....	46
10. SUMMARY OF ESTIMATED COSTS.....	50
11. STAKEHOLDER ENGAGEMENT AND INPUT .....	51
Literature.....	53
Annex 1. Biodiversity specialists involved.....	54
Annex 2. EUNIS Mapping.....	55
Annex 3. Habitats listed in the Annex I of the EU Habitat Directive Mapping .....	61
Annex 4. Map of the Priority Biodiversity Features Triggering Criteria 12.i.a (EBRD, PR6) and Critical Habitats and Criteria 1.a (EIB, ESS 4) .....	67
Annex 5. Summary of the Proposed BAP Actions .....	73
Annex 6. Proposed Locations of Wildlife Crossings.....	75
Annex 7. Design Recommendations for Wildlife Crossings.....	77

## LIST OF TABLES AND FIGURES

Table 1. International E&S Conventions and Agreements pertinent to the Project.....	10
Table 2. Summary Table of Priority Biodiversity Features and Critical Habitats Identified in the Study Area as per EBRD PR6.....	16
Table 3. Summary Table of Critical Habitats Identified in the Study Area as per EIB ESS4 ..	18
Table 4. Synthesis of the Numbers of PBF and CH Identified in the EAAA by Groups.....	19
Table 5. Conclusion Table of Habitats and Species Triggering CH taking into Account the More Stringent of the 3 Lenders Standards (EBRD/EIB/ADB) .....	19

Table 6. Assessment of Impacts on Biodiversity Features .....	22
Table 7. Proposed biodiversity impact mitigation .....	24
Table 8. Assessment of Residual Impacts on Biodiversity Features .....	30
Table 9. PBF and CH for Which Significant Residual Impacts Occur Requiring NNL/NG Offsets .....	34
Table 10. Gains Needed regarding Habitats to Achieve a No Net Loss (PBF) or Net Gain (CH) .....	35
Table 11. List of the Monitoring of Mitigation Measures .....	47
Table 12. List of the Proposed Species' Monitoring to Better Understand the Use of the Valleys by Fauna during the Construction and Operation Phase of the Road .....	49
Table 13. Indicative Estimation of the Costs Required for the Implementation of the BAP Actions .....	50
Figure 1. Location of the Sisian-Kajaran Road Project, Syunik Region, Armenia .....	6
Figure 2. Ecological corridors for the Caucasus Biodiversity Hotspot, of which the East Lesser Caucasus where the project is occurring (CEPF, 2004).....	8
Figure 3. The Proposed Sisian-Kajaran Road together with the Positions of Tunnels and Bridges.....	14
Figure 4. Critical Habitat Map for Fauna and Habitats (according to EBRD and EIB Criteria) .....	20

## 1. INTRODUCTION

### 1.1. Background

A range of new regional road corridors are currently being implemented to improve connectivity between countries in, and across Asia and Europe (i.e., the core Trans-European Transport Network (TEN-T)). Armenia is an integral part of this transport initiative and is establishing the North South Road Corridor (NSRC). The Road Department Fund (the RD) under the Ministry of Territorial Administration and Infrastructure of Armenia (MTAI or the Promoter) is the Implementing agency for the construction of the 60 km Sisian-Kajaran road section (the Project) of Armenia's strategic NRSC (see **Figure 1**).



*Prepared by the ESIA Consultant.*

**Figure 1. Location of the Sisian-Kajaran Road Project, Syunik Region, Armenia**

The Sisian-Kajaran road will be divided into three construction packages<sup>1</sup>:

- Lot 1: 27.1 km Northern road section (from 0+000 km to 27+130 km);
- Lot 2: 8.64 km Bargushat tunnel (from 27+130 km to 35+770 km); and
- Lot 3: 24.2 km Southern road section (from 35+770 km to 60+022 km).

The European Bank for Reconstruction and Development (EBRD) is considering providing a sovereign loan to the Republic of Armenia (the Borrower or the RA) to finance Lot 3: 24.2 km Southern road section (the EBRD Project). The European Investment Bank (EIB) is expected to co-finance the Southern road section (Lot 3). Lot

<sup>1</sup> The indicated lengths are preliminary. The final lengths of the sections will be determined after the detailed design is split into three sections; it is anticipated that while the length of the Bargushat tunnel remains the same, several kilometres will be added to it at the portals, thus reducing the lengths of the Northern and Southern sections.

1: the Northern road section and Lot 2: Bargushat tunnel are expected to be financed by the EIB, the Asian Development Bank (ADB), and the Government of Armenia.

The Sisian-Kajaran Road Project has been categorised as Category A according to the international lenders' requirements, and an Environmental and Social Impact Assessment (ESIA) has been commissioned for it, including for the biodiversity component - a Critical Habitat Assessment (CHA), a Biodiversity Action Plan (BAP), and an Appropriate Assessment (AA). A consortium of environmental and social (E&S) consulting companies (the Consultant)<sup>2</sup> had been commissioned to prepare the ESIA and associated documents, which were publicly disclosed for the period of over 120 days (from 21 July to 1 December 2023), according to the lenders requirements. The current version of the BAP captures the feedback from stakeholders collected during the ESIA disclosure and will be re-disclosed, together with the ESIA Disclosure and Consultation Report, for the Project life-cycle.

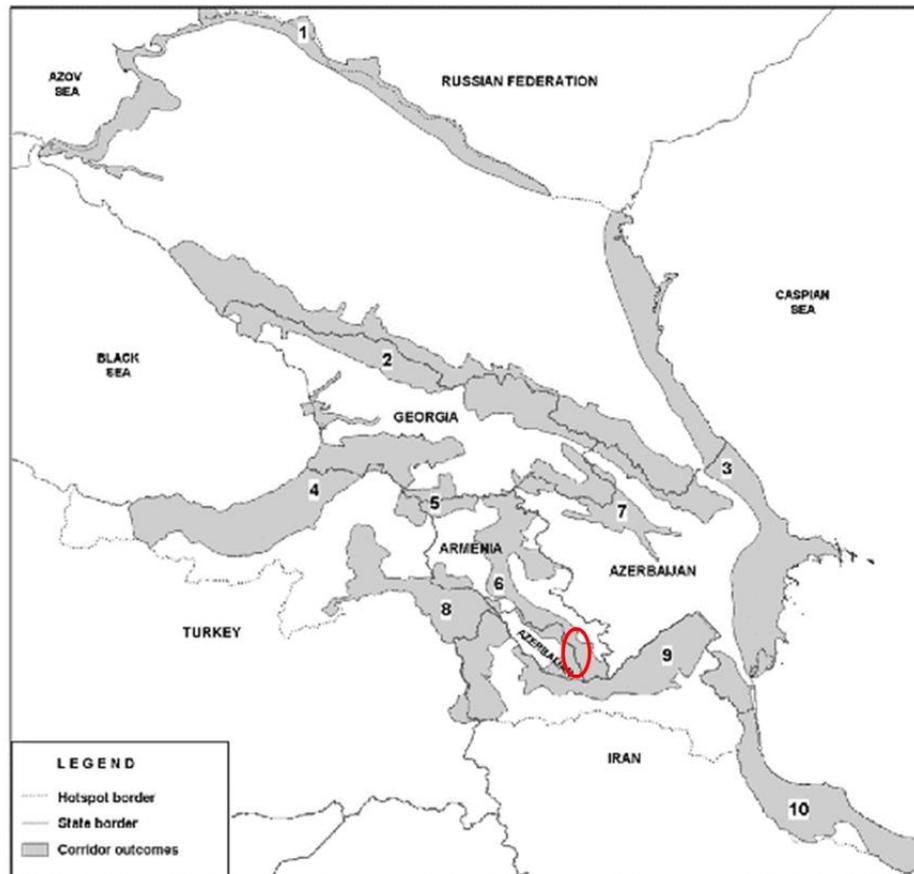
## **1.2. Purpose of and Need for the BAP**

The Project is in the Caucasus Biodiversity Hotspot (CEPF<sup>3</sup>, 2011; see **Figure 2**) and more particularly in the East Lesser Caucasus Corridor (1.43 million hectares) targeted by the CEPF due to the high number of threatened and/or endemic species, to ensure biodiversity conservation in this hotspot. The high number of protected areas in this region confirms the global importance of Syunik Region in biodiversity conservation (Zangezur Sanctuary, Biosphere complex, Emerald Site, etc.). As such, assessment of project impacts on biodiversity is very important for this Project which must be mitigated, by designing and implementing a robust mitigation strategy.

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<sup>2</sup> The consortium encompasses Ecoline International Ltd. (Bulgaria), SE Solutions Pty. (South Africa) and ATMS Solutions LLC (Armenia) and is supported by Biotope (France) and Biogeotech (Armenia) for biodiversity component.

<sup>3</sup> Critical Ecosystem Partnership Fund.



**Figure 3. Corridor outcomes for the Caucasus hotspot**  
 1 - Kuma-Manych; 2 - Greater Caucasus; 3 - Caspian; 4 - West Lesser Caucasus; 5 - Javakheti; 6 - East Lesser Caucasus; 7 - Iori-Mingechaur; 8 - Southern Uplands; 9 - Arasbaran; 10 - Hyrcan

 Location of the project

***Figure 2. Ecological corridors for the Caucasus Biodiversity Hotspot, of which the East Lesser Caucasus where the project is occurring (CEPF, 2004)***

**This document constitutes the BAP for the Project.** The BAP articulates actions that together can ensure the conservation or enhancement of potentially affected habitats and species considered of conservation value. Ultimately, the major objective of a BAP is to achieve **no net biodiversity loss** and/or, if Critical Habitat is affected, a **net biodiversity gain**. The BAP has been informed by the Project's biodiversity baseline, CHA, AA and ESIA reports, and has been developed with input from a range of stakeholders, including Manager of the protected area and, state body authorities, external experts, national conservation organisations and Project-affected communities. The BAP will need to be updated if changes to the Project design occur and prior to the road commissioning. Any update of the BAP should be agreed with the Lenders (EBRD, EIB, and ADB) and 'no objection' should be obtained from them by the Road Department.

## 2. LEGAL AND REGULATORY FRAMEWORK REGARDING BIODIVERSITY

### 2.1. Armenian Legal Requirements

According to the **Law on Environmental Impact Assessment and Expert Examination (2014)**<sup>4</sup>, there are two types of documents, which are subject to environmental impact assessment (EIA) and expert examination. These documents are: (i) Framework Document – a policy, strategy, concept, scheme of utilization of natural resources, program, master plan, urban development document, which are likely to affect the environment; and (ii) Design Document - technical report, feasibility study and construction-engineering design of intended activity. According to Article 14 of the Law, the types of activities, which should undergo EIA are divided into A, B and C categories depending on their expected environmental impact. The current project is subject to a two-stage EIA (preliminary and main) and a state expert examination procedure. The procedure for public notification and public discussions is outlined in the RA Government Decree No.1325-N dated 19.11.2014.

The **Law on Flora (1999)**<sup>5</sup> and **Law on Fauna (2000)**<sup>6</sup> outline Armenia's policies for the conservation, protection, use, regeneration and management of natural populations of plants and animals as well as the impact of human activities on biodiversity. These laws are aimed at the sustainable preservation and use of flora/fauna and the conservation of biodiversity. The laws also contain provisions for assessing and monitoring flora and fauna, especially rare and threatened species. The RA Government Decrees No.71-N and No.72-N on approval of the **RA Red Book of Animals**<sup>7</sup> and **RA Red Book of Plants**<sup>8</sup> respectively define the biology of threatened (rare, threatened, endangered, vulnerable) species of flora and fauna as well as their quantity, habitats, and variety. The Law of Fauna was materially updated in 2022 to introduce the new concepts in order to complete Armenia's commitments under the 2018 Partnership Agreement with the EU<sup>9</sup> and align with the EU legislation. The amendments included such notions as fauna monitoring, definition of invasive species, use of the fauna objects for health, protection and industrial use, Important Bird Areas (as areas of special environmental interest separated for conservation of birds (outside of specially protected nature areas or included therein), serving for nesting, wintering or rest, and others.

Draft amendments to the Law on Flora have been proposed and are under discussion among the state authorities and disclosed to the public at <https://www.e-draft.am>.

RA Government Decree N 781-N **On the order of protection of flora objects of the Republic of Armenia and their use for the purpose of reproduction in natural conditions** (2014)<sup>10</sup> defines the measures for the protection, including translocation, of plants under threat of extinction as a result of economic activity.

The **Law on Special Protected Areas of Nature (2006)**<sup>11</sup> regulates special protected areas of the RA and eco-systems that have environmental, economic, social, scientific, educational, historical, cultural, healthcare and recreation value. It also outlines the legal basis for state policies regarding sustainable development, restoration, protection,

<sup>4</sup><https://www.arlis.am/documentview.aspx?docid=140512>

<sup>5</sup><https://www.arlis.am/documentview.aspx?docid=120784>

<sup>6</sup><https://www.arlis.am/documentview.aspx?docid=176441>

<sup>7</sup><https://www.arlis.am/DocumentView.aspx?DocID=56347>

<sup>8</sup><https://www.arlis.am/DocumentView.aspx?DocID=56348>

<sup>9</sup> Comprehensive and enhanced Partnership Agreement between the European Union and the European Atomic Energy Community and their Member States, of the one part, and the Republic of Armenia, of the other part ([https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:22018A0126\(01\)](https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:22018A0126(01))).

<sup>10</sup> <https://www.arlis.am/documentview.aspx?docID=91830>

<sup>11</sup><https://www.arlis.am/documentview.aspx?docid=140513>

reproduction and use of natural objects and complexes. The Law defines four categories of protected areas in Armenia: (i) State Reserves; (ii) National Parks; (iii) Sanctuaries; and (iv) Nature Monuments. The list of the nature monuments is approved by the RA Government Decree No. 967-N dated 14.08.2008<sup>12</sup>.

The **Forest Code (2005)**<sup>13</sup> regulates sustainable management of forests: guarding, preserving, rehabilitation, afforestation and rational use of forests and forest lands in Armenia as well as with forest stock-taking, monitoring and control.

The **Water Code (2002)**<sup>14</sup> provides the legal basis for protection of water resources, the provision of water for people and economic sectors through effective management of water resources and ensuring the protection of water resources for future generations. The Water Code includes the following: responsibilities of state/local authorities and public, development of the national water policy and national water program, water cadastre and monitoring system, public access to relevant information, water use and water system use permitting systems, trans-boundary water resources use, water quality standards, safe operation of hydraulic facilities, protection of water resources and state supervision. The quality of surface water in Armenia is monitored as per the principles of EU Water Framework Directive adopted by the RA Government Decree No. 75-N dated 27.01.2011.

Armenia is a signatory/party to several **international agreements** related to biodiversity (see the table below).

**Table 1. International E&S Conventions and Agreements pertinent to the Project<sup>15</sup>**

International Convention or Protocol	Description
Convention on Wetlands of International Importance - (Ramsar 1971)	The Ramsar Convention is an intergovernmental treaty to maintain the ecological character and plan the sustainable use of Wetlands of International Importance. The Convention entered into force in Armenia in 1993.
The Convention on the Conservation of Migratory Species of Wild Animals (1979) (Bonn Convention)	The objective of the Bonn Convention, which was adopted in 1979, is to ensure the conservation of land, marine and air migratory species over the whole of their area of distribution. Armenia is a State party since 2011.
Convention on International Trade in Endangered Species (CITES) (1973)	This convention is designed to ensure that international trade in animals and plants does not threaten their survival in the wild. Armenia joined this convention in 2008.
Convention on the Conservation of European Wildlife and Natural Habitats, Bern (1979)	The Bern Convention is a binding international legal instrument in the field of nature conservation, covering most of the natural heritage of the European continent and extending to some States of Africa. Ratified by Armenia in 2008.
The Convention on Biological Diversity (1992)	The three main objectives of the Convention are: the conservation of biological diversity; the sustainable use of the components of biological diversity; and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources. Signed by Armenia in 1993.
UN Convention to Combat Désertification, Paris (1994)	This Convention is the sole legally binding international agreement linking environment and development to sustainable land management. The Convention addresses specifically the arid, semi-arid and dry sub-humid areas, known as the drylands, where some of the most vulnerable ecosystems and peoples can be found. Ratified by Armenia in 1997.

<sup>12</sup><https://www.arlis.am/documentview.aspx?docid=157090>

<sup>13</sup><https://www.arlis.am/DocumentView.aspx?docid=121312>

<sup>14</sup><https://www.arlis.am/DocumentView.aspx?docid=148955>

<sup>15</sup> The Convention on Environmental Impact Assessment in a Transboundary Context (Finland, Espoo, February 1991) (the Espoo Convention), ratified by the RA in 1997, is not triggered by the proposed Project as no significant adverse transboundary impacts are expected.

## 2.2. Applicable International Lenders' Requirements

### 2.2.1. European Bank for Reconstruction and Development (EBRD)

The main requirements of the EBRD for its own activities are formulated in the Bank's ESP (2019), and the requirements for the E&S aspects of the Client-borrower's activities are set out in the Performance Requirements (RRs)<sup>16</sup>. The ESP sets E&S requirements for the EBRD clients' activities to achieve sustainable results, with the PR1: Assessment and Management of Environmental and Social Risks and Impacts being the umbrella PR for the other requirements. The one relevant regarding Biodiversity is the **PR 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources** which determines the requirements for the conservation of biological and landscape diversity in the development area. PR 6 requires the borrower to characterise the state of biodiversity, identifying sensitive species and habitats, and developing measures to avoid / reduce impacts. PR 6 defines criteria for critical habitat screening and requires developing a Biodiversity Action Plan (BAP) where significant adverse impacts on biodiversity are expected.

### 2.2.2. European Investment Bank (EIB)

The 2022 EIB's Environmental and Social Policy<sup>17</sup> sets the policy context for the protection of the environment and human well-being. The Policy is operationalised via 11 EIB Environmental and Social Standards (ESSs) that EIB's clients / projects should comply with. Of these, Standard 1: Environmental and social impacts and risks contains umbrella requirements, and **Standard 4: Biodiversity and ecosystems** is applicable to the Project regarding biodiversity. While the EIB ESSs are largely aligned with the EBRD PRs, the EIB applies more stringent thresholds and more criteria for critical habitat screening.

### 2.2.3. Asian Development Bank (ADB)

The ADB's Safeguard Policy Statement (ADB, 2009)<sup>18</sup> sets out the bank's specific safeguard requirements that the borrowers are expected to meet when addressing E&S impacts and risks. The document includes Safeguard Requirements (SRs) 1 to 3 that implement a structured process of impact assessment, planning, and mitigation to address the adverse effects of projects throughout the project cycle. The **SR 1: Environment** is relevant to the Project regarding biodiversity.

## 2.3. Good International Practice (GIP) Guidelines

Specific E&S requirements applicable to the Project are set out in the EBRD's Sub-sectoral Environmental and Social Guidelines: Building and Construction Activities (2010)<sup>19</sup>. They elaborate on typical E&S risks related to construction, operation, maintenance and decommissioning of facilities.

The Lenders' guidance documents that are particularly relevant to biodiversity and used in the Project's ESIA, CHA and AA are as follows:

<sup>16</sup> EBRD. 2019. ESP. <https://www.ebrd.com/news/publications/policies/environmental-and-social-policy-esp.html>.

<sup>17</sup> EIB. 2022. <https://www.eib.org/en/publications/eib-group-environmental-and-social-policy>.

<sup>18</sup> <https://www.adb.org/documents/safeguard-policy-statement>

<sup>19</sup> <https://www.ebrd.com/downloads/policies/environmental/construction/building.pdf>

- EBRD's Guidance Note 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources (Guidance Note PR6, EBRD, 2022)<sup>20</sup>;
- EIB's Guidance Note for Standard 3 on Biodiversity and Ecosystems (2018)<sup>21</sup>.

#### 2.4. Applicable EU Directives

- Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora,
- Council Directive 2009/147/EC on the conservation of wild birds, and other relevant international treaties were applied during the ESIA study.
- Bern Convention (1979):
  - Resolution No. 4 (revised Annex I to Resolution No. 4 (1996) adopted in 2014 by the Standing Committee) listing endangered natural habitats requiring specific conservation measures.
  - Resolution No. 5 (1998) concerning the rules for the Network of Areas of Special Conservation Interest (Emerald Network).
  - Resolution No. 6 (revised Annex I to Resolution No. 6 (1998), adopted in 2011 by the Standing Committee) listing the species requiring specific habitat conservation measures.
  - Resolution No. 8 (2012) on the national designation of adopted Emerald sites and the implementation of management, monitoring, and reporting measures.

### 3. PROJECT DESCRIPTION

The proposed Project is essential to unlocking the connectivity required of the NSRC because it will replace two largely inadequate road sections that currently have to be used. Firstly, the M2 Goris-Kapan road, which cannot presently be used by vehicles with Armenian registration plates. The only remaining route is therefore the 130km road via Tatev (H-45) that features steep gradients and tight bends and is overloaded with heavy vehicle traffic, for which it was not designed. Both the M2, and the M2-Tatev-Aghvani-M2(Syunik) (H-45) are far below the level of standard expected of a national road. A new, shorter and more direct road with limited gradients and gentler bends adhering to modern international road safety standards is essential.

A Feasibility Study and the Detailed Design<sup>22</sup> for the Project were prepared between 2016-2019 and funded by ADB. A national Environmental Impact Assessment (EIA) was prepared for the Sisian-Kajaran Road Project in parallel with the Feasibility Study and Detailed Design, and received a positive conclusion of the State Environmental Review in March 2018. However, the validity of this conclusion expired in March 2019, and as such the national EIA process was re-launched by the RD in March 2023. The new positive EIA Conclusion was obtained by the RD on 27 November 2023.

The new road will consist of (**Figure 3**):

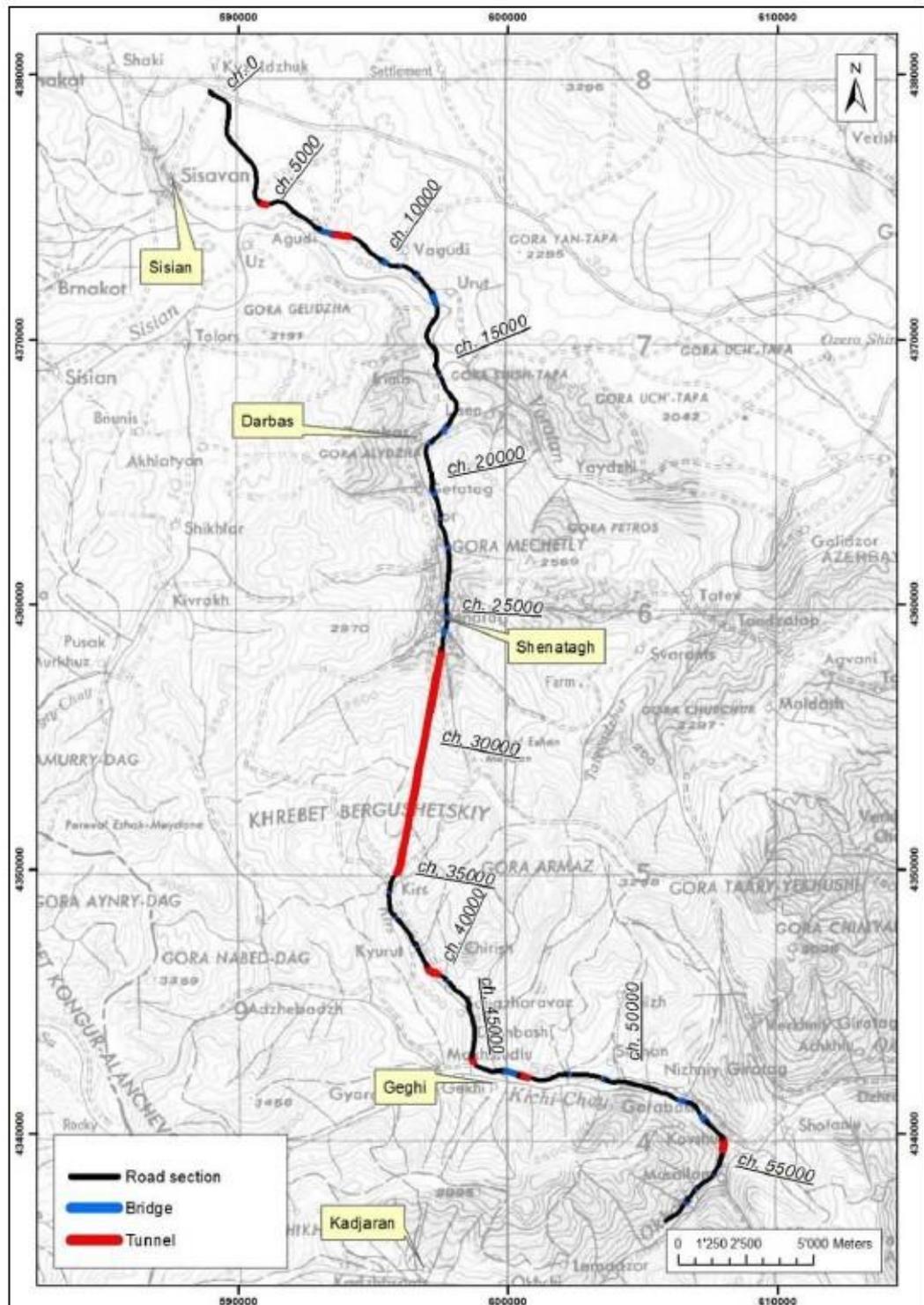
<sup>20</sup> <https://www.ebrd.com/who-we-are/our-values/environmental-and-social-policy/implementation.html>

<sup>21</sup> <https://www.eib.org/en/publications/guidance-note-on-biodiversity-and-ecosystems>

<sup>22</sup> North-South Road Corridor Investment Program, Tranche 4: Section Sisian-Kajaran, Detailed Design, General Report, April 2019.

- road sections,
- 27 bridges to cross both rivers and valleys (in total making ca. 5km and ranging in length from 60 m to 560 m),
- 3 major interchanges at 0 km, 15 km and 57 km connecting to existing roads,
- 4 passages for agricultural vehicles and five cattle crossings (all underpasses);
- 14 service roads connecting to the existing secondary roads and ranging from 200 m to 1,280 m, and
- 9 tunnels (in total making about 13 km and ranging in length from 359 m to 8.64 km (Bargushat tunnel).

The Bargushat tunnel will be the largest one creating for the first time a **direct connection between Sisian and Kajaran**. The tunnel will also prevent the Project from directly affecting the Zangezur Sanctuary (a specially protected area). The road will be two lanes (one in each direction) with additional climbing lanes on steep ascents. The proposed route was selected from three alternative routes as having the least environmental and social impacts. Other alternatives have been considered in the ESIA as well, such as the 'no project' alternative, upgrade of the existing road, development of railway road and others.



Source: North-South Road Corridor Investment Program, Tranche 4: Section Sisian-Kajaran, Detailed Design, General Report, April 2019.

**Figure 3. The Proposed Sisian-Kajaran Road together with the Positions of Tunnels and Bridges**

No-go areas were identified as well in order to prevent the siting of Project facilities (such as spoil disposal areas (SDAs), construction camps, access roads to SDAs, laydown sites and others the locations for which are not yet defined) in the areas of high biodiversity value or ecological functionalities (see Volume 2 of the Project's ESIA).

#### 4. BIODIVERSITY VALUES

Biodiversity values for this Project are defined as the species and habitats that qualify as Priority Biodiversity Features and Critical Habitat.

The assessment against EBRD PR6 has revealed **7 habitats<sup>23</sup> and 47 fauna species identified as Priority Biodiversity Features (PBF), and 2 fauna species, 1 insect species and 5 flora species triggering Critical Habitat (CH) (cf. Table 2).** The assessment against EIB ESS4 has revealed **2 habitats, 22 fauna species and 5 flora species triggering Critical Habitat (Table 3).** The main difference between the two assessments is that the EIB applies the requirements of the standard linked to Annex I, II and IV of the EU Habitats Directive, while EBRD does not. Indeed, as per the EBRD Guidance Note on PR6 and Declaration on the European Principles for the Environment, the EBRD adopted the country-sensitive approach for countries that are part of the European Neighbourhood Policy, which further reflects on the application of the criteria and conditions for identifying priority biodiversity features and critical habitats. This means that the requirements of the EU Directives would not be automatically applicable to the analysis below.

This, however, did not affect the final outcome of the CHA analysis (Table 2) since the stricter requirements of the EIB policy were applied to the CHA, which called for the full application of the EU Directives.

The presence of these habitats confirms the importance of this natural area within the East Lesser Caucasus, already identified by the CEPF as critical for several threatened and/or endemic species. With fauna species such as the European otter, *Lutra lutra*, (LC) and the bat species listed in the resolution 6 of the Bern convention (cf. List in the table 5) living at the scale of the landscape of the different watersheds crossed by the project, **the entire project area therefore constitutes a critical habitat** based on the "species living at the scale of the valley" EAAA (cf. Figure 4). **It should be noted, however, that considering the proportion of the project footprint against the EAAA ( $3.86/1369 = 0.28\%$  of the EAAA), the magnitude of the impact on this critical habitat is low at the scale of the EAAA and minor after the implementation of adequate mitigation (including avoidance measures) and additional conservation measures as per the BAP. Furthermore, there are no viable alternatives in the area of the lesser biodiversity value at the scale of Bargushat and Zangezour mountain ranges as they support the same biodiversity features, and there is already an existing road in the valleys crossed by the Project.**

A synthesis of the numbers of PBF and CH identified in the EAAAs is presented in Table 4.

Maps of priority biodiversity features triggering EBRD PR6 Criterion 12 i.a and of critical habitats triggering EIB ESS4 Criterion 1.a (for habitats) are presented in Annex 4.

Maps of habitats according to the EUNIS typology are presented in Annex 2.

Maps of habitats according to the EU Habitat Directive typology are presented in Annex 3.

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<sup>23</sup> According to the Natura 2000 codes, but Habitats listed in the Resolution 4 of the Bern Convention.

**Table 2. Summary Table of Priority Biodiversity Features and Critical Habitats Identified in the Study Area as per EBRD PR6<sup>24</sup>**

N°	Criterion	Features (Habitats/ecosystems/species)
<b>Priority Biodiversity Features as per EBRD PR6 (§12)</b>		
i	12.i.a EAAA is habitat type listed in Resolution 4 of the Bern Convention	<u>Habitats (x7)</u> 3240. Alpine rivers and their ligneous vegetation with <i>Salix elaeagnos</i> 6190. Rupicolous pannonic grasslands ( <i>Stipo-Festucetalia pallentis</i> ) 62A0. Eastern sub-mediterranean dry grasslands ( <i>Scorzoneratalia villosae</i> ) 9160. Sub-Atlantic and medio-European oak or oak-hornbeam forests of the Carpinion <i>betuli</i> 9170. Galio-Carpinetum oak-hornbeam forests 92A0. <i>Salix alba</i> and <i>Populus alba</i> galleries 5210. Arborecent matorral with <i>Juniperus spp.</i>
ii	12.ii.a EAAA for species and their habitats listed in the Resolution 6 of the Bern Convention <sup>25</sup>	<u>Terrestrial mammal (*6)</u> <i>Capra aegagrus</i> (VU) <i>Ursus arctos</i> (LC) <i>Canis lupus</i> (LC) <i>Vormela peregusna</i> (VU) <i>Lutra lutra</i> (NT) <i>Lynx lynx</i> (LC)  <u>Birds (x23)</u> <i>Gypaetus barbatus</i> (NT) <i>Neophron percnopterus</i> (EN) <i>Aegypius monachus</i> (NT) <i>Accipiter brevipes</i> (LC) <i>Aquila chrysaetos</i> (LC) <i>Clanga pomarina</i> (LC) <i>Gyps fulvus</i> (LC) <i>Circaetus gallicus</i> (LC) <i>Circus cyaneus</i> (LC) <i>Caprimulgus europaeus</i> (LC) <i>Coracias garrulus</i> (LC) <i>Alcedo atthis</i> (LC) <i>Anthus campestris</i> (LC) <i>Dendrocopos syriacus</i> (LC) <i>Leipopicus medius</i> (LC) <i>Emberiza hortulana</i> (LC) <i>Ficedula parva</i> (LC) <i>Ficedula semitorquata</i> (LC) <i>Lanius collurio</i> (LC) <i>Lanius minor</i> (LC) <i>Melanocorypha calandra</i> (LC) <i>Pyrrhocorax pyrrhocorax</i> (LC) <i>Sylvia nisoria</i> (LC)  <u>Bats (x8)</u> <i>Rhinolophus mehelyi</i> (VU) <i>Rhinolophus euryale</i> (NT) <i>Rhinolophus ferrumequinum</i> (NT)

<sup>24</sup> In case a species would trigger several criteria in the PBF and CH, the species is listed in this table only as the highest conservation concern, which is CH. If the species triggers different criteria inside the same category (PBF or CH), the criteria that is the most discriminant is presented (e.g. population proportions, reproductive units). For a full description of the different criteria triggers by a certain species, please refer to the table source file.

<sup>25</sup> Considering that Armenian MoE is still working on the transposition of the EU Habitat and Bird Directives in the Armenian Laws and by-laws in the framework of the Comprehensive and Enhanced Partnership Agreement (CEPA) with EU, the habitats and species were not assessed against the Annex I of the EU Bird Directive and Annex I, II and IV of the Habitat Directive regarding the EBRD PR6.

N°	Criterion	Features (Habitats/ecosystems/species)
		<i>Rhinolophus hipposideros</i> (NT) <i>Rhinolophus blasii</i> (LC) <i>Miniopterus schreibersii</i> (VU) <i>Myotis blythii</i> (LC) <i>Myotis emarginatus</i> (LC) <u>Reptiles</u> (x2) <i>Testudo graeca</i> (VU) <i>Emys orbicularis</i> (NT)
	12.ii.b EAAA supports < 0.5% of global population OR < 5 reproductive units of a CR or EN species <sup>26</sup>	<u>Birds</u> (x1, already triggering ii.a and ii.d) <i>Neophron percnopterus</i> (EN)
	12.ii.c EAAA supports VU species	2 Species of bats and 1 species of terrestrial mammals already triggering criteria 12.ii.a <u>Insects</u> (*1) <i>Parnassius apollo</i> (VU) <u>Reptiles</u> (*1) <i>Vipera eriwanensis</i> (VU)
	12.ii.d EAAA for regularly occurring nationally or regionally listed EN or CR species	<u>Bats</u> (*1, already triggering cr.12 ii.a) <i>Rhinolophus blasii</i> (EN on the Armenian Red book) <u>Birds</u> (*2) <i>Neophron percnopterus</i> (EN) already triggering cr.12 ii.a and ii.b <i>Aegypius monachus</i> (EN) already triggering cr.12 ii.a <u>Insects</u> (*1) <i>Polyommatus (Agrodiaetus) huberti</i> (EN on the Armenian Red book)
	12.ii.e EAAA for regularly occurring range-restricted species	<u>Reptiles</u> (*2) <i>Vipera eriwanensis</i> (VU) already qualifying as 12.ii.d <i>Montivipera raddei</i> (NT) <u>Insects</u> (*1) <i>Polyommatus aserbeidschanus</i> (NE) already qualifying for Cr 14 ii.d
	12.iii Significant biodiversity features identified by a broad set of stakeholders or governments	<u>Insects</u> (*1) <i>Brenthis ino</i> (LC) <u>Birds</u> (*3) <i>Tetrao mlokosiewiczzi</i> (NT) <i>Tetraogallus caspius</i> (LC) <i>Accipiter gentilis</i> (LC)
<b>Critical Habitats as per EBRD PR6 (§14)</b>		
	14.ii.d EAAA for important concentrations of a nationally or regionally listed EN or CR species	<u>Terrestrial mammals</u> (*2) <i>Ovis gmelinii gmelinii</i> (NT) <i>Panthera pardus saxicolor</i> (CR on the Armenian Red book) <u>Insect</u> (*1) <i>Polyommatus (Agrodiaetus) aserbeidschanus</i> (EN on the Armenian Redbook) <u>Flora</u> (*5) <i>Hypericum armenum</i> (CR on the Armenian Redbook) <i>Astragalus xiphidium</i> (EN on the Armenian Redbook) <i>Iris lineolata</i> (EN on the Armenian Redbook) <i>Tulipa sosnowskyi</i> (EN on the Armenian Redbook) <i>Tulipa florenskyi</i> (EN on the Armenian Redbook)
iii	14.iii.a EAAA regularly holds ≥ 10% of global population AND ≥ 10 reproductive units of the species***	<u>Flora</u> (*1) <i>Hypericum armenum</i> (CR on the Armenian Redbook) already triggering 14 ii.d

<sup>26</sup> On the global IUCN Redlist

**Table 3. Summary Table of Critical Habitats Identified in the Study Area as per EIB ESS4**

N°	Criterion	Features (Habitats/ecosystems/species)
<b>Critical Habitats as per EIB ESS4</b>		
1	1.a Priority Habitats listed in Annex I of the Habitats Directive and habitats considered to be their equivalent in countries outside the EU	<u>Habitats</u> (x2) 6240*: Sub-Pannonic steppic grasslands 40A0*: Subcontinental peri-Pannonic scrub
	2.c Nationally or regionally-important concentration of a species listed as endangered or critically endangered on a regional/national IUCN Red List, or equivalent on national/regional listing.	<u>Terrestrial mammals</u> (*2) <i>Ovis gmelinii gmelinii</i> (EN on the Armenian redbook) also triggering 2.d <i>Panthera pardus saxicolor</i> (VU) <u>Insect</u> (*1) <i>Polyommatus (Agrodiaetus) aserbeidschanus</i> (EN on the Armenian Redbook) <u>Flora</u> (*5) <i>Hypericum armenum</i> (CR on the Armenian Redbook) <i>Astragalus xiphidium</i> (EN on the Armenian Redbook) <i>Iris lineolata</i> (EN on the Armenian Redbook) <i>Tulipa sosnowskyi</i> (EN on the Armenian Redbook) <i>Tulipa florenskyi</i> (EN on the Armenian Redbook)
2	2.d A population of species listed in Annex II and IV of the Habitats Directive	<u>Terrestrial mammals</u> (x8) <i>Ovis gmelinii gmelinii</i> (NT) <i>Capra aegagrus</i> (VU) <i>Ursus arctos</i> (LC) <i>Canis lupus</i> (LC) <i>Vormela peregusna</i> (VU) <i>Lutra lutra</i> (NT) <i>Felis silvestris</i> (LC) <i>Lynx lynx</i> (LC) <u>Bats</u> (x8) <i>Rhinolophus mehelyi</i> (VU) <i>Rhinolophus euryale</i> (NT) <i>Rhinolophus ferrumequinum</i> (NT) <i>Rhinolophus hipposideros</i> (NT) <i>Rhinolophus blasii</i> (LC) <i>Miniopterus schreibersii</i> (VU) <i>Myotis blythii</i> (LC) <i>Myotis emarginatus</i> (LC) <u>Reptiles</u> (*2) <i>Testudo graeca</i> (VU) <i>Emys orbicularis</i> (NT) <u>Insects</u> (*2) <i>Parnassius apollo</i> (NT) <i>Maculinea arion</i> (NT)
3	3.a EAAA regularly holds $\geq 10\%$ of global population AND $\geq 10$ reproductive units of the species***	<u>Flora</u> (*1) <i>Hypericum armenum</i> (CR on the Armenian Redbook) already triggering 14 ii.d

**Table 4. Synthesis of the Numbers of PBF and CH Identified in the EAAA by Groups**

Group	EBRD PR6		EIB ESS4
	Biodiversity Priority Features	Critical Habitat	Critical Habitat
Habitats	7 habitats	/	2 habitats
Plants	/	5 species	5 species
Terrestrial Mammals	6 species	2 species	9 species
Bats	8 species	/	<b>8 species</b>
Birds	26 species	/	/
Reptiles	4 species	/	2 species
Amphibians	/	/	/
Insects	3 species	1 species	3 species

**Table 5. Conclusion Table of Habitats and Species Triggering CH taking into Account the More Stringent of the 3 Lenders Standards (EBRD/EIB/ADB)**

N°	Groups	Critical Habitats triggers
1	Habitats (*2)	6240*: Sub-Pannonic steppic grasslands 40A0*: Subcontinental peri-Pannonic scrub
2	Plants (*5)	<i>Hypericum armenum</i> (CR on the Armenian Redbook) <i>Astragalus xiphidium</i> (EN on the Armenian Redbook) <i>Iris lineolata</i> (EN on the Armenian Redbook) <i>Tulipa sosnowskyi</i> (EN on the Armenian Redbook) <i>Tulipa florenskyi</i> (EN on the Armenian Redbook)
3	Terrestrial Mammals (*9)	Armenian Mouflon, <i>Ovis gmelinii gmelinii</i> (NT) Bezoar Goat, <i>Capra aegagrus</i> (VU) Brown Bear, <i>Ursus arctos</i> (LC) Grey Wolf, <i>Canis lupus</i> (LC) Marble Polecat, <i>Vormela peregusna</i> (VU) Eurasian Otter, <i>Lutra lutra</i> (NT) Wildcat, <i>Felis silvestris</i> (LC) Lynx, <i>Lynx lynx</i> (LC) Caucasian Leopard, <i>Panthera pardus saxicolor</i> (VU)
4	Bats (*8)	<i>Rhinolophus mehelyi</i> (VU) <i>Rhinolophus euryale</i> (NT) <i>Rhinolophus ferrumequinum</i> (NT) <i>Rhinolophus hipposideros</i> (NT) <i>Rhinolophus blasii</i> (LC) <i>Miniopterus schreibersii</i> (VU) <i>Myotis blythii</i> (LC) <i>Myotis emarginatus</i> (LC)
5	Reptiles (*2)	<i>Testudo graeca</i> (VU) <i>Emys orbicularis</i> (NT)
6	Insects (*3)	<i>Polyommatus (Agrodiaetus) aserbeidschanus</i> (EN on the Armenian Redbook) <i>Parnassius apollo</i> (NT) <i>Maculinea arion</i> (NT)

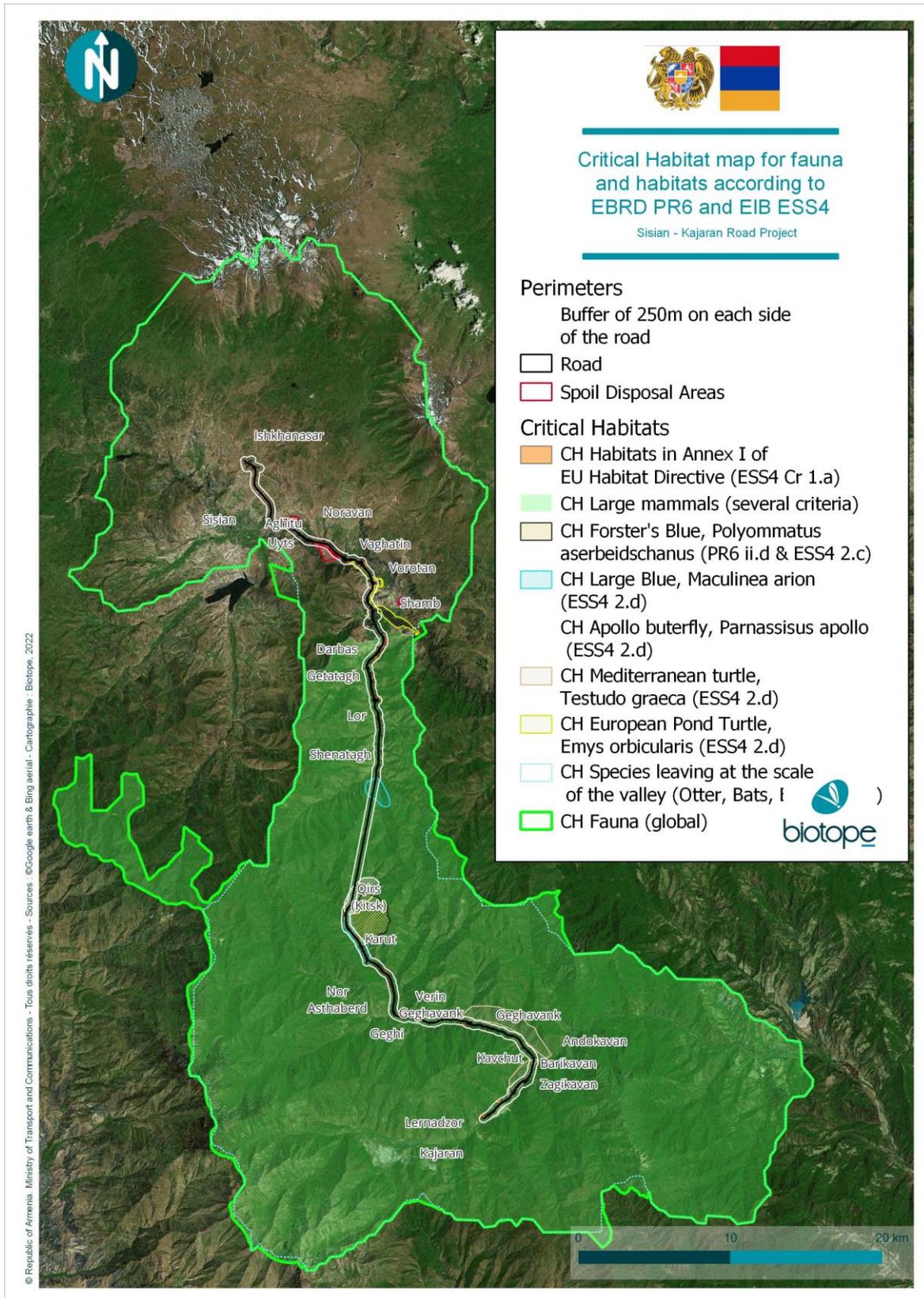


Figure 4. Critical Habitat Map for Fauna and Habitats (according to EBRD and EIB Criteria)

## 5. SUMMARY OF POTENTIAL IMPACTS

As presented in the ESIA, the Project will be implemented in a biodiversity sensitive area, of which many are listed endemic and/or threatened in the IUCN Red List and/or the Armenian Red book. Biodiversity impacts are likely during both construction and operations.

The methodology for assessing the significance of impacts is provided in Section 5.5 of ESIA Volume 1. The impacts of the Project on biodiversity will occur during:

- Construction phase, and
- Operation and maintenance phase.

The methodology of impact assessment, including identification of impact magnitude, proposed descriptors, and criteria for the sensitivity of receptors, and definition of impact significance are detailed in **Section 5 of ESIA Volume 1**. *Impact significance* is determined as a function of a receptor's *sensitivity* to the Project's pressure and the *impact magnitude* (extent of change to the natural or social environment), which is determined by its spatial extent, duration, potential to occur, and reversibility of expected changes. Receptor sensitivity ranges on a four-level scale from high, medium, low to very low; impact magnitude ranges on a four-level scale from high, medium, low, and negligible and additionally can be of 'no-change'. The key significance categories used within the ESIA are major, moderate, minor, and negligible; significance grades were determined for both positive impacts and negative impacts. Potential impacts on biodiversity and ecosystem services (including PBF and CH triggers) derive from:

- Activities during construction phase:
  - Degradation, fragmentation, and destruction (loss) of habitats (vegetation clearance, excavation, risk of soil and/or watercourse pollution, risk of acid rock drainage, etc.)
  - Flora species loss (vegetation clearance and excavation)
  - Disturbance of fauna species by dust, noise, vibration, blasting and light pollution (construction machinery, base camps, traffic, lighting of the infrastructure)
  - Introduction and proliferation of invasive alien species,
  - Disturbance and damage of aquatic fauna species from water contamination (accidental events), sediment resuspension,
  - Loss of ecological connectivity for large mammal species (infrastructure crossing wildlife corridors acting as a barrier effect)
- Activities during operational phase:
  - Increased mortality of fauna species (collision, loss of species habitats and ecological connectivity, delay in migration patterns, increased poaching pressure, etc.)
  - Loss of ecological connectivity for large mammal species (infrastructure crossing wildlife corridors acting as a barrier effect)
  - Disturbance of fauna species by noise and light pollution (traffic, lighting of the infrastructures)
  - Edge effect
  - Induced impacts by increase access to a previously remote natural area (in-migration).

Positive impacts of this project will be socio-economic and the safety and amenity for road users. There are no positive impacts on biodiversity.

As there are many biodiversity receptors (terrestrial and aquatic habitats and species) and many types of impacts on each receptor, no individual impact assessment table

have been developed (as in other ESIA volumes). Rather the characteristics of the construction and operation impacts were described together and per group and then the results were synthesised in the aggregate table in **Table 6**.

Indeed, the important number of Priority Biodiversity Features and critical habitat triggering species and the fact that they constitute umbrella species (species whose conservation confers protection to many naturally co-occurring species) allows that mitigation measures that will be applied to these species will be beneficiary as well for the other species sharing the same ecology and/or habitat.

**Table 6. Assessment of Impacts on Biodiversity Features**

Receptor		Impact identification	Impact Assessment		
			Sensitivity	Magnitude	Relative impact significance
Habitats		Alien Invasive species proliferation ( <i>Ailanthus altissima</i> )	Low	Low	Minor
3240	Alpine rivers and their ligneous vegetation with <i>Salix elaeagnos</i>	Habitat degradation (1.32ha*0.25=0.33ha)	Medium	Low	Moderate
6190	Rupicolous pannonic grasslands ( <i>Stipo-Festucetalia pallentis</i> )	Habitat loss (94.71ha)	High	High	Major
		Habitat degradation (632.6ha*0.25=158ha)	Medium	Medium	Moderate
62A0	Eastern sub-mediterranean dry grasslands ( <i>Scorzoneratalia villosae</i> )	Habitat loss (1.43ha)	High	High	Major
		Habitat degradation (7.61ha*0.25=2ha)	High	Low	Moderate
6240*	Sub-Pannonic steppic grasslands	Habitat loss (6.61ha)	High	High	Major
		Habitat degradation (71.84ha*0.25=18ha)	High	Low	Moderate
6170	Alpine and subalpine calcareous grasslands	Habitat loss (15.72ha)	High	High	Major
		Habitat degradation (9.77ha*0.25=2.5ha)	High	Low	Moderate
40A0*	Subcontinental peri-Pannonic scrub	Habitat loss (20.72ha)	High	High	Major
		Habitat degradation (204.09ha*0.25=51ha)	High	Low	Moderate
9160	Sub-Atlantic and medio-European oak or oak-hornbeam forests of the <i>Carpinion betuli</i>	Habitat loss (15.63ha)	Medium	High	Major
		Habitat degradation (241.41ha*0.25=60.5ha)	Medium	Low	Moderate
9170	Galio-Carpinetum oak-hornbeam forests	Habitat loss (2.21ha)	Medium	High	Major
		Habitat degradation (26.33ha*0.25=6.5ha)	Medium	Low	Moderate
92A0	<i>Salix alba</i> and <i>Populus alba</i> galleries	Habitat loss (3.27ha)	Medium	High	Major
		Habitat loss (149.7ha*0.25=37.5ha)	Low	Low	Minor
5210	Arborescent matorral with <i>Juniperus spp.</i>	Habitat loss (30.43ha)	High	High	Major
		Habitat degradation (221.39ha*0.25=55.5ha)	Medium	Low	Moderate
8210	Calcareous rocky slopes with	Habitat loss (8.54ha)	High	High	Major

Receptor		Impact identification	Impact Assessment		
			Sensitivity	Magnitude	Relative impact significance
	chasmophytic vegetation	Habitat degradation (69.85ha*0.25=17.5ha)	High	Low	Moderate
Flora species		Flora species loss - Loss of 2 locations of CH species that are well distributed in the EAAA.	High	Low	Moderate
		Disturbance by dust, affects the photosynthesis, potential necrosis of the plant tissue due to impacts to plant stomata.		Low	Moderate
Large terrestrial mammals and associated habitats Brown Bear, Grey Wolf, Armenian Mouflon, Persian Leopard, Eurasian Lynx, Wildcat, Bezoar Goat, Marbled polecat		Degradation, fragmentation of habitats by the road	High	Medium	Major
		Loss of ecological connectivity for large mammals		High	Major
		Increased mortality of individuals (e.g. through collision with vehicles, etc.)		High	Major
		Disturbance by air, soil, water and light pollution, dust and noise		Low	Moderate
		Disturbance by explosion and vibration from blasting		High	Major
		Increasing presence of human settlements and activities and Increasing access, including facilitated access to new farmlands, pastures, hunting and fishing areas (and potential poaching)		Medium	Major
Aquatic species and associated habitats Eurasian Otter		Degradation of watercourses by sedimentation during construction phase	High	Medium	Major
		Loss of ecological connectivity		Medium	Major
		Disturbance and damage from water contamination (accidental events) during Construction and possibly during operation phase		Medium	Major
Bats and their associated habitats Mehely's horseshoe bat, Mediterranean horseshoe bat, Blasius' horseshoe bat, Schreiber's Bat, Greater Horseshoe Bat, Lesser Horseshoe Bat, Lesser Mouse-eared Myotis, Geoffroy's Bat, etc.		Degradation, fragmentation, and destruction of habitats The project footprint corresponds to 0.28% of the EAAA (3.86/1369), so the magnitude is low	High	Low	Moderate
		Increased mortality of individuals (e.g. through collision with vehicles, etc.)	Medium	Medium	Moderate
		Disturbance by air, soil, water and light pollution, dust, noise and vibration from blasting	Medium	Medium	Moderate
Raptors and their associated habitats Bearded Vulture, Black Vulture, Egyptian Vulture, Golden Eagle, Griffon Vulture, Lesser Spotted Eagle, Northern Goshawk, Short-toed Snake-eagle, etc.		Degradation, fragmentation, and destruction of habitats (especially for Short toed Snake-eagle and Northern Goshawk). No impact on habitats for Vultures and Eagles	Medium	Low	Moderate
Lekking bird species and associated habitats Caspian Snowcock, Caucasian Black Grouse		Disturbance by air, soil, water and light pollution, dust, noise and vibration from blasting. Mostly blasting is concerned for those species	High	High	Major
Reptile species and their associated habitats Armenian steppe viper, Radde's Viper, Mediterranean turtle, Eurasian Pond Turtle, etc.		Increased mortality of individuals through collision with vehicles	Medium	Medium	Moderate
		Disturbance by air, soil, water and light pollution, dust, noise and vibration from blasting. Only blasting is concerned for those species		Medium	Moderate
Insect species Forster's Blue, Apollo Butterfly, Large Blue, etc.		Degradation, fragmentation, and destruction of habitats The project footprint corresponds to 7.35% of the EAAA (0.5km <sup>2</sup> /6.8km <sup>2</sup> ), so the magnitude is medium	Medium	Medium	Moderate
		Disturbance by air, soil, water and light pollution, dust, noise and vibration		Medium	Moderate

## 6. MITIGATION MEASURES AND KEY IMPLEMENTATION ROLES

Mitigation has been planned according to the **mitigation hierarchy** as per the E&S policies and standards of the three Lenders meaning that avoidance has been prioritised, followed by reduction and minimisation, with measurable offsets only applied as a last resort where residual impacts are unavoidable, or as an additional conservation measure. Mitigation has been formulated for the pre-construction / detailed design, construction, and operational project stages. Some mitigation will need to be implemented for all Project stages, such as the delineation of the project boundaries.

The overall responsibility for the implementation of the BAP rests with the Road Department (RD), including the offset measures. The RD and their Project Implementation Unit will be supported by the Project Implementation Consultant, that will provide biodiversity capacity-building to the RD and its contractors engaged in the Project implementation, assist the RD in integrating the BAP actions into the Project overall environmental and social management system, and should provide expertise in developing the BOMP.

Construction Contractor, selected through the RD bidding process and responsible for Project construction, will implement the **mitigation measures** identified in the ESMP and this BAP, such as the inclusion of the wild animal passages and fencing in the updated detailed design, while the offset measures are the RD's responsibility to implement through cooperation with the key stakeholders identified in this BAP. The Contractor must have a Biodiversity Specialist with international experience / experience with lender requirements who will implement the BAP. The Contractor will engage a specialised biodiversity organisation to implement specific pre-construction surveys.

Supervision Engineer will be appointed by the RD to monitor Project implementation and ensure compliance with the Project's ESMP, BAP and other commitments. The Supervision Engineer must have a Biodiversity Specialist with international experience / experience with lender requirements who will monitor the BAP and BOMP implementation and report on the progress to the RD.

Any revisions / updates to the BAP will be approved by the Lenders.

**Table 7. Proposed biodiversity impact mitigation**

MITIGATION MEASURES – AVOIDANCE– REDUCTION – RESTORATION	
<b>Design phase and Pre-construction (land clearance)</b>	
<b>AVOIDANCE (AV)</b>	<p><b>AV01</b> – Prevent/avoid construction works and/or setting-up dumpsites or any other type of infrastructure inside the Zangezur ASCI (e.g., the portals have been relocated outside of the ASCI, and there will be no ventilation shafts daylighting in the reserve to avoid Annex I habitats loss in the PA).</p> <p><b>AV02</b> – Prevent/avoid construction, and/or establishing SDAs or other infrastructure in the transversal valleys between Kitsk and Kajaran in the identified no-go zones and prioritize the use of closed mining tailing south of the M2 between Kavchut and Lerdnazor for SDAs</p> <p><b>AV03</b> – Contain all activities within the project footprint and inform all operators on the strict necessity to respect project boundaries. Any clearance or other impacts outside the project footprint must be treated as an environmental incident and immediately restored/remediated. If the incident is in critical habitat, the habitat loss must be added to the offsetting needed to achieve net habitat gain.</p> <p><b>AV04</b> – Avoid creating new access routes for project activities and/or local community access. Prioritise existing tracks and access roads for use. Detailed maps of all existing tracks and access roads must be produced along with impact reduction measures (e.g., speed reduction, no hooting, etc. cf. RD02. Development of a Traffic Management Plan on construction Sites (see ESAP Action 1.2, also the Project's ESMP).</p>

MITIGATION MEASURES – AVOIDANCE– REDUCTION – RESTORATION	
	<p><b>AV05</b> – Avoid all activities including land clearance, cutting trees and blasting during breeding period and migration period, especially from 15<sup>th</sup> of March to 10<sup>th</sup> of June and from 15<sup>th</sup> of October to 15<sup>th</sup> of November, to limit impacts of the project on large mammals, bats, avifauna, reptiles and butterflies.</p> <p><b>AV11</b> - Adapt the road alignment to preferentially use already degraded habitats and/or existing road instead of destroying natural habitats</p>
<b>REDUCTION (RD)</b>	<p><b>RD01</b> – Establish a 200 m buffer zone (100m on each side of the watercourse) on permanent rivers and streams, where activities will be prohibited (apart from where bridges are to be built).</p> <p><b>RD02</b> – Develop a <b>Traffic Management Plan</b> on construction Sites containing maps of access to construction sites, and implement training of all the employees to avoid traffic outside of the “off-track” and respect speed limits (&lt; 30km/h), for both human safety and to decrease the risk of wildlife (mammals, reptiles, amphibians, bats, birds and butterflies) collision and disturbance.</p> <p><b>RD03</b> – Clearly delineate project boundaries, especially in critical habitats, with relevant signage to inform employees and local communities on biodiversity and potential risks.</p> <p><b>RD04</b> – Control access on tracks developed for the Project purpose to limit all access to natural areas and critical habitats (from DK 28+000 till DK 60+000), especially south of the Bargushat Tunnel</p> <p><b>RD05</b> – Minimise pesticide use, replacing it with biological methods of pest control and organic maintenance of the road and associated facilities</p> <p><b>RD06</b> – Minimise impacts by adjustments of the location of the annexes following Pre-Construction Biodiversity surveys to preferentially use already degraded habitats and/or existing road instead of destroying natural habitats</p> <p><b>RD07 - Design suitable wildlife crossings</b> (preferably overpasses and/or road passing on bridges for large mammals and amphibian tunnels when in the vicinity of conservation-worthy habitats) and establish them in locations to restore ecological continuity for large mammals where this could otherwise be impaired by the project (cf. <a href="#">Annex 6</a> and <a href="#">Annex 7</a>).</p> <p><b>RD08</b> – Develop a <b>Waste management plan</b> (see ESAP Action 1.2, also the Project’s ESMP). Temporary organic waste storage must be kept dry and no water discharge allowed before treatment in conformity with International and national quality standards. Moreover, the pre-treatment of the waste rocks of the tunnels before disposal should be addressed, detailed, and implemented (risk of acid rock drainage due to the presence of sulphur oxides in the waste rock).</p> <p><b>RD09</b> – Develop an <b>Erosion and Sediment Control plan</b> and <b>Spill Prevention Control and Countermeasures plan</b> (see ESAP Action 1.2, also the Project’s ESMP) to limit erosion and sediment resuspension in watercourses (e.g., including installation of separators and treatment facilities to clean water runoff from sediments prior discharge into rivers, regularly inspect repair or maintain drainage structures to avoid sedimentation, etc.)</p> <p><b>RD10</b> – Develop an <b>Invasive Alien Species Management Plan</b> (see ESAP Action 1.2, also the Project’s ESMP) to prevent the spread of alien species through vehicle movement. Include dominant species that could also spread and degrade natural or critical habitats such as pseudo-steppes and grasslands (e.g., thistle species, etc.), into the plan.</p> <p><b>RD11</b> – Optimize cut to fill ratio to limit the area needed for storage of excavated material</p> <p><b>RD12</b> – Implement <b>pre-construction biodiversity surveys</b> (PCBS) in the final project footprint in areas with a high ecological value (from DK 28+000 till DK 60+000) prior to any type of construction for any type of infrastructure – even Annexes such as base camps, parking, SDAs, etc. and access roads (conducted by experts– e.g. flora, birds, mammals, bats, reptiles and amphibians) in order to check for the presence of CH triggering species, threatened species listed on the Armenian Red book (e.g. <i>Sclerochloa woronowii</i>), and breeding sites (e.g. nests, dens, etc.), the presence of endemic and/or restricted-range plant stations, of Alien Invasive Species (AIS), and so forth. Represent findings on maps and verify the no-go areas (presented in Volume 2 of the ESIA), if needed. Regarding flora AIS, maps of the exact location of the IAS should be prepared to either 1/remove it and dispose of it</p>

MITIGATION MEASURES – AVOIDANCE– REDUCTION – RESTORATION	
	properly (AIS under the footprint) 2/delineate it to avoid touching it (if at the border of the footprint). Regarding reptiles and amphibians, salvaging actions might be needed if individuals were to be found on the future construction site, so the qualified biodiversity expert needs to obtain/have proper permits for wildlife handling and transport, and in the case of species encounter, he/she should relocate the individuals outside of the area of impact to another nearby suitable site within the same general habitat (e.g. within daily or season movement distances) and including favourable microhabitats/refuges such as stones, piles of rocks, brick piles, woody debris, etc. If needed, install temporary exclusion fencing where relevant to prevent the salvaged individuals from returning to the work area during construction. Upon completion of the project work, remove the fencing.
<b>RESTORATION (RE)</b>	<b>RE01</b> – Develop a <b>Restoration plan</b> including restoration of temporary project Annexes (restoration of areas degraded by the project and no longer needed – ex. Base camps) and restoration/closure of dumping sites (see ESMP, ESAP Action 1.2.). Restoration must start as soon as possible and be progressively phased.
Construction	
<b>AVOIDING (AV)</b>	<p><b>AV06</b> – Prevent contaminated effluent from entering watercourses and streams.</p> <p><b>AV07</b> – Protect trees (including their roots) from machinery damage along the right-of-way by marking and prohibiting machinery in the area under the tree crown.</p> <p><b>AV08</b> – If found later (for yet unknown locations of construction camps, SDAs), access to the caves (roosting sites for bats) must be prohibited. Install signs at sites close to roads and project facilities to raise awareness about the presence of caves hosting bat populations and necessary conservation measures.</p> <p><b>AV09</b> – Avoid lighting in the proximity of bat roosting sites and/or raptors nesting sites and prohibit direct night lighting of caves where the presence of bats and nesting raptors would be confirmed after Pre-Construction Biodiversity Surveys on new footprints.</p> <p><b>AV10</b> – Prohibit hunting and natural resource harvesting (consumption of bushmeat by workforce or cutting trees for heating and cooking) within the project area and arrange sharing/capacity building program on the importance and values of priority biodiversity with local communities and employees. Contractors must supply energy in the base camps to prevent wood collection. Prohibit pesticides for control of damage-causing animals, harvesting fish and bushmeat, harvesting animals for traditional medicine, poaching for wildlife products, etc.</p>
<b>REDUCING (RE)</b>	<p><b>RD13</b> – Set up temporary culverts for stream crossings and rehabilitate after work is completed.</p> <p><b>RD14</b> – Strip topsoil to a depth of 10cm and store separately from remaining topsoil to retain a soil seed bank for use in restoration of natural habitats following suitable protocols to ensure the maintenance of a viable seedbank.</p> <p><b>RD15</b> – Monitor the presence of Armenian Mouflon and other large mammals (e.g., Bezoar Goat, Brown Bear, Grey Wolf, Lynx) in the vicinity of construction in key crossing areas, and during maintenance phases at the wildlife crossings by setting-up a network of Infra-red cameras that will continuously record (day and night) in real-time wildlife, cattle, and local communities. Monitor the sensitive isolated populations of the priority butterfly species as well, in order to track the potential impact of the road operation on these species, and if necessary, develop further mitigation.</p> <p><b>RD16</b> – Define and display clear rules forbidding hunting, poaching and plant collection, on construction sites and in the vicinity of the same.</p> <p><b>RD17</b> –Biodiversity specialists to be present at the beginning of construction in sections with high ecological value (from DK 28+000 till DK 60+000) in case of presence of PBF or CH species so that they can be removed prior to site preparation and in that eventuality, to record this data in a global biodiversity database at the scale of the whole alignment.</p>

MITIGATION MEASURES – AVOIDANCE– REDUCTION – RESTORATION	
	<p><b>RD18</b> – Water unpaved roads during construction. Adapt the frequency to the weather conditions, keeping in mind that regular light watering is better than less frequent, heavy watering.</p> <p><b>RD19</b> – Biodiversity specialists to review blasting plans for all tunnel areas and facilitate monitoring changes in bat behaviour and/or large mammal and lekking birds' behaviour as a result of blasting in order to improve knowledge of the actual impacts on biodiversity. Any updates/changes to the blasting plan should be communicated to the Biodiversity specialists of the RD/Project Implementation Unit &amp; Support Consultant, Contractor, and Supervision Engineer as soon as possible.</p> <p><b>RD20</b> – Establish fencing of ca. 2m height (and 30-50 cm underground) all along the road or at least 1km before and after every type of crossing (e.g. wildlife, cattle, agricultural crossings) combined with jump-outs or exit ramps (in areas where the road is not on a bridge or in a tunnel or cut in a steep slope) (NB: safety guardrails on both sides of the road for the entire length of the road apart from tunnels are envisioned to be included in the updated detailed design, however these are not sufficient to prevent animals from entering the road).</p>
<b>RESTORATION (RE)</b>	<p><b>RE02</b> – Develop a tree nursery (and seed store), containing <i>Juniperus sp.</i> and endemic species impacted by the project, based on pre-construction biodiversity surveys (PCBS) (or other species associated with the natural ecosystems observed in the project footprint) and ensure recovery of forest products from vegetation clearance and establish mechanisms to distribute them among the local population and use for site rehabilitation. The selection of trees (and seeds) and the location of replanting must be validated by a flora expert.</p> <p><b>RE03</b> – Implement passive restoration (as per the details provided below in BMP 4. Demarcate “no go” areas (based on habitat quality/type) for employees, subcontractors, and communities, within the project area, favouring natural regeneration of plant species and supplement with regular control and monitoring activities to compare with assisted regeneration.</p>
<b>Operations/Maintenance</b>	
<b>REDUCING (RD)</b>	<p><b>RD21</b> – Limit fixed-source lighting along the road only to critical areas representing a risk for human safety (e.g., interchanges, tunnels, or intersections if present). Maintain darkness for nocturnal species (such as large mammals, bats, and nocturnal birds)</p> <p><b>RD22</b> – Maintain fencing to limit the collision risk in association with wildlife crossings</p>
<b>RESTORATION (RE)</b>	<b>RE02; RE03</b>

In addition to this mitigation, it is crucial to implement universal accompanying measures to ensure the efficiency of the mitigation, such as:

- **AC01:** Training and awareness raising of construction employees on biodiversity, to ensure they fully understand and respect the rules on the construction sites regarding biodiversity protection (speed limitation, strict respect of the limited project footprint, hunting prohibition, etc.)
- **AC02:** Consult protected area sponsors and managers, affected communities and other stakeholders, to ensure no unexpected impacts may occur, and maintain a functional Grievance Mechanism (refer to the Project's Stakeholder Engagement Plan).

**This BAP forms part of the tender documentation for the Project.** All mitigation contained in this BAP will be included in the Terms of Reference and contract of the Construction Contractor and cascaded into contracts of relevant subcontractors as appropriate.

**Project Lenders will be kept updated on BAP implementation progress via regular E&S Monitoring Reports** (by independent external monitoring consultants, as stipulated in the ESAP).

## 7. RESIDUAL IMPACT ASSESMENT

The residual impact, remaining impact after the implementation of the proposed mitigation (*i.e.*, avoidance, minimisation, and restoration) is assessed as follows:

**Minor or Negligible residual impact:** considered as negligible or minor/acceptable residual impacts for which additional measures are not necessary (no offset measures nor additional conservation actions/Biodiversity Net Positive measures).

**Moderate or Major residual impact:** unacceptable unless they can be offset by other positive impacts of the project or controlled through the imposition of permitting conditions and/or specific actions implemented through the project's E&S management and monitoring plan.

**In case of Moderate or Major residual impacts** on 1/priority biodiversity features, additional measures will be designed to achieve "no net loss" and **on 2/critical habitats** net gain is required (through offsets as per EBRD PR6 and EIB ESS4 definitions).

N.B.: In case of Minor or Negligible residual impacts on CH, the net gains can be achieved through additional conservation actions / Biodiversity Net Positive measures.

In order to conclude on the final significance of the potential impact after avoidance and reduction measures, the ESIA biodiversity experts have relied on expert opinion based on the experience of impact mitigation for road construction projects.

**Table 8. Assessment of Residual Impacts on Biodiversity Features**

Receptor		Impact identification	Impact Assessment			Mitigation Measures (Avoiding (Av), reducing (Rd), restoring (Re), Accompanying (Ac))	Residual impact	Offset needed
			Sensitivity	Magnitude	Relative impact significance			
Habitats		Alien Invasive species proliferation ( <i>Ailanthus altissima</i> )	Low	Low	Minor	AV01 ; AV02 ; AV03 ; AV04 ; AV05 ; AV06 ; AV07 ; AV11 RD01 ; RD02 ; RD03 ; RD04 ; RD05 ; RD06 ; RD08 (WMP) ; RD11 ; RD12 ; RD17 ; RD18 RE01 ; RE02 ; RE03	Minor	
3240	Alpine rivers and their ligneous vegetation with <i>Salix elaeagnos</i>	Degradation of habitats (1.32ha*0.25=0.33ha)	Medium	Low	Moderate		Minor	
6190	Rupicolous pannonic grasslands ( <i>Stipo-Festucetalia pallentis</i> )	Habitat loss (94.71ha)	High	High	Major		Moderate	Yes (No Net Loss)
		Degradation of habitats (632.6ha*0.25=158ha)	Medium	Medium	Moderate		Minor	
62A0	Eastern sub-mediterranean dry grasslands ( <i>Scorzoneratalia villosae</i> )	Habitat loss (1.43ha)	High	High	Major		Moderate	Yes (No Net Loss)
		Degradation of habitats (7.61ha*0.25=2ha)	High	Low	Moderate		Minor	
6240*	Sub-Pannonic steppic grasslands	Habitat loss (6.61ha)	High	High	Major		Moderate	Yes (Net gain)
		Degradation of habitats (71.84ha*0.25=18ha)	High	Low	Moderate		Minor	
6170	Alpine and subalpine calcareous grasslands	Habitat loss (15.72ha)	High	High	Major		Moderate	Yes (No Net Loss)
		Degradation of habitats (9.77ha*0.25=2.5ha)	High	Low	Moderate		Minor	
40A0*	Subcontinental peri-Pannonic scrub	Habitat loss (20.72ha)	High	High	Major		Moderate	Yes (Net gain)
		Degradation of habitats (204.09ha*0.25=51ha)	High	Low	Moderate		Minor	
9160	Sub-Atlantic and medio-European oak or oak-hornbeam forests of the <i>Carpinion betuli</i>	Habitat loss (15.63ha)	Medium	High	Major		Moderate	Yes (No Net Loss)
		Degradation of habitats (241.41ha*0.25=60.5ha)	Medium	Low	Moderate		Minor	
9170	Galio-Carpinetum oak-hornbeam forests	Habitat loss (2.21ha)	Medium	High	Major		Moderate	Yes (No Net Loss)
		Degradation of habitats (26.33ha*0.25=6.5ha)	Medium	Low	Moderate		Minor	
92A0	<i>Salix alba</i> and <i>Populus alba</i> galleries	Habitat loss (3.27ha)	Medium	High	Major	Moderate	Yes (No Net Loss)	
		Degradation of habitats (149.7ha*0.25=37.5ha)	Low	Low	Minor	Minor		

Receptor	Impact identification	Impact Assessment			Mitigation Measures (Avoiding (Av), reducing (Rd), restoring (Re), Accompanying (Ac))	Residual impact	Offset needed
		Sensitivity	Magnitude	Relative impact significance			
5210	Arborescent matorral with <i>Juniperus spp.</i>	Habitat loss (30.43ha)	High	High	Major	Moderate	Yes (No Net Loss)
		Degradation of habitats (221.39ha*0.25=55.5ha)	Medium	Low	Moderate	Minor	
8210	Calcareous rocky slopes with chasmophytic vegetation	Habitat loss (8.54ha)	High	High	Major	Moderate	Yes (No Net Loss)
		Degradation of habitats (69.85ha*0.25=17.5ha)	High	Low	Moderate	Minor	
Flora species triggering CH and PBF 5 EN/CR plant species and/or range-restricted	Flora species destruction	High	Low	Moderate	AV01 ; AV02 ; AV03 ; AV04 ; AV05 ; AV07 ; AV11 RD01 ; RD02 ; RD03 ; RD04 ; RD05 ; RD06 ; RD08 (WMP) ; RD12 ; RD17 RE01 ; RE02 ; RE03	Minor	
	Disturbance from dust emission		Low	Moderate	RD18	Minor	
Large terrestrial mammals triggering CH and associated habitats Brown Bear, Grey Wolf, Armenian Mouflon, Persian Leopard, Eurasian Lynx, Wildcat, Bezoar Goat, Marbled polecat	Degradation, fragmentation of habitats by the road	High	Medium	Major	AV01 ; AV02 ; AV03 ; AV04 ; AV05 ; AV06 ; AV07 ; AV10 ; AV11 RD01 ; RD02 ; RD03 ; RD04 ; RD05 ; RD06 ; RD08 (WMP) ; RD11 ; RD15 ; RD18 ; RD19 ; RD20 ; RD 22 RE01 ; RE02 ; RE03	Minor	
	Loss of ecological connectivity for large mammals		High	Major	RD07 ; RD15 ; RD20 ; RD22 RE01 ; RE02 ; RE03	Minor	
	Increased mortality of individuals (e.g. through collision with vehicles, etc.)		High	Major	RD02 ; RD04 ; RD07 ; RD08 ; RD16 ; RD17 ; RD12 ; RD10	Minor	
	Disturbance from air, soil, water and light pollution, dust emission, noises		Low	Moderate	RD08 (WMP) ; RD18 ; RD20 ; RD12 ; RD09	Minor	
	Disturbance from explosion and vibrations from blasting		High	Major	RD19	Minor	
	Increasing presence of human settlements and activities and Increasing access for the communities, including facilitated access to new farmlands, pastures, hunting and fishing areas (and potential poaching)		Medium	Major	AV01 ; AV02 ; AV04 ; AV10 RD03 ; RD04 ; RD16 ; RD20	Minor	

Receptor	Impact identification	Impact Assessment			Mitigation Measures (Avoiding (Av), reducing (Rd), restoring (Re), Accompanying (Ac))	Residual impact	Offset needed
		Sensitivity	Magnitude	Relative impact significance			
Aquatic species triggering CH and associated habitats <i>Eurasian Otter</i>	Degradation of watercourses by sedimentation during construction phase	High	Medium	Major	AV01 ; AV02 ; AV03 ; AV04 ; AV06 ; AV07 RD01 ; RD02 ; RD03 ; RD13 ; RD09 ; RD11 ;	Minor	
	Loss of ecological connectivity		Medium	Major	RD03 ; RD13 RE01 ; RE03	Minor	
	Disturbance and damage from water contamination (accidental events) during Construction and possibly during operation phase		Medium	Major	AV06 RD01 ; RD05 ; RD09	Minor	
Bats qualifying as CH and their associated habitats <i>Mehely's horseshoe bat, Mediterranean horseshoe bat, Blasius' horseshoe bat, Schreiber's Bat, Greater Horseshoe Bat, Lesser Horseshoe Bat, Lesser Mouse-eared Myotis, Geoffroy's Bat, etc.</i>	Degradation, fragmentation, and destruction of foraging habitats such as gallery forest	High	Low	Moderate	AV01 ; AV02 ; AV03 ; AV04 ; AV05 ; AV06 ; AV07 ; AV08 RD01 ; RD02 ; RD03 ; RD05 ; RD08 ; RD11 ; RD17 RE01 ; RE03	Minor	
	Increased mortality of individuals (e.g. through collision with vehicles, etc.)	Medium	Medium	Moderate	RD01, RD02, RD17, RD20, RD21, RD22	Minor	
	Disturbance from air, soil, water and light pollution, dust emission, noises and vibrations from blasting	Medium	Medium	Moderate	AV06 ; AV09 RD08 ; RD17 ; RD18 ; RD19 ; RD20 ; RD12	Minor	
Raptors qualifying as PBF and their associated habitats <i>Bearded Vulture, Black Vulture, Egyptian Vulture, Golden Eagle, Griffon Vulture, Lesser Spotted Eagle, Northern Goshawk, Short-toed Snake-eagle</i>	Degradation, fragmentation, and destruction of habitats (especially for Short-toed Snake Eagle and Northern Goshawk. No impact on habitats for Vulture and Eagle	Medium	Low	Moderate	AV01 ; AV02 ; AV03 ; AV04 ; AV05 ; AV07 ; AV10 RD01 ; RD02 ; RD03 ; RD04 ; RD05 ; RD11 ; RD19 RE01 ; RE02 ; RE03	Minor	
Lekking bird species qualifying as PBF and associated habitats <i>Caspian Snowcock, Caucasian Black Grouse</i>	Disturbance by air, soil, water and light pollution, dust, noise and vibration from blasting. Mostly blasting is concerned for those species	High	High	Major	AV01 ; AV02 ; AV03 ; AV04 ; AV05 ; RD19	Minor	
Reptile species qualifying as PBF and CH <i>Armenian steppe viper, Radde's Viper, Mediterranean turtle, Eurasian Pond Turtle</i>	Increased mortality of individuals through collision with vehicles	Medium	Medium	Moderate	RD02 ; RD03 ; RD04 ; RD07 ; RD10	Minor	
	Disturbance from air, soil, water and light pollution, dust emission, noises and vibrations from blasting. Only		Medium	Moderate	AV06 RD08 ; RD12 ; RD18 ; RD19 ; RD20	Minor	

Receptor	Impact identification	Impact Assessment			Mitigation Measures (Avoiding (Av), reducing (Rd), restoring (Re), Accompanying (Ac))	Residual impact	Offset needed
		Sensitivity	Magnitude	Relative impact significance			
	blasting is concerned for those species						
Insect species qualifying as PBF or CH Forster's Blue, Apollo Butterfly, Large Blue	Degradation, fragmentation, and destruction of habitats	Medium	Medium	Moderate	AV01 ; AV02 ; AV03 ; AV04 ; AV05 ; AV06 ; AV10 RD01 ; RD02 ; RD03 ; RD04 ; RD05 ; RD11 ; RD12 ; RD17 RE01 ; RE02 ; RE03	Minor	
	Disturbance from air, soil and water pollution, dust emission and noises		Medium	Moderate	AV05 RD08 ; RD12 ; RD18	Minor	

Biodiversity Net Positive measures and offsets to achieve « no net loss » (NNL) and « net gain » (NG) are developed hereafter.

## 8. OFFSETTING STRATEGY

The technical rationale of how the project's mitigation strategy will achieve a net gain (NG) or no net loss (NNL), for CH and PBF, respectively, as required by EBRD PR 6 and EIB ESS4, is presented in this section.

The offsetting strategy thus aims **achieve NNL or NG on biodiversity values on which significant residual impacts occur, outside of the Project Aol in order to ensure additionality**, while still being in the area in order to benefit the same impacted ecosystems and species. It is proposed to base the offsetting strategy on these three pillars: monitoring, law enforcement, capacity building and sensitization, adapted and deployed for each of the offsetting measures detailed in **Section 8.3**.

### 8.1. Summary of NNL and NG Goals

The table below lists the PBF and CH for which significant residual impacts occur, and thus for which offsets are needed to deliver NNL/NG as per EBRD PR6 and EIB ESS4. More details are available in the Action sheet BAP 1 of this BAP.

**Table 9. PBF and CH for Which Significant Residual Impacts Occur Requiring NNL/NG Offsets**

Code Natura 2000	Habitat	Type	NNL/NG approach
6240*	Sub-Pannonic steppic grasslands	CH	NG based on habitat restoration and conservation
40A0*	Subcontinental peri-Pannonic scrub	CH	NG based on habitat restoration and conservation
6190	Rupicolous pannonic grasslands (Stipo-Festucetalia pallentis)	PBF	NNL based on habitat restoration
62A0	Eastern sub-mediterranean dry grasslands ( <i>Scorzoneratalia villosae</i> )	PBF	NNL based on habitat restoration
6170	Alpine and subalpine calcareous grasslands	PBF	NNL based on habitat restoration
9160	Sub-Atlantic and medio-European oak or oak-hornbeam forests of the <i>Carpinion betuli</i>	PBF	NNL based on habitat restoration
9170	Galio-Carpinetum oak-hornbeam forests	PBF	NNL based on habitat restoration
92A0	Riverine willow woodland	PBF	NNL based on habitat restoration
5210	Arborescent matorral with <i>Juniperus spp.</i>	PBF	NNL based on habitat restoration
8210	Calcareous rocky slopes with chasmophytic vegetation	PBF	NNL based on habitat restoration

### 8.2. Loss and gain calculation

#### Loss calculation

After implementation of mitigation measures, the key residual impacts are:

- The loss of 6.61 ha of CH Sub-Pannonic steppic grasslands (6240\*)
  - The loss of 20.72 ha of CH Subcontinental peri-Pannonic scrub (40A0\*)
- ⇒ *Both marked as "priority habitat type" in the Annex I of EU Habitats Directive, under the permanent project footprint (NG);*

- The loss of 0.33ha of 3240 Alpine rivers and their ligneous vegetation with *Salix elaeagnos*;
- The loss of 94.71ha of 6190 Rupicolous pannonic grasslands (*Stipo-Festucetalia pallentis*);
- The loss of 15.72ha of 6170 Alpine and subalpine calcareous grasslands
- The loss of 15.63ha of 9160 Sub-Atlantic and medio-European oak or oak-hornbeam forests of the Carpinion betuli
- The loss of 2.21ha of 9170 Galio-Carpinetum oak-hornbeam forests
- The loss of 3.27ha of 92A0 *Salix alba* and *Populus alba* galleries
- The loss of 30.43ha of 5210 Arborescent matorral with *Juniperus spp.*
- The loss of 8.54ha of 8210 Calcareous rocky slopes with chasmophytic vegetation  
⇒ *All listed in Annex I of EU Habitats Directive, under the permanent project footprint (NNL)*

### **Gain calculation**

As the practices in Armenia regarding offsetting multiplier has a range between 1 to 10, the following multipliers are proposed:

- multiplier of 1.5 for the PBF to reach the no net loss target, taking into consideration a restoration success rate of 80% (pers. com. of ADB based on the experience with other NSRC road sections in Armenia) and adding 0.3 multiplier as a precautionary approach if the restoration success would be lower than 80% expected,
- multiplier of 3 for the CH in order to reach the net gain target and to take into consideration the uncertainties on the restoration success.

While consultations on various biodiversity topics have been held with stakeholders (including the timing of baseline studies, location and duration of camera trap surveys, location of the SDAs, migration routes and population size of animals (see ESIA Volume 2 containing the Appropriate Assessment and Critical Habitat Assessment, and **Section 11** below), the multipliers have not been discussed specifically. The BAP with the multipliers was circulated among the stakeholders during the ESIA disclosure and was specifically and repeatedly sent to the MoE with a request to carefully review it. As neither written, nor verbal comments were received about the proposed multipliers, this approach is seen as accepted and would imply the need to realize the following gains through offsetting actions.

**Table 10. Gains Needed regarding Habitats to Achieve a No Net Loss (PBF) or Net Gain (CH)**

Habitats		Loss (ha)	Multiplier	Gain needed (ha)
<b>Critical habitats</b>				
6240*	Sub-Pannonic steppic grasslands	6.61	3	19.83
40A0*	Subcontinental peri-Pannonic scrub	20.72	3	62.16
<b>Total offset CH</b>				82ha
<b>Priority Biodiversity Features</b>				
3240	Alpine rivers and their ligneous vegetation with <i>Salix elaeagnos</i>	0.33	1.5	0.5
6190	Rupicolous pannonic grasslands ( <i>Stipo-Festucetalia pallentis</i> )	94.71	1.5	142.1

Habitats		Loss (ha)	Multiplier	Gain needed (ha)
<b>Critical habitats</b>				
62A0	Eastern sub-mediterranean dry grasslands (Scorzoneratalia villosae)	1.43	1.5	2.1
6170	Alpine and subalpine calcareous grasslands	15.72	1.5	23.6
9160	Sub-Atlantic and medio-European oak or oak-hornbeam forests of the <i>Carpinion betuli</i>	15.63	1.5	23.5
9170	Galio-Carpinetum oak-hornbeam forests	2.21	1.5	3.3
92A0	<i>Salix alba</i> and <i>Populus alba</i> galleries	3.27	1.5	4.9
5210	Arborescent matorral with <i>Juniperus spp.</i>	30.43	1.5	45.6
8210	Calcareous rocky slopes with chasmophytic vegetation	8.54	1.5	12.8
<b>TOTAL OFFSET PBF</b>				<b>258.4 ha</b>

The gains will have to be assessed within the framework of a detailed Biodiversity Offsetting Management Plan (BOMP), based on fieldwork to identify potential restoration areas for the different targets. A first orientation would be to implement fieldwork for the identification of relevant areas in the Zangezur protected area to increase the efficiency of the measures, their control and monitoring in the long-term. The areas to target could be degraded habitats where proper management and conservation would be implemented to decrease pressures on the habitats (overgrazing, overgrowth, etc.) and other areas where habitat could be actively restored. If areas found in the existing protected area would not be enough, these habitats are available at the scale of the largest EAAA to ensure a net gain for these CH, but the precise locations will need to be identified during the BOMP process through fieldwork.

It should be noted that the Project's BAP applies a surface-based approach for off-setting impacts on the priority biodiversity species and critical habitat. The BAP approach and national EIA Conclusion's (i.e., the Environmental Permit) approach (which is based on an individual count of trees and is yet to be clarified in terms of a hectare-based approach) will be merged at the stage of the BOMP development, when the details of the restoration and offset sites are known. The BOMP implementers will monitor the number for each species of trees and shrubs planted in the framework of habitat restoration (per the BAP) and will take this number into consideration in the framework of the compensation for the plantation according to the EIA Conclusion (i.e., the relevant part of the BAP commitments will be integrated into the plantations to reach the targets 1 to 10 for the Redbook species and 1 to 6 for other species).

### 8.3. Offsets and Principles of Biodiversity Net Positive Measures

In addition to mitigation proposed mostly for the construction phase ([Section 6](#)), offsets and Biodiversity Net Positive measures are proposed to achieve a>NNL/NG for the different CH and PBF. The details are presented in the measures below and a summary table is provided in [Annex 5](#).

#### Preliminary offsetting measures

### **BAP 1: Community based critical habitats restoration and conservation targeting degraded habitats**

SCOPE OF THE MEASURE	
<b>Objective:</b>	Set-up a community-based restoration and conservation of Critical habitats (Sub-Pannonic steppic grasslands and Subcontinental peri-Pannonic scrub) and habitats listed in the resolution 4 of the Bern Convention in the vicinity of the project area in order to conciliate local development objectives and biodiversity restoration objectives.
<b>Critical habitat/ Priority Biodiversity Feature concerned:</b>	<p>CH:</p> <ul style="list-style-type: none"> <li>• 6240*: Sub-Pannonic steppic grasslands</li> <li>• 40A0*: Subcontinental peri-Pannonic scrub</li> </ul> <p>PBF:</p> <ul style="list-style-type: none"> <li>• 6190: Rupicolous pannonic grasslands (<i>Stipo-Festucetalia pallentis</i>)</li> <li>• 62A0: Eastern sub-mediterranean dry grasslands (<i>Scorzoneratalia villosae</i>)</li> <li>• 6170: Alpine and subalpine calcareous grasslands</li> <li>• 9160: Sub-Atlantic and medio-European oak or oak-hornbeam forests of the <i>Carpinion betuli</i></li> <li>• 9170: <i>Galio-Carpinetum</i> oak-hornbeam forests</li> <li>• 92A0: Riverine willow woodland</li> <li>• 5210: Arborescent matorral with <i>Juniperus</i> spp.</li> <li>• 8210: Calcareous rocky slopes with chasmophytic vegetation</li> </ul>
MEASURE IMPLEMENTATION	
<b>Project phase:</b>	Project lifespan (pre-construction, construction and operation <sup>27</sup> )
<b>Measure description:</b>	<p>For all types of habitats, the selection of favourable areas and the restoration process should be detailed in the BOMP and set-up precisely by scientists and in close collaboration with local communities in order to ensure their sustainability (long-term efficiency), and a complete ecological diagnostic of the candidate land plots (that are outside of AoI) in order to have a good ecological baseline on the selected potential sites to be able to assess the gains and ensure the NNL or NG.</p> <p>Some orientations for the respective restoration approaches are given below, but dedicated restoration programs should be developed by an agroecologist in the framework of offsetting.</p> <p>The habitats present in the temporary footprints (not spatially defined for the moment: base camps, access roads, etc.) will need to be rehabilitated after completion of construction works in order to contribute to the NNL/NNG approach (RE01, RE02 and RE03).</p> <p>Moreover, other degraded habitats patches outside of the AoI should be looked for to be conserved in order to achieve a Net Gain for CH.</p> <p>The establishment of species-rich grasslands is most successful when seeds, seed-containing plant material or soil are spread on bare soil of ex-arable fields after tilling or topsoil removal, or on raw soils (<a href="#">Kiehl et al, 2009</a>), so this approach could be used for the restoration of different grassland habitats (6240*: Sub-Pannonic steppic grasslands; 6190: Rupicolous pannonic grasslands (<i>Stipo-Festucetalia pallentis</i>) ; 62A0: Eastern sub-mediterranean dry grasslands (<i>Scorzoneratalia villosae</i>) ; 6170: Alpine and subalpine calcareous grasslands).</p> <p>Restoration could be implemented as well through the selection and protection of overgrazed habitats (preventing new grazing activities in these patches and/or controlling grazing activity</p>

<sup>27</sup> Operation in this section implies the loan re-payment period of about 15-20 years.

	<p>Regarding forested habitats, the restoration approach is to find a combination of protection of parcels where natural regeneration will be favoured, and other patches where plantation of young trees and/or seedlings will be implemented in collaboration with local communities / Sisian and Kapan Forestry or even implement Assisted Natural Regeneration (<i>cf.</i> <a href="#">RE02 for the establishment of tree nurseries</a>). It will be important to ensure as well that grazing will be controlled in these parcels as it is one of the threats causing low succession of young trees (too high proportion of overmature trees and too few younger trees, <a href="#">UNECE, 2019</a>).</p> <p>The same approach could be applied for restoration of other habitats. The approach could be based on a combination of (1) protection of the small native areas which survived the construction process, (2) development of necessary conditions for natural regeneration, (3) planting of saplings of the trees, and sowing the seeds of the herbaceous plants.</p> <p>For the CH 6240*: Sub-Pannonic steppic grasslands and 40A0*: Subcontinental peri-Pannonic scrub, an additional conservation or management of parcels in good state of conservation could as well be implemented (<i>e.g.</i>, integration of these habitats in a protected area through an extension or through dedicated community conservation agreement).</p>
<b>Timeline</b>	<p>1<sup>st</sup> year: Pilot workshop and consultations with 2 selected local communities to set-up a community-based restoration program</p> <p>2<sup>nd</sup> year: Implementation of the restoration program</p> <p>3<sup>rd</sup> year: Eventual adaptations to the restoration program/protocol</p>
<b>Location</b>	<p>Forested habitats: Between Shenatagh and Kavchut, in degraded forest areas where their restoration could restore wildlife corridors as well.</p> <p>Grasslands habitats on degraded/overgrazed patches in altitude in the vicinity of the Zangezour Sanctuary, where Armenian Mouflon could potentially be found grazing as well.</p>
<b>Responsible for measure implementation:</b>	Road Department - overall responsibility
<b>Institutional or technical support:</b>	Project Implementation Unit Support Consultant - biodiversity expert / Agro-ecologist expert/botanical expert
<b>Plan to ensure measure durability:</b>	Dedicate an internal RD staff responsible for Biodiversity restoration programme linked with local communities.
<b>Implementation constraints and other remarks:</b>	<ul style="list-style-type: none"> <li>Necessary involvement of local communities</li> <li>As forested habitats take several years to be restored, in the framework of offsetting it is crucial to anticipate this delay in the gains and start the implementation of the action as soon as possible, even before construction starts.</li> <li>Ensure that there are control and reference patches in the protocols proposed to be able to assess the efficiency of the measures implemented</li> </ul>
<b>MEASURE MONITORING (BMP4)</b>	
<b>Key Performance Indicators (KPI) and targets</b>	<ul style="list-style-type: none"> <li>Consultations and workshops with local communities to set-up the pilot study (target=occurrence of this participative process)</li> <li>Area (ha) of Sub-Pannonic steppic grasslands identified for restoration and rehabilitation (target= 6.61 ha)</li> <li>Area (ha) of Subcontinental peri-Pannonic scrub identified for restoration and rehabilitation (target= 20.72 ha)</li> </ul>

	<ul style="list-style-type: none"> <li>• Area (ha) of the other HD Annex I Habitats identified for restoration (<i>cf.</i> details in the table 5)</li> <li>• %age of Sub-Pannonic steppic grasslands successfully restored (target=100%)</li> <li>• %age of ha of Subcontinental peri-Pannonic scrub successfully restored (target=100 %)</li> <li>• %age of ha of each of the other HD Annex I Habitats successfully restored (target=100%)</li> <li>• Annual report presenting the progress in the action and the results and analysis of the restoration processes monitoring (target= presence of the annual report)</li> </ul>
<b>Modalities for monitoring the effectiveness of KPI:</b>	<ul style="list-style-type: none"> <li>• Audit of the protocol, restoration success and their results by the Supervision Engineer's biodiversity (agroecologist) expert</li> </ul>
<b>Monitoring frequency:</b>	<ul style="list-style-type: none"> <li>• Bi-annually during the three first years, then annually</li> </ul>
<b>Responsible for monitoring the measure:</b>	Supervision Engineer

### Biodiversity Net Positive measures

#### BAP 2: Reinforce anti-poaching efforts in the area between Shenatagh and Kajaran

SCOPE OF THE MEASURE	
<b>Objective:</b>	Decrease poaching in the wildest area along the road, especially as there is a risk for it to increase due to induced effects of improved accessibility to once remote places.
<b>Critical habitat/ Priority Biodiversity Feature concerned:</b>	Fauna species, especially large mammals (such as Brown Bear, Grey Wolf, Armenian Mouflon, Persian Leopard, Eurasian Lynx, Wildcat, Bezoar Goat, Marbled polecat)
MEASURE IMPLEMENTATION	
<b>Project phase:</b>	Construction and operation
<b>Measure description:</b>	Anti-poaching is already enforced in the area, especially in the Zangezur Biosphere Complex by the rangers of the protected area. However, the territory to cover is immense, and it seems that poaching pressure on Shenatagh side of the tunnel is higher than on Kitsk side. The aim of this action is to reinforce existing anti-poaching efforts (inside and outside Zangezur protected area), notably to secure stable prey populations for Leopard, which include CH species (Armenian Mouflon, Bezoar goat) in addition to Roe deer, wolf, wild boar, etc. To facilitate this task, include the anti-poaching provisions in the Worker Code of Conduct (see the ESMP and ESAP), conduct training on these provisions and ensure the monitoring of the Project workers. In addition, expand the use of technologies such as drones to increase efficiency of the patrols given the large area to cover and support recruitment and training of the rangers.
<b>Timeline</b>	2023: Consultations with the ZBC, WWF and any other relevant stakeholder to identify opportunities for collaboration to support Anti-poaching effort in the area. During construction: Induction training for all workers about anti-poaching provisions in the Worker Code of Conduct; Poaching evolution monitoring Operation: Diagnostic of poaching once infrastructure is functional and anti-poaching efforts strengthening
<b>Location</b>	Between Shenatagh and Kajaran
<b>Responsible for measure implementation:</b>	Road Department
<b>Institutional or technical support:</b>	Zangezur Biosphere Complex WWF Others – to be updated later
<b>Plan to ensure measure durability:</b>	Contractor to develop and implement the Worker Code of Conduct and capacity building
<b>Implementation constraints and other remarks:</b>	This measure includes potential additional ranger recruitment to support the anti-poaching effort outside of the protected area in cooperation with ZBC.
MEASURE MONITORING	
<b>Key Performance Indicators (KPI) and targets</b>	<ul style="list-style-type: none"> <li>• Anti-poaching provisions included in the Worker Code of Conduct and Project workers trained</li> <li>• Jointly prepared Memorandum of Understanding (between RD with Contractor, ZBC and WWF) about anti-poaching cooperation in the area between</li> </ul>

	<p>Shenatagh and Kajaran and the strengthening actions and support the RD will provide in the framework of the offsetting strategy for the road project (target= Memorandum of Understanding prepared and signed by all the parties)</p> <ul style="list-style-type: none"> <li>• Implementation of the anti-poaching Memorandum of Understanding</li> <li>• Evolution of poaching (number of individuals killed of the different species) (target= decrease of poaching in general and no poaching of priority species)</li> </ul>
<b>Modalities for monitoring the effectiveness of KPI:</b>	<ul style="list-style-type: none"> <li>• Supervision Engineer and Project Implementation Unit</li> </ul>
<b>Monitoring frequency:</b>	<ul style="list-style-type: none"> <li>• Annually</li> </ul>
<b>Responsible for monitoring the measure:</b>	Supervision Engineer (Biodiversity Specialist)

### BAP 3: Contribute to the strengthening and extension of protection and management of Zangezur Biosphere Complex around the project area

#### SCOPE OF THE MEASURE

<b>Objective:</b>	As an impacting project in the natural landscape of the Zangezur Biosphere Complex (ZBC), contribute to the monitoring and data collection of the protected area which is charge of the protection of its biodiversity in order to mutualize efforts and contribute to their biodiversity data collection.
<b>Critical habitat/ Priority Biodiversity Feature concerned:</b>	All habitats, flora and fauna species triggering CH or PBF

#### MEASURE IMPLEMENTATION

<b>Project phase:</b>	Project lifespan (construction and operation)
<b>Measure description:</b>	<p>Set-up and establish a close partnership (maybe through the signing of a <i>Memorandum Of Understanding</i> – MOU that will precise the axis of cooperations and engagements between the 2 parties) with the ZBC in order to:</p> <ul style="list-style-type: none"> <li>• coordinate biodiversity additional surveys and monitoring together (<i>cf.</i> BMP 6),</li> <li>• identify additional threats' locations (<i>e.g.</i> poaching, <i>cf.</i> BAP 2),</li> <li>• identify potential relevant restoration areas for habitats and/or species corridors,</li> <li>• capitalize biodiversity data to improve knowledge on the biodiversity of Zangezur area.</li> </ul> <p>This measure will bring additionality to the measures already implemented by the protected area staff and support them in their management.</p> <p>Opportunities of Zangezur protected area extension could be discussed as well, where deemed relevant, and if support can be provided by the RD regarding PA staff training and recruitment for rangers in order to increase law enforcement as induced impacts will probably increase poaching. It is indeed expected that more patrols will be needed (and at the right time during the day), but the actual work power of the PA will be insufficient to</p>

	<p>satisfy the new needs considering the remoteness and potentially increased area to cover (pers. com. Director of the Zangezur Biosphere Complex SNCO).</p> <p>Finally, the MOU should precise as well the biodiversity data sharing conditions. For example, in that regards the results of the system of video-surveillance network that will be implemented at the wildlife crossings on the road in order to monitor their efficiency (cf. <a href="#">RD07</a> and <a href="#">RD10</a>) will be shared with the ZBC.</p> <p>Finally, establish a governance body to monitor the results of the various long-term monitoring activities (e.g. scientific committee) collected in the framework of the project, and as most of the priority species to monitor contributed to the designation of the Zangezur sanctuary and BC, propose the ZBC to be a key stakeholder of this scientific committee.</p>
<b>Timeline</b>	<p>1<sup>st</sup> year: Consultations with the ZBC to identify opportunities for collaboration and development of an MOU.</p> <p>From 2<sup>nd</sup> year onward: Biodiversity Data sharing with ZBC, coordination of the biodiversity monitoring measures, PA staff training, and patrols reinforcement (recruitment and funding of several rangers).</p>
<b>Location</b>	Zangezur Sanctuary and its vicinity
<b>Responsible for measure implementation:</b>	Road Department during construction (with support of the Project Implementation Unit Support Consultant) and operation phase
<b>Institutional or technical support:</b>	Zangezur Biosphere Complex (ZBC)
<b>Plan to ensure measure durability:</b>	<ul style="list-style-type: none"> <li>Engage the ZBC in the project BOMP design and implementation (e.g. consultations, data sharing)</li> <li>Establishment of a scientific committee in charge of following the progress on biodiversity monitoring linked with mitigation measures implementation, in which the ZBC will have a key role</li> <li>Preparation and signing of a MOU between the RD and the ZBC</li> </ul>
<b>Implementation constraints and other remarks:</b>	/
<b>MEASURE MONITORING</b>	
<b>Key Performance Indicators (KPI) and targets</b>	<ul style="list-style-type: none"> <li><i>Memorandum of Understanding (MOU)</i> establishing the conditions of collaboration between the RD and ZBC and presenting the strengthening actions and support the RD will provide in the framework of the offsetting strategy for the road project (target= MOU prepared and signed by all the parties)</li> <li>Implementation of the MOU (target= Conditions of the MOU fulfilled by both parties)</li> </ul>
<b>Modalities for monitoring the effectiveness of KPI:</b>	<ul style="list-style-type: none"> <li>Audit by a third counter-part (a professional NGO)</li> <li>Initial development of the standard methodology</li> <li>Revision of the capacity of the personnel (regarding data collection, analysis, and interpretation), if necessary, organisation and delivery of the appropriate trainings.</li> </ul>
<b>Monitoring frequency:</b>	<ul style="list-style-type: none"> <li>Annually monitoring of the implementation of the MOU</li> </ul>

<b>Responsible for monitoring the measure:</b>	Supervision Engineer during construction phase (Biodiversity specialist)
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## BAP 4: Community, workforce and stakeholder education on good environmental practices

### SCOPE OF THE MEASURE

<b>Objective:</b>	<ul style="list-style-type: none"> <li>Develop good environmental practices and ensure the sustainability of the BAP actions implemented through:                             <ul style="list-style-type: none"> <li>(a) education and environmental awareness programs for local communities, and</li> <li>(b) training of staff/workers including all the sub-contractors on biodiversity best practices.</li> </ul> </li> <li>Reduce traffic speeds in areas of anticipated large mammals crossing</li> <li>Use training, education, and engagement to combat illegal wildlife poaching along the road (including in newly/facilitated accessible areas)</li> </ul>
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<b>Critical habitat/ Priority Biodiversity Feature concerned:</b>	All habitats, flora and fauna species triggering CH or PBF.
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### MEASURE IMPLEMENTATION

<b>Project phase:</b>	Project lifespan (Pre-construction, construction and operation)
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<b>Measure description:</b>	<p>In addition to construction staff awareness on good environmental practices during construction work, develop community, staff in charge of the road maintenance and stakeholders' education on good environmental practices through workshops and deployment of environmental signage to raise awareness on biodiversity values and their monitoring ; anti-hunting and poaching; sustainable uses of natural resources; cohabitation with Bears, Wolves and shepherds ; reporting in case of Priority species observations ; etc.</p> <p>In this perspective, develop an environmental awareness raising, and education programme for several target groups (e.g., workers on the construction site, schools, local communities) addressing different issues regarding biodiversity relevant to their use and/or relationship to biodiversity. To develop this programme, work with communities to identify an appropriate mechanism for them to participate in conservation and restoration activities (cf. BAP 1), such as conservation committees etc. in order to ensure the sustainability of the biodiversity conservation actions.</p> <p>Some examples but not exhaustive of topics to include in the program:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #008080; color: white;"> <th>Topic</th> <th>Targets</th> </tr> </thead> <tbody> <tr> <td><b>Biodiversity values in the area</b> (presentation of the habitats and key species)</td> <td>Workers, Schools, Local communities</td> </tr> <tr> <td><b>Invasive species management on the construction sites</b></td> <td>Workers</td> </tr> <tr> <td><b>Roadkills and road maintenance</b></td> <td>Workers</td> </tr> </tbody> </table>	Topic	Targets	<b>Biodiversity values in the area</b> (presentation of the habitats and key species)	Workers, Schools, Local communities	<b>Invasive species management on the construction sites</b>	Workers	<b>Roadkills and road maintenance</b>	Workers
Topic	Targets								
<b>Biodiversity values in the area</b> (presentation of the habitats and key species)	Workers, Schools, Local communities								
<b>Invasive species management on the construction sites</b>	Workers								
<b>Roadkills and road maintenance</b>	Workers								

	<table border="1"> <tr> <td><b>Mitigation measures to decrease the impacts on wildlife</b> (e.g., reduction of speed limit, eco-bridges)</td> <td>Workers, Schools, Local communities</td> </tr> <tr> <td><b>Habitat restoration</b></td> <td>Local communities, Schools</td> </tr> <tr> <td><b>Human-wildlife conflicts</b> (Depredation, crop-raiding, poaching, etc.)</td> <td>Workers, Local communities, Schools</td> </tr> </table> <p>It will be important to establish a <u>Biodiversity education referent</u> to coordinate the environmental awareness raising, and education program/Biodiversity education programme design and its implementation with different relevant local NGOs. Moreover, the training program will need to be reviewed and updated regularly (at least on annual basis), following adaptive management approach.</p>	<b>Mitigation measures to decrease the impacts on wildlife</b> (e.g., reduction of speed limit, eco-bridges)	Workers, Schools, Local communities	<b>Habitat restoration</b>	Local communities, Schools	<b>Human-wildlife conflicts</b> (Depredation, crop-raiding, poaching, etc.)	Workers, Local communities, Schools
<b>Mitigation measures to decrease the impacts on wildlife</b> (e.g., reduction of speed limit, eco-bridges)	Workers, Schools, Local communities						
<b>Habitat restoration</b>	Local communities, Schools						
<b>Human-wildlife conflicts</b> (Depredation, crop-raiding, poaching, etc.)	Workers, Local communities, Schools						
<b>Timeline</b>	1 <sup>st</sup> year: Workshops to design the program and program definition and establishment From 2 <sup>nd</sup> year onward: Implementation of the Environmental awareness raising and education program, and review and update of the training program as needed following adaptive management approach.						
<b>Location</b>	All along the road alignment, but especially in the wildest areas (between Shenatagh – Kajaran)						
<b>Responsible for measure implementation:</b>	RD with support of the Project Implementation Unit Support Consultant and Contractor during construction; and RD during operation phase						
<b>Institutional or technical support:</b>	Zangezur Biosphere Complex WWF Armenia Other relevant local NGOs of environmental education						
<b>Plan to ensure measure durability:</b>	Dedicate an internal RD / Project Implementation Unit staff responsible for Biodiversity awareness raising and education						
<b>Implementation constraints and other remarks:</b>	Integrate local communities and local NGOs from the beginning in order to ensure the success of the action						
<b>MEASURE MONITORING</b>							
<b>Key Performance Indicators (KPI) and targets</b>	<ul style="list-style-type: none"> <li>• Workshops with local communities and workers to design the program (target= at least 1 workshop with each the first year)</li> <li>• Staff responsible of Biodiversity awareness raising and education regarding biodiversity values of the area (target= 1 staff from the 1<sup>st</sup> year)</li> <li>• Environmental awareness raising, and education program designed and implemented (target= program designed, based on stakeholder consultations and workshops, and implemented)</li> </ul>						
<b>Modalities for monitoring the effectiveness of KPI:</b>	<ul style="list-style-type: none"> <li>• Audit of the environmental awareness raising, and education program by the supervision engineer's biodiversity staff during the first year, and then following the monitoring frequency below</li> </ul>						
<b>Monitoring frequency:</b>	<ul style="list-style-type: none"> <li>• Annually monitoring of the implementation of the program the subsequent 4 years, and bi-annually afterwards</li> </ul>						
<b>Responsible for monitoring the measure:</b>	Supervision Engineer during (pre)construction						

## BAP 5: Experimental translocation of endemic restricted-range plant species

### SCOPE OF THE MEASURE

<b>Objective:</b>	Decrease the impacts of the project on range-restricted plant species through removal before construction work start and successful translocation (relocation of plants from the area adversely affected by development to a favourable area reserved or protected from ongoing impacts) to contribute to the long-term conservation of the species or community.
<b>Critical habitat/ Priority Biodiversity Feature concerned:</b>	<ul style="list-style-type: none"> <li>• Restricted-range plant species already identified under the project footprint:             <ul style="list-style-type: none"> <li>○ <i>Iris lineolata</i> (EN on the Armenian Redbook)</li> <li>○ <i>Tulipa florenskyi</i> (EN on the Armenian Redbook)</li> <li>○ And other potential Restricted-range plant species found under the project footprint during PCBS, which has not been observed for over several last years in the area or where not identified during the baseline survey in the 500m buffer (e.g. <i>Sclerochloa woronowii</i>, EN on the Armenian Redbook, etc.).</li> </ul> </li> </ul>

### MEASURE IMPLEMENTATION

<b>Project phase:</b>	Project lifespan (pre-construction: removal of the Restricted-range plant individuals/communities and translocation to the favourable and protected habitat; construction and operation: monitoring of the measure efficiency)
<b>Measure description:</b>	<p>Investigate the feasibility of translocation for the different restricted-range flora species under the project footprint and whenever deemed relevant, develop species selective translocation protocols to implement in case such plants stations would be found during the Pre-Construction Biodiversity Survey (PCBS) under the project footprint, in order to remove them and translocate them to favourable areas according to relevant methods in order to maximize the success of this experimental measure (e.g. methods for removal, storage, favourable locations and conditions for planting, planting process and maintenance, monitoring, etc.).</p> <p>In addition, monitor the translocation success in order to improve knowledge on this type of experimental measures and orientate further actions (see BMP9).</p>
<b>Timeline</b>	<p>2023-2024: Align the translocation timing and construction work plan; confirm the translocation potential for the different restricted-range plant species found under the project footprint and develop detailed translocation protocols;</p> <p>Just before construction works: PCBS (<i>cf.</i> RD12) and translocation of the species for which it was validated / it is possible [NB: Any plant translocation process should pass an assessment process and obtain sufficient permit from the Ministry of Environment]</p> <p>After translocation: monitoring of the translocation success following the monitoring proposed in the translocation and monitoring protocol.</p>
<b>Location</b>	Existing concentrations of restricted-range plant species in the EAAA
<b>Responsible for measure implementation:</b>	RD with support of the Project Implementation Unit Support consultant, Contractor and specialised biodiversity organisations in the region, Ministry of Environment -permitting
<b>Institutional or technical support:</b>	<p>Zangezur Biosphere Complex</p> <p>Institute of Botany of NAS RA</p> <p>Armenian Botanical Society</p> <p>Ministry of Environment RA</p> <p>Armenian National Agrarian University</p> <p>Biological Department of Yerevan State University, Botanical Cathedra</p>
<b>Plan to ensure measure durability:</b>	<ul style="list-style-type: none"> <li>• Dedicate an internal RD staff responsible for Biodiversity issues</li> <li>• Ensure the quality of translocation protocols and their adjustment to the ecological traits of the translocated populations to optimise translocation success (e.g., long-term impacts to the recipient ecosystem, carrying capacity of translocation sites and proposing different translocation/management techniques to facilitate practitioners selecting the most effective management actions for the future have been considered and integrated).</li> </ul>

	<ul style="list-style-type: none"> <li>Articulate with the Invasive Alien Species prevention and control plan (RD10) to avoid additional threats to fragile endemic species during translocation process (e.g., use of contaminated material or else).</li> </ul>
<b>Implementation constraints and other remarks:</b>	It is generally unlikely that a mitigation translocation will compensate, in its own right, for impacts generated on that population (hence the experimental character of this measure and its extraction from the biodiversity loss and gain calculations). Thus, the translocation proposals must be assessed very thoroughly in terms of its effectiveness at making a contribution to the long-term conservation of the plant species population or community.
<b>MEASURE MONITORING</b>	
<b>Key Performance Indicators (KPI) and targets</b>	<ul style="list-style-type: none"> <li>Confirmation of translocation measures of restricted-range plant species located under the project footprint (target= translocation potential confirmed)</li> <li>For the restricted-range plant species located under the project footprint, develop and implement the species selective protocols for translocation, including the diagnostic of the translocation sites before translocation (target= to be realistic, it depends on how many plant species and individuals will be effectively present under the project footprint, which will be assessed during PCBS)</li> <li>% translocation success of plant species translocated (target= to be fixed in the translocation protocol depending on the species)</li> </ul>
<b>Modalities for monitoring the effectiveness of KPI:</b>	<ul style="list-style-type: none"> <li>Audit of the protocol, studies, and their results (distribution, abundance, management actions, etc.) by an experienced botanist in translocation</li> </ul>
<b>Monitoring frequency:</b>	<ul style="list-style-type: none"> <li>To be detailed in the BOMP</li> </ul>
<b>Responsible for monitoring the measure:</b>	Supervision Engineer

The details and operational aspects of these offset measures will have to be further developed in the Biodiversity Offsetting Management Plan (BOMP).

The>NNL/NG for habitats and species will be demonstrated by monitoring biodiversity indicators as proposed in the Biodiversity Monitoring section (cf. [Section 9](#)).

## 9. BIODIVERSITY MONITORING

After implementation of additional surveys on elusive species requiring targeted surveys such as the Persian Leopard, Armenian Mouflon, Bezoar Goat, Otter, Lynx and so forth to have a robust baseline, ongoing monitoring and evaluation is the key to adaptive management. Adaptive management is good practice and necessary to ensure the efficiency of the mitigation and offsetting.

For the PBF and CH, it is proposed to establish long-term joint-monitoring with national and local key stakeholders (e.g., WWF, Zangezur Biosphere Complex, Caucasus Nature Fund, Hydrometeorology and Monitoring Centre SNCO) of habitats and so-called “umbrella” species which will also be good indicators of habitat quality, through camera-trapping:

- Terrestrial habitats (grasslands, woodlands, rocky areas, steppes, *Juniperus* endemic forests, etc.): Persian Leopard, Armenian Mouflon, Bezoar Goat, Brown Bear, Grey Wolf, Eurasian Lynx, Bat species,
- Aquatic habitats (rivers, wetlands): Eurasian Otter.

To:

- i/ Better understand the ecology of these animals and the influence of the project on their populations, movements, and behaviour seasonally.
- ii/ Assess the efficacy of the wildlife crossings to evaluate the residual barrier effect of the road on wildlife corridors
- iii/ Assess the efficacy of the offsets in association with local communities in achieving>NNL/NG.

Thus, the proposed **long-term monitoring** is for:

- Armenian Mouflon populations;
- Bezoar Goat populations;
- Persian Leopard;
- Other large terrestrial mammals (Grey Wolf, Brown Bear, Eurasian Lynx, Marbled Polecat);
- Eurasian Otter;
- Vulture species;
- Other endangered species in the Redbook of Armenia (e.g. reptiles, butterflies, etc.);
- Roadkill;
- Area of priority habitats listed in the Annex I of the Habitat directive (Sub-Pannonic steppic grasslands and Subcontinental peri-Pannonic scrub) rehabilitated or restored;
- Area of other habitats listed in the Resolution 6 of the Bern Convention;
- Restricted-range plant species;
- Habitats in the 250m buffer around the road alignment to fine-tune 1/the degradation factor used in the impact assessment and 2/better understand habitat resilience and recovery rate in Armenia.

Two categories will be applied: 1/Monitoring of mitigation measures 2/Species' additional surveys and monitoring, as given in the below table.

**Table 11. List of the Monitoring of Mitigation Measures**

Code	Detail	Key Performance Indicator	Responsible	Indicative cost
<b>Monitoring during construction</b>				
BMP1	<p><b>Monitoring of water quality and Suspended Sediment downstream of construction sites</b></p> <p>Monitor water quality and suspended sediments downstream of construction sites (0-500m unless there is a tributary downstream before 500m) and the functioning of sediment traps every month and after heavy rain episodes</p>	<ul style="list-style-type: none"> <li>• Water quality</li> <li>• Turbidity</li> </ul>	<p>Road Department via the Contractor</p> <p>Supervising engineer to supervise implementation of this activity</p>	No additional cost as it is the job of the biodiversity expert of the construction contractor to implement.
BMP2	<p><b>Monitoring of Flora Alien Invasive Species proliferation</b></p> <p>Ensure that 1/sub-contractors implement Invasive Alien Species Prevention and Control</p>	<ul style="list-style-type: none"> <li>• Presence of an IAS prevention and control plan</li> <li>• Outbreak of invasive species</li> </ul>	Preparation of the Invasive Alien Species Prevention and Control Plan (cf. RD10): sub-contractors	No additional cost as it is the job of the biodiversity expert of the

Code	Detail	Key Performance Indicator	Responsible	Indicative cost
	Plan 2/there is no spread of any AIS (e.g., <i>Ailanthus altissima</i> , <i>Acer negundo</i> or <i>Robinia pseudoacacia</i> ) over the road alignment due to construction works. If any AIS are identified, the biodiversity coordinator is to map the occurrence and define and implement a control plan.	<ul style="list-style-type: none"> <li>• Ha of invasive species along the road</li> </ul>	<p>Control of the AIS spread: Road Department via the Contractor</p> <p>Supervising engineer to supervise implementation of this activity</p>	construction contractor.
<b>Monitoring during operation</b>				
BMP3	<p><b>Monitoring of wildlife crossing efficiency</b></p> <p>Set-up 2 camera-traps – 1 at each side – of each wildlife crossing to continually monitor through the year, regular data collection (videos and images download every 3 months) and analysis in order to implement corrective and adaptive measures as needed (NB: 9 cameras are available at the RD).</p>	<ul style="list-style-type: none"> <li>• Number of camera-traps and functionality</li> <li>• Annual report presenting data collected, monitoring results and associated management interventions</li> <li>• Number of species and individuals utilising the crossings</li> </ul>	Road Department	<p>To be done by RD's expert of camera trapping and mammals</p> <p>50 000 USD for the set-up and 50 000 USD/year for data collection every 3 months and yearly analysis and reporting.</p>
BMP4	<p><b>Monitoring of habitat restoration success</b></p> <p>To assess restoration success in the framework of restoration actions (RE01, RE02, RE03) and offsets (BAP1), monitor the area of each CH and PBF restored and % restoration success. Every year for the first 3 years, then at 5 years and every 5 years</p>	<ul style="list-style-type: none"> <li>• Area (ha) of each habitat to restore</li> <li>• %age of restoration success</li> </ul>	Road Department	To quote in the BOMP
BMP5	<p><b>Monitoring of roadkill</b></p> <p>Monitor and record roadkills of PBF and CH species, especially large mammals, bats, reptiles and birds through collision and carcass data collection in the framework of regular road maintenance.</p> <p>Implement a collision reporting system, precisising the procedure to follow in case of collision.</p> <p>In case of collision, go to the site and collect data as soon as it is reported:</p> <p>1/georeference the observation with a Global Positioning System,</p> <p>2/take pictures of the animal on all the sides, front, back and top and eventual specific criteria that could help for identification</p>	<ul style="list-style-type: none"> <li>• Number of roadkills (/year and /species)</li> </ul>	Road Department	No additional Cost. Can be done during regular maintenance of the road

Code	Detail	Key Performance Indicator	Responsible	Indicative cost
	<p>3/identify the species if possible and</p> <p>4/remove the carcasses to limit additional collision risk with scavenger birds (such as Egyptian vultures or Bearded vultures) that would land on the road and dispose it at a feeding station (that will have to be located in a key area far away from the road, to attract scavengers away from the road).</p> <p>5/Analysis of the results and implementation of adaptive management in case of areas identified with higher roadkill (add fencing if not already in place, or other dispositive adapted to the more impacted species)</p>			

**Table 12. List of the Proposed Species' Monitoring to Better Understand the Use of the Valleys by Fauna during the Construction and Operation Phase of the Road**

Code	Detail	Key Performance Indicator	Responsible & partner	Indicative cost
Species monitoring				At least 780 000 USD
BMP6	<p>As part of the regular monitoring during construction and operational phases, undertake monitoring to improve understanding of species composition, density, and habitat use of large mammals Monitor Bezoar Goat, Armenian Mouflon, Persian Leopard, Brown Bear, Grey Wolf, Eurasian Lynx, Wildcat, Marbled polecat between Shenatagh and Kajaran, on mountain ridges in the vicinity of the road, and Eurasian Otter close to the Shamb and Geghavank Reservoir.</p> <p>To implement during the construction phase and 3 years following the start of operation.</p>	<ul style="list-style-type: none"> <li>Monitoring protocols for each targeted species</li> <li>Studies for each species coinciding with their active periods</li> <li>Management of biodiversity risks related to the project</li> <li># of individuals observed by species and if possible population size estimates</li> <li>Annual report presenting progress on actions and monitoring results and analysis</li> </ul>	Road Department Mammals' expert Herpetologist expert	<p>50 000 - 60 000 USD/year</p> <p>During at least 9 years (6 years during construction and 3 during operations)</p>
BMP7	Implement monitoring on bats outside of the Aol in the EAAA and protect potential bat roosting sites found in the EAAA	<ul style="list-style-type: none"> <li>Detection of roosting sites in EAAA</li> <li>Annual report presenting progress on actions and monitoring results and analysis</li> <li>Number of bat species</li> </ul>	Road Department Chiropterologist	50 000 USD
BMP8	Implement monitoring on butterflies	<ul style="list-style-type: none"> <li>Survey protocols for butterflies in the framework of PCBS</li> <li>Fieldwork</li> </ul>	Road Department Entomologist or Lepidoptera expert	50 000 USD

Code	Detail	Key Performance Indicator	Responsible & partner	Indicative cost
		<ul style="list-style-type: none"> <li>Annual report presenting progress on actions and monitoring results and analysis</li> <li>Number of butterflies species listed in the red book</li> </ul>		
BMP9	Implement monitoring over the translocated restricted-range plant species	<ul style="list-style-type: none"> <li>% translocation success of translocated plant species</li> </ul>	Road Department Bonatist	15 000 USD / year during 6 years (depends on the number of plants translocated)
BMP10	Implement monitoring for threatened reptile species on the IUCN Red list and/or on the Armenian Redbook	<ul style="list-style-type: none"> <li>Monitoring protocols for reptiles during 1/construction and 2/operations</li> <li>Fieldwork implemented</li> <li># of individuals observed by species and if possible population size estimates</li> <li>Annual report presenting progress on actions and monitoring results and analysis</li> </ul>	Road Department Herpetologist expert	50 000 USD

## 10. SUMMARY OF ESTIMATED COSTS

A summary of the indicative estimated costs to implement the BAP are provided below

**Table 13. Indicative Estimation of the Costs Required for the Implementation of the BAP Actions<sup>28</sup>**

Code	Detail	Indicative cost
Offsetting measure		To be detailed in BOMP
BAP 1	Community based critical habitats restoration and conservation targeting degraded habitats	<i>Habitat restoration budget will be detailed in the BOMP based on the field identification of favourable areas</i>
Biodiversity Net Positive measures		Ca.750 000 – 850 000 USD for 5 years
BAP 2	Reinforce anti-poaching efforts in the area between Shenatagh and Kajaran	50 000 USD for the staff capacity building
BAP 3	Contribute to strengthening protection and management of Zangezur Biosphere Complex around the project area (on Shenatagh side too)	70 000 USD/year for the staff recruitment for 5 years
BAP 4	Community, workforce and stakeholder education on good environmental practices	50 000 USD
BAP 5	Experimental translocation of endemic restricted-range plant species	200 000 – 300 000 USD

<sup>28</sup> Disclaimer: costs provided are indicative and they will need to be detailed by contractors and Biodiversity consultants once Terms of reference will be released

Code	Detail	Indicative cost
Monitoring of mitigation measures during construction		<i>Integrated in the biodiversity supervising engineer missions and wage</i>
BMP1	Monitoring of water quality and Suspended Sediment downstream of construction sites	<i>Integrated in the biodiversity supervising missions and wage</i>
BMP2	Monitoring of Flora Alien Invasive Species proliferation	<i>Integrated in the Contractor's biodiversity missions and wage</i>
Monitoring of mitigation measures during operation		At least 100 000 USD
BMP3	Monitoring wildlife crossing use	50 000 USD for the set-up and 50 000 USD/year for the treatment and analysis of the medias collected (videos/pictures)
BMP4	Monitoring of habitat restoration success	To detail in the BOMP
BMP5	Monitoring of roadkill	<i>Included in the road maintenance.</i>
Species monitoring in the EAAA		At least 780 000 USD
BMP6	Improve understanding of species composition, density and habitat use by large mammals	At least 450 000 USD – 540 000 USD (50 000 – 60 000 USD/year over 9 years)
BMP7	Implement additional survey on bats in the area and protect bat roosting sites	50 000 USD
BMP8	Implement additional survey on butterflies	50 000 USD
BMP9	Implement monitoring over the translocated restricted-range plant species	At least 90 000 USD (15 000 USD/year over 6 years)
BMP10	Implement monitoring for endangered reptile species	50 000 USD

## 11. STAKEHOLDER ENGAGEMENT AND INPUT

This BAP is based on information from several stakeholder consultations and data collection activities completed during:

- The 2016-2018 Project feasibility study and preliminary design stages accompanied by the related national EIA process;
- ESIA inception consultations in 2021 including interviews and/or consultations with 35 key informants at the regional, municipal (community) and local levels;
- ESIA scoping disclosure in April-May 2022 accompanied by one biodiversity-focused consultation meeting and six public hearings; and
- ESIA socio-economic field studies in May – June 2022 that included in-depth interviews with key informants, focus groups and consultations with around 180 target persons. Questionnaires for all target groups, including affected villagers, farmers, and local authorities incorporated questions related to biodiversity and ecosystem services.

In addition, this version of the BAP considered the feedback from the ESIA public disclosure, including written suggestions and verbal comments received during the dedicated biodiversity consultation meeting held on 26 October 2023 in Yerevan and other meetings. Biodiversity-related comments and suggestions received from the stakeholders, as well as responses to them, are documented in detail in the stand-alone ESIA Disclosure and Consultation Report.

A dedicated Register of Stakeholder Engagement on Biodiversity Themes is maintained by the Project ESIA Consultant.

Stakeholder organizations and bodies consulted and whose views and knowledge informed this BAP include:

- "Zangezur Biosphere Complex" SNCO, under the Ministry of Environment, which is in charge of Zangezur State Sanctuary and other six SPAs. The list of proposed measures by the Director of the Zangezur Biosphere Complex SNCO have been discussed between the experts of the project team and taken into account in the ESIA and the BAP;
- Ministry of Environment specifically via its Specially Protected Areas and Biodiversity Policy Department, the Forest Committee and its "Hayantar" (ArmForest) SNCO with Sisian Forestry and Kapan Forestry branches, and "Environmental Impact Expertise Center" SNCO;
- WWF Armenia;
- Eco-coalition Armenia NGO;
- BirdLinks Armenia NGO;
- Specialists of the RD, EBRD, ADB and EIB;
- Syunik Regional Administration,
- Kajaran and Sisian Community Administrations,
- Heads of rural administrative units in the Project area and local residents.

Stakeholder engagement continues about biodiversity matters with representatives of the Zangezur Biosphere Complex, Kapan and Sisian Forestries, WWF Armenia and local authorities of the Project-affected settlements. Additional details about engagement regarding impacts on protected areas and candidate Emerald Sites are provided in the Project's Appropriate Assessment.

Informal consultations that have occurred at institutions with which the Project's five national biodiversity experts are affiliated have also contributed to the BAP, CHA, AA and ESIA (including the Institute of Botany of the National Academy of Sciences of Armenia, Faculty of Biology at Yerevan State University, and others).

The upcoming ESIA consultations and disclosure activities are detailed in the Project's Stakeholder Engagement Plan. Requirements and recommendations of the aforementioned biodiversity stakeholders have been considered when developing this document.

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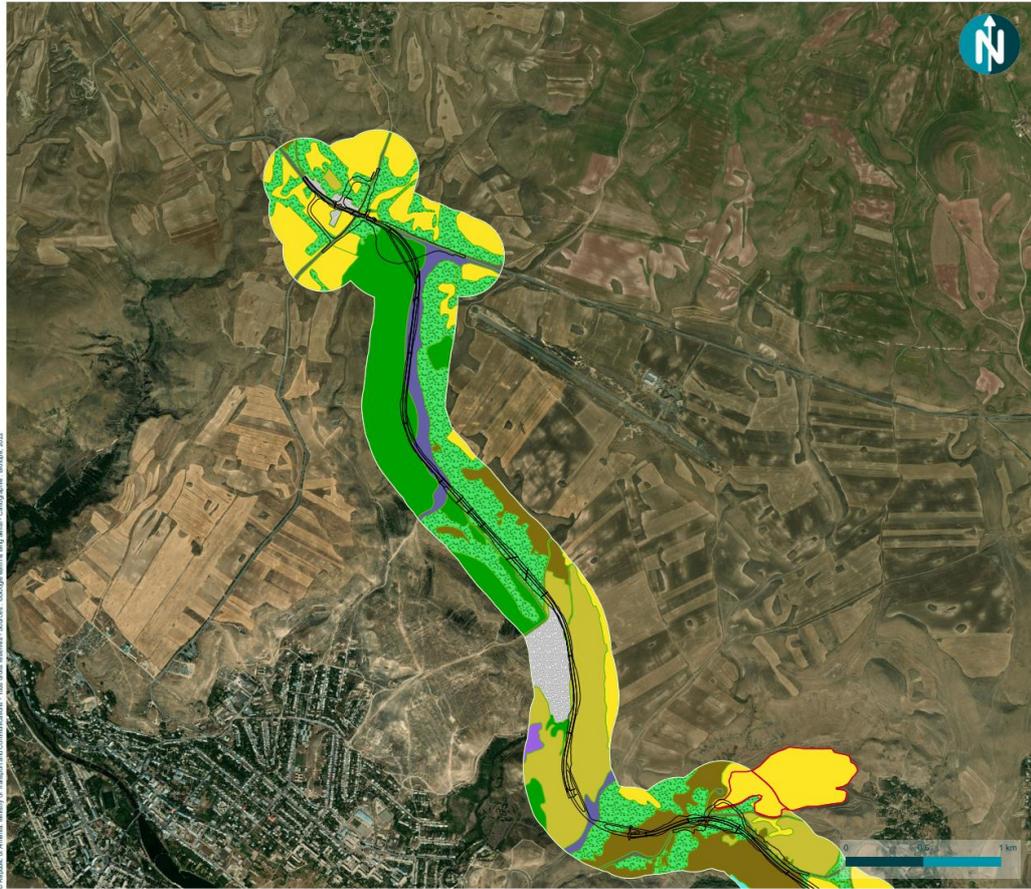
## ANNEX 1. BIODIVERSITY SPECIALISTS INVOLVED

The field work and preparation of the background biodiversity report (Annex 1 to the ESIA Volume 2. Biodiversity) have been undertaken by the following team of specialists:

- **Ornithology and lepidopterology surveys** (as well as the overall coordination of biodiversity field work and findings reporting): Karen Aghababyan, PhD in Zoology, over 100 publications on ornithology and lepidopterology.
- **Mammals survey**: Astghik Ghazaryan, PhD in Zoology, over 30 publications on mammalogy;
- **Ichthyologic and batrachologic surveys**: Samvel Pipoyan, Doctor of Science, Professor, over 180 publications on ichthyology and batrachology;
- **Botanic and palaeobotanic surveys**: Ivan Gabrielyan, Dr of Biology, over 150 publications on botany and palaeobotany;
- **Herpetologic surveys**: Levon Aghasyan, PhD in Zoology, 24 scientific publications.

The ESIA, CHA, AA and BAP have been prepared by Biotope International Department team: Rénaud Boulnois (Director of Study, specialist of international standards on conservation of biodiversity and sustainable management of living natural resources – PS6, PR6, ESS4, etc.), Xavier Rufay (Director of Study, birds and mammals specialist), Aurore Malapert (Project manager, specialist in Biodiversity conservation).

ANNEX 2. EUNIS MAPPING



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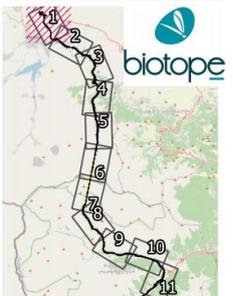
**EUNIS habitats map**  
1 / 11  
Sisian - Kajaran Road

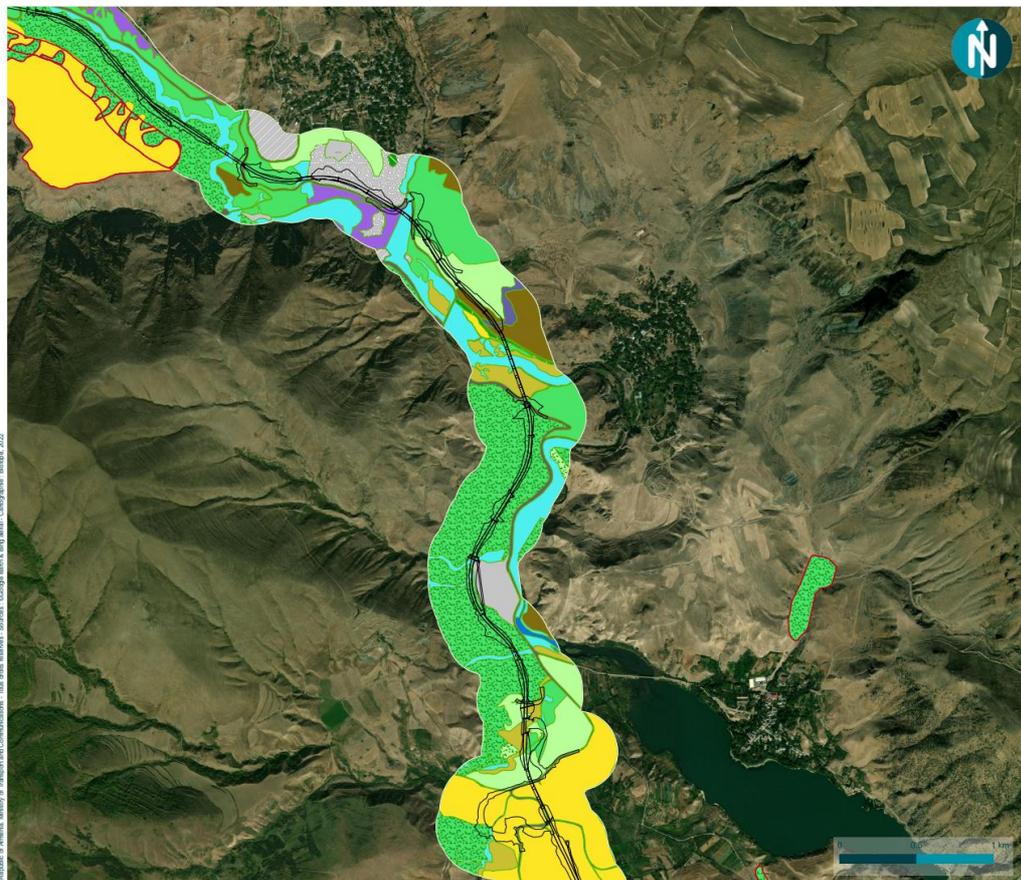
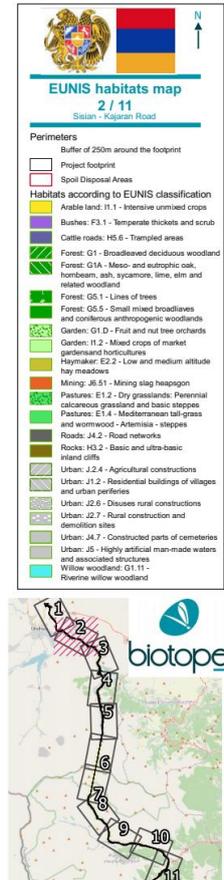
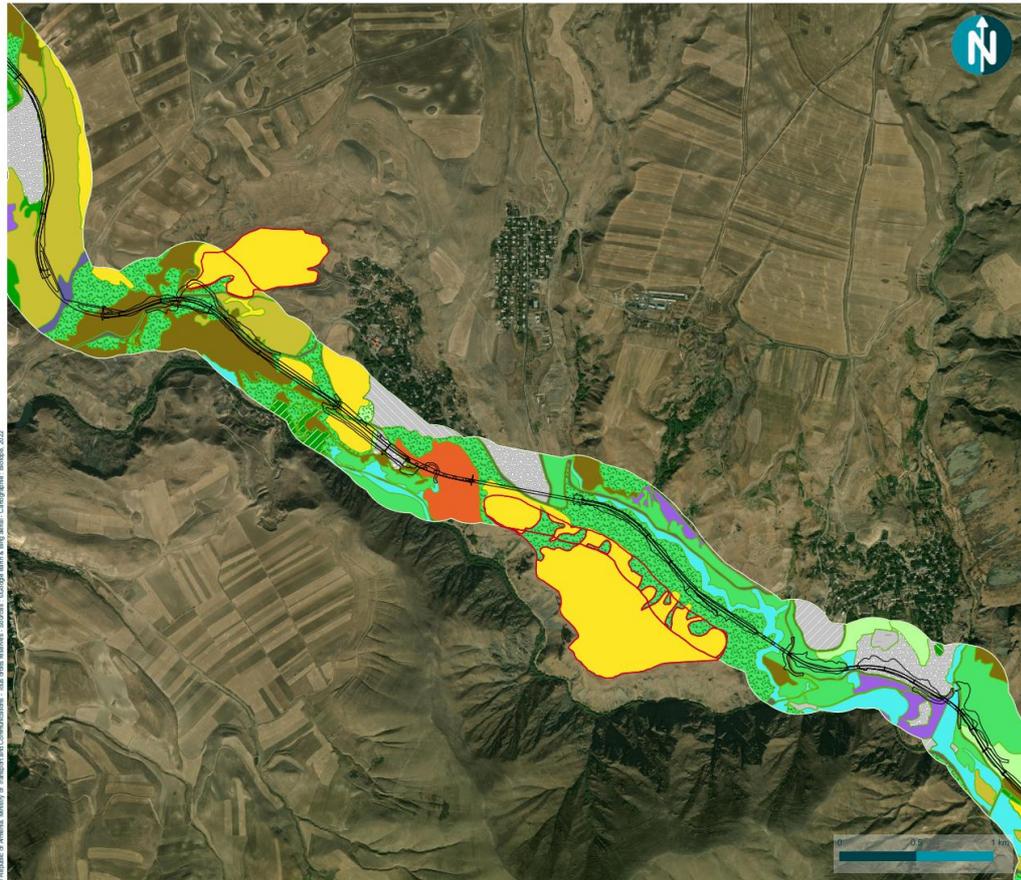
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Buffer of 250m around the footprint

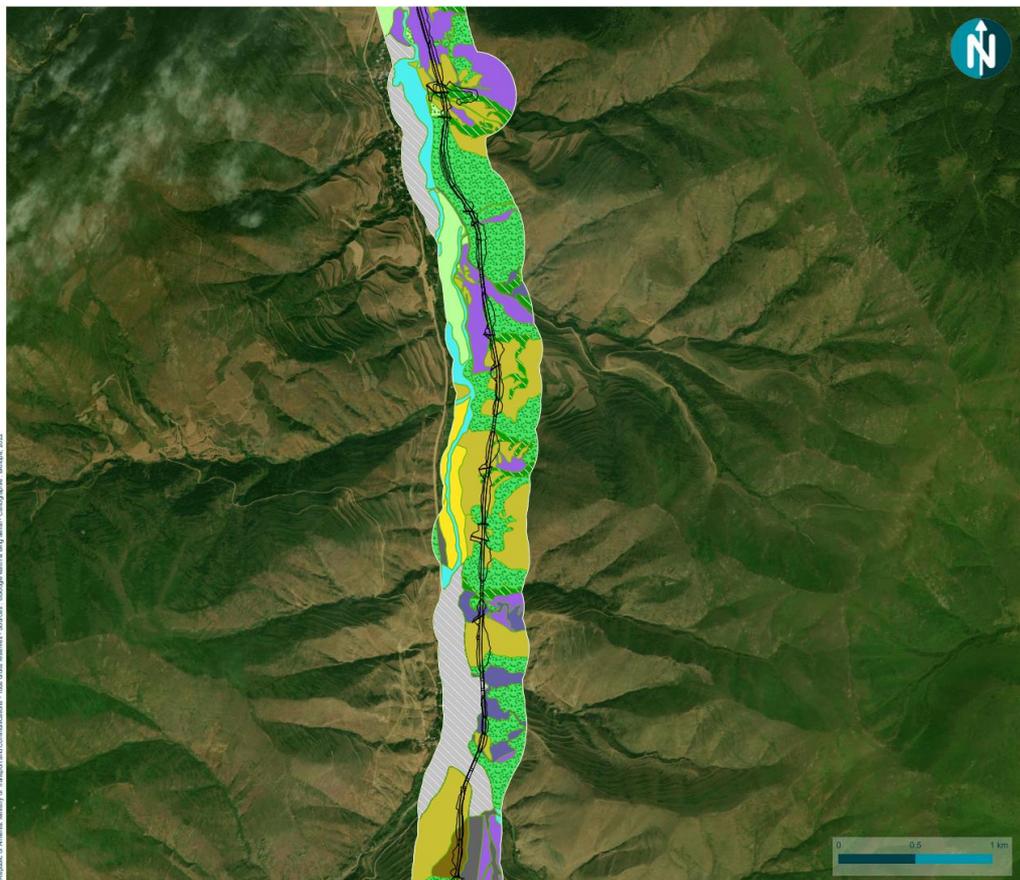
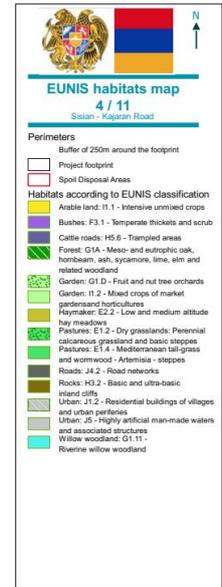
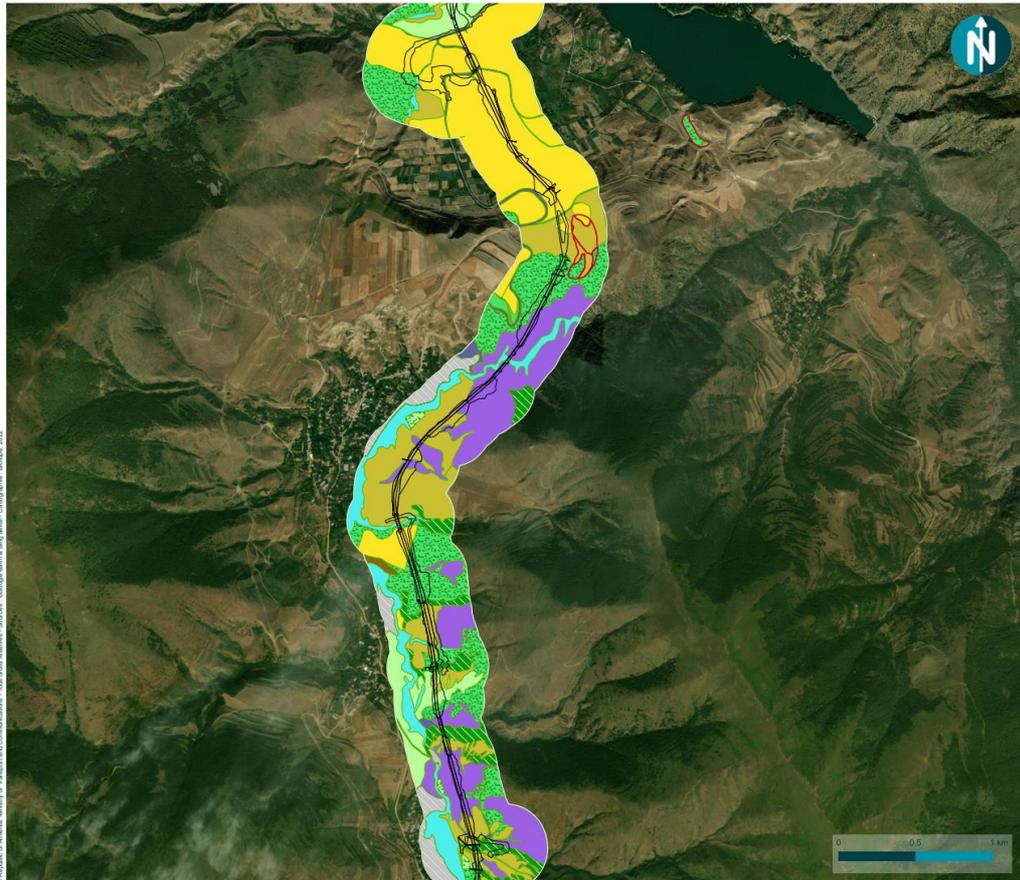
- Project footprint
- Spoil Disposal Areas

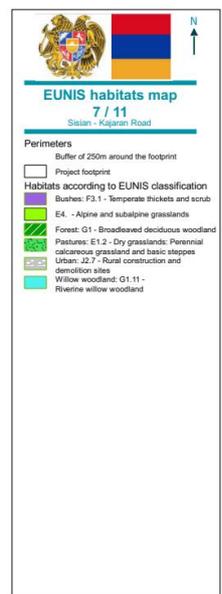
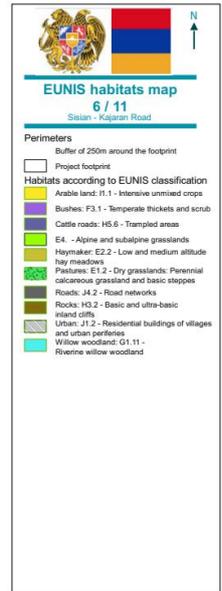
**Habitats according to EUNIS classification**

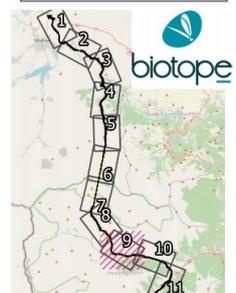
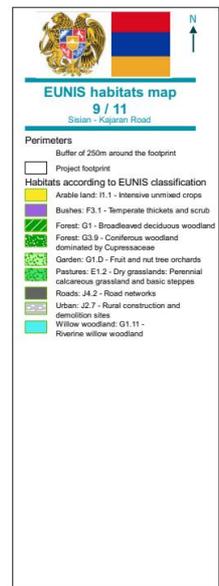
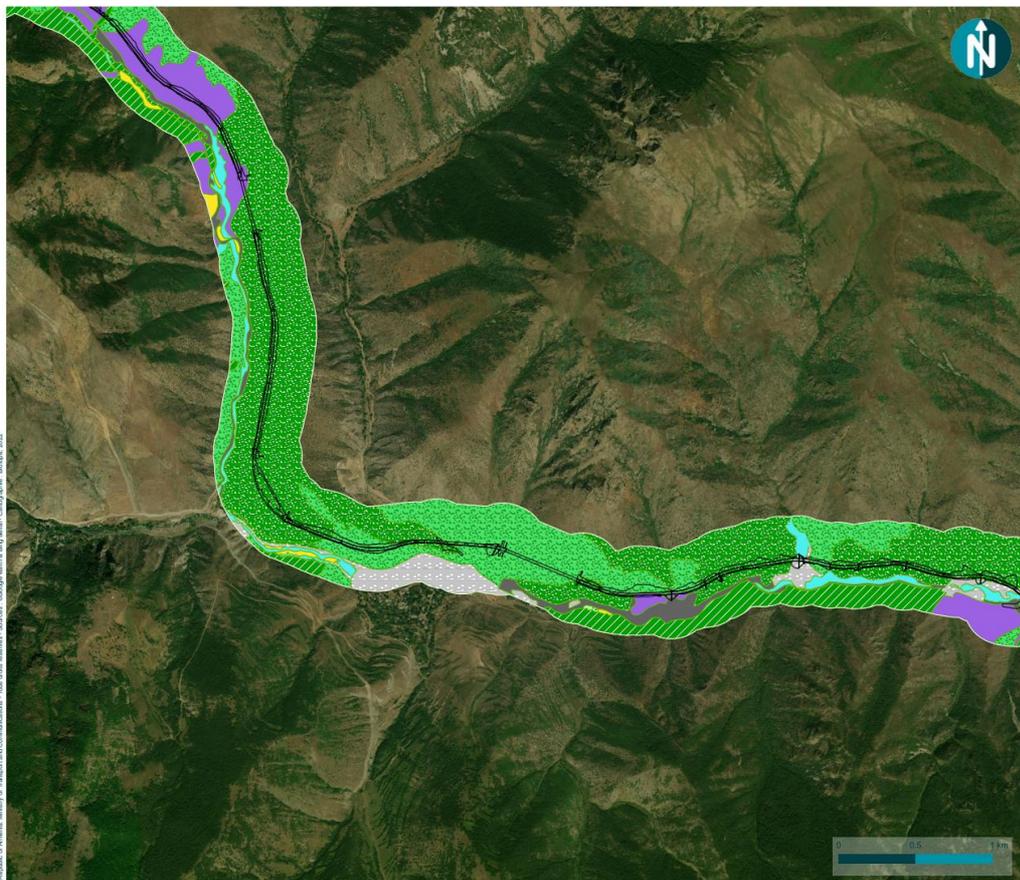
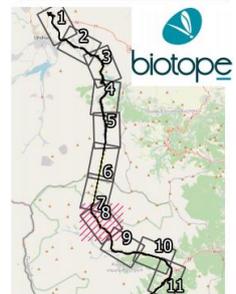
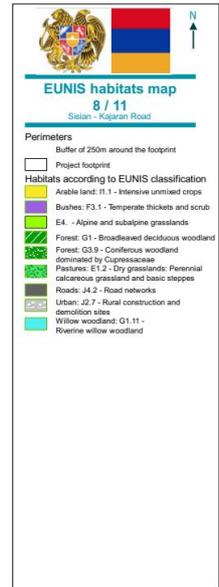
- Arable land: I1.1 - Intensive unimproved crops
- Bushes: F3.1 - Temperate thickets and scrub
- Cattle roads: H5.6 - Trampled areas
- Forest: G5.5 - Small mixed broadleaves and coniferous anthropogenic woodlands and coniferous anthropogenic woodlands
- Haymaker: G2.2 - Low and medium altitude hay meadows
- Pastures: E1.2 - Dry grasslands: Perennial calcareous grassland and basic steppes
- Roads: J4.2 - Road networks
- Rocks: K3.2 - Basic and ultra-basic inland cliffs
- Urban: J2.4 - Agricultural constructions
- Urban: J1.2 - Residential buildings of villages and urban peripheries
- Urban: J2.6 - Disused rural constructions
- Willow woodland: G1.11 - Riverine willow woodland

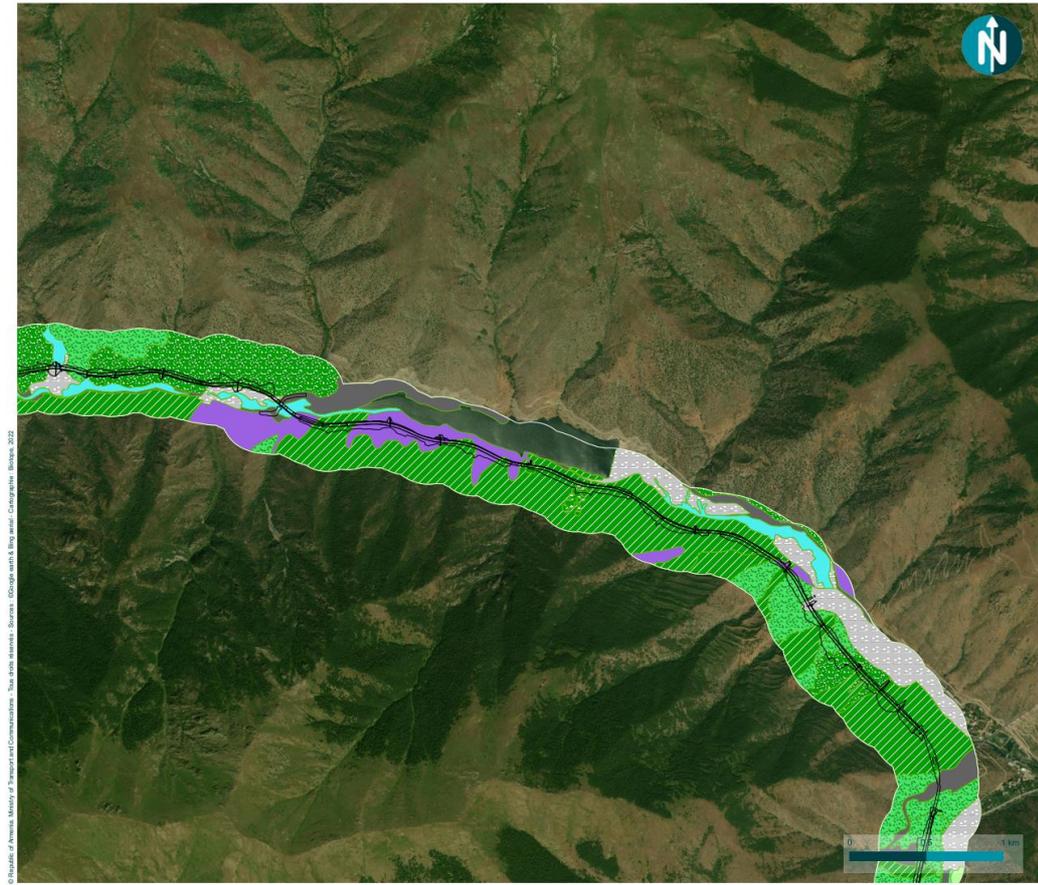












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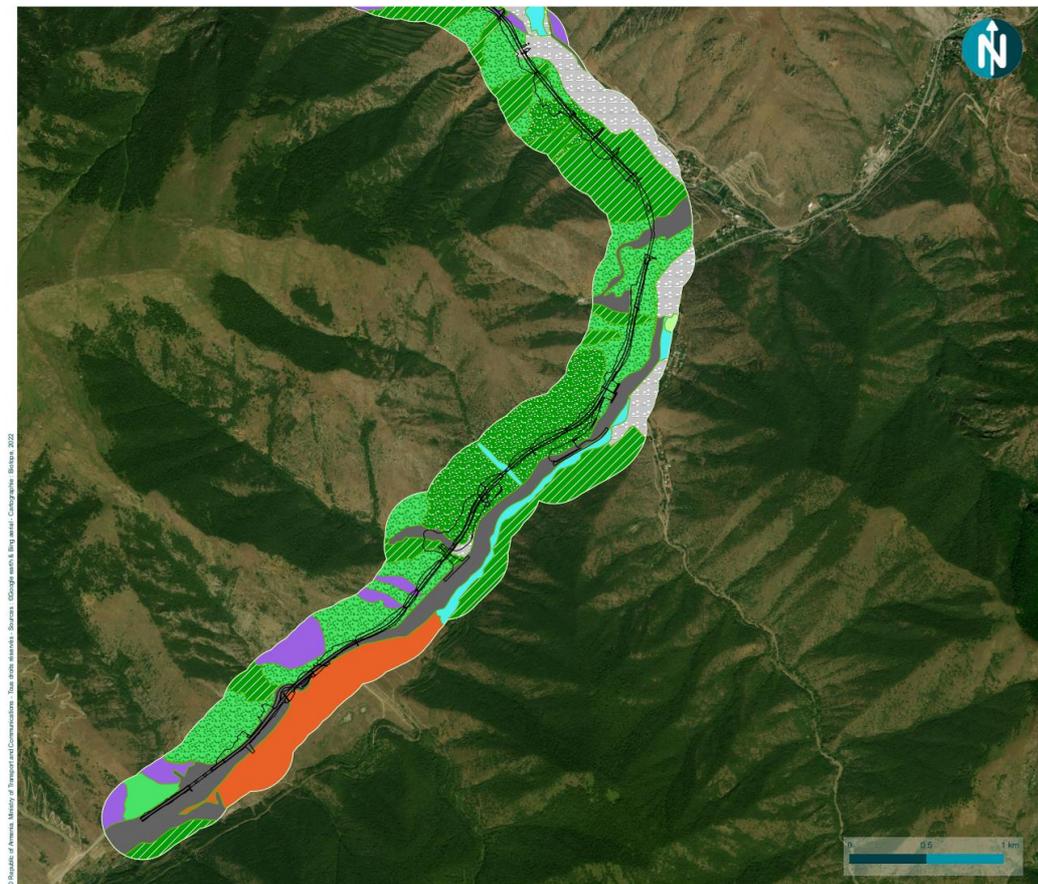
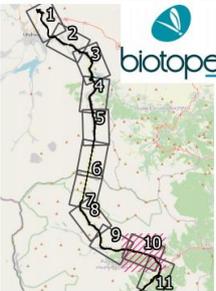
**EUNIS habitats map**  
10 / 11  
Sisian - Kajaran Road

**Perimeters**  
Buffer of 250m around the footprint

Project footprint

**Habitats according to EUNIS classification**

- Bushes: F3.1 - Temperate thickets and scrub
- Forest: G1 - Broadleaved deciduous woodland
- Forest: G3.9 - Coniferous woodland dominated by Cupressaceae
- Forest: G3.F22 - Exotic pine plantations
- Garden: H1.2 - Mixed crops of market garden and horticulture
- Pastures: E1.2 - Dry grasslands; Perennial calcareous grassland and basic steppes
- Roads: J4.2 - Road networks
- Urban: J2.7 - Rural construction and demolition sites
- Willow woodland: G1.11 - Riverine willow woodland



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**EUNIS habitats map**  
11 / 11  
Sisian - Kajaran Road

**Perimeters**  
Buffer of 250m around the footprint

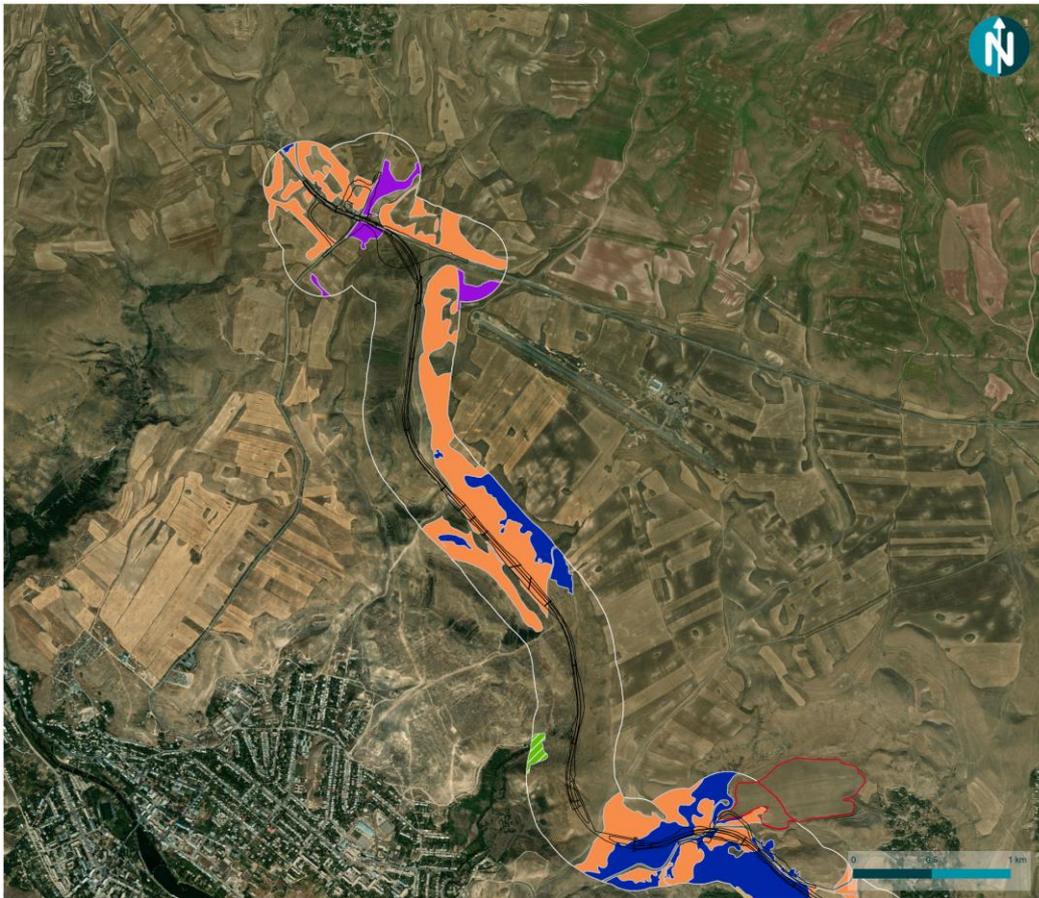
Project footprint

**Habitats according to EUNIS classification**

- Bushes: F3.1 - Temperate thickets and scrub
- Forest: G1 - Broadleaved deciduous woodland
- Forest: G3.9 - Coniferous woodland dominated by Cupressaceae
- Garden: H1.2 - Mixed crops of market garden and horticulture
- Mining: J6.51 - Mining slag heap
- Pastures: E1.2 - Dry grasslands; Perennial calcareous grassland and basic steppes
- Pastures: E1.4 - Mediterranean tall-grass and wormwood - Adiantum - steppes
- Roads: J4.2 - Road networks
- Urban: J2.7 - Rural construction and demolition sites
- Willow woodland: G1.11 - Riverine willow woodland



ANNEX 3. HABITATS LISTED IN THE ANNEX I OF THE EU HABITAT DIRECTIVE MAPPING

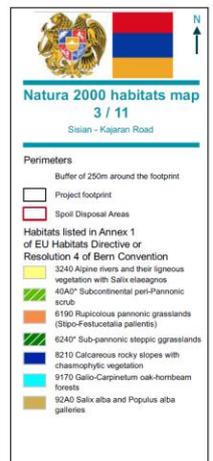
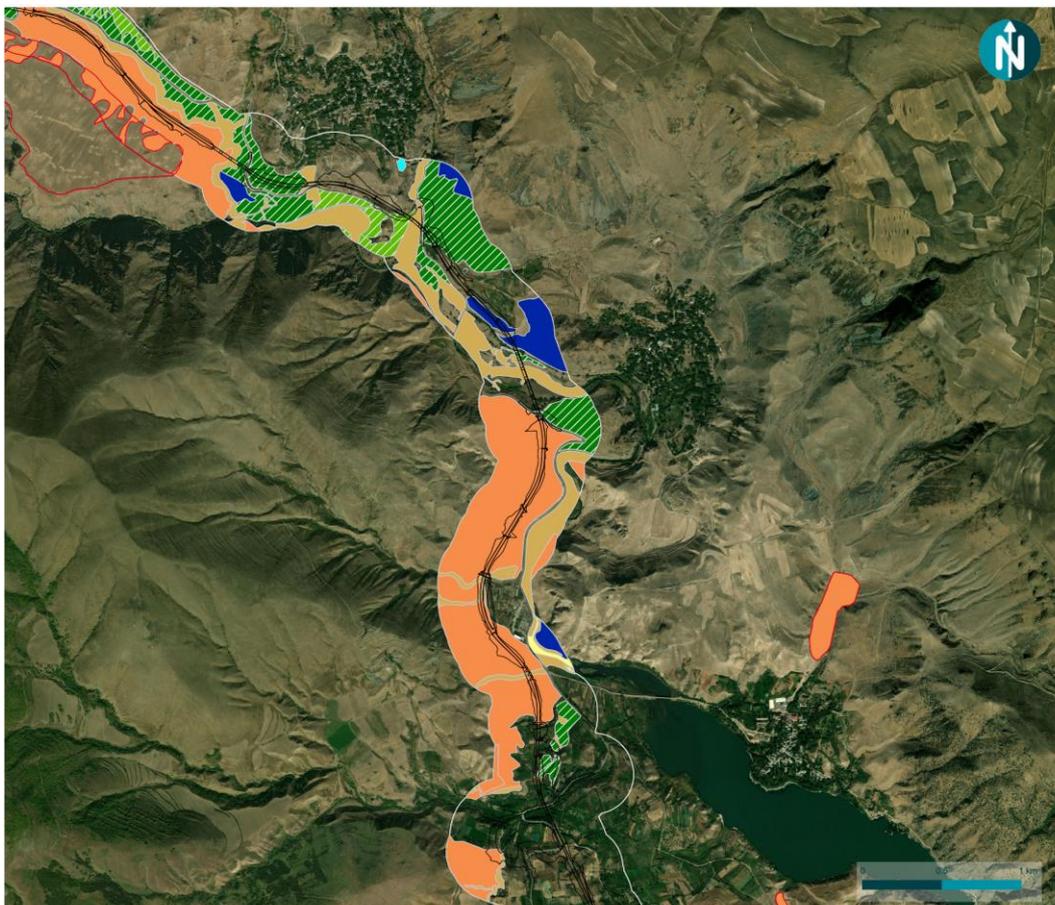
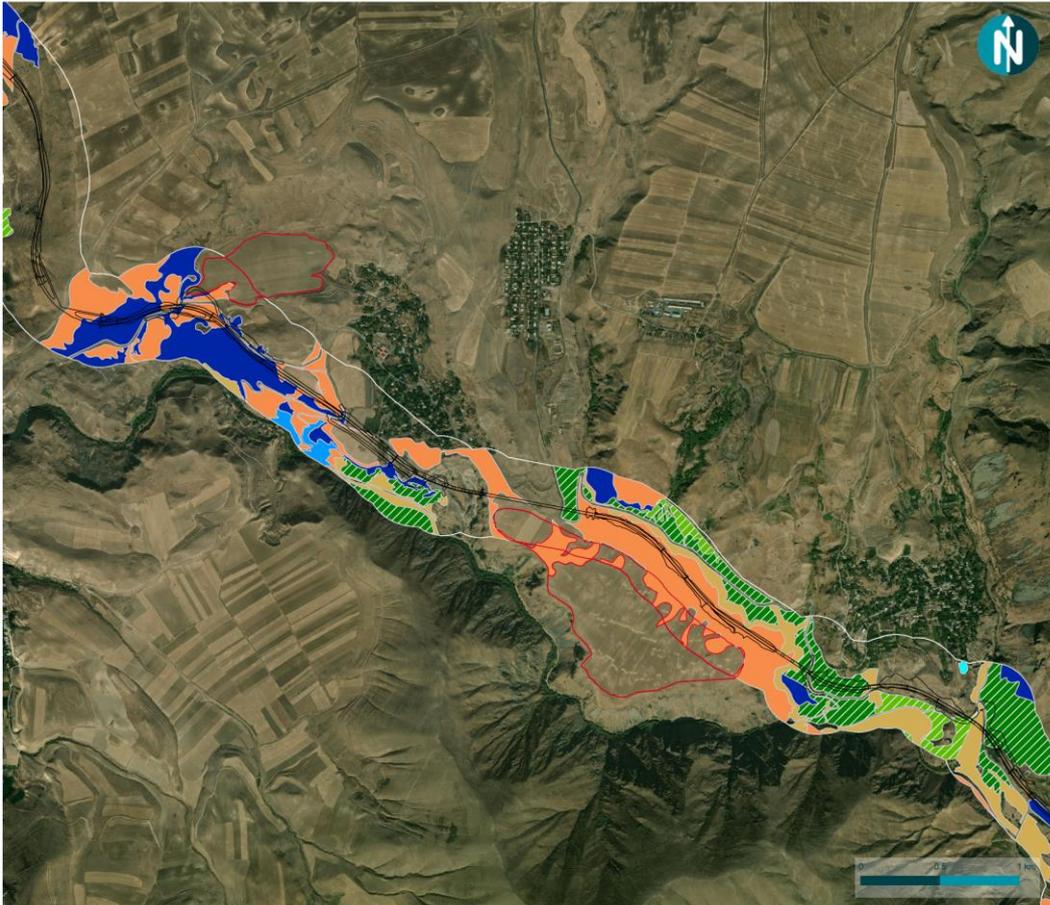


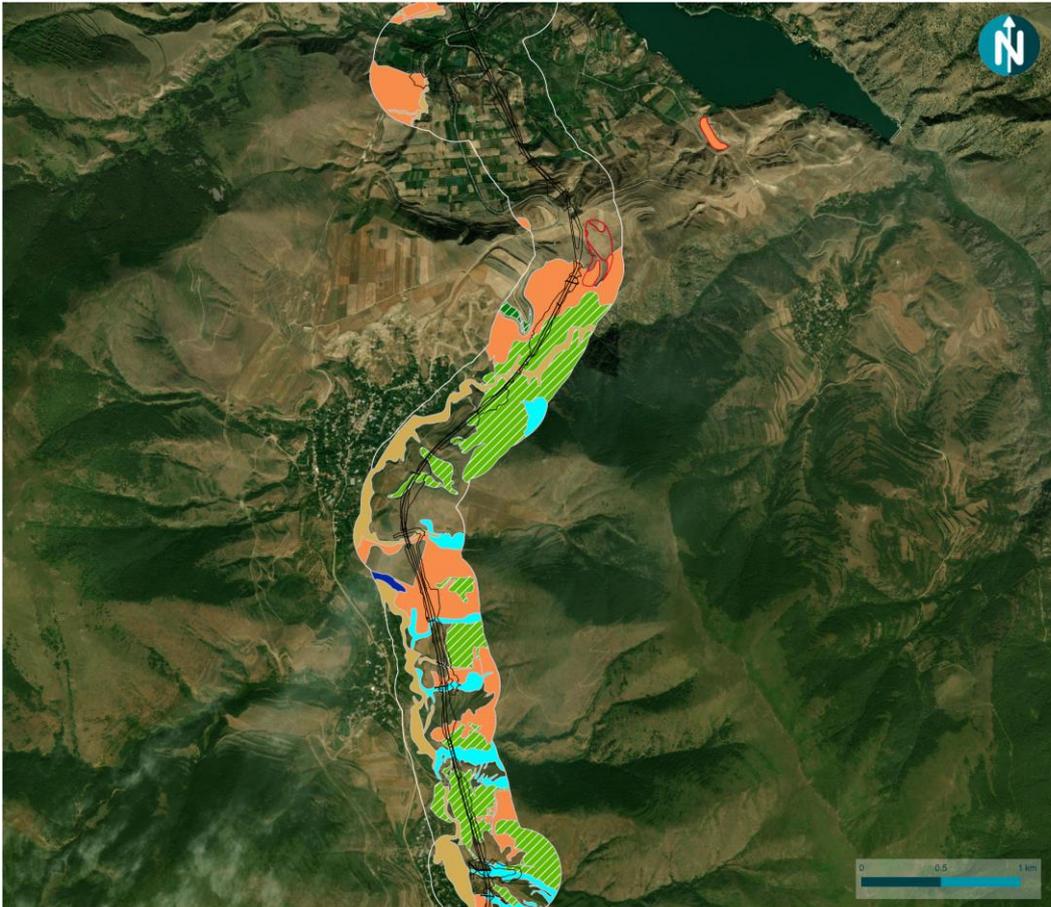

  
**Natura 2000 habitats map**  
**1 / 11**  
 Sisian - Kajaran Road

**Perimeters**  
 Buffer of 250m around the footprint  
 Project footprint  
 Spoil Disposal Areas

**Habitats listed in Annex I of EU Habitats Directive or Resolution 4 of Bern Convention**  
 40A2\* Subcontinental peri-Pannonic scrubs  
 6190 Rupicolous pannonic grasslands (Stipo-Festucetalia pallens)  
 62A0 Eastern sub-mediterranean dry grasslands (Siccochloetalia villosae)  
 8210 Calcareous rocky slopes with chasmophytic vegetation  
 92A0 Salix alba and Populus alba galleries







 N ↑

**Natura 2000 habitats map**  
4 / 11

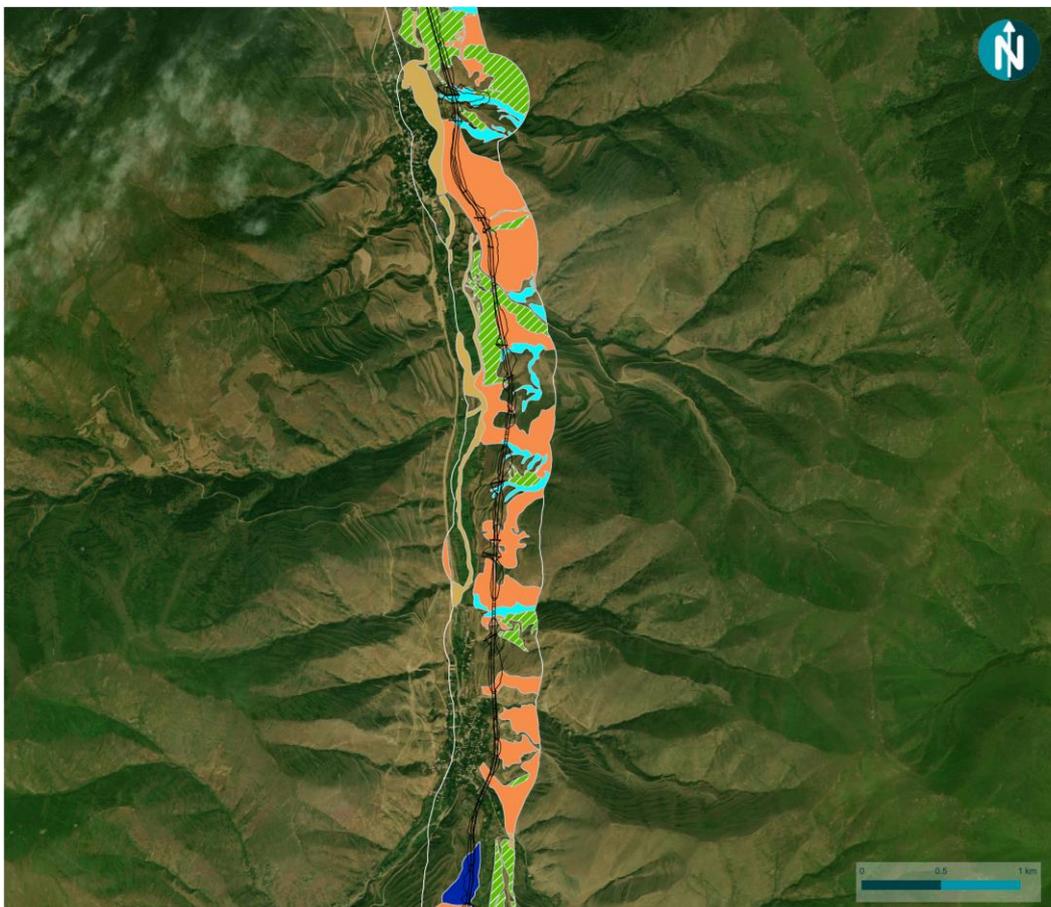
Sisian - Kajaran Road

**Perimeters**  
Buffer of 250m around the footprint

- Project footprint
- Spill Disposal Areas

**Habitats listed in Annex 1 of EU Habitats Directive or Resolution 4 of Bern Convention**

- 40A0\* Subcontinental peri-Pannonic scrub
- 6190 Rupicolous pannonic grasslands (Sippo-Festucetalia pallentes)
- 6240\* Sub-pannonic steppic grasslands
- 8210 Calcareous rocky slopes with chasmophytic vegetation
- 9170 Galio-Carpinetum oak-hornbeam forests
- 92A0 Salix alba and Populus alba galleries



 N ↑

**Natura 2000 habitats map**  
5 / 11

Sisian - Kajaran Road

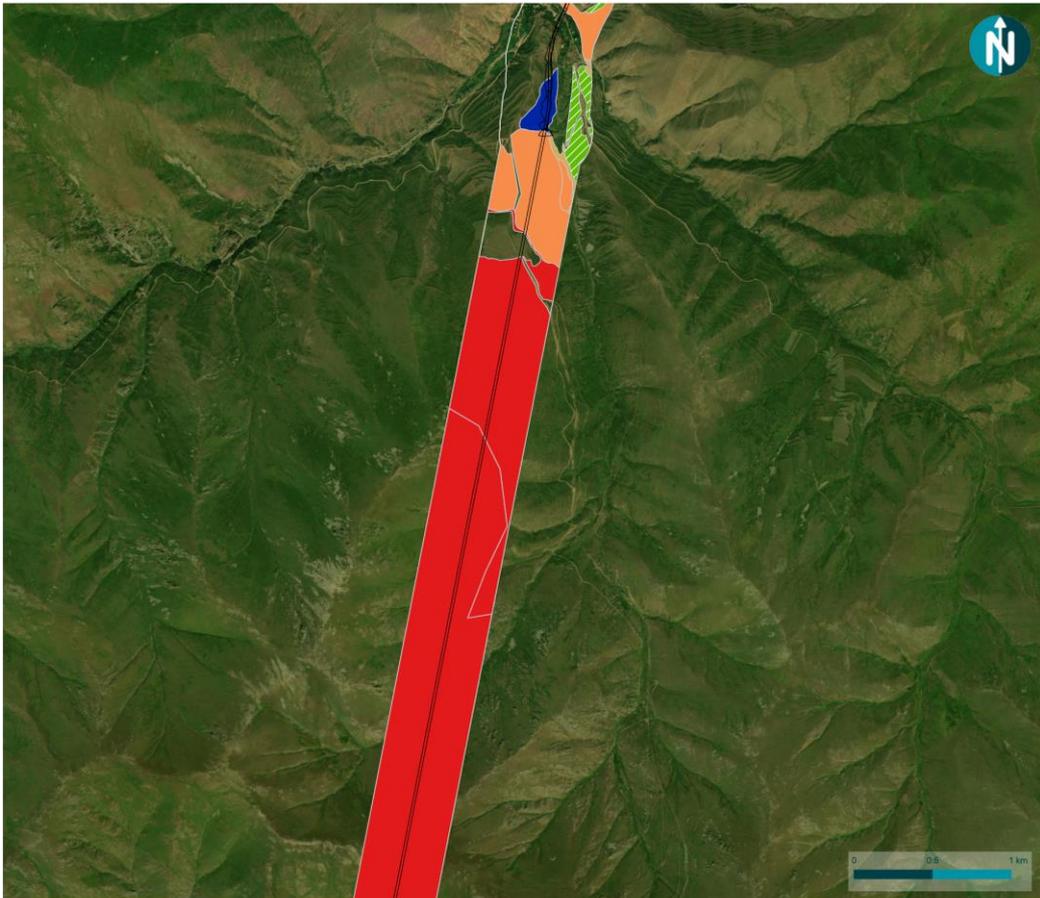
**Perimeters**  
Buffer of 250m around the footprint

- Project footprint

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- 40A0\* Subcontinental peri-Pannonic scrub
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- 9170 Galio-Carpinetum oak-hornbeam forests
- 92A0 Salix alba and Populus alba galleries





**Natura 2000 habitats map**  
6 / 11  
Sisian - Kajaran Road

**Perimeters**  
Buffer of 250m around the footprint  
Project footprint

**Habitats listed in Annex 1 of EU Habitats Directive or Resolution 4 of Bern Convention**

- 40A0\* Subcontinental peri-Pannonic scrub
- 6170 Alpine and subalpine calcareous grasslands
- 6190 Rupicolous pannonic grasslands (Stipo-Festucetalia pallentis)
- 6210 Calcareous rocky slopes with characteristic vegetation
- 92A0 Salix alba and Populus alba galleries



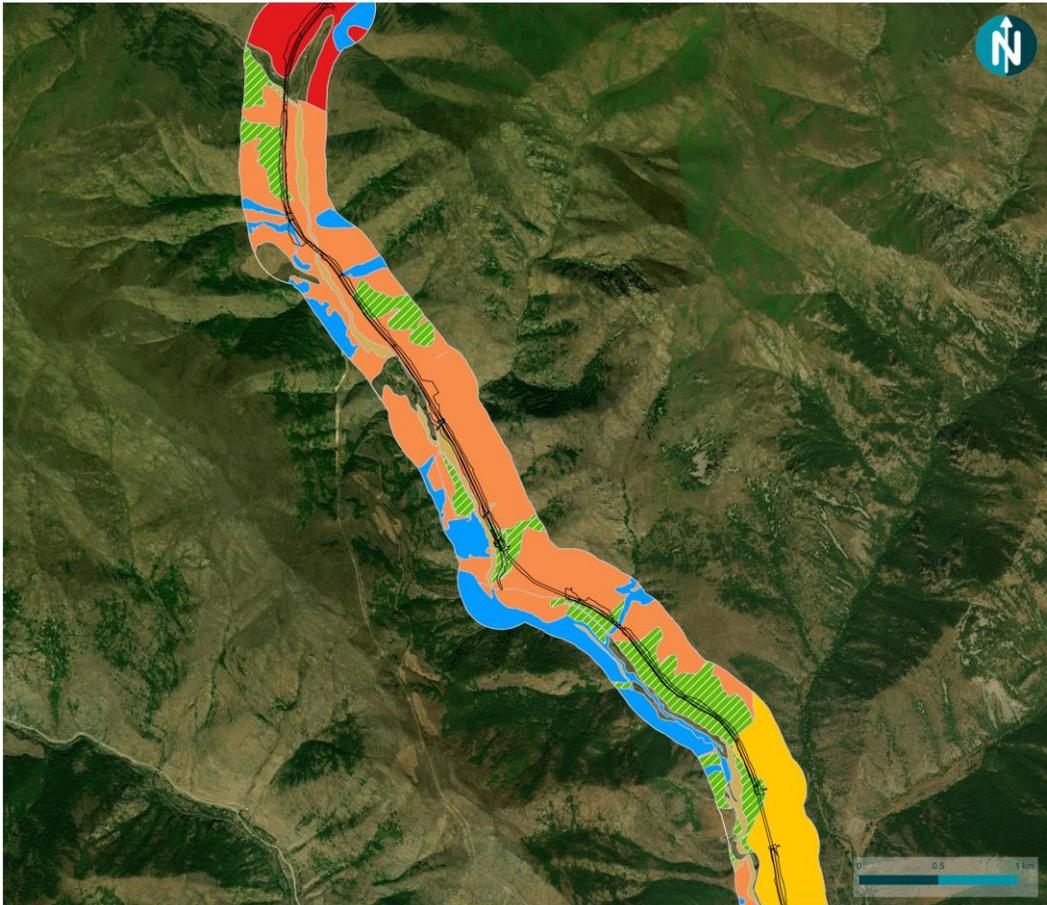
**Natura 2000 habitats map**  
7 / 11  
Sisian - Kajaran Road

**Perimeters**  
Buffer of 250m around the footprint  
Project footprint

**Habitats listed in Annex 1 of EU Habitats Directive or Resolution 4 of Bern Convention**

- 40A0\* Subcontinental peri-Pannonic scrub
- 6170 Alpine and subalpine calcareous grasslands
- 6190 Rupicolous pannonic grasslands (Stipo-Festucetalia pallentis)
- 9160 Sub-Atlantic and medio-European oak or oak-birch forests of the Carpinion betuli
- 92A0 Salix alba and Populus alba galleries





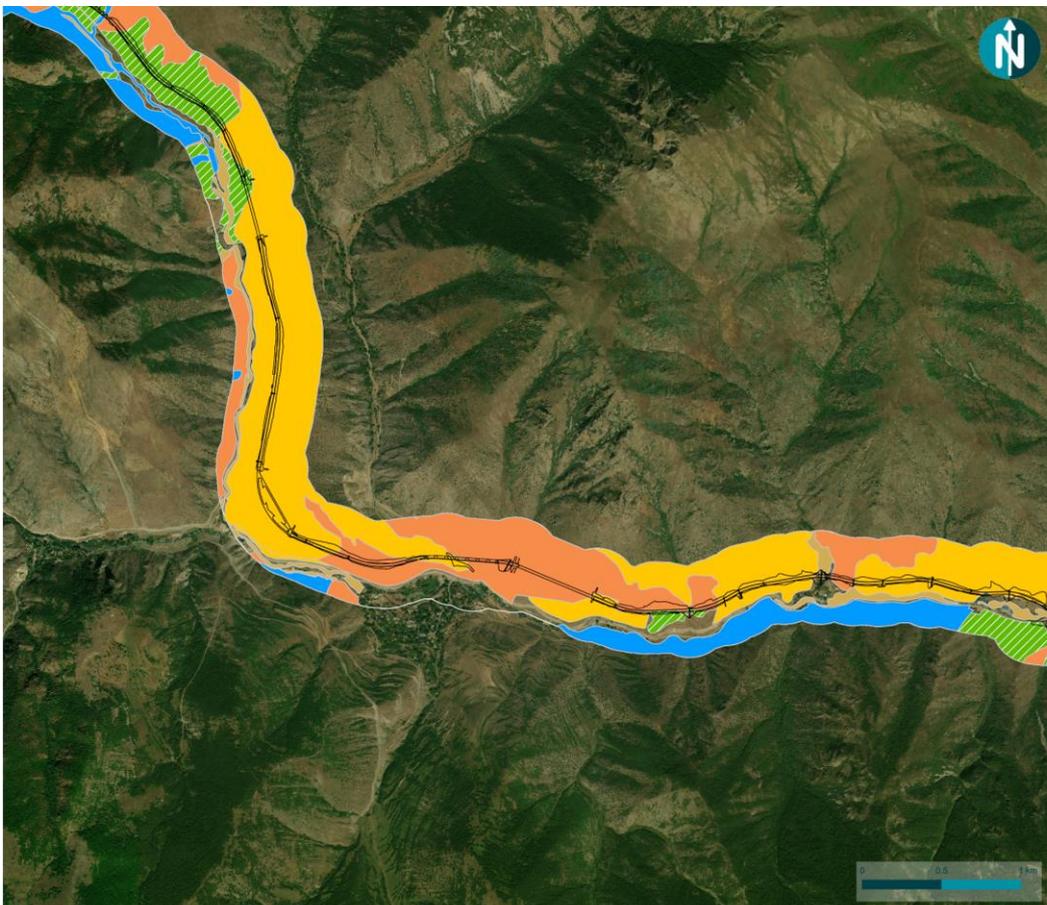
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**Natura 2000 habitats map**  
8 / 11  
Sisian - Kajaran Road

**Perimeters**  
Buffer of 250m around the footprint  
Project footprint

**Habitats listed in Annex 1 of EU Habitats Directive or Resolution 4 of Bern Convention**

-  4040\* Subcontinental peri-Pannonic scrub
-  5210 Arborescent matorral with Juniperus spp.
-  6170 Alpine and subalpine calcareous grasslands
-  6190 Rupicolous pannonic grasslands (Stipo-Festucetalia pallentis)
-  9160 Sub-Atlantic and medio-European oak or oakhornbeam forests of the Carpinion betuli
-  92A0 Salix alba and Populus alba galleries



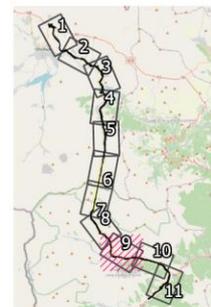
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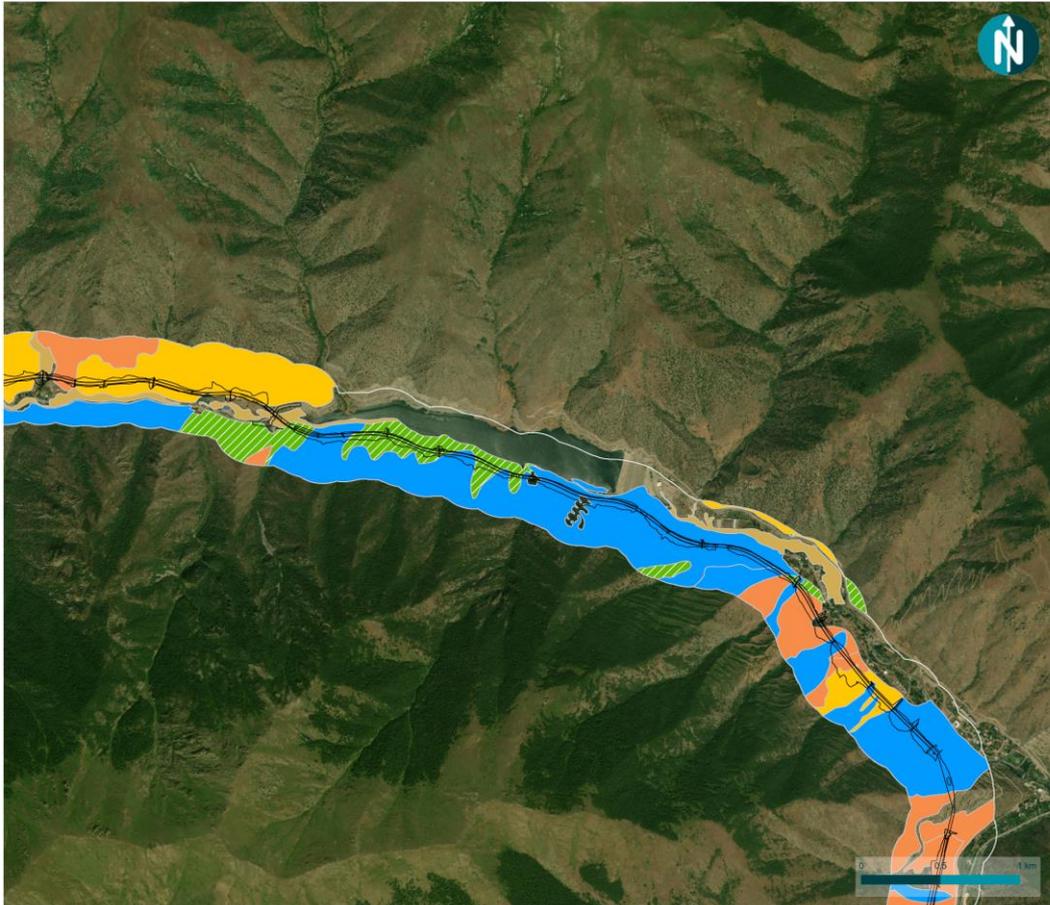
**Natura 2000 habitats map**  
9 / 11  
Sisian - Kajaran Road

**Perimeters**  
Buffer of 250m around the footprint  
Project footprint

**Habitats listed in Annex 1 of EU Habitats Directive or Resolution 4 of Bern Convention**

-  4040\* Subcontinental peri-Pannonic scrub
-  5210 Arborescent matorral with Juniperus spp.
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-  9160 Sub-Atlantic and medio-European oak or oakhornbeam forests of the Carpinion betuli
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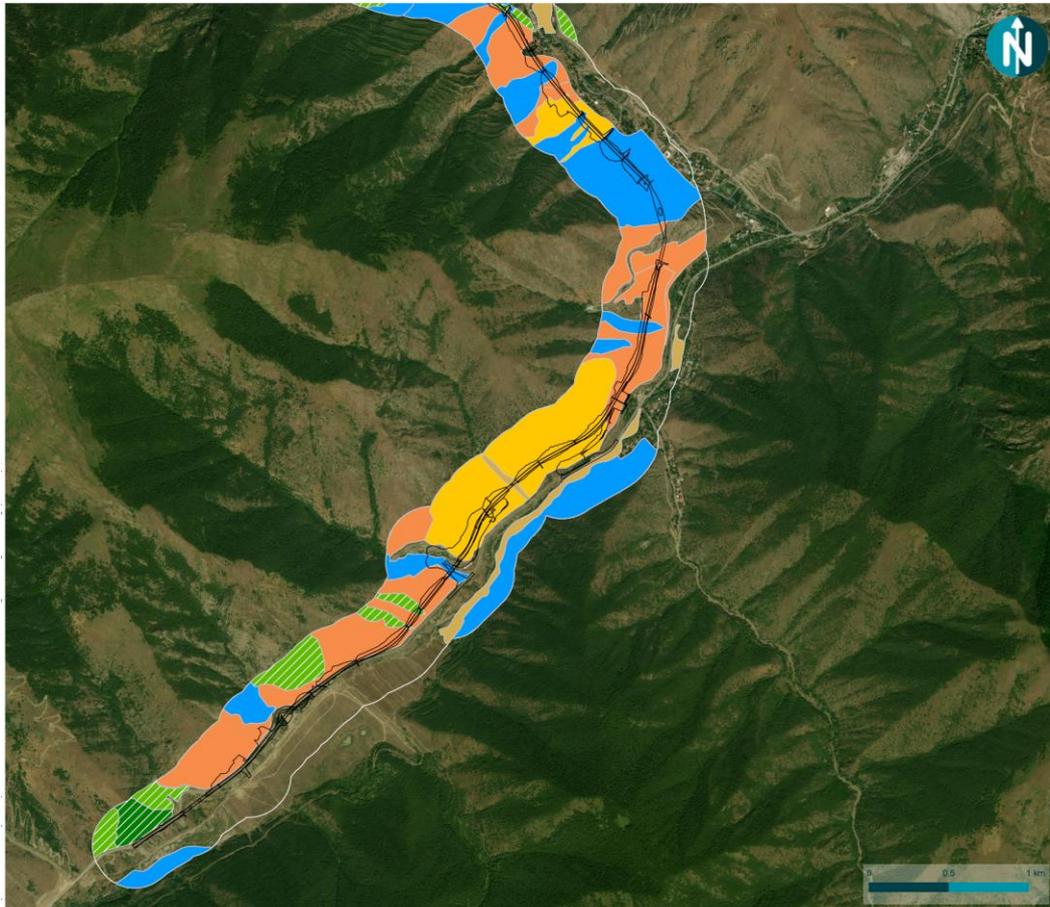


 **Natura 2000 habitats map**  
10 / 11  
Sisian - Kajaran Road

**Perimeters**  
Buffer of 250m around the footprint  
Project footprint

**Habitats listed in Annex 1 of EU Habitats Directive or Resolution 4 of Bern Convention**

-  40A0\* Subcontinental peri-Pannonic scrub
-  5210 Arboreal matral with Juniperus spp.
-  6190 Rapiolous panonic grasslands (Stipo-Festucetalia pallentis)
-  9160 Sub-Atlantic and medio-European oak or oakhornbeam forests of the Carpinion betuli
-  92A0 Salix alba and Populus alba galleries



 **Natura 2000 habitats map**  
11 / 11  
Sisian - Kajaran Road

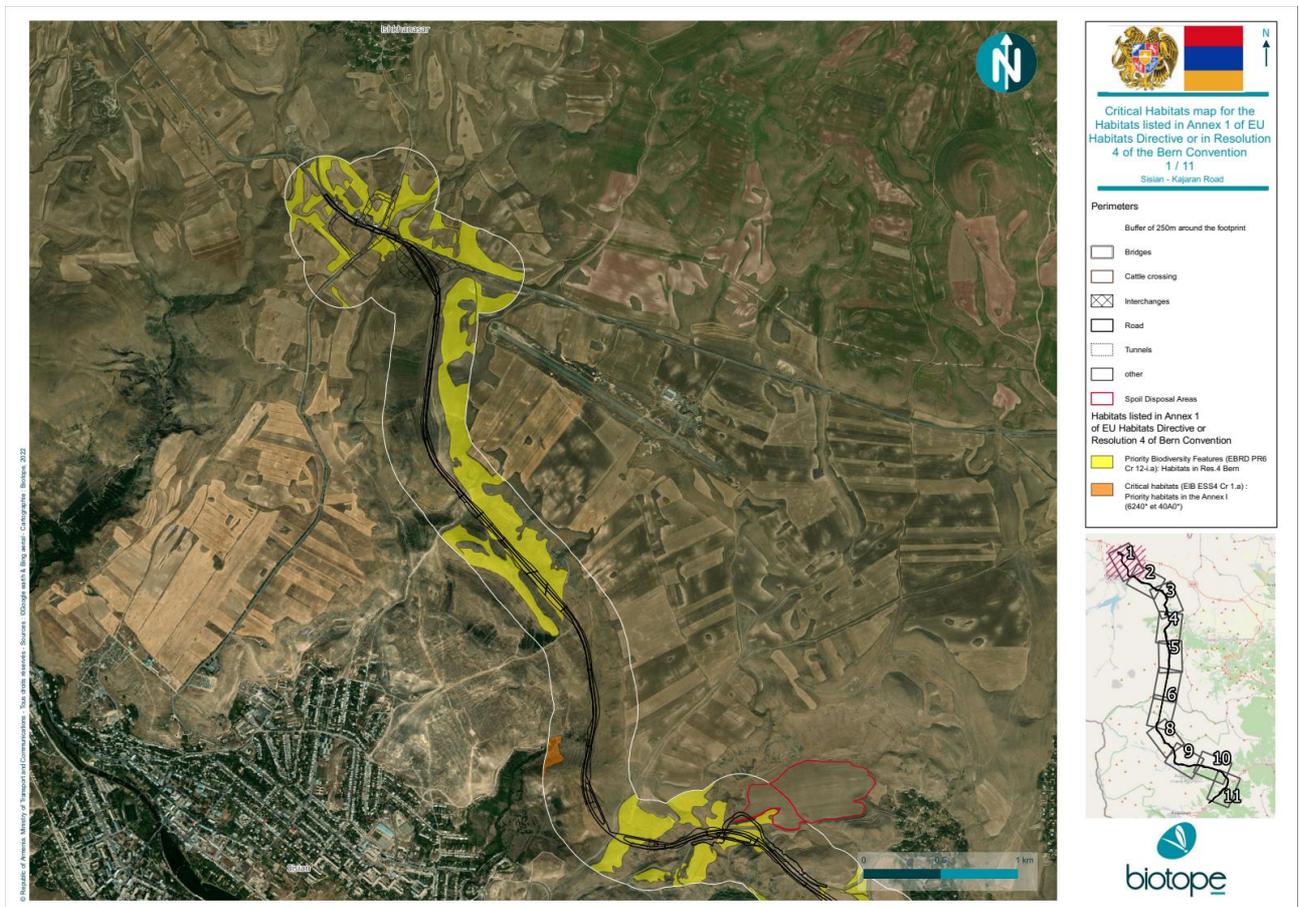
**Perimeters**  
Buffer of 250m around the footprint  
Project footprint

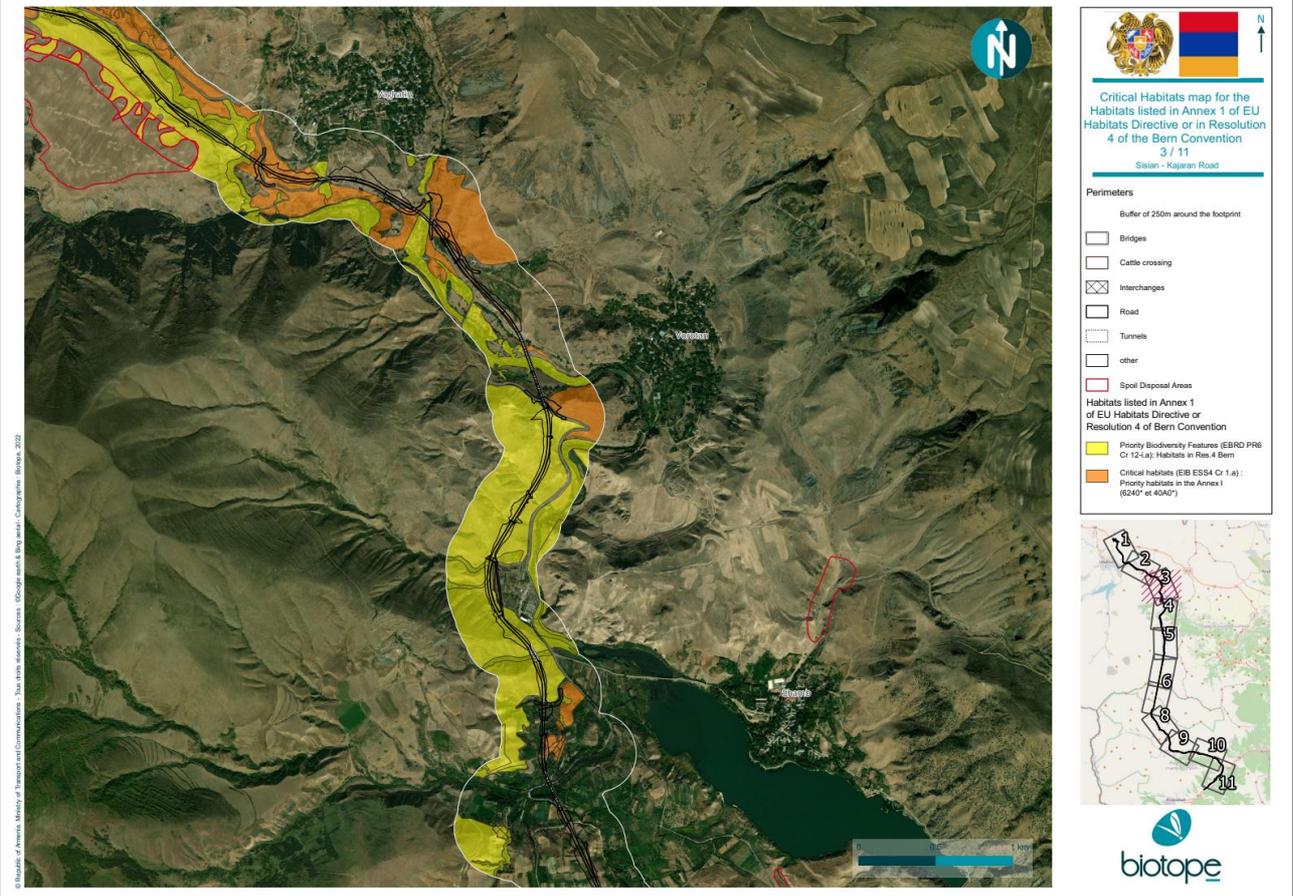
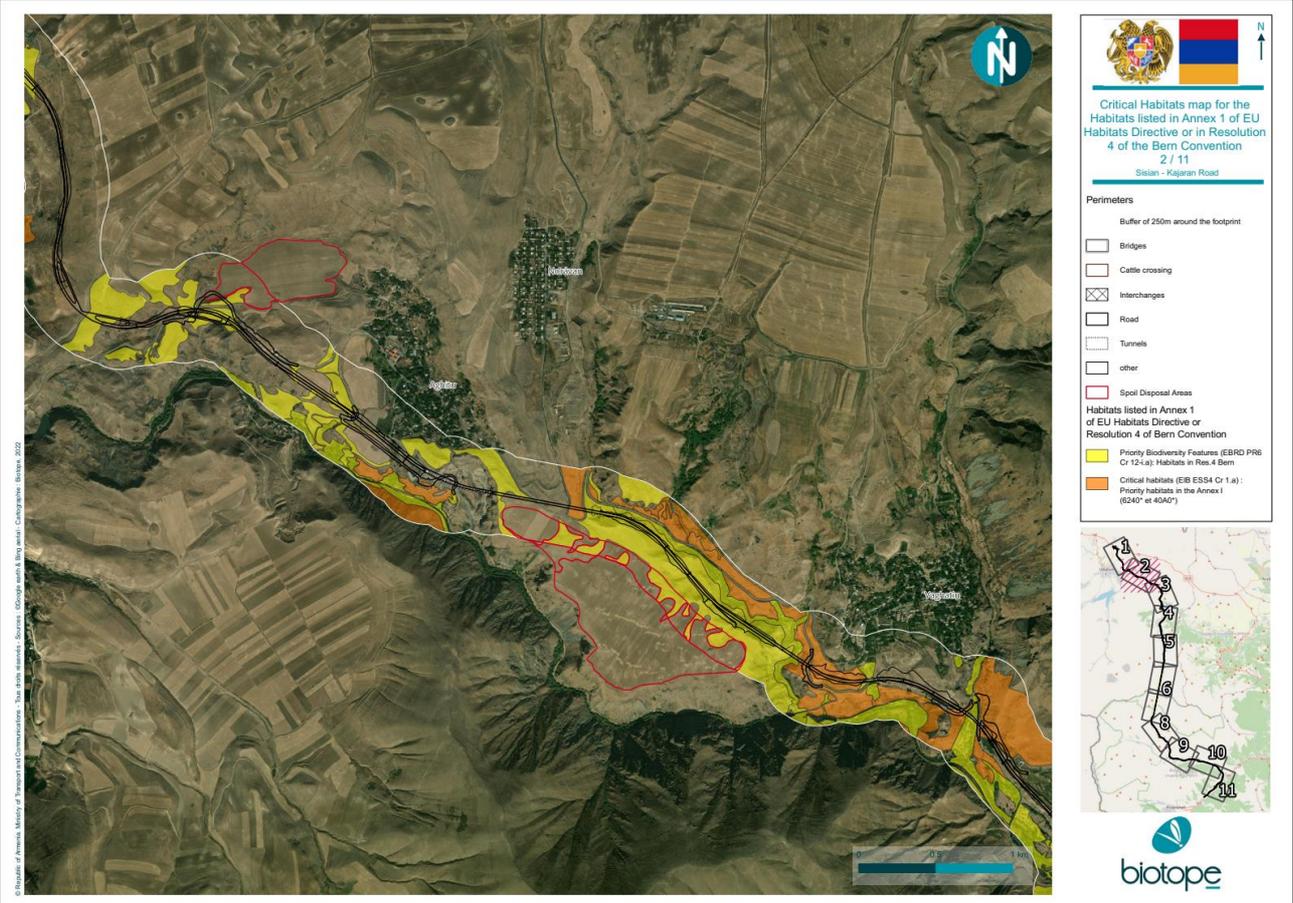
**Habitats listed in Annex 1 of EU Habitats Directive or Resolution 4 of Bern Convention**

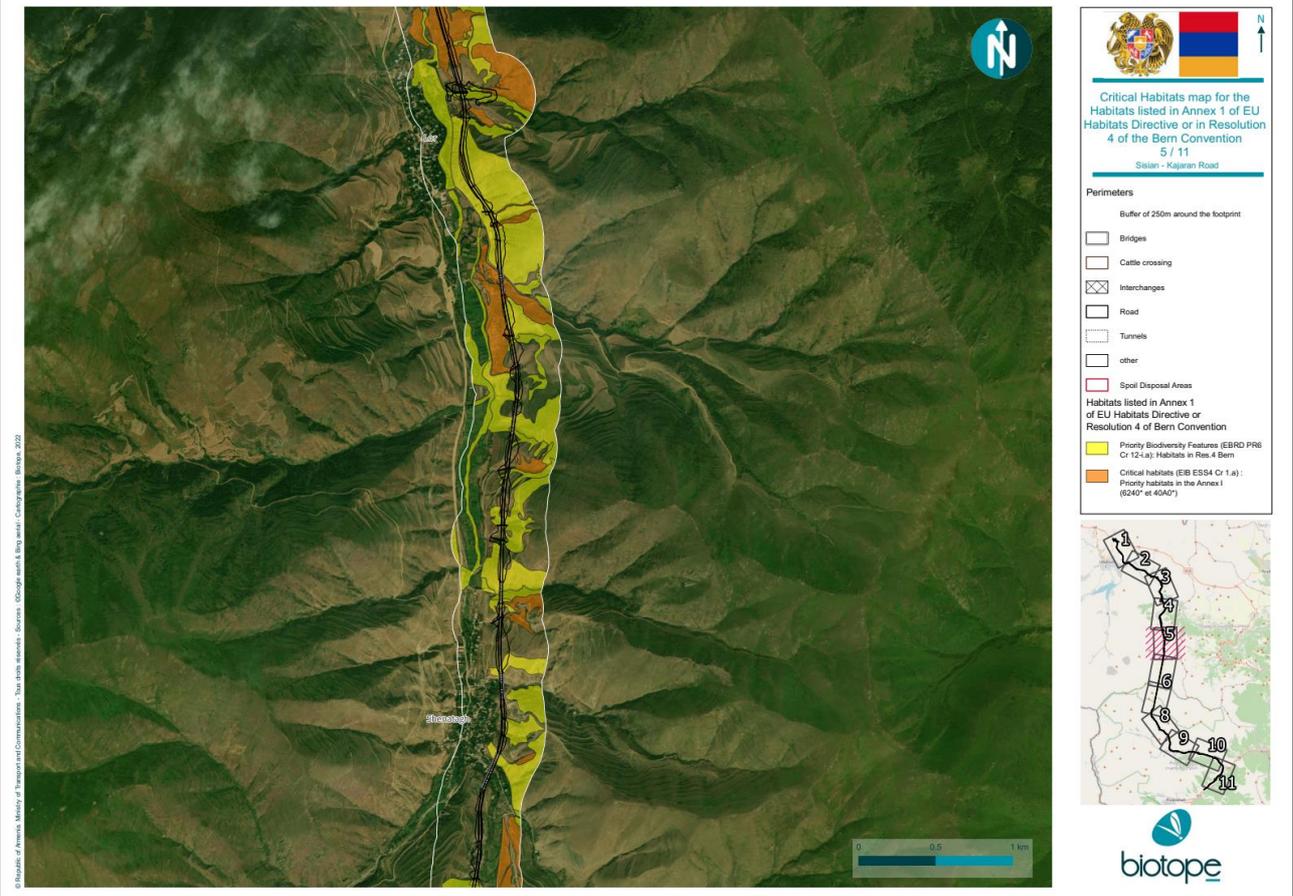
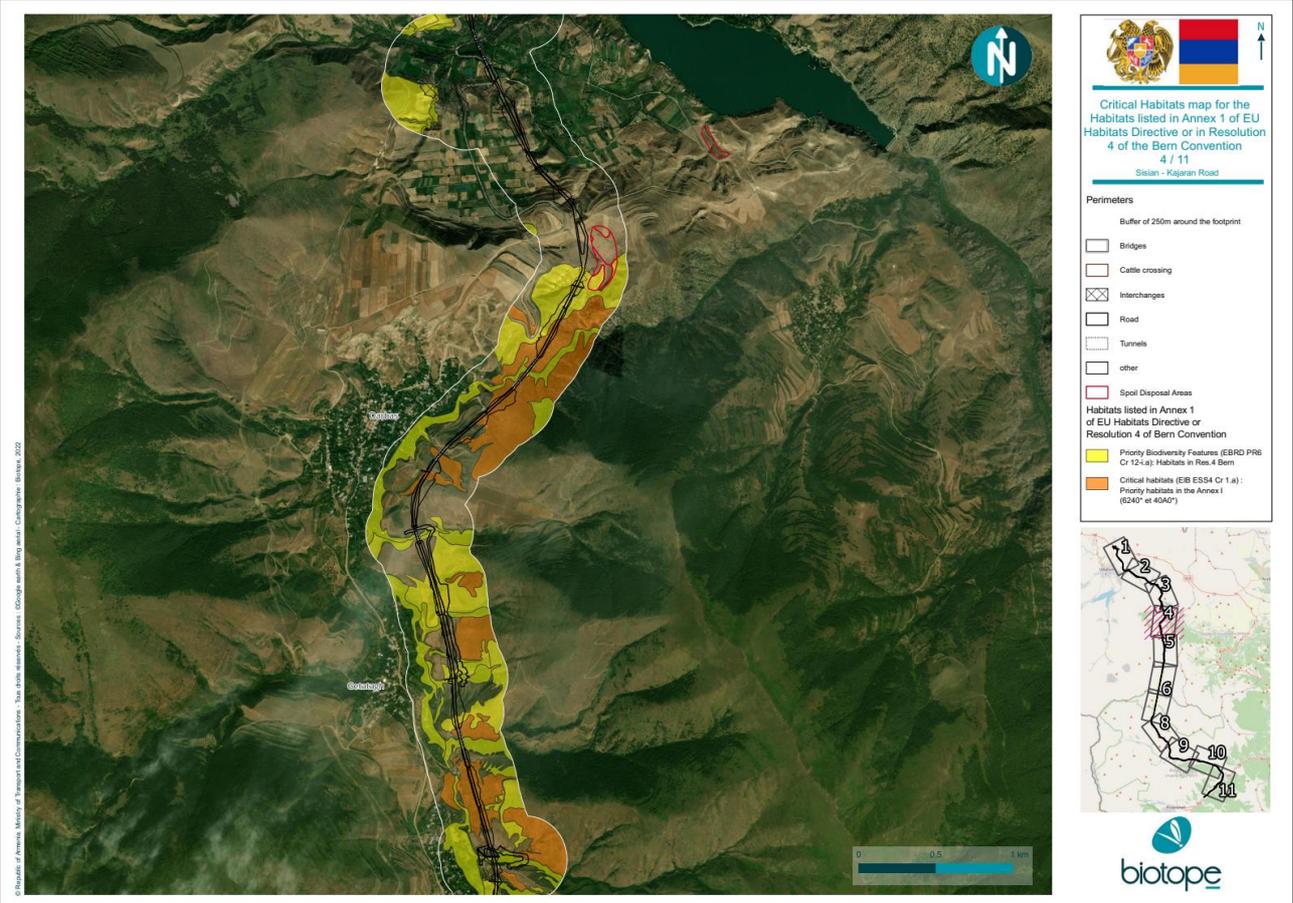
-  40A0\* Subcontinental peri-Pannonic scrub
-  5210 Arboreal matral with Juniperus spp.
-  6190 Rapiolous panonic grasslands (Stipo-Festucetalia pallentis)
-  6240\* Sub-panonic steppic ggrasslands
-  9160 Sub-Atlantic and medio-European oak or oakhornbeam forests of the Carpinion betuli
-  92A0 Salix alba and Populus alba galleries

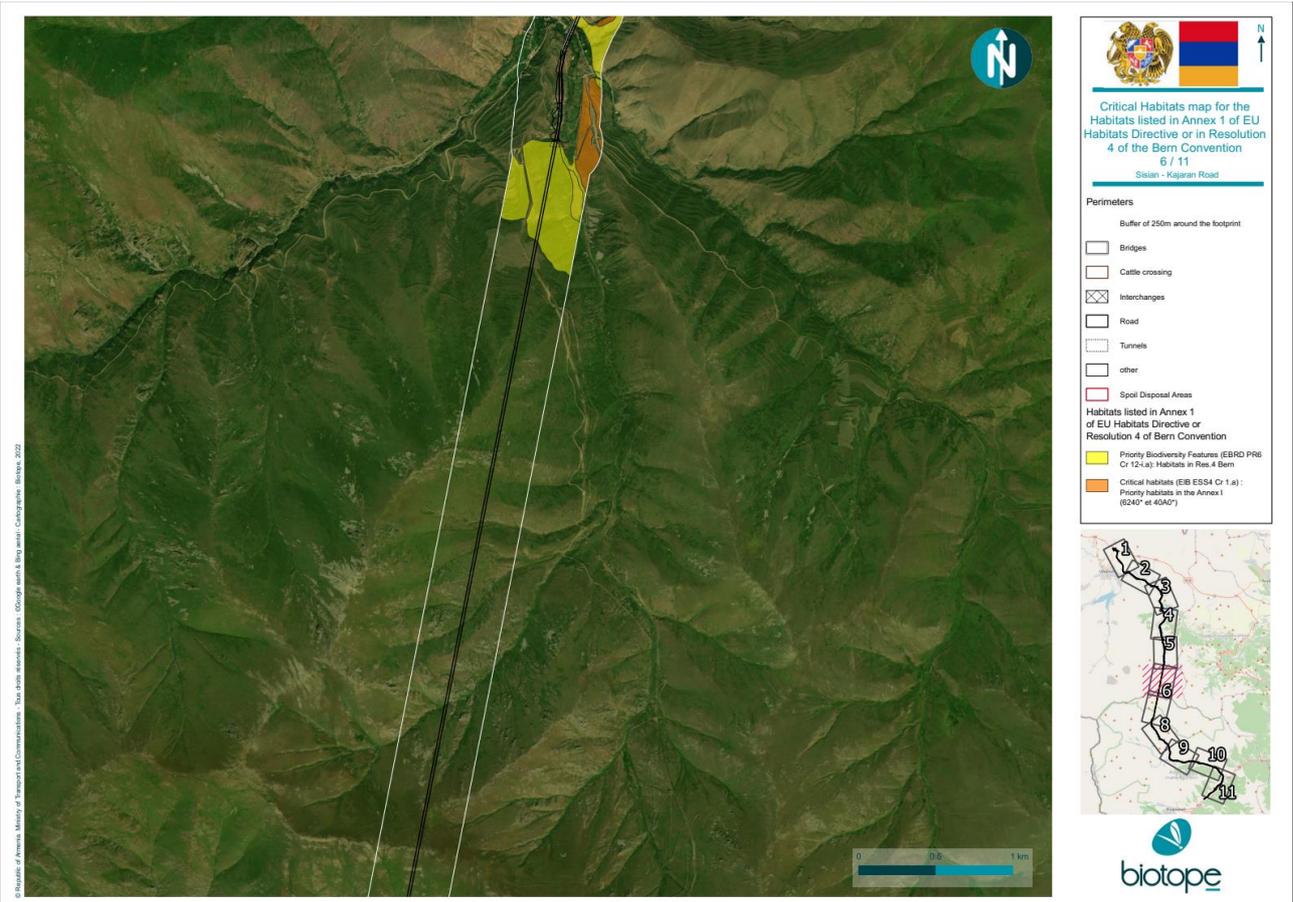


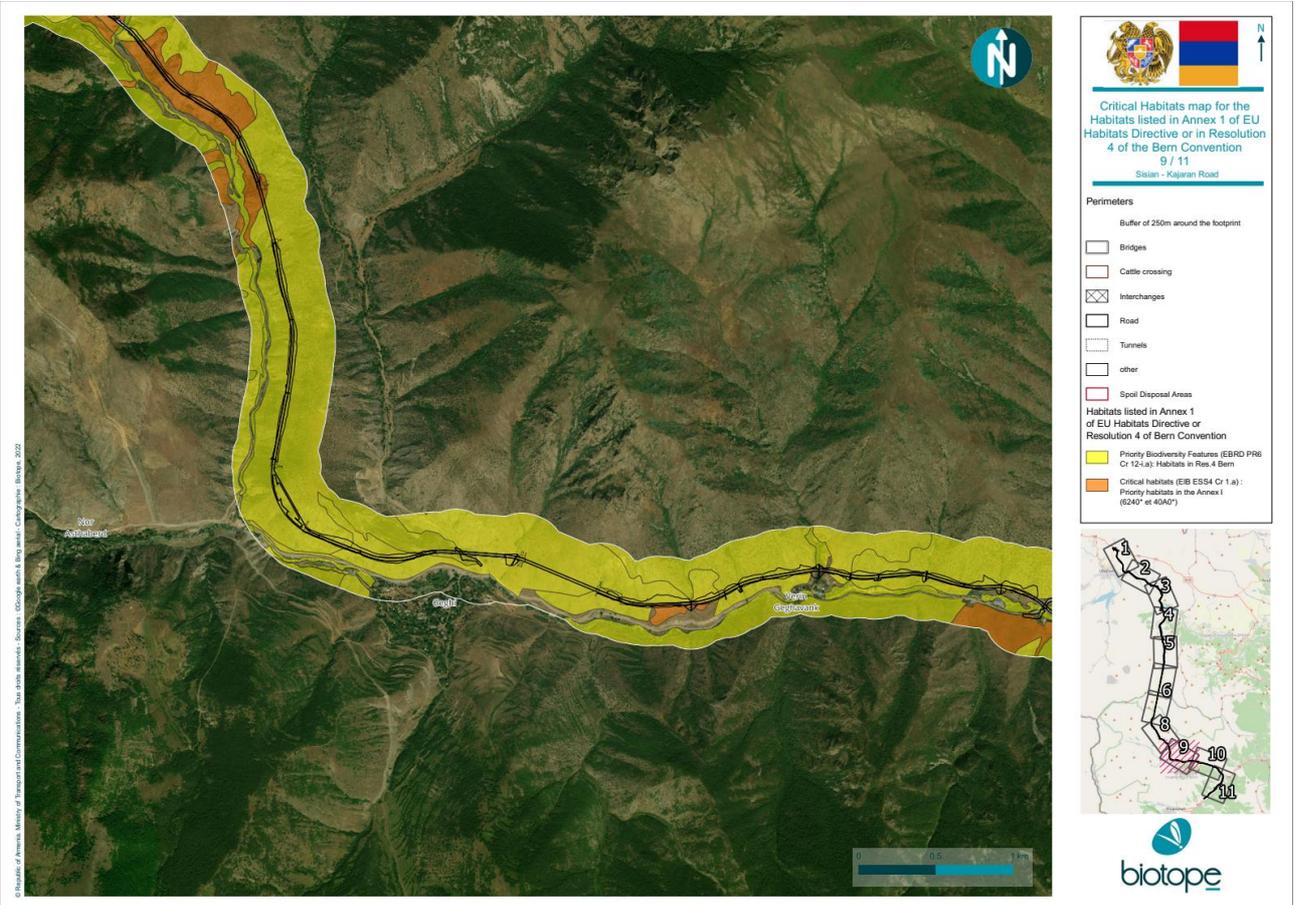
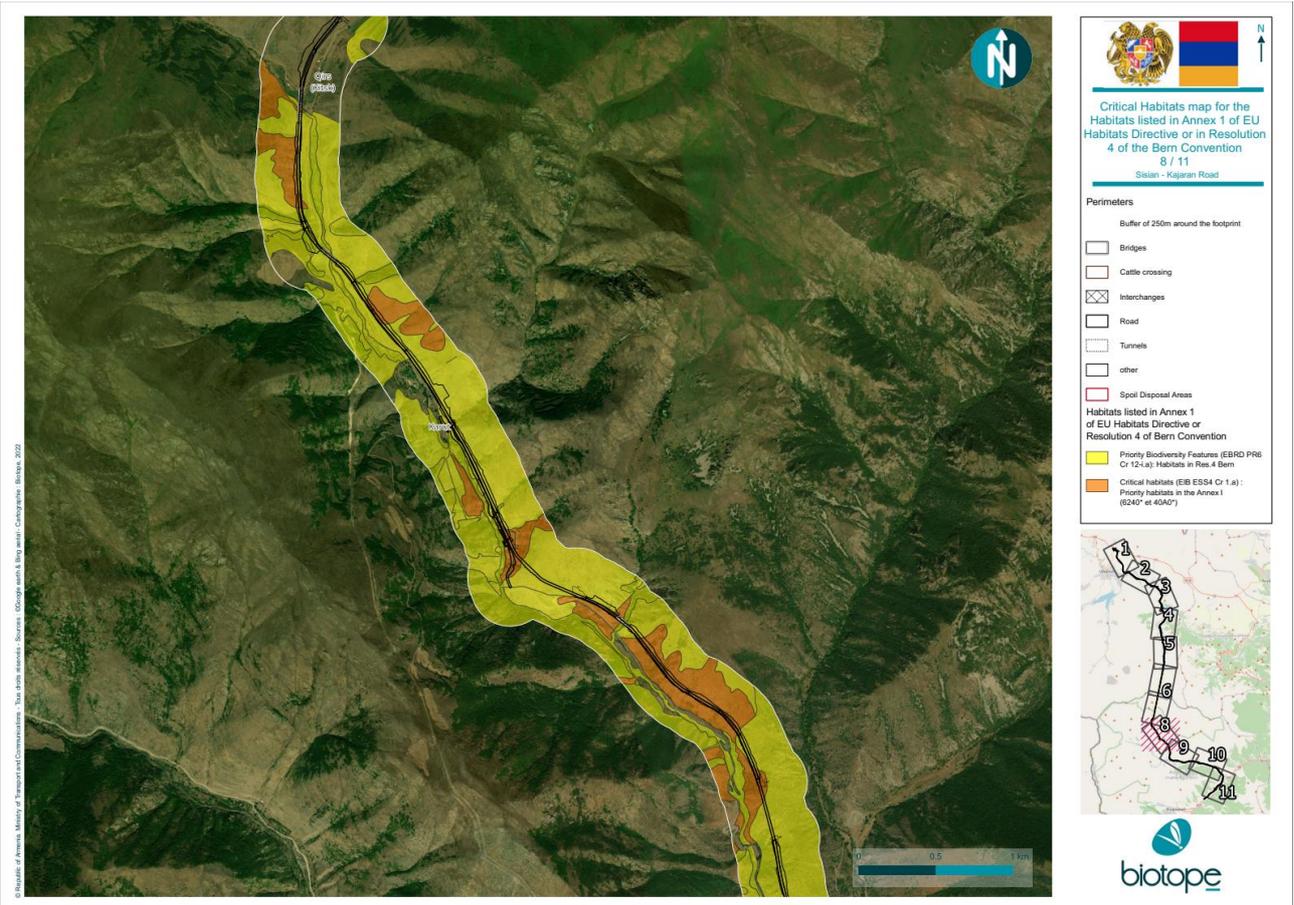
ANNEX 4. MAP OF THE PRIORITY BIODIVERSITY FEATURES TRIGGERING CRITERIA 12.1.A (EBRD, PR6) AND CRITICAL HABITATS AND CRITERIA 1.A (EIB, ESS 4)

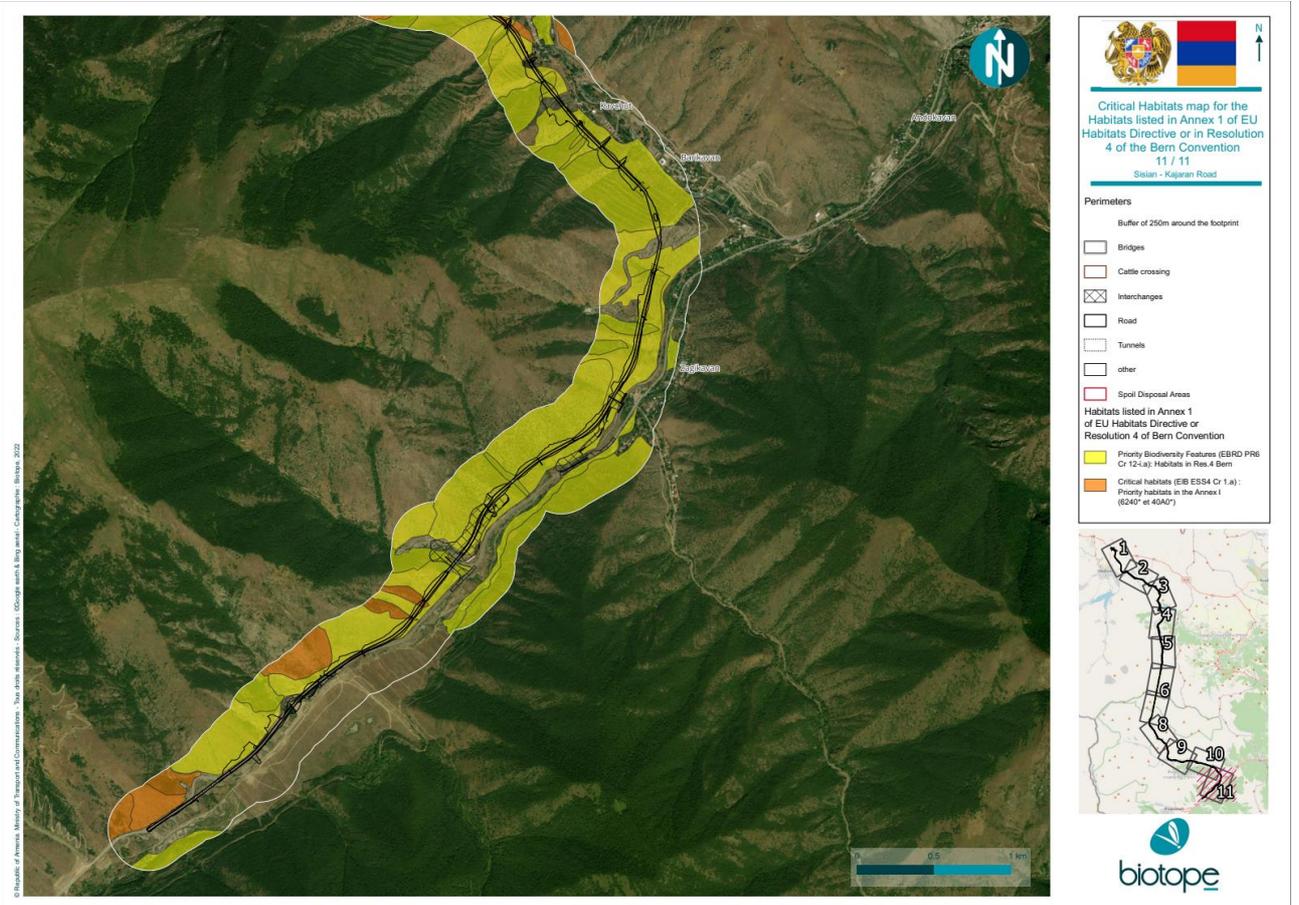
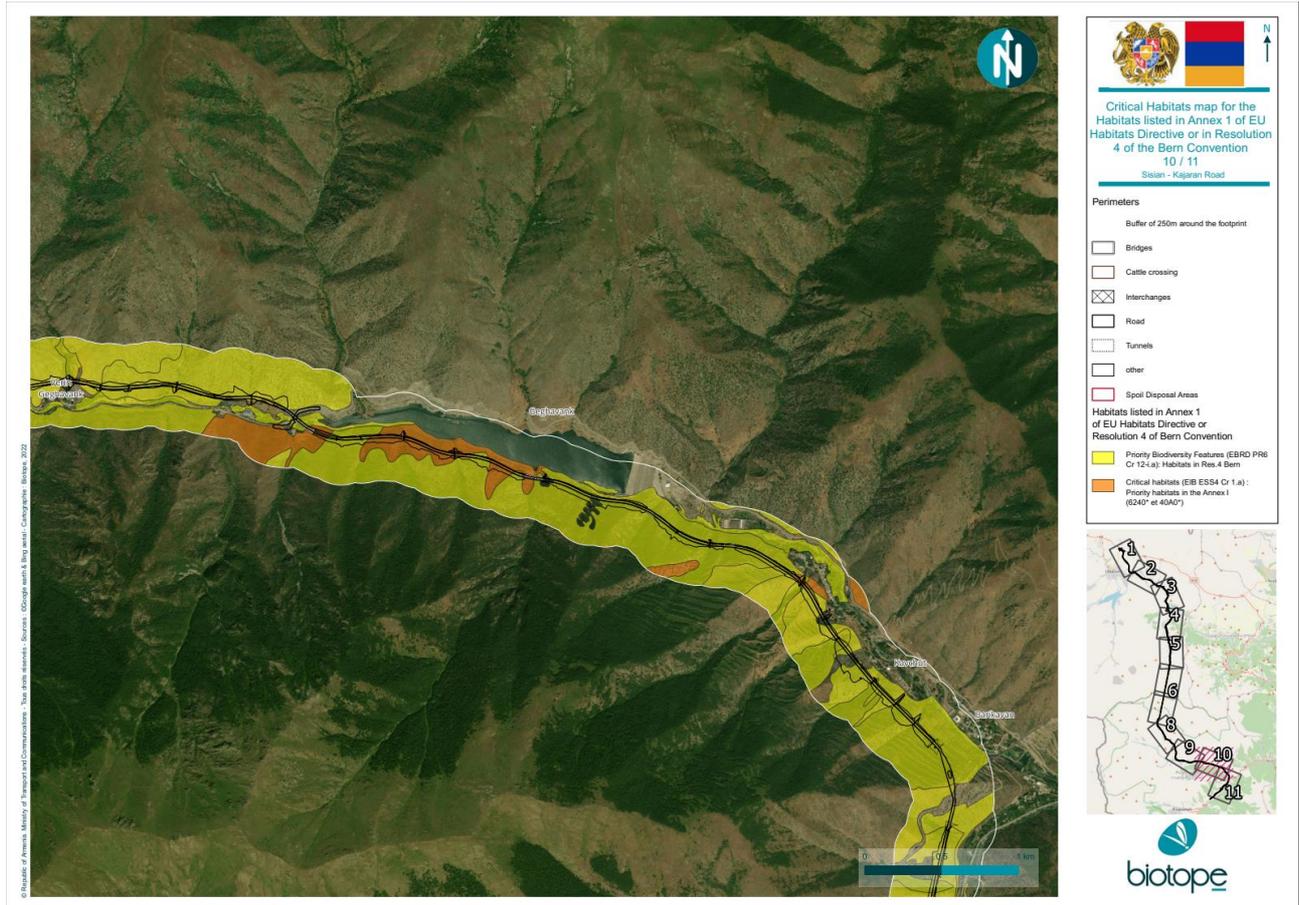












## ANNEX 5. SUMMARY OF THE PROPOSED BAP ACTIONS

Code	Name	Target feature	Potential location	Estimated budget <sup>29</sup>
Offsetting actions				To be detailed in BOMP
BAP 1	Community-based critical habitats restoration and conservation targeting degraded habitats	6240*: Sub-Pannonic steppic grasslands 40A0*: Subcontinental peri-Pannonic scrub	Conservation and active restoration on degraded/overgrazed patches in the vicinity of the Zangezur Sanctuary and other areas of the EAAA where the habitats are present.	<i>Habitat restoration budget will be detailed in the BOMP based on the field identification of favourable areas</i>
		3240 Alpine rivers and their ligneous vegetation with <i>Salix elaeagnos</i> 6190 Rupicolous pannonic grasslands ( <i>Stipo-Festucetalia pallentis</i> ) 62A0 Eastern sub-mediterranean dry grasslands ( <i>Scorzoneratalia villosae</i> ) 6170 Alpine and subalpine calcareous grasslands 9160 Sub-Atlantic and medio-European oak or oak-hornbeam forests of the Carpinion betuli 9170 Galio-Carpinetum oak-hornbeam forests 92A0 <i>Salix alba</i> and <i>Populus alba</i> galleries 5210 Arborescent matorral with <i>Juniperus spp.</i> 8210 Calcareous rocky slopes with chasmophytic vegetation	Restoration of each of the habitats in relevant locations in the EAAA	<i>Habitat restoration budget will be detailed in the BOMP based on the field identification of favourable areas</i>
Biodiversity Net Positive measures which will lead to Net-Gain				750 000 – 850 000 USD for 5 years
BAP 2	Reinforce anti-poaching efforts in the area between Shenatagh and Kajaran	Large mammals	Area between Shenatagh and Kajaran (and specifically on Shenatagh side where poaching seems to be already very developed)	50 000 USD for the staff capacity building 70 000 USD /year for the staff recruitment for 5 years
BAP 3	Contribute to the strengthening of protection and management of Zangezur Biosphere Complex around the project area	All PBF and CH habitats, flora and fauna species	Zangezur Biosphere Complex	

<sup>29</sup> These budgets are rough and indicative and should be adjusted in the framework of the BOMP.

Code	Name	Target feature	Potential location	Estimated budget <sup>29</sup>
	(on Shenatagh side too)			
BAP 4	Community, workforce and stakeholder education on good environmental practice	All habitats, flora and fauna species	All along the road alignment, but especially in the wildest area (between Shenatagh – Kajaran)	50 000 USD
BAP 5	Experimental translocation of endemic restricted-range plant species	Flora species triggering CH	In relevant habitats in the EAAA, remote enough to be protected – to define precisely in the protocol	200 000 – 300 000 USD

## ANNEX 6. PROPOSED LOCATIONS OF WILDLIFE CROSSINGS

As wildlife crossings require adjustments or changes to design, the following categorisation of changes is used and further work between the designers and local communities is required (see ESIA Volume 1 for explanations):

Category 0 (Cat 0)	No changes, usage of nearest structures is proposed as is, additional stakeholder engagement will be required (where indicated as *)
Category 1 (Cat 1)	mitigation can be implemented without changing the alignment or design criteria.
Category 2 (Cat 2)	mitigation can be implemented by changing the alignment but without changing the design criteria (e.g., changes to speed or gradient)
Category 3 (Cat 3)	mitigation can be implemented only after changing the design criteria (change of speed, gradient), then changing a vertical or horizontal alignment

Wild animal passages proposed		Existing solutions in the 2019 Detailed Design				Solutions as of 27 Feb 2023 - to be included in the ToR for designers <sup>30</sup>
Station	Reason / justification	Station	Evaluation comments per design	Fulfilled by design?	If no, recommendations of the technical team	
14+400 KM	Desirable as the animal use this pathway, but not critical.	12+850 KM	Bridge (BR005) 12+646-13+200, 66.0x31.40m max. between two piers	yes, bridge sizes large enough, but are not at km 14+400	Cattle crossing currently provided at logical location and the bridge is further on. Consider shifting cattle crossing at km 14+250 to km 14+400 and enlarge as necessary	Cat 1: move a cattle crossing envisioned in the original design at km 14+250 to km 14+400*
		14+250 KM	Cattle Crossing (CC002) 5.0x3.0m			
		14+268 KM	RC Culvert (CB033) 3.0x3.0m			
		15+000 KM	Bridge (BR006) 14+950 - 15+250, 28.0x21.8m max. between two piers			
37+250KM	Proposed wildlife crossing or bridge (Green Bridge - GB5)	37+200KM	CW Culvert (CB069) 1.5x1.5m	no, BR018 does not cover the area	Topography does not lend itself well to a bridge (alignment at valley floor level); consider a wildlife overpass	Cat 2: extend BR18 - to redesign within the existing design criteria, so that the animals can pass under it
		37+242KM	CW Culvert (CB070) 3.0x3.0m			
		37+475KM	Bridge (BR018) 37+425 - 37+525, 48.0x14.8m max. between two piers			
38+760KM	Proposed Green Bridge 4	38+840KM	Cattle Crossing (CC03) 5.0x3.0m, L = 30.09m	no, crossing size for larger animals 15 x 3.5 m recommended; openness index too small (H*B/L) = 0.5	Consider adapting cattle crossing size to create a large underpass and avoid a green bridge	Cat 1: enlarge the cattle crossing envisioned in the original design in 80 m and propose fencing to direct animals to the pass
		38+860KM	CW Culvert (CB074) 3.0x3.0m, L = ?			
39+650KM	Proposed bridge	39+499 KM	CW Culvert (CB075) 2.0x2.0m, L = ?	no, culvert sizes are too small,	Very difficult location to create either a bridge or an underpass due to the steepness of the valley. The road is cut into the side of a steep slope.	Cat 0: The animals will find way to cross over the tunnel that is in 105 m
		39+687KM	CW Culvert (CB076) 2.0x2.0m, L=?			
		39+755KM	tunnel portal T005 North portal			
40+700KM	Proposed Green Bridge 3	40+650KM	Bridge (BR019) 28.0x31.40m max. between two piers	yes, bridge size large enough	None, unless the ESIA Consultant really wants a bridge over the road	Cat 0: BR019 is in 50m and wild animals should be able to pass under it
41+300KM	Proposed Green Bridge 2	41+270KM	CW Culvert (CB078) 1.5x1.5m, L=?	no, culvert sizes are too small	Consider a green bridge over the road	Cat 1 - the closest culvert should be enlarged a bit, no way to have an overpass
43+300KM	Proposed Ecoduc if road at the bottom of the valley to join the rocky areas	43+430KM	RC Culvert (CB084) 1.5x1.5m (above road alignment?), L = 19.13m	no, culvert sizes are too small	Road is already descending at the maximum gradient; difficult to amend without a change in design parameters. The road is cut into the side of a steep slope.	no options - unless the southern part is lowered - CAT 3  Alternative options were further discussed such as a bridge, and the Construction Contractor will look into site-specific solutions

<sup>30</sup> In late 2023, the RD confirmed that the FIDIC Yellow Book would be used by the RD to allow to address all proposed mitigation in relation to wildlife passages.

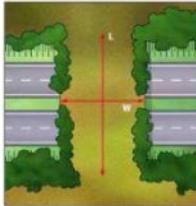
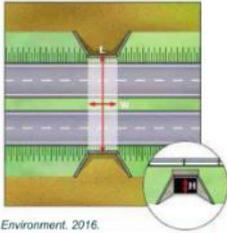
Wild animal passages proposed		Existing solutions in the 2019 Detailed Design				Solutions as of 27 Feb 2023 - to be included in the ToR for designers <sup>30</sup>
Station	Reason / justification	Station	Evaluation comments per design	Fulfilled by design?	If no, recommendations of the technical team	
47+850KM	Proposed bridge	47+893KM	RC Culvert (CB094) 1.5x1.5m, L = ?	no, crossing size for larger animals 15 x 3.5 m recommended; openness index	Underpass is possible. Elevated road structure instead of large embankment should be considered	Cat 1 - Adjust the nearest cattle crossing in 70 m to be used by the animals + direct them OR
		47+921KM	Cattle Crossing (CC04) 5.0x3.0m, L = 40.12m	too small (H*B/L) = 0.38,		Cat 2 - to move the cattle crossing down the hill by 50m - (re-designing)
48+600KM	Proposed Green Bridge 1	48+598KM	CW Culvert (CB097) 3.0x3.0m , L = ?	no, culvert sizes are too small	Consider an underpass in discussion with ESIA Consultant	Cat 1 - enlarge the culvert to be used by the animals
50+000KM	Proposed bridge	49+452KM	Bridge (BR021) 66.0x30.30m max. between two piers	No	The south side of the alignment is in cut so a bridge on the current alignment is not possible; moving the road out of the hillside would enable a bridge	Cat 1 - Adjust the nearest culvert in 120 m to be used by the animals + measures needed to direct them OR
		49+878KM	R/C Culvert (CB101) 2.0x2.0m (above road alignment?)			Cat 2 – moving the road out of the hillside would enable a bridge

## ANNEX 7. DESIGN RECOMMENDATIONS FOR WILDLIFE CROSSINGS



### Concepts

- **Wildlife crossings should be adapted to the priority species and located preferentially where their corridors have been impacted/fragmented.**
- **Possible set-up vary according to different criteria:**
  - Their type (e.g. underpass, overpass, ecoduct, etc.)
  - Their size (width, length, etc.)
  - Their setting (rocky, vegetated, topographic constraints)
  - Their use (mixed, fauna, pedestrians)

Ministry of Agriculture, Food and the Environment. 2016.



### Proposed wildlife crossing types

Under the infrastructure	Over the infrastructure
<input type="checkbox"/> Multi-use underpasses	<input type="checkbox"/> Multi-use overpasses
<input type="checkbox"/> Large mammals underpasses	<input type="checkbox"/> Wildlife overpasses
<input type="checkbox"/> Modified Viaducts	<input type="checkbox"/> Ecoducts/Landscape bridges



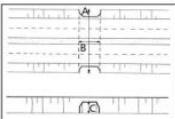
### Wildlife crossing typology - Underpasses

- **Under the infrastructure**
  - Multi-use underpasses
  - Large mammals underpasses
  - Optimized viaducts









- Recommended width = 15 x 3.5 m
- Openness index ( $B \cdot C / A$ ) > 0.75
- Difference between the 2 underpasses : presence of tracks for vehicles for the multi-use underpasses

- Recommended width = 15 x 3.5 m
- Openness index ( $B \cdot C / A$ ) > 0.75
- Piles must be located outside the river channel to preserve the continuity of the riparian corridor
- Revegetation and a perimeter fence must be installed to guide wildlife from the surrounding habitats to the viaduct where necessary

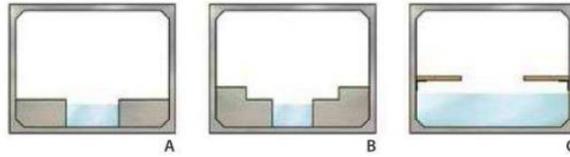
Sources : ; Spanish



## Wildlife crossing typology - Underpasses

### • Under the infrastructure

#### ☐ Modified culverts



- The culvert dimensions depend on the water flow. They must have a minimum section of 2 x 2 m (or 2 m in diameter in the case of circular structures, which are less desirable) for adaptation to wildlife passage.
- Minimum width of ledges: 0.5 m. Height defined by the ordinary flood level.

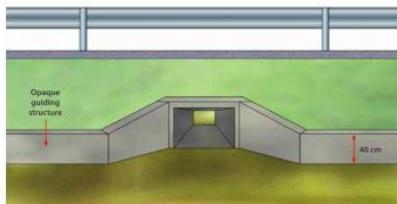
Sources : Spanish



## Wildlife crossing typology - Underpasses

### • Under the infrastructure

#### ☐ Amphibian tunnels



- Maximum distance between crossings: 60 m, or up to 100 m if the guide fence has a slight funnel shape to facilitate movement towards the crossing
- Minimum height of the guide fence: 0.4m ; recommended : 0.6 m
- Pipe structures can be adapted, but boxes are preferable since their vertical walls facilitate amphibian movement in the right direction

Crossing length (m)	<20	20-30	30-40	40-50
Width x Height (m)	1 x 0.75	1.50 x 1	1.75 x 1.25	2 x 1.50

Sources : Spanish



## Wildlife crossing typology - Overpasses

### • Over the infrastructure

#### ☐ Multi-use overpasses



- Recommended width = 20-50 m (minimum = 10 m)
- Width/length ratio >0.8.
- Minimum width of revegetated lateral strips or natural soil: 1 m.
- Lateral screen height: 2 m.

#### ☐ Wildlife overpasses



- Recommended width: 40-50 m (minimum = 20 m)
- Width/length ratio >0.8.
- Lateral screen height: 2 m.
- Minimum topsoil depth for herbaceous plantations: 0.3 m; for shrub plantations: 0.6 m

#### ☐ Ecoducts



- Largest infrastructure
- Minimum width = 80 m

Sources : Spanish



## Wildlife crossing types – Large infrastructures



Figure 2.35 - This viaduct in northern England leaves the river valley intact. (Photo by Highways Agency, UK)



<https://www.theguardian.com/environment/2022/apr/09/wildlife-bridge-california-highway-mountain-lions>



## Decision key to orientate wildlife crossings types

Key 1 : Status	Key 2 : topographic constraints	Key 3 : target species or groups	Most suitable type of crossing
Critical habitat (Net gain)	Crossing river, canyon, wetland	Large mammals and all other species	Optimized Viaducts/Bridge
	Cut, Flat, slope	All species	Ecoduct/Landscape bridge (80m)
		Large mammals, Otter and all other species	Wildlife overpass (40-50m)
Biodiversity priority features (No Net Loss)	Fill (embankment)	Amphibians	Large mammals underpasses
	Cut, Flat, slope	All species	Optimized bridges and culverts
Fill (embankment)		Amphibians	Amphibian tunnels
	Modified habitat (Without biodiversity priority features or CH triggering species)	Cut, Flat, slope	All species
All species			Multi-use underpasses (every 500m along the line)
Fill (embankment)		Amphibians and fishes	Optimized bridges and culverts
	Cut, Flat, slope	All species	Multi-use overpasses
		All species	Multi-use underpasses
	Fill (embankment)	Amphibians and fishes	Amphibian tunnels and fish passes

Adapted from Spanish Ministry of Agriculture, Food and the Environment, 2016



## Key criterias for wildlife crossing efficiency

- The infrastructures should be situated in areas that are known wildlife corridors (and for the overpasses : if possible with minimal human disturbance)
- Set-up fences that funnel animals towards the crossing
- Keep vegetation under the infrastructure (or implement revegetation after construction works)
- Overpasses should have a similar vegetative composition to the vegetation in adjacent habitats
- For underpasses, ensure to respect the openness index. If not possible, consider other options to avoid “tunnel” effect (e.g. build parallel structures to minimise the length of the underpass and to provide increased light below, “light well”, etc.)



Crossing type	Uses	Target fauna groups <sup>1</sup>	Crossing size <sup>2</sup>	
			Minimum	Recommended
Ecoducts	Specifically for fauna	All except amphibians & aquatic fauna	W: 80m	—
Large mammal overpasses	Specifically for fauna	Large mammals	W: 20 m and W/L > 0.8*	W: 40-50 m
Multi-use overpasses	Wildlife crossing + drainage + track/livestock trail	Large mammals	W: 10 m and W/L > 0.8*	W: 20-50 m

Ministry of Agriculture, Food and the Environment. 2016.



## Conclusion

- **Bezoar goats, Armenian Mouflon, Lynx, wolves, bears**
  - ⇒ Prefer overpasses than underpasses (landscape bridges, large mammal overpasses) or depending on the topography, optimized viaducs
- **Otter**
  - ⇒ Modified culverts
- **Other species**
  - ⇒ Properly designed, vegetated and with the relevant habitats (e.g. rocks, etc.) underpasses and overpasses (apart for fishes : underpasses/culverts)



## Conclusion

Crossing type	Uses	Target fauna groups <sup>1</sup>	Crossing size <sup>2</sup>				
			Minimum (W x H)			Recommended (W x H)	
Modified viaducts	Multi-use	All	—			—	
Large mammal underpasses	Specifically for fauna	Large mammals	- Wild boar + roe deer: 7 x 3.5 m and openness index: >0.75 - Red deer: 12 x 3.5 m and openness index: >0.75			15 x 3.5 m	
Multi-use underpasses	Wildlife drainage + track/livestock trail	Large mammals	- Wild boar + roe deer: 7 x 3.5 m and openness index: >0.75 - Red deer: 12 x 3.5 m and openness index: >0.75			15 x 3.5 m	
Underpasses for small vertebrates	Specifically for fauna	Small vertebrates	2 x 2 m			—	
Modified culverts for terrestrial animals	Wildlife crossing + drainage	Small vertebrates	2 x 2 m			—	
Modified culverts for fish	Wildlife crossing + drainage	Fish	—			—	
Amphibian tunnels	Specifically for fauna	Amphibians	Length (m):	<20	20-30	30-40	40-50
			Section H x W (m):	1 x 0.75	1.5 x 1	1.75 x 1.25	2 x 1.5

<sup>1</sup> For more information on taxa included in each target fauna group, see section 3.5.3.

<sup>2</sup> W: Width; L: Length; openness index (W x H)/L.

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