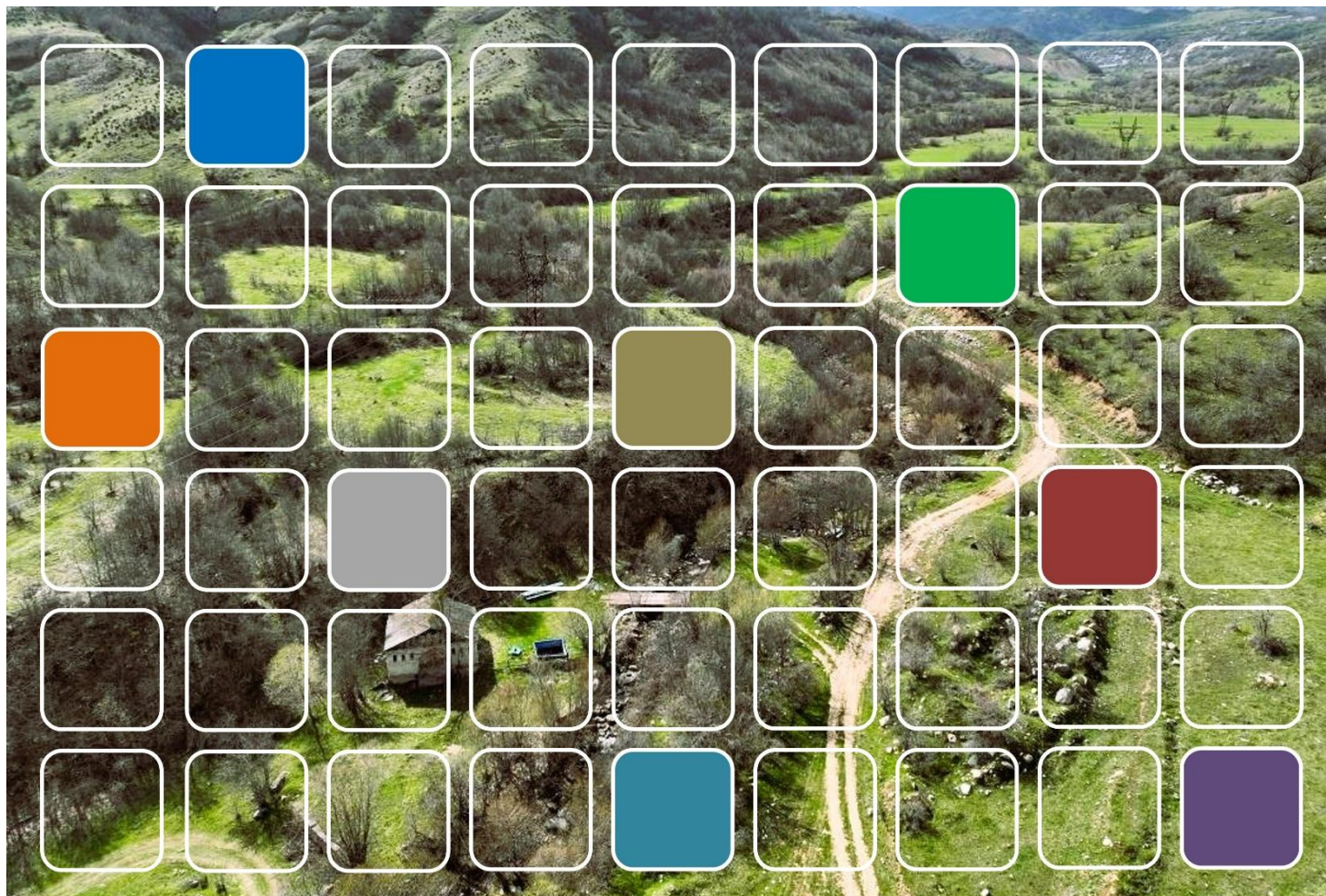




Source: Photos taken by the Consultant during the site visits

WATER RESERVOIRS PROJECT - ARMENIA

Environmental and Social Impact Assessment for the Lichk Reservoir Construction Project

BIODIVERSITY ACTION PLAN

Rev02

February 2026

Prepared for:

*European Bank for
Reconstruction and
Development*

and

*Water Committee under the
Ministry of Territorial
Administration and
Infrastructure of the Republic
of Armenia*



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Consultancy Services Contract № 2023.009567

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Prepared by:



ATMS Solutions Ltd. (Armenia)

Director: Dr. Artak Ter-Torosyan

1, 11 Griboedov str.,

0051, Yerevan, Armenia

Tel.: +37499 109495

E-mail: artak.ter-torosyan@atms.am

www.atms.am

and



Ecoline International Ltd. (Bulgaria)

Director: Dr. Maia Gachechiladze-Bozhesku

Tel.: +380 951 100 727

+ 359 876 63 0522

E-mail: mgachechiladze@ecoline-int.org

www.ecoline-int.org

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Disclaimer

This Biodiversity Action Plan (BAP) has been developed as part of the Environmental and Social Impact Assessment (ESIA) for the Lichk Reservoir Construction Project (hereinafter 'the Project'). The assessment is based on information drawn from multiple sources, including the detailed design documentation, reports from field investigations, meeting records, relevant publications, various databases, and data collected directly by the ESIA team.

Verifying all sources with complete certainty is extremely challenging; therefore, validation has been undertaken primarily through careful review and logical assessment of the available information. Every effort has been made to ensure that all information used in the ESIA has been accurately presented.

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List of Abbreviations

BAP	- Biodiversity Action Plan
BMP	- Biodiversity Management Plan
BOMP	- Biodiversity Offset Management Plan
CH	- Critical Habitat
CJSC	- Close Joint Stock Company
EAAA	- Ecologically Appropriate Area of Analysis
EBRD	- European Bank for Reconstruction and Development
EIA	- Environmental Impact Assessment
ESAP	- Environmental and Social Action Plan
ESIA	- Environmental and Social Impact Assessment
ESHS	- Environmental, Social, Health, and Safety
ESMP	- Environmental and Social Management Plan
ESMS	- Environmental and Social Management System
ESP	- Environmental and Social Policy
EU	- European Union
E&S	- Environmental and Social
GIP	- Good International Practice
ME	- Ministry of Environment
MTAI	- Ministry of Territorial Administration and Infrastructure
NG	- Net Gain
NNL	- No Net Loss
OHS	- Occupational Health and Safety
OHSMP	- Occupational Health and Safety Management Plan
GA	- Government of Armenia
PAP	- Project Affected Person
PBF	- Priority Biodiversity Features
PIU	- Project Implementation Unit
PPE	- Personal Protective Equipment
PR	- Performance Requirement
RA	- Republic of Armenia
SDA	- Spoil Disposal Area
SDMP	- Spoil Disposal Management Plan
SPA	- Spoil Disposal Area
SPMP	- Spill Prevention and Management Plan
SSESMP	- Site-Specific Environmental and Social Management and Monitoring Plan
WCRA	- RA Water Committee
WMP	- Waste Management Plan

Table of Content

1.	Introduction.....	6
2.	Need, Purpose and Structure of the BAP.....	7
3.	Legal and Regulatory Framework for Biodiversity.....	8
3.1	National Requirements	8
3.2	Ratified International Agreements	9
3.3	EBRD Requirements	10
3.4	Good International Practice (GIP) Guidelines	11
3.5	Applicable EU Directives	11
4.	Project Description	11
5.	Biodiversity Values	13
6.	Summary of Potential Impacts	17
7.	Mitigation: Biodiversity Management Plan	20
8.	Residual impact.....	24
9.	Offsetting strategy	27
9.1	Loss and gain analysis and calculations	27
9.2	Offsetting measures	30
10.	Biodiversity monitoring	37

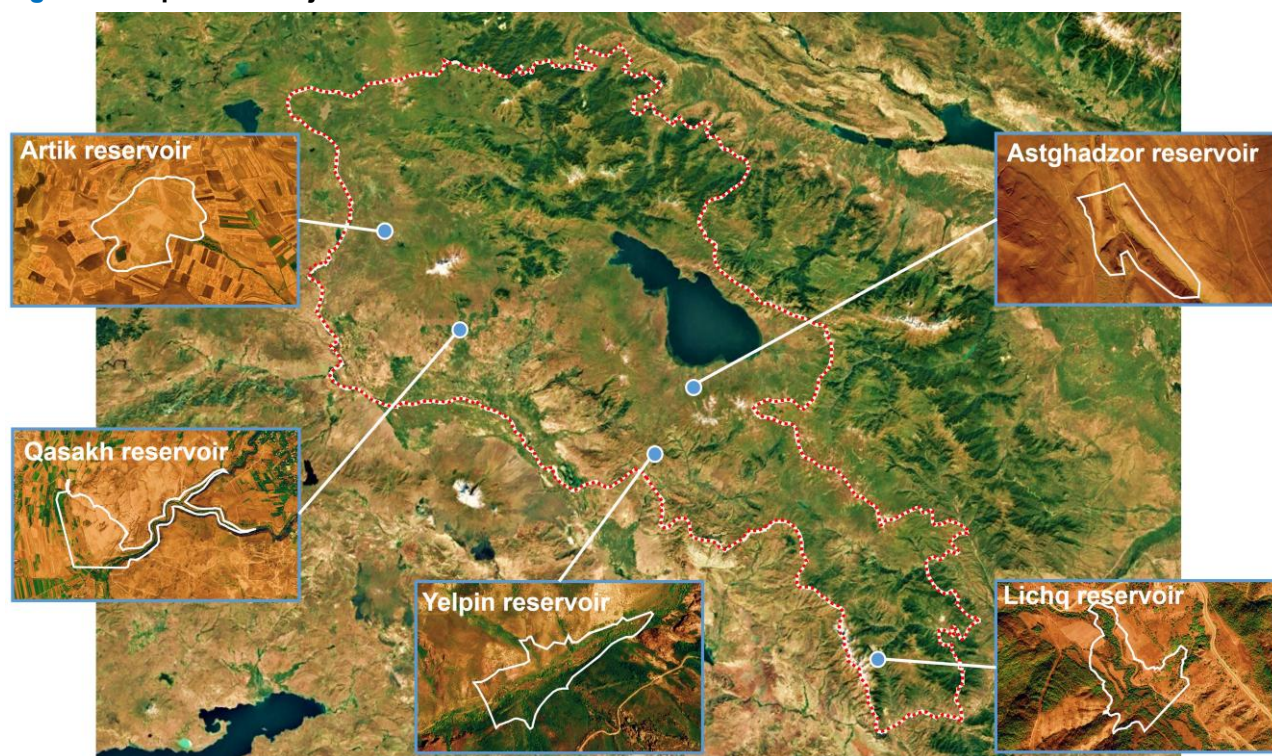
1. Introduction

The Government of the Republic of Armenia ('RA') plans to construct 17 reservoirs within the EU support initiative 'Recovery, resilience and reform: post 2020 Eastern Partnership priorities' to the Government of Armenia ('GA') to enhance the water and food security level in the country. The European Bank for Reconstruction and Development ('EBRD' or the 'Bank') is considering provision of a loan to the GA to finance the construction of five water reservoirs in different regions (Marzes) of Armenia:

- Kasakh reservoir in Aragatsotn Marz¹,
- Lichk reservoir in Syunik Marz,
- Yelpin reservoir in Vayots Dzor Marz,
- Artik reservoir in Shirak Marz,
- Astghadzor reservoirs in Gegharkunik Marz.

The locations of the Project reservoirs are shown in **Figure 1**.

Figure 1. Map of the Project reservoirs



The EBRD has categorized this greenfield project as 'A' in line with its Environmental and Social Policy ('ESP') (2019) because it may cause significant environmental and social impacts. This means that a comprehensive Environmental and Social Impact Assessment ('ESIA') report and associated documents must be elaborated, followed by their public disclosure for a minimum period of 120 days.

One of the five reservoirs listed above is planned for construction within the administrative boundaries of Lichk rural settlement of Meghri enlarged community, RA Syunik Marz. The Lichk Reservoir is designed with a capacity of 3.76 mln. m³ and will be fed by the Lichk (Arevik) tributary of the Meghri River. It is intended to provide irrigation water to approximately 1,510.8 ha of

¹"Marz" means "Region" in Armenian

agricultural land across the settlements of Meghri, Agarak, Alvank, Shvanidzor, Nrnadzor, Lehvaz, Vardanidzor and Karchevan.

The Bank has engaged the Consultant² to update the national Environmental Impact Assessment ('EIA') report for the Lichk Reservoir Construction Project into the ESIA in accordance with the EBRD ESP and to prepare the associated Environmental and Social (E&S) documentation, including this Biodiversity Action Plan ('BAP') proportionate to the Project's specific impacts, benefits, and opportunities.

2. Need, Purpose and Structure of the BAP

Armenia is a key contributor to biodiversity within the South Caucasus, one of the world's recognised biodiversity hotspots. Despite its relatively small size, Armenia hosts an exceptional variety of ecosystems and habitats, including semi-deserts, mountain steppes, broadleaf and mixed forests, riverine and wetland systems, subalpine and alpine meadows, and high-mountain rocky ecosystems. This habitat diversity supports high species richness and numerous endemic and rare species.

Located at the junction of Europe, Asia, and the Middle East, Armenia also functions as an ecological corridor, facilitating species movement and maintaining genetic exchange across the region. These characteristics give Armenia an important ecological role at both national and transboundary levels.

As presented in the ESIA, the Lichk Reservoir Construction Project will be implemented in an area of high biodiversity where valued habitats and species were identified. The CHA has revealed biodiversity values assessed as PBFs and CHs that will be adversely affected by the Project; some habitats will be lost. According the EBRD PR6, this requires mitigation and, as a last resort, offsetting. This requirement underpins the need for a Biodiversity Action Plan (BAP).

Purpose of the BAP is development of mitigation measures in accordance with the mitigation hierarchy and design a biodiversity offset strategy to address the project's significant residual impacts on biodiversity.

The BAP provides a biodiversity summary from the ESIA including a description of legal framework for biodiversity conservation, outline of the Project and findings on biodiversity values and impacts on them. In accordance with to the EBRD PR6, a set of mitigation measures is designed in the form of Biodiversity Management Plan (BMP) comprising objectives, specific actions, timelines, assigned responsibilities, and monitoring indicators. Just after, remained residual impacts on some PBFs and CHs are assessed. Finally, the BAP designs an offsetting strategy to achieve no net loss/net gains of priority biodiversity features (PBFs) and critical habitats (CHs).

The BAP has been informed by the Project's biodiversity baseline, national EIA and ESIA reports, and has been developed with input from a range of stakeholders, including Ministry of Environment (ME), biodiversity experts, available national level reports as well as documents prepared by the international organization specialised in the biodiversity studies. The BAP will need to be updated if changes to the Project design occur and prior to the commissioning of the reservoir. Any update of the BAP should be agreed with the EBRD and "no objection" should be obtained from the Water Committee of the Republic of Armenia (WCRA).

²A consortium consisting of ATMS Solutions Ltd. (Armenia) and Ecoline International Ltd. (Bulgaria)

3. Legal and Regulatory Framework for Biodiversity

3.1 National Requirements

According to the **RA Law on Environmental Impact Assessment and Expert Examination (2014, revised in 2023)**³, there are two types of documents, which are subject to environmental impact assessment 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) (ii) Design Document - technical report, feasibility study and construction-engineering design of intended activity.

The Law establishes the general legal and organizational principles for conducting the mandatory EIA of various types of activities and concept documents of sectoral development. According to Article 12 of the Law, the types of activities, which should undergo EIA are divided into "A" and "B" categories depending on their expected environmental impact.

As per Article 12 the Law, the reservoirs or artificial lakes with 500,000 m³ and more capacities are subject of national EIA and State expert examination. The roles and powers of parties engaged in EIA and expert examination processes are set out in Chapter 2 of the Law. The procedure for public notification and public discussions is outlined in the **RA Government Decree №1325-N** dated 19.11.2014⁴.

The **RA Law on flora (1999)**⁵ and **RA Law on fauna (2000)**⁶ 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 Decree №71-N and №72-N on approval of the **RA Red Book of animals**⁷ and **RA Red Book of plants**⁸ 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 EU⁹ and align with the EU legislation. The amendments included such notions as fauna monitoring, definition of invasive species, use of fauna for health, protection and industrial purposes, Important Bird Areas (as areas of special environmental interest established for conservation of birds (outside of specially protected nature areas or included therein), serving for nesting, wintering or rest, and others.

RA Government Decree №781-N "On the order of protection of flora of the Republic of Armenia and its use for the purpose of reproduction in natural conditions (2014)"¹⁰ defines the measures for

³<https://www.arlis.am/documentview.aspx?docid=178468>

⁴<https://www.arlis.am/documentview.aspx?docid=188071>

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

⁶<https://www.arlis.am/documentview.aspx?docid=120790>

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

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

⁹Comprehensive 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))).

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

the protection, including translocation, of plants threatened with extinction as a result of economic activity.

The **RA Law on special protected natural areas (2006)**¹¹ regulates special protected areas of RA and eco-systems that have environmental, economic, social, scientific, educational, historical, cultural, healthcare and recreational value. It also outlines the legal basis for state policies regarding sustainable development, restoration, protection, reproduction and use of natural features 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 №967-N** dated 14.08.2008¹².

The **RA Forest Code (2005)**¹³ regulates the sustainable management of forests: guarding, preserving, rehabilitation, afforestation and rational use of forests and forest lands in Armenia as well as forest inventory, monitoring and control.

The **RA Water Code (2002)**¹⁴ provides the legal basis for the 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 №75-N** dated 27.01.2011¹⁵.

Article 1 of the Water Code defines, among other things:

- 'Water protection zone' as an area designated to prevent the pollution and depletion of water resources, and to maintain a favourable water regime; such areas are not subject to privatization or confiscation.
- 'Protected sanitary zone of water ecosystems' as an area designated to protect water resources used for drinking, healthcare, domestic services, medical facilities, resorts, and other health-related purposes.

3.2 Ratified International Agreements

Republic of Armenia is a signatory/party to several international agreements related to biodiversity (**Table 1**).

Table 1. List of ratified by the RA international agreements applicable for the project

International agreements (convention or protocol)	Description
Convention on Wetlands of International Importance - (Ramsar 1971)	The Ramsar Convention is an intergovernmental treaty aiming to maintain the ecological character and plan the sustainable use of Wetlands of International Importance. The Convention entered into force in Armenia in 1993.

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

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

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

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

¹⁵<https://www.arlis.am/documentview.aspx?docid=200962>

International agreements (convention or protocol)	Description
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 Desertification, 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.
Convention on Environmental Impact Assessment in a Transboundary Context, Espoo Convention (1991)	The Convention sets out the obligations of the Parties to carry out an environmental impact assessment of certain activities at an early stage of planning. Before permitting an industrial project, the country to decide on the project ("country of origin") must notify any countries which could be affected by the transboundary impacts of a project located in another country ("affected parties"). The affected party and the public in the affected area must be able to express their views and comments about the proposed project. This is a separate procedure which is additional to any relevant national permitting process. The permitting state must take these comments into account in its final decision and communicate it to the affected country and the public. The projects subject to consultations under the Convention are those listed in Appendix I including 'large dams and reservoirs'. Ratified by Armenia in 1997.

3.3 EBRD Requirements

The main requirements of the EBRD for its own activities are formulated in the Bank's ESP (2019), while the requirements for the E&S aspects of the Client-borrower's activities are set out in the RRs. 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 BAP where significant adverse impacts on biodiversity are expected.

3.4 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)¹⁶. They elaborate on typical E&S risks related to construction, operation, maintenance and decommissioning of facilities.

The following biodiversity guidelines were used for the BAP development:

- EBRD's Guidance Note 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources (Guidance Note PR6, EBRD, 2022)¹⁷,
- Hardner, J., R.E. Gullison, S. Anstee, M. Meyer. 2015. Good Practices for Biodiversity Inclusive Impact Assessment and Management Planning. Prepared for the Multilateral Financing Institutions Biodiversity Working Group¹⁸,
- Biodiversity Offsets: a User Guide. World Bank Group. October, 2016¹⁹,
- A Cross-sector Guide for Implementing the Mitigation Hierarchy. Prepared by The Biodiversity Consultancy. Cross-sector Biodiversity Initiative, 2015²⁰,
- Edgar, P., Foster, J. and Baker, J. (2010). Reptile Habitat Management Handbook. Amphibian and Reptile Conservation, Bournemouth²¹.

3.5 Applicable EU Directives

- Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora²²,
- Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds²³.

4. Project Description

The Lichk Reservoir is planned for construction within the administrative boundaries of Lichk rural settlement of Meghri enlarged community, RA Syunik Marz (**Figure 2**). The Lichk rural settlement borders the Tashtun settlement to the north, Vardanidzor to the west, and Lehvaz to the south. The reservoir will be fed by the Arevik (Lichk) tributary of the Meghri River. It is intended to provide irrigation water to approximately 1,510.8 ha of agricultural land across the settlements of Meghri, Agarak, Alvank, Shvanidzor, Nrnadzor, Lehvaz, Vardanidzor, and Karchevan.

The reservoir site is located at 1,529 to 1,602 MASL altitude. The Lichk Reservoir itself will occupy an area of 19.2 ha (surface area at the full supply level).

¹⁶<https://www.ebrd.com/downloads/policies/environmental/construction/buidling.pdf>

¹⁷<https://www.ebrd.com/who-we-are/our-values/environmental-and-social-policy/implementation.html>

¹⁸<https://publications.iadb.org/publications/english/document/Good-Practices-for-Biodiversity-Inclusive-Impact-Assessment-and-Management-Planning.pdf>

¹⁹<https://documents1.worldbank.org/curated/en/344901481176051661/pdf/110820-WP-BiodiversityOffsetsUserGuideFinalWebRevised-PUBLIC.pdf>

²⁰<https://www.icmm.com/en-gb/guidance/environmental-stewardship/2015/implementing-mitigation-hierarchy>

²¹<https://dnu7gk7p9afoo.cloudfront.net/Files/37.-edgar-p.-foster-j.-and-baker-j.-2010.-reptile-habitat-management-handbook.amphibian-and-reptile-conservation-bournemouth.pdf>

²²<https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A01992L0043-20250714>

²³<https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02009L0147-20190626>

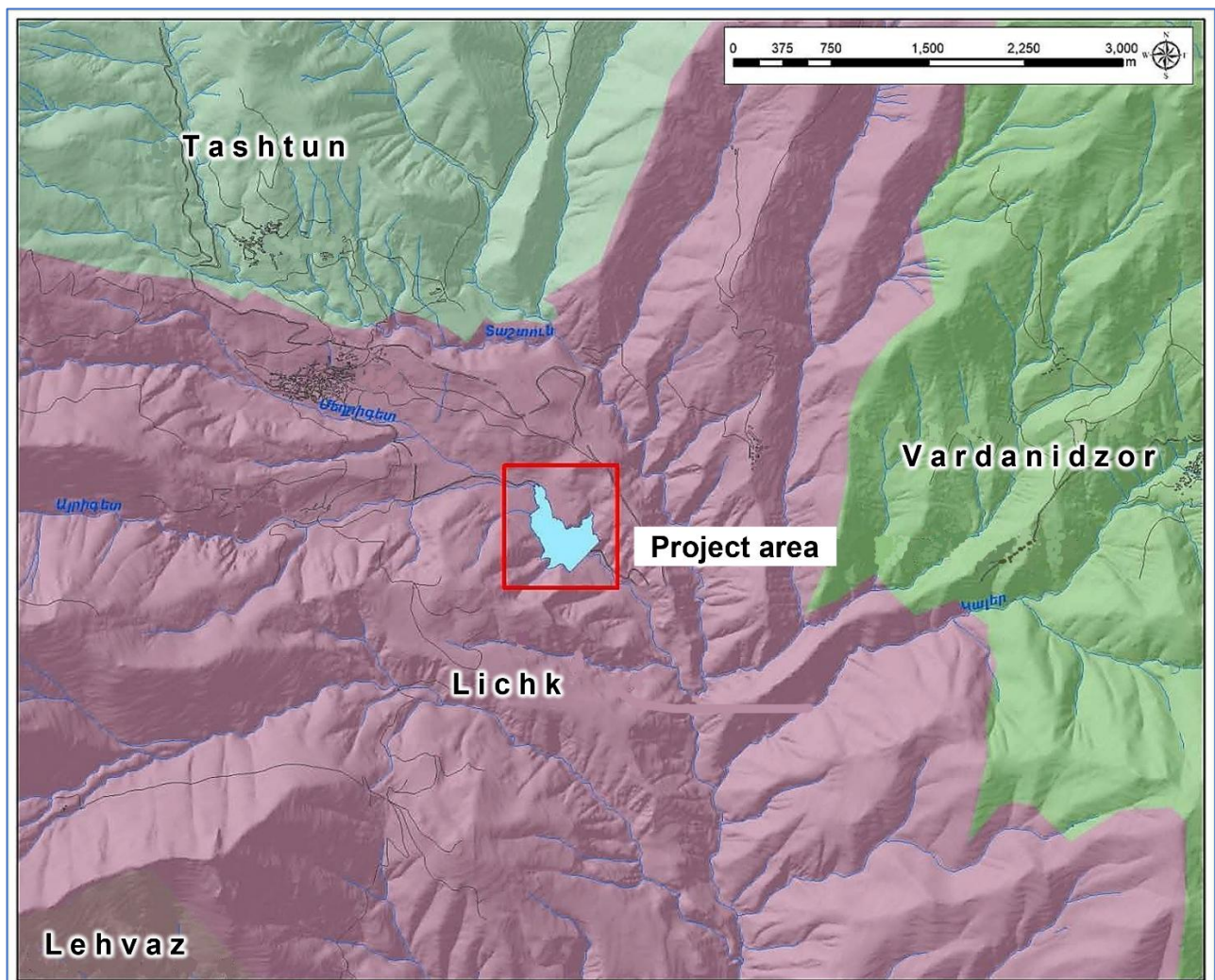
The full footprint area, that is 24.6 ha, covers the reservoir area of 19.2 ha plus the area of the not flooded part of the dam (5.4 ha). The area of the buffer (protection) zone including the footprint area is 80 ha, and the area of the buffer zone alone is 55.4 ha (as was determined during the Project design study).

The reservoir will have a storage capacity of 4.02 million m³.

The reservoir hydraulic unit consists of:

1. Dam,
2. Construction (diversion) outlet,
3. Irrigation outlet,
4. Emergency spillway,
5. Service facilities and structures.

Figure 2. Location of the Lichk reservoir within administrative boundaries of the Lichk rural settlement



The main technical characteristics of the dam are as follows:

- Dam maximum height - 61.5 m,
- Inclination of the upstream slope - 1:3,
- Inclination of the downstream slope - 1:2.75,
- Crest width - 8.0 m,

species) and six mammal species, three reptile species, one amphibia and seven plant species triggering CHs (totally 17 species) (see **Table 2**).

In line with the EBRD Guidance Note on PR6 and Declaration on the European Principles for the Environment, the EBRD has adopted the country-sensitive approach for countries that are part of the European Neighbourhood Policy, which involves tailoring the application of the criteria and conditions for identifying PBFs and CHs to the needs of a specific country. This means that the requirements of the EU Directives would not be automatically applicable to the analysis below.

Table 2. CHA Findings: Summary Table of PBFs and CHs identified in the footprint area as per EBRD PR6²⁴

No	Criterion	Features (Habitats/species)
Priority Biodiversity Features as per EBRD PR6 (§12)		
i	12.i.a EAAA ²⁵ is habitat type listed in Annex I of the EU Habitats Directive and Resolution 4 of the Bern Convention	<u>Habitats (×1 - according to the EU Habitats Directive)</u> 92A0 <i>Salix alba</i> and <i>Populus alba</i> galleries
ii	12.ii.a EAAA for species and their habitats listed in Annex II of the Habitats Directive, Annex I of the Birds Directive, or Resolution 6 of the Bern Convention	<u>Birds (×17)</u> <i>Pernis apivorus</i> (LC) <i>Gypaetus barbatus</i> (NT) <i>Gyps fulvus</i> (LC) <i>Neophron percnopterus</i> (EN) <i>Circaetus gallicus</i> (LC) <i>Buteo rufinus</i> (LC) <i>Aquila chrysaetos</i> (LC) <i>Clanga pomarina</i> (LC) <i>Hieraaetus pennatus</i> (LC) <i>Falco peregrinus</i> (LC) <i>Caprimulgus europaeus</i> (LC) <i>Dendrocopos syriacus</i> (LC) <i>Lullula arborea</i> (LC) <i>Ficedula semitorquata</i> (LC) <i>Lanius collurio</i> (LC) <i>Lanius minor</i> (LC) <i>Pyrrhocorax pyrrhocorax</i> (LC) <u>Insects (×1)</u> <i>Euphydryas aurinia</i>
	12.ii.d EAAA for regularly occurring nationally or regionally listed EN or CR species	<u>Birds (×1)</u> <i>Neophron percnopterus</i> (EN) (×1, already triggering cr.12 ii.a) <u>Plants (×9, to be confirmed)</u> <i>Astragalus sangezuricus</i> Boriss. <i>Carex capitellata</i> L. <i>Centaurea elbrusensis</i> Boiss&Buhse <i>Centaurea schelkovnikovii</i> Sosn. <i>Cousinia qaradaghensis</i> Rech.

²⁴In case a species would trigger several criteria in the PBF and CH, it is listed in this table only once as the highest conservation concern, which is CH.

²⁵EAAA - ecologically appropriate area of analysis

No	Criterion	Features (Habitats/species)
iii		<i>Erysimum lilacinum</i> E. Steinb. <i>Linaria megrica</i> Tzvelev <i>Pyrus raddeana</i> Woronow <i>Tulipa sosnovskyi</i> Achverdov & Mirzoeva
	12.ii.e EAAA for regularly occurring range-restricted species	<u>Birds (×1)</u> <i>Phylloscopus nitidus</i> (LC) <u>Reptilia (×3)</u> <i>Darevskia raddei</i> <i>Elaphe hohenackeri</i> (LC) <i>Montivipera raddei</i> (NT) <u>Insects (×4)</u> <i>Thaleropsis ionia</i> <i>Carabus hollbergi</i> <i>Procerus scabrosus</i> <i>Dorcadion leave</i> Plants (×6, already triggering cr.12 ii d) <i>Astragalus sangezuricus</i> Boriss. <i>Centaurea schelkovnikovii</i> Sosn. <i>Cousinia qaradaghensis</i> Rech. <i>Erysimum lilacinum</i> E. Steinb. <i>Pyrus raddeana</i> Woronow <i>Tulipa sosnovskyi</i> Achverdov & Mirzoeva
	12.iii Significant biodiversity features identified by a broad set of stakeholders or governments	<u>Mammals (×1, listed in the Red Book of RA as Vulnerable)</u> <i>Hystrix indica</i> (LC) <u>Birds (×7, listed in the Red Book of RA as Vulnerable, already triggering cr.12 ii e)</u> <i>Gypaetus barbatus</i> (NT) <i>Gyps fulvus</i> (LC) <i>Circaetus gallicus</i> (LC) <i>Aquila chrysaetos</i> (LC) <i>Clanga pomarina</i> (LC) <i>Hieraaetus pennatus</i> (LC) <i>Falco peregrinus</i> (LC) <u>Reptiles (×2, listed in the Red Book of RA as Vulnerable, already triggering cr.12 ii e)</u> <i>Elaphe hohenackeri</i> (LC) <i>Montivipera raddei</i> (NT) <u>Insects (×1, listed in the Red Book of RA as Vulnerable, already triggering cr.12 ii.e)</u> <i>Procerus scabrosus</i>
Critical Habitats as per EBRD PR6 (§14)		
ii	14.ii.a EAAA for species and their habitats listed in Annex IV of the Habitats Directive	<u>Mammals (×6)</u> <i>Felis silvestris</i> (LC) <i>Canis lupus</i> (LC) <i>Lynx lynx</i> (LC)

No	Criterion	Features (Habitats/species)
		<i>Dryomys nitedula</i> (LC) <i>Rhinolophus hipposideros</i> (LC) (?) <i>Pipistrellus</i> sp. (?) <u>Reptiles (×3)</u> <i>Pseudopus apodus</i> <i>Lacerta media</i> (<i>Lacerta viridis</i>) <i>Coronella austriaca</i> <u>Amphibians (×1)</u> <i>Bufo viridis</i>
	14.ii.b EAAA supports ≥ 0.5 per cent of the global population AND ≥ 5 reproductive units of a CR or EN species	<u>Plants (x7, to be confirmed)</u> <i>Rubus zangezurus</i> <i>Pyrus voronovii</i> Rubtzov <i>Pyrus hajastana</i> <i>Pyrus tamamschianae</i> <i>Pyrus nutans</i> <i>Pyrus daralagezi</i> <i>Cousinia lomakinii</i>

The habitat map of PBF triggering the EBRD PR6 Criterion 12 i.a is presented on **Figure 4**.

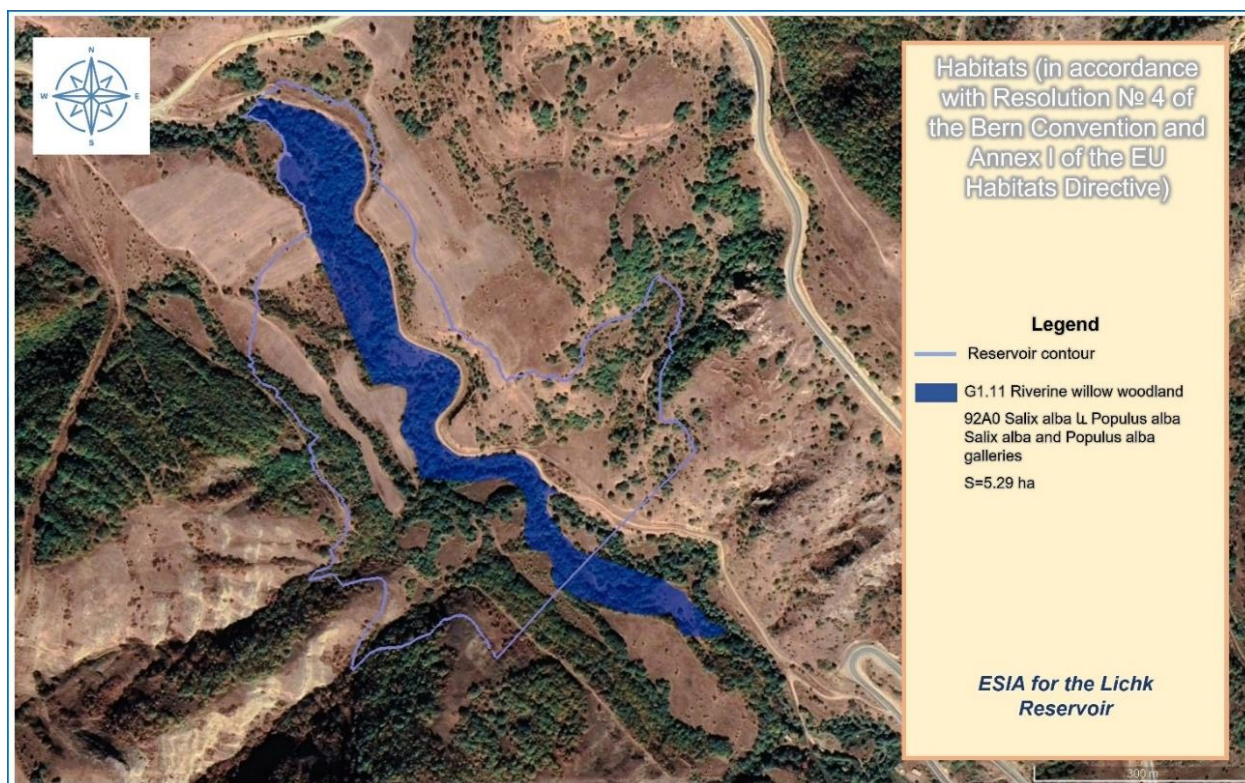
According to the ESIA none of the protected plant species included in the RA Red Book (2010) (namely nine PBF species and one CH species, *Pyrus voronovii* Rubtzov, listed in Table 2) were recorded within the Project footprint area during the field surveys. However, as surveys were carried out in early spring, when many species are not yet in bloom or bearing fruit, the plants may not have been found. Other plant species (six CH species listed in Table 2) were not studied in the footprint area.

Among these 16 protected species, one species, *Pyrus voronovii* Rubtzov, is listed in the IUCN Red List under CR category. According an official letter from the Ministry of Environment regarding the locations and population trends of the species, *Pyrus voronovii* Rubtzov is found in areas of Arevik National Park near the settlements of Tashtun, Arevik, and Lichk. The species shows positive signs of propagation and reproduction.

Experts from the Institute of Botany at the Academy of Sciences provided information from their herbarium laboratory regarding the species locations where *Pyrus voronovii* Rubtzov was discovered during field biodiversity studies. The species was discovered near Lichk settlement around 2 km from the planned reservoir site (three herbarium specimens) and to the west of the Lichk settlement located approximately 2.3 km from the reservoir site (one herbarium specimen). Other locations (four herbarium specimens) are far from the reservoir site.

According to information from the biodiversity experts involved in monitoring the North-South Road construction project (which passes very close to the Lichk Reservoir site from the east) their most recent biodiversity monitoring, conducted in November 2025, did not identify *Pyrus voronovii* Rubtzov at the site.

Figure 4. Map of the habitat in the Project footprint area listed in Annex I of the EU Habitat Directive and Resolution 4 of the Bern Convention



Aquatic life

As described in the ESIA, ichthyological studies conducted under the EIA in the Lichk River revealed the absence of fish. This finding is supported by the surveys among local residents who reported that never observed fish in the river. At the same time, residents mentioned that some individual farmers had attempted to raise Rainbow Trout in the Lichk River, and the fish demonstrated high growth rates.

The river, a typical upland tributary, is devoid of fish for several possible reasons. These include the presence of various river slides that hinder fish migration, poaching, seasonal fluctuation in water flow, the operation of small hydropower plants, and water abstraction for agricultural use.

There are no other available data about aquatic biota of the Lichk River. A field survey focused on the river aquatic biota is included in the BAP as a preventive mitigation measure (see mitigation measures in [Section 7](#)).

6. Summary of Potential Impacts

As presented in the ESIA, the Project will be implemented in the rich biodiversity area where valued (priority) habitats and species were identified.

The impacts of the Project on biodiversity will occur during both construction and operation / maintenance. The construction phase involves the dam building and reservoir filling. The methodology of impact assessment, including the identification of impact characteristics and significance matrix are detailed in Section 5 of the ESIA. As different species and their groups respond differently to different impacts, their sensitivity as receptors was considered during assessment.

The following potential impacts on biodiversity (including PBFs and CHs) could result from the Project activities during:

1. Construction phase:

- Destruction (loss) of habitats (by vegetation clearance, excavation, top-soil removal and transportation, reservoir filling),
- Flora species loss (by vegetation clearance, including trees cutting, excavation, top-soil removal and its transportation, reservoir filling),
- Disturbance of fauna species by blasting, noise, vibration and light pollution (construction machinery, traffic, lighting at the construction site),
- Destruction of sedentary animals' habitats and risk of their death (as a result of excavation, top-soil removal and its transportation, reservoir filling),
- Loss of foraging habitats for medium and large mammals (excavation, top-soil removal and its transportation, reservoir filling),
- Loss of foraging habitats for bats (as a result of excavation, top-soil removal and its transportation, reservoir filling) (probably, but should be confirmed)
- Loss of breeding and foraging habitats for birds (as a result of excavation, top-soil removal and its transportation, reservoir filling),
- Loss of breeding, foraging and wintering habitats of invertebrates and a risk of death of their overwintering stages (vegetation clearance, removal of top-soil, quarrying, excavation, movement and placement of topsoil and quarried materials reservoir filling,
- Impact on protected areas and internationally designated areas.

2. Operation and maintenance phase:

- Emergence of new habitats (water, riparian),
- Increased access to the area.

Negative impacts could occur mainly at the construction phase; they are caused by the dam building and flooding of the reservoir footprint area.

Some positive impacts on biodiversity occur during the operational phase; they are connected with the emergence of new habitats where large water surface area and coastal vegetation would attract some species of animals.

The assessment is completed for each predicted impact at the construction and operation phases and per each group of biodiversity receptors, which were combined based on their ecological characteristics; in some cases, impacts on individual species are assessed where possible.

Table 3. Assessment of impacts on the identified biodiversity features (PBFs and CHs)

Code	Receptor	Key impacts identification	Impact significance
92A0	Salix alba and Populus alba galleries	Habitat loss (5.29 ha)	Significant
	<i>Sedentary animals</i> Mammals: Forest dormouse Reptilians: Pallas's glass lizard, Medium Lizard, Smooth snake, Transcaucasian rat snake, Armenian viper,	Destruction of sedentary animals' habitats: Forest dormouse - about 5.29 ha (riparian woodland) Reptilians - about 5.12 ha in total (open spaces and glades; scrub and rocky habitats; the species' ranges overlap). Risk of their death due to vegetation clearance,	Significant

Code	Receptor	Key impacts identification	Impact significance
	Darevskia raddei	excavation works, flooding reservoir	
	<i>Sedentary animals</i> Amphibians: Variable toad/ green toad	Destruction of animals' habitats and risk of their death; however, the flooded area will increase the periphery of the coastline and thus increase the habitat of the species	Moderate
	Transit and rare medium and large mammals Grey Wolf European wildcat Lynx Indian Crested Porcupine	Loss of foraging habitats for the species (should be confirmed)	Low
	Flying mammals: bats Lesser horseshoe bat Pipistrellus sp.	Loss of foraging habitats (should be confirmed) Increase in amphibious insect numbers around the filled reservoir might increase food supply for the bat species	Not defined
	Birds Syrian Woodpecker 1 pairs Wood Lark 8-13 pairs Red-backed Shrike 5-7 pairs	Loss of breeding habitats Lost habitats - about 19.4 ha in total ²⁶ (the species' ranges overlap)	Significant
	Birds: Green Warbler	Impact on the edge of the species' habitat	Low
	Insects: <i>Thaleropsis ionia</i> <i>Euphidrias aurinia</i> <i>Carabus hollbergi</i> <i>Procerus scabrosus</i> <i>Dorcadion leave</i>	Destruction of habitats, increased mortality of individuals due to vegetation clearance, excavation works, flooding reservoir	Significant
	Plants <i>Astragalus sangezuricus</i> Boriss. <i>Carex capitellata</i> L. <i>Centaurea elbrusensis</i> Boiss&Buhse <i>Centaurea schelkovnikovii</i> Sosn. <i>Cousinia qaradaghensis</i> Rech. <i>Erysimum lilacinum</i> E. Steinb. <i>Linaria megrica</i> Tzvelev <i>Pyrus raddeana</i> Woronow <i>Tulipa sosnovskyi</i> Achverdov & Mirzoeva <i>Rubus zangezurus</i> <i>Pyrus voronovii</i> Rubtzov <i>Pyrus hajastana</i> <i>Pyrus tamamschianae</i> <i>Pyrus nutans</i> <i>Pyrus daralagezi</i>	Loss of the species and destruction of their habitats	Not defined

²⁶This area covers all natural habitats (woodlands, open forests, shrubs, dry lands) in the footprint area but does not include disturbed areas (roads, construction sites, croplands)

Code	Receptor	Key impacts identification	Impact significance
<i>Cousinia lomakinii</i>			

In addition to the habitat lost within the reservoir and dam footprint area, some habitats will be destroyed in the buffer zone east, south and west of the dam, and west of the reservoir due to the planned location of pipeline, roads and irrigation objects (**Figure 3**). At present, no complete data are available on the types and area of the habitats that will be destroyed due to these auxiliary structures; but, according a preliminary estimation, most of the habitats are agriculture areas and disturbed habitats. Nevertheless, the survey to identify habitats and their affected areas should be carried out at the pre-construction phase and appropriate mitigation measures developed (this is included in the BMP, see below).

7. Mitigation: Biodiversity Management Plan

According to the EBRD PR6, the mitigation hierarchy should be applied, where impact avoidance is the first choice. If avoidance is not possible, adverse impacts have to be minimised or mitigated. And, as a measure of last choice, offsetting may be applied, if significant residual impacts remain after all previous efforts.

Mitigation measures were developed in the ESIA in terms of the priority features groups. In the current BAP, developed measures are presented in the framework of the BMP with monitoring targets (indicators), timeframe and responsible parties.

Mitigation measures related to capacity improvement of the priority species habitats, capture and relocation of animals are included in the offset measures (see the Offsetting strategy, BAP2). Additional studies are included in the BMP to identify habitats that will be destroyed due to the reservoir construction activities within the buffer zone (but beyond the reservoir and dam footprint area), as well as to assess the significance of the project site for bats and transit and rare mammals.

This BAP forms part of the tender documentation for the Project. All mitigation contained in this BAP at the pre-construction and construction phase will be included in the Terms of Reference and contract of the Construction Contractor and cascaded into contracts of relevant subcontractors as appropriate. Hiring professional zoologists will be required to implement surveys and relocation of animals.

Project Lenders will be kept updated on BAP implementation progress via regular E&S Monitoring Reports (by independent external monitoring consultants).

All mitigation contained in this BAP at the operation and maintenance phase will be included in the Client's operation plan.

The matrix of the mitigation measures, that is the BMP, is presented in **Table 4**.

Table 4. Mitigation measures: Biodiversity Management Plan

Measures, actions	Timeframe	Responsible	Indicator
BMP1 (avoidance measures)			
Objective: Avoid mortality of burrow animals due to construction works and flooding			
<i>Pre-construction phase</i>			
A1. Survey the area to map inhabited burrows of badger and other burrowing mammals; if the burrows	Prior to the commencement	Mammologist (with support	

Measures, actions	Timeframe	Responsible	Indicator
may be affected by the pre-construction/construction works, provide relocation by species-specific methods	of any pre-construction preparations	of the Client or the construction contractor)	
Actions			
1. Survey the footprint areas to identify inhabited burrows (and map their locations), species and estimate quantity of animals	First year, best time - February to April, October to November (for badger)	Mammologist	Report, maps
2. If relocation is needed: survey the areas adjacent to the buffer zone with suitable habitats to where the animals can be relocated in order to estimate their species-specific capacity	First year		Report, maps
3. Develop relocation protocol	Second year		Developed relocation protocol.
4. Carry out the relocation	Second year		Identified/ Safely relocated and settled animals
5. Monitor the relocated animals in the new locations	For two years after relocation		Monitoring report, percent of settled animals
Construction phase			
A2. Before filling the reservoir, check the mapped residential burrows of badger and other animals; if they remain, capture them and relocate to the safe habitats.	Before filling the reservoir, from March - to October	Construction contractor, overall responsibility	
1. Examine potentially flooded area based on the prepared map of the burrow locations (see A1.1) to identify yet inhabited burrows and animals	March-September	Mammologist	Identified /relocated animals
2. If any animals remained: capture and relocate them according to the earlier developed protocol (see A1.3)	For two years after		Monitoring report, percent of settled animals
3. Monitor the relocated animals at the new locations			
BMP2 (reduction measures)			
Objective: decrease direct impacts of the construction works, operation and employee on fauna			
Pre-construction phase			
R1. Develop the Worker Code of Conduct for employees of the construction company to prevent poaching and 'Procedures to prevent harm to animals during construction works'	During the building preparation	Construction contractor, overall responsibility	Developed and approved documents
Actions:			
1. Develop the Worker Code of Conduct for employees focusing on prevention of poaching and protection of animals during building		Construction contractor,	Developed documents

Measures, actions	Timeframe	Responsible	Indicator
2. Develop 'Procedures to prevent harm to animals during construction works' focusing on impact from excavating and blasting 3. Approve the documents by the construction contractor order 4. Train personnel and subcontractors on the documents' application	During the construction preparation Each new staff worker; all personnel - two times a year	mammologist, herpetologist Construction contractor, Supervision Engineer	Approved documents Trained personnel and subcontractors
<i>Construction phase</i>			
R2. Prevent any harm to animals and poaching during construction by applying the developed documents (see R1)	During construction works	Construction contractor - overall responsibility; Water Committee - supervision	Absence of cases of harm to animals, cases of poaching
Actions: 1. Apply the "Procedures" during construction works including, among others: - Start construction works from one edge of the dam area, this approach will allow the remaining animals to leave, - Start vegetation clearance and construction works after the breeding season - not earlier than August) (i.e. avoid these between March - July to avoid impacts to breeding animals) or confirm absence of breeding animals through an expert survey; this will prevent/reduce mortality of animals including offspring, - Strictly respect the limited project footprint areas, speed limitations, - qualified and experienced zoologist is to be engaged to supervise the excavation works - should any animals be found, procedures on capture and relocation must be followed, 2. Apply and monitor compliance with the Worker Code of Conduct of employee to prevent poaching during construction.	During construction works During construction works	Supervision Engineer, Zoologist Supervision Engineer	Number of discovered animals, Number of saved and relocated animals Number of poaching cases
R3. Develop the Worker Code of Conduct for employees of the reservoir operator to prevent poaching and 'Procedures to observe, treat and save encountered animals during operations'	At the finishing construction works	Water Committee	Developed documents
Actions: 1. Develop the Worker Code of Conduct for employees focusing on prevention of poaching and saving animals during operation 2. Develop the 'Procedures to observe, treat and save encountered animals during operations' 3. Approve the documents 4. Educate and train hired personnel on the documents' application	At the operation preparation phase Just after personnel hired,	JRAR CJSC - reservoirs operator - responsible person, mammologist, herpetologist	Developed documents Approved documents

Measures, actions	Timeframe	Responsible	Indicator
	further - two times a year	Supervision person	Trained personnel
<i>Operation and maintenance phase</i>			
R4. Prevent poaching and save animals during the operations of the reservoir hydraulic structure	During operation	JRAR CJSC - reservoirs operator	Absence of cases of harm to animals, cases of poaching
Actions: 1. Observe animals in the reservoir, riverbanks and buffer zone 2. If observed animal is at risk or harmed, implement animal saving actions according to the developed protocol (see R3), contact a responsible person/zoologist 3. Apply and monitor compliance of the reservoir's operator with the Worker Code of Conduct to prevent poaching	During operation	JRAR CJSC - reservoirs operator Supervision person, if any	Number / species of animals discovered at risk or harmed, number of saved animals cases of poaching
BMP3: Additional surveys			
<i>Pre-construction phase</i>			
S1. Survey the Project area (footprint) to identify species of bats, and a) reveal possible bat roosts (can be found on trees, in hollows, crevices, foliage, caves) and estimate their number, b) estimate value of the area for the bats' foraging. If the bat roosts or significant values of the area for the species foraging are identified, develop an offset project. <u>Potential components of the offset project:</u> <i>S1.1 In case the bats' roosts are confirmed in the area, identify the existing forest and rocky habitats which are potentially suitable for bat roosting in the vicinities of the flooded area, built the bat artificial roosts (bat boxes) and hang them on trees to increase the habitat capacities for bats (in the framework of offset project), monitor the bats' occurrence</i> <i>S1.2. In case of considerable value of the area for bat foraging, take into account the bats' needs in food (insects) in the offset project on protection and development of habitats for insects (see the Offsetting strategy)</i>	from March to October (active period), November – March (hibernation period)	Water Committee - overall responsibility Mammologist	Report, maps
S2. Survey the footprint and buffer areas to confirm/rule out the presence of the living dens of Gray Wolf, European Wildcat, Lynx, Indian crested porcupine; if a den is found, take measures to scare away animals from the areas	After the breeding season (after end June)	The Client - overall responsibility, zoologist	Report, maps; if the den is found, uninhabited den
S3. Carry out a survey to identify habitats that will be destroyed by the construction objects in the buffer zone; if needed, develop appropriate mitigation measures for habitats restoration and/or offset project	In spring - summer	The Client - overall responsibility, geobotanist	Report, maps, addendums to the offsetting strategy

Measures, actions	Timeframe	Responsible	Indicator
S4. Additionally survey aquatic ecosystem in the Project area and downstream, to identify aquatic species (if any) and estimate potential impact of the Project on these species. If the species identified and impact is assessed as moderate or significant, to develop appropriate mitigation measures and, if needed, offset project	From March to June	The Client - overall responsibility Aquatic biologist	Report, maps
S5. Survey the footprint and buffer areas to confirm or rule out the presence of these endangered plant species in the Project area. If any species are discovered, develop an offset project. <i>Potential key components of the offset project:</i> <i>S5.1. Study the Project footprint and buffer areas to estimate the structure and size of the protected plant species populations and their habitats,</i> <i>S5.2 Study areas adjacent to the buffer zone (mainly west, north-west and south-west from the buffer zone) and plots inside the reservoir's buffer zone that will not be destroyed, to estimate habitats suitable for the plants translocation and bulbs/seeds planting, including the "capacity" of the habitats and possibilities to construct additional habitats to increase their capacity; define boundaries of the suitable habitats,</i> <i>S5.3 Develop and implement a BOMP within the framework of which to harvest bulbs/seeds and propagate, translocate adult individuals suitable for translocation, continuously support newly established populations.</i>	Spring survey - May, 2026 Autumn survey (if Spring survey identifies requirement) - September, 2026 (fruiting season for pear species)	The ESIA Consultant The Client - overall responsibility, botanist	Report, maps Report maps

8. Residual impact

The residual impact, remaining impact after the implementation of the mitigation measures is assessed as follows:

Minor or negligible residual impact: considered as negligible or minor/acceptable residual impacts for which additional measures are not necessary,

Moderate or major residual impact: unacceptable unless they can be offset by other positive impacts of the project.

In case of moderate or major residual impacts on 1) PBFs, additional measures will be designed to achieve "no net loss" and on 2) CHs net gain is required (through offsets as per EBRD PR6 definitions).

The final significance of the residual potential impacts after avoidance and reduction measures is presented in [Table 5](#).

WATER RESERVOIRS PROJECT - ARMENIA
ESIA for the Lichk Reservoir Construction Project

Biodiversity Action Plan

rev01

Table 5. Assessment of residual impacts

	Receptor	Key impacts identification	Impact significance	Mitigation measures	Residual impact	Offset needed
92A0	Salix alba and Populus alba galleries	Habitat loss (5.29 ha)	Significant	No	Significant	Yes (no net loss)
	Sedentary animals Mammals: Forest dormouse Reptilians: Pallas's glass lizard, Medium Lizard, Smooth snake, Transcaucasian rat snake, Armenian viper, Darevskia raddei	Destruction of sedentary animals' habitats: Forest dormouse - about 5.29 ha (riparian forest) Reptilians - about 5.12 ha in total (open spaces and glades; scrub and rocky habitats; the species' ranges overlap) Risk of their death due to vegetation clearance, excavation works, flooding reservoir	Significant	R1-R4	Moderate	Yes (net gain)
	Sedentary animals Amphibians: Variable toad/ green toad	Destruction of animals' habitats and risk of their death; but the flooded area will increase the periphery of the coastline and thus, will increase the habitat of the species	Moderate	R1-R4	Minor	No
	Transit species of terrestrial mammals: Grey Wolf European wildcat Lynx Indian Crested Porcupine	Loss of foraging habitats for the mammals species (should be confirmed)	Low	S2	Minor	No
	Flying mammals: bats Lesser horseshoe bat Pipistrellus sp.	Loss of foraging habitats (should be confirmed) Increase in amphibious insect numbers around the filled reservoir might increase food supply for the bat species	Not defined	S1	Not defined	Probably

WATER RESERVOIRS PROJECT - ARMENIA

ESIA for the Lichk Reservoir Construction Project

Biodiversity Action Plan

rev01

	Receptor	Key impacts identification	Impact significance	Mitigation measures	Residual impact	Offset needed
Birds Syrian Woodpecker 1 pairs Wood Lark 8-13 pairs Red-backed Shrike 5-7 pairs		Loss of breeding habitats: Lost habitats - about 19.4 ha totally (the species' ranges overlap)	Significant	R1-R4	Moderate	Yes (no net loss)
Birds: Green Warbler		Impact of the edge of the species habitat	Low	R1-R4	Minor	No
Insects: <i>Thaleropsis ionia</i> <i>Euphidrias aurinia</i> <i>Carabus hollbergi</i> <i>Procerus scabrosus</i> <i>Dorcadion leave</i>		Destruction of habitats, increased mortality of individuals due to vegetation clearance, excavation works, flooding reservoir	Significant	R1-R4	Moderate	Yes (no net loss)
Plants <i>Astragalus sangezuricus</i> Boriss. <i>Carex capitellata</i> L. <i>Centaurea elbrusensis</i> Boiss&Buhse <i>Centaurea schelkovnikovii</i> Sosn. <i>Cousinia qaradaghensis</i> Rech. <i>Erysimum lilacinum</i> E. Steinb. <i>Linaria megrica</i> Tzvelev <i>Pyrus raddeana</i> Woronow <i>Tulipa sosnovskyi</i> Achverdov & Mirzoeva <i>Rubus zangezurus</i> <i>Pyrus voronovii</i> Rubtzov <i>Pyrus hajastana</i> <i>Pyrus tamamschianae</i> <i>Pyrus nutans</i> <i>Pyrus daralagezi</i> <i>Cousinia lomakinii</i>		Loss of the species and destruction of their habitats	Not defined	S5	Not defined	Probably

9. Offsetting strategy

The technical rationale of how the project's mitigation strategy (offset) will achieve a net gain (NG) or no net loss (NNL), as required by EBRD PR6, is presented in this section.

The offsetting strategy aims to achieve NNL or NG on biodiversity values (habitats - ecosystems) based on the "biodiversity conservation" approach ("averted loss"). The Project will fully destroy valuable habitat (ecosystem) within the boundaries of the dam and reservoir footprints and, partly, in the buffer zone, due to construction works and flooding. At the same time, similar habitats are situated upstream. These similar habitats will be conserved to avoid their changes/destruction in the future (due to such potential threats as building, overgrazing, agricultural usage, hunting, other).

Furthermore, offset is needed to provide species habitats for animals who will lose their habitats due to construction of the reservoir (see [Table 5](#)). Conserved habitats (ecosystems) will be used for relocation of animals and, where needed, for improvement/construction of the species local habitats to increase the habitats capacities. Accordingly, the second offsetting approach – habitat improvement/restoration, will be applied in relation to the species habitats while, at the same time, contributing to restoration of the habitats/ecosystems.

Additionally, the restoration approach will be applied to restore habitats similar to the existing riverine habitat along shoreline of the new reservoir (in some sections of the shoreline).

It is proposed to base the offsetting strategy on such pillars as stakeholders' involvement and capacity building, adaptive monitoring and law enforcement, adapted for the offsetting measures.

9.1 Loss and gain analysis and calculations

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

Lost habitats (ecosystems):

- 92A0 Salix alba and Populus alba galleries 5.29 ha

Lost species habitats (in brackets - codes of the habitats/ecosystems where the species occur):

- Mammals: Forest dormouse, about 5.29 ha (92A0 Salix alba and Populus alba galleries)
- Reptilians: Pallas's glass lizard, Medium Lizard, Smooth snake, Transcaucasian rat snake, Armenian viper, Darevskia raddei, totally up to 5.12 ha (open spaces and glades as well as scrub and rocky plots of the habitats G1.A1D12-AM Oak forests with Crataegus spp. and Cornus mas, G4.92-AM Mixed open forests with Juniperus spp. and deciduous trees and shrubs, E1.C54-AM Other Umbelliferae species communities²⁷),
- Birds: Syrian Woodpecker, Wood Lark, Red-backed Shrike, totally about 19.4 ha (natural and semi-natural areas of the habitats 92A0, G1.A1D12-AM, G4.92-AM, E1.C54-AM).

Habitats of insects (PBF, 5 species - see [Table 5](#)) within the footprint area will be lost. The exact habitat area of the each of the insect species is currently unknown and will be estimated under the offset project.

An additional component of the offset may be the support of the habitats of the observed bat species just after implementation of the S1 mitigation measure (see [Table 4](#)). But it depends on results of the bat field survey planned under the S1 measure.

²⁷Description of all habitats (ecosystems) in the footprint area is included in the ESIA

Lost habitats have a different state of nature - from insignificant disturbances to areas with disturbed lands due to grazing, water intake and people passing. So, appropriate quality coefficients were defined for the habitats (see [Table 6](#)). The same coefficient is accepted for 92A0 habitats proposed to be an offset upstream; but higher coefficients are accepted for forest and open dry land habitats proposed to be offsets west from the reservoir (due to their less disturbance because location in less accessible mountain zones).

According to the literature sources²⁸ and expert (geobotanist) opinion, all lost habitats (ecosystems) are rather common for Armenia, there are no rare features among them. According to the practices in Armenia, offsetting multiplier has a range between 1 and 10.

Considering all the above, the multiplier of 1.5 is proposed for the PBF habitats (ecosystems) to reach the 'no net loss' target, taking into consideration a potential restoration success rate of around 70%. The same multiplier is proposed for the PBF species and multiplier 3 - for the CH species.

The multipliers will need to be discussed and agreed with relevant stakeholders. If validated, this approach would imply the need to realize the below gains through offsetting actions ([Table 6](#)).

Table 6. Gains needed regarding Habitats/ecosystems to achieve NNL (PBF) and NG (CH)

Code	Habitats	Residual impact			Offset			
		Physical Loss (ha)	Quality coefficients	Calculated loss (Qha)	Multiplier	Quality coefficients	Gain needed (Qha)	Gain needed, physical (ha) ²⁹
92A0	Salix alba and Populus alba galleries	5.29	0.75	3.97	1.5	0.75	5.95	7.94
	TOTAL (PBF)	5.29		3.97			5.95	7.94
	Other habitats, ha	19.31						
	Footprint area, ha	24.6						
	Buffer zone, ha	55.4						

The species loss and gain analysis is developed based on calculation related to the PBF habitat 92A0 ([Table 6](#)) and three more suitable habitats that will be lost in the footprint area (G1.A1D12-AM, G4.92-AM, E1.C54-AM).

The analysis for Forest dormouse is presented in [Table 7](#); it is based on the 92A0 habitat analysis and provides "net gain" for the species. Results for reptiles and birds are presented in [Table 8](#).

Table 7. Gains needed regarding Forest dormouse habitats to achieve NG

Species	Codes of suitable habitats	Residual impact		Offset		Multipliers
		Physical Loss (ha)	Calculated loss (Qha)	Gain needed (Qha)	Gain needed, physical (ha)	
		a	b	c	d	c/b
Mammals: Forest dormouse	92A0	5.29	3.97	5.95	7.94	1.5

²⁸Habitats of Armenia, 2016, G.M. Fayvush, A.S. Aleksanyan

https://www.researchgate.net/publication/303689840_Habitats_of_Armenia

²⁹Physical gain needed is calculated by dividing "Gain needed" (Qha) by the respective quality coefficients.

Table 8. Gains needed regarding reptiles and birds habitats to achieve NG/NNL

Species	Codes of suitable habitats	Residual impact			Offset			
		Physical Loss (ha)	Quality coefficients	Calculated loss (Qha)	Multiplier	Quality coefficients	Gain needed (Qha)	Gain needed, physical (ha) ³⁰
Reptilians³¹: Pallas's glass lizard Medium Lizard Smooth snake Transcaucasian rat snake, Armenian viper, Darevskia raddei	G1.A1D12-AM, G4.92-AM, E1.C54-AM	5.12	0.8	4.096	3	0.9	12.288	13.65
Birds³²: Syrian Woodpecker Wood Lark Red-backed Shrike	92A0	5.29	0.75	3.97	1.5	0.75	5.95	7.94
	G1.A1D12-AM, G4.92-AM, E1.C54-AM	14.11	0.8	11.29	1.5	0.9	16.93	18.81
	Total:							26.75

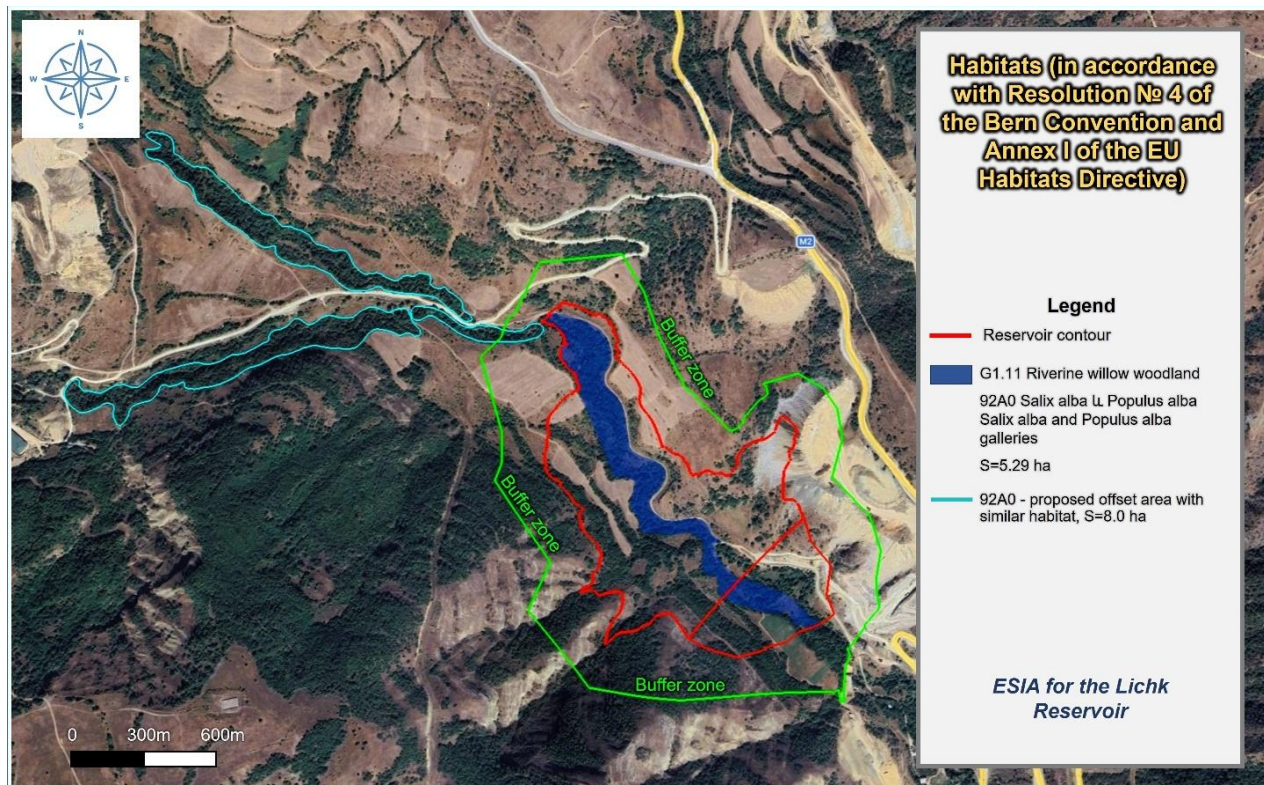
The losses and gains will have to be precisely assessed within the framework of a detailed Biodiversity Offsetting Management Plan (BOMP), based on fieldwork to identify potential conservation and construction areas for the different targets.

Preliminary, potential offsetting areas for 92A0 habitat (ecosystem) proposed to be located outside (excluding few small areas) the buffer zone are presented in [Figure 5](#).

³⁰Physical gain needed is calculated by dividing "Gain needed" (Qha) by the respective quality coefficients.

³¹For reptiles, the lost habitats are sum of open natural and semi-natural plots of the G1.A1D12-AM and C54-AM habitats and area of the G4.92-AM habitat. Coefficient 3 is proposed as three of the reptile species are triggered as CHs. Open rocky and dry lands located to south-west from the reservoir are proposed for offsetting (their status is closed to natural).

³²For birds, the lost habitats are all natural and semi-natural areas of the habitats in the footprint area. Coefficient 1.5 is proposed as the birds are triggered as PBFs. The 92A0 habitat offset area (7.94 ha) and forest areas with plots of dry lands located to west of the reservoir are proposed for offsetting.

Figure 5. Offsetting area suggested for 92A0 habitat (PBF)

9.2 Offsetting measures

Offset measures are proposed to achieve NNL for the PBF and NG for CH. The details are presented in the measures below; the BAP consists of the below four components.

Table 9. Offsetting measures

BAP 1: Community-based conservation of valuable habitats (PBF)	
THE SCOPE OF THE MEASURE	
Objective:	Set-up a community-based conservation of valuable habitat (PBF) in the vicinity of the project area, by conciliating local development objectives and biodiversity conservation objectives
PBF concerned	PBF: 92A0 Salix alba and Populus alba galleries
MEASURE IMPLEMENTATION	
Project phase	Project lifespan (pre-construction, construction, operation and maintenance)
Measure description	<i>Pre-construction phase</i> - Study the valuable habitat (92A0, PBF) in the Project area, their plant composition and ecological structure, specify areas, - Study areas upstream of the reservoir to define existing habitats including those that are equivalent to the lost priority habitat, - Develop a BOMP to provide the conservation of the valuable habitat in the areas most suitable for conservation (using the «averted loss» offsetting approach); the BOMP will include a Riverine Habitats Construction Plan to plan and support the construction and maintenance of the riverine habitat in the suitable areas along the

	reservoir's banks (using the «restoration» offsetting approach); agree the BOMP with all stakeholders. The final determination of the boundaries of habitats that are equivalent to the valuable lost habitat and the conservation procedures should be detailed in the BOMP and set up precisely by scientists and the Client in close collaboration with the local community in order to ensure the sustainability of the conserved habitats. <i>Construction, operation and maintenance</i> 4. Ensure the conservation of valuable habitats in agreed borders
Timeline	Year 1: Seasonal habitat studies, development of a BOMP, workshop and consultations with local community, the BOMP approval Year 2 and onwards: Implement the conservation measures
Location	Upstream of the reservoir
Party responsible for implementing the measure	Client - overall responsibility
Institutional or technical support	Project Implementation Unit Support Consultant - biodiversity expert / geobotanist
Plan to ensure the measure durability	Dedicate an internal Client staff responsible for Biodiversity conservation linked with local community
Implementation constraints and other remarks:	- Necessary involvement of local community - Necessary management and control of the Client - Law enforcement (for protection of the reservoir's water protection zone)
MEASURE MONITORING	
Key Performance Indicators (KPI) and targets	- Field report on the study of habitats - Developed BOMP - Consultations and workshop with local communities to set-up the habitat conservation - The area of 92A0 Salix alba and Populus alba galleries (target 7.94 ha) - Annual report presenting the progress of implementation and the results and analysis of the conservation process monitoring (target = the availability of the annual report)
Monitoring frequency	annually during the two first years, then bi-annually
Party responsible for monitoring the measure	Supervision Engineer

BAP 2: conservation and construction of the sedentary species' habitats (PBF/CH)**THE SCOPE OF THE MEASURE**

Objective	Set up a conservation and construction/support of the sedentary species habitats (PBF and CHs)
CH/ PBF concerned	CHs: Mammals: Forest dormouse

	Reptiles: • Pallas's glass lizard • Medium Lizard • Smooth snake PBF: Reptiles: • Transcaucasian rat snake, • Armenian viper, • Darevskia raddei
MEASURE IMPLEMENTATION	
Project phase	Project lifespan (pre-construction, construction, operation and maintenance)
Measure description	<i>Pre-construction phase</i> 1. Study the Project area (footprint) to estimate the structure and size of the sedentary species population, areas of habitats, 2. Study areas adjacent to the buffer zone (west, north-west and south-west from the buffer zone) and plots inside the reservoir's buffer zone that will not be destroyed, to estimate habitats suitable for the population relocation / development, including the "capacity" of the habitats and possibilities to construct additional habitats to increase their capacity; define boundaries of the suitable habitats, 3. Develop a BOMP, agree the BOMP with all stakeholders, 4. Within the framework of the BOMP: - plant indigenous tree species (for example, wild plum and pear) to increase habitat capacities for Forest dormice, - provide additional rocky outcrops to increase habitat capacities for the lizards and snakes, - survey the Project area to capture as many individuals as possible and to move them to the safe habitats identified and/or arranged. According to the preliminary estimation, suitable riverine habitats (92A0) can be defined upstream the reservoir (see Figure 5); suitable plots including open spaces and glades, shrubs and dry land habitats (G1.A1D12-AM, G4.92-Am, E1.C54-AM) for the reptiles can be defined west and south-west from the reservoir, in the buffer zone and beyond it. The final determination of the habitats should be detailed in the BOMP and set up precisely by zoologists and the Client specialists in close collaboration with local community in order to ensure the sustainability of the habitats. <i>Construction, operation and maintenance</i> 5. Before filling the reservoir, survey the flooded area and capture as many individuals as possible (if remained), and to move them to the safe habitats identified and/or arranged before 6. Monitor and maintain tree and rocky habitats of the species, 7. Introduce/support a sustainable grazing practice in the areas that surround the planned reservoir, as the improved quality of the habitats can provide higher and diverse food supply for reptiles (increasing insect quantity), thus supporting an increase in the density of the snake and lizard species. This measure requires additional involvement, awareness and sensitization of the local community that will be planned in the BOMP. Dormice and reptilians safely relocation and settlement procedures will be elaborated in terms of protocols developed basing on national and

	international requirements. The following national regulatory documents of the RA will be followed: ▪ The Procedure for relocating wild animals to natural conditions³³, ▪ The Procedure for issuing permits for the resettlement of wild animals into natural conditions³⁴ Internationally coordinated approaches for animal relocation are presented in IUCN Guidelines for Reintroductions and Other Conservation Translocations³⁵. For the species-specific approaches and technics the following manuals have to be followed: 1. The dormouse conservation handbook https://ptes.org/wp-content/uploads/2014/06/Dormouse-Conservation-Handbook.pdf 2. Reptile Habitat Management Handbook https://www.arc-trust.org/shop/reptile-habitat-management-handbook 3. Reptile Guidance for Developers https://www.lbp.org.uk/downloads/Publications/PlanningGuidance/NE_reptileguidelines.pdf
Timeline	Year 1: Seasonal studies, development of a BOMP, workshop and consultations with local community, the BOMP approval Year 2: habitats construction, relocation of the species individuals Year 3 and onwards: monitoring of the populations
Location	Within the reservoir's water protection zone and beyond it
Party responsible for implementing the measure	The Client - overall responsibility
Institutional or technical support	Project Implementation Unit Support Consultant - biodiversity expert / zoologist
Plan to ensure the measure durability	• Dedicate an internal Client staff responsible for Biodiversity conservation linked with local community
Implementation constraints and other remarks	• Necessary involvement of local community • Necessary management and control of the Client • Law enforcement (for protection of the reservoir's water protection zone)
MEASURE MONITORING	
Key Performance Indicators (KPI) and targets	• Field report on the study of the species populations and habitats • Developed BOMP • Consultations and workshop with local community • Area of inhabiting reptilians: : Pallas's glass lizard, Medium Lizard, Smooth snake, Transcaucasian rat snake, Armenian viper, Darevskia raddei (target 13.65 ha) • Annual report presenting the progress of implementation and the results and analysis of the monitoring (target = the availability of the annual report)
Monitoring frequency	• annually during the first three years, then bi-annually

³³Approved by the RA governmental decree #758-N from 23.03.2024 <https://www.arlis.am/hy/acts/193176>

³⁴Approved by the order of the Ministry of Environment of the RA #113-N from 03.04.2024 <https://www.arlis.am/hy/acts/191577>

³⁵IUCN/SSC (2013). Guidelines for Reintroductions and Other Conservation Translocations. Version 1.0. Gland, Switzerland: IUCN Species Survival Commission <https://portals.iucn.org/library/efiles/documents/2013-009.pdf>

Party responsible for monitoring the measure	Supervision Engineer
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BAP 3: Conservation and construction of the bird species' habitats (PBF)**THE SCOPE OF THE MEASURE**

Objective:	Set up a conservation and construction/support of the bird species' habitats (PBF)
CH / PBF concerned	PBFs: • Syrian Woodpecker • Wood Lark • Red-backed Shrike

MEASURE IMPLEMENTATION

Project phase	Project lifespan (pre-construction, construction, operation and maintenance)
Measure description	<i>Pre-construction phase</i> 1. Study the reservoir's water protection zone and adjacent areas to estimate habitats suitable for the bird species, including the "capacity" of the habitats and possibilities to construct additional habitats to increase their capacity; define suitable habitats, 2. Develop a BOMP, agree the BOMP with all stakeholders, 3. Within the framework of the BOMP implementation: - plant additional indigenous species of Poplar, Willow, and Walnut trees for Syrian Woodpecker in the vicinity of the reservoir area (riverine habitats restored under the Riverine Habitats Construction Plan can be used), - plant additional thorny bush species in the vicinity of the reservoir area as breeding spots for Red-backed Shrike, helping birds to discover new breeding sites. Conserved riverine habitats (92A0 - see BAP1) are suitable for the species. Also, forest and open dry habitats similar to the habitats G1.A1D12-AM, G4.92-AM, E1.C54-AM are suitable for the birds. According to the preliminary estimation, these habitats can be defined west and south-west of the reservoir in the buffer zone and beyond it. These four habitats will be conserved ("averted loss" approach) and, in some places, improved ("restoration" approach) to increase species-specific local habitats. The final determination of the habitats should be detailed in the BOMP and set up precisely by zoologists and Client specialists in close collaboration with local community in order to ensure the sustainability of the habitats. <i>Construction, operation and maintenance</i> 4. Monitor and maintain the planted tree and bush species, 5. Introduce/support sustainable grazing practices in the local community, which would improve the quality of grassland plots, increase the number and diversity of invertebrates, and support the necessary food supply for the bird species This measure requires additional involvement, awareness and sensitization of the local community that will be planned in the BOMP.
Timeline	Year 1: Seasonal studies, development of a BOMP, workshop and consultations with local community, the BOMP approval Year 2: habitats construction

	Year 3 and onwards: monitoring of the populations
Location	The reservoir's water protection zone, areas around, upstream of the reservoir
Party responsible for implementing the measure	Client - overall responsibility
Institutional or technical support	Project Implementation Unit Support Consultant - biodiversity expert / zoologist
Plan to ensure the measure durability	Dedicate an internal Client staff responsible for Biodiversity conservation linked with local community
Implementation constraints and other remarks	- Necessary involvement of local community - Necessary management and control of the Client - Law enforcement (for protection of the reservoir's water protection zone)
MEASURE MONITORING	
Key Performance Indicators (KPI) and targets	- Field report on the study of the species habitats - Developed BOMP - Consultations and workshop with local community - The area inhabited by birds: Syrian Woodpecker, Wood Lark, Red-backed Shrike (target 26.75 ha) - Annual report presenting the progress of implementation and the results and analysis of the monitoring (target = the availability of the annual report)
Monitoring frequency	annually during the first three years, then bi-annually
Party responsible for monitoring the measure	Supervision Engineer

BAP 4: conservation and construction of the insect species' habitats (PBF)	
THE SCOPE OF THE MEASURE	
Objective:	Set up a conservation and construction/support of the insect species' habitats (PBF)
CH / PBF concerned:	PBF: <i>Thaleropsis ionia</i> <i>Euphydrys aurinia</i> <i>Carabus hollbergi</i> <i>Procerus scabrosus</i> <i>Dorcadion leave</i>
MEASURE IMPLEMENTATION	
Project phase	Project lifespan (pre-construction, construction, operation and maintenance)
Measure description:	<i>Pre-construction phase</i> - Study the Project area to estimate the size of the insect species populations and areas of the habitats, lost by these species, - Study the reservoir's water protection zone and adjacent areas to estimate habitats suitable for the species, including the "capacity" of the

	habitats and possibilities to construct additional habitats to increase their capacity; define suitable habitats, 3. Develop a BOMP, agree the BOMP with all stakeholders, 4. Within the framework of the BOMP implementation. - count the number of lost <i>Celtis sp.</i> trees, and plant the appropriate number on the open slopes at some of the degraded parts of the surroundings, to compensate for the habitat loss of <i>Thaleropsis ionia</i>, - count the lost grasslands, and develop similar grassland areas at the mosaic and degraded parts of surroundings to compensate for the habitat loss of <i>Euphidrias aurinia</i> and <i>Dorcadion leave</i>, - count the lost parts of woodlands and restore some fragmented parts of the surrounding deciduous woodlands to increase the habitats of <i>Carabus hollbergi</i> and <i>Procerus scabrosus</i>. The insect species habitats have to coincide with the conserved/constructed habitats for the reptilian and bird species (see BAP1-3) supporting the food chains. Species-specific restoration/improvement of the habitats (see p.4 above) will increase their capacities. The determination of the habitats should be detailed in the BOMP and set up precisely by entomologists and Client specialists in close collaboration with local community in order to ensure the sustainability of the habitats. <i>Construction, operation and maintenance</i> 5. Monitor and maintain the habitats with the species forage plants 6. Introduce/support sustainable grazing practices in the local community, which would improve the quality of grassland habitat and increase the number and diversity of invertebrates. This measure requires additional involvement, awareness and sensitization of the local community that will be planned in the BOMP.
Timeline	Year 1: Seasonal studies, development of a BOMP, workshop and consultations with local community, the BOMP approval, Year 2: habitats construction, Year 3 and onwards: monitoring of the population.
Location	Predominantly within the reservoir's water protection zone
Party responsible for implementing the measure	Client - overall responsibility
Institutional or technical support	Project Implementation Unit Support Consultant - biodiversity expert / zoologist
Plan to ensure the measure durability	• Dedicate an internal Client staff responsible for Biodiversity conservation linked with local community
Implementation constraints and other remarks	• Necessary involvement of local community • Necessary management and control of the Client • Law enforcement (for protection of the reservoir's water protection zone)
MEASURE MONITORING	
Key Performance Indicators (KPI) and targets	• Field report on the study of the species and their habitats • Developed BOMP • Consultations and workshop with local community

	• The area inhabited by insects (the 5 species, PBFs; target: at least 1.5 times greater than the area of the lost habitats) • Annual report presenting the progress of implementation and the results and analysis of the monitoring (target = the availability of the annual report)
Monitoring frequency	• annually during the first three years, then bi-annually.
Party responsible for monitoring the measure	Supervision Engineer

10. Biodiversity monitoring

After the completion of the studies and surveys, a robust baseline will be established. Only after that can the BMP be updated and detailed. Reliable and high-quality monitoring and evaluation are the keys to adaptive management. Adaptive management is a good practice that is necessary to ensure the efficiency of the mitigation and offsetting.

For the PBFs and CHs, it is proposed to establish the long-term joint-monitoring of habitats and indicator species with the involvement of the national/local key specialists/stakeholders. The following two types of monitoring will be maintained: 1) the monitoring of mitigation measures and 2) the monitoring of habitats and species of the BOMP.