

«УТВЕРЖДАЮ»
Заместитель министра энергетики
Кыргызской Республики

С.С.Садыракунов
 «__» _____ 2026г.

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Terms of Reference

Integrated Aquatic and Terrestrial Biodiversity Study

Naryn River (Kambarata-1 HPP)

OBJECT	
Project	Naryn River Jalal-Abad region Kyrgyz Republic Kambarata-1 Hydroelectric Power Station (hereinafter referred to as K-1), the allocated project area of K-1 (including: Hydropower Plant Diversion Tunnel, dam area, reservoir area, water protection zone, adjacent area within a radius of 5 km)
Executive agency	Ministry of Energy of the Kyrgyz Republic (hereinafter referred to as ME), Bishkek, st. Zhibek-Zholu, 326 Authorized Person of the Ministry of Energy: will be determined by the decision of the supervising Deputy Minister of Energy
Regulatory framework	WB ESF / ESS 6; IFC PS 6; EBRD 2024 Environmental & Social Policy (ESP); IUCN Guidelines; SLT Standards; Laws of the Kyrgyz Republic; This study is being conducted in accordance with the obligations set out in the Environmental and Social Commitment Plan (ESCP) and ESIA for K1 HPP.
Purpose/Object species	To undertake a comprehensive assessment of ecology in the entire project area, with a focus on areas likely to be impacted due to the proposed construction of Diversion Tunnels, being advanced before completion of full Detailed Design of the other elements, based on the following: (i) Animal species living in the project area (ii) Plant species growing in the project area (iii) IUCN- listed species VU or worse risk; CITES listed species; (iv) Species included in the Red Book of the Kyrgyz Republic (v) Species and habitats that trigger Critical Habitat (as defined by WB and EBRD) or Priority Biodiversity Feature (as defined by EBRD) using observational integrated aquatic (eDNA-focused) and terrestrial biodiversity baseline survey with construction impact monitoring focus
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1. Background and Context

The Kambarata-1 Hydropower Plant (K-1 HPP) is a major hydropower development project on the Naryn River in the Kyrgyz Republic, featuring a 1,860 MW installed capacity. The project includes construction of a diversion tunnel during the initial construction phase to manage river flows.

The diversion tunnel construction activities—including excavation, muck disposal, dewatering, and associated infrastructure (haul roads, portals, disposal sites)—have potential to impact aquatic and terrestrial biodiversity through multiple pathways: sediment release, chemical discharge, habitat fragmentation, direct habitat loss, and hydrological alteration. The World Bank is supporting the preparation of the Environmental and Social due diligence package for this project through a technical assistance package to the Government of the Kyrgyz Republic.

The Naryn River is a critical tributary of the Syr Darya Basin and supports endemic fish species and migratory pathways. The project must comply with World Bank Environmental and Social Standard 6 (ESS6) on Biodiversity Conservation and Sustainable Management of Living Natural Resources, requiring baseline biodiversity data, impact assessment, and adaptive management protocols.

In order to expedite implementation, the Government of the Kyrgyz Republic intends to undertake the construction of diversion tunnels through its own resources, while complying with the World Bank's Environmental and Social Framework and EBRD's 2024 ESP, as internationally recognized standards of responsible project development.

The baseline data collected in this assignment will serve as a critical reference point for monitoring potential impacts during construction and operation phases, ensuring compliance with international environmental standards and supporting evidence-based decision-making for biodiversity conservation measures. The recommendations for the ESMP augmentation will be integrated into the Works contract documentation to ensure their implementation as this important activity commences in advance of anticipated international financing of the project.

This ToR includes the following:

- 1) Detailed biodiversity surveys/assessments for the construction of the diversion tunnel, expected to start in summer 2027. This includes research on:
 - (i) Baseline biodiversity studies of terrestrial ecosystems through systematic surveys of flora and fauna in activity impact zones (tunnel entrances, access roads, waste disposal sites, construction sites);
 - (ii) Development of measures to compensate and reimburse damage to biodiversity in the event of significant negative impacts being identified in the bypass tunnel section;
 - (iii) Identification and mapping of critical habitats and priority biodiversity sites within the bypass tunnel area.
 - (iv) Analysis of construction activities and their impact on biodiversity.
- 2) Closing biodiversity gaps identified in the ESIA. This includes research on:
 - (i) Aquatic Biodiversity (eDNA). Environmental DNA study is designed to establish a comprehensive biodiversity baseline using state-of-the-art environmental DNA (eDNA) methods and observational methods for aquatic ecosystems and traditional survey methods for terrestrial ecosystems, explicitly linked to: construction impact pathways and Environmental and Social Management Plan (ESMP) sub-plans for the construction of these diversion tunnels and the Cumulative Impact Assessment (CIA) for the project, supplementing the draft ESIA already prepared by the Kyrgyz Republic and disclosed on their website and that of the World Bank;
 - (ii) Terrestrial Biodiversity (Terrestrial Fauna and Flora). This study shall be carried out on the basis of the comments of the Ministry of Natural Resources No. 12-4/7302 of August 27, 2025 to address gaps in the ESIA and ESMP.
 - (iii) Impact Pathways. This study shall be carried out on the basis of the comments of the Ministry of Natural Resources No. 12-4/7302 of August 27, 2025 to address gaps in the ESIA and ESMP.
 - (iv) Critical Habitat. This study shall be carried out on the basis of the comments of the Ministry of Natural Resources No. 12-4/7302 of August 27, 2025 to address gaps in the ESIA and ESMP.

- (v) Integration of study results into the ESIA and ESMP and other subplans.

A more detailed description with references to sections of the document is given in Chapter 2.

It is important to understand that all work on the main design will begin only after the completion of biodiversity research. In this context, the ToR should be correlated with another separate consulting assignment: design of diversion tunnels, including geological and other technical studies.

The early work schedule is provided in Technical Assistance for Kambarata 1 Hydropower Plant Project – Feasibility Study Update, Volume 1.5, Construction Schedule – August 2025 (see Annex 5).

The Consultant shall provide biodiversity information (research information) at defined decision points so that in accordance with Annex 4 for timely assessment by the PMO, the Expert Panel and project donors.

2. Objectives

The primary objectives of this biodiversity study are:

#	Description	Type of activity	Brief information for completing the task
1.	Establish aquatic biodiversity baseline using eDNA metabarcoding methods covering the Naryn River mainstem, suitably supplemented with observational methods for K-1 project influence area, including Toktogul Reservoir	ESIA/ESMP Supplement	Annex 1. Environmental DNA (eDNA) Feasibility Assessment and Optional Survey for Fish Species Identification
2.	Establish terrestrial biodiversity baseline through systematic flora and fauna surveys in activity impact zones (tunnel portals, haul roads, muck disposal sites, construction footprint) Including zones of similar nature to determine whether the relevant species also occur outside the area of interest.	ESIA/ESMP Supplement Construction of a bypass tunnel	Annex 2. Brief Description of the Terrestrial Biodiversity Survey Task
3.	Identify and map Critical Habitat and Priority Biodiversity Features as defined under World Bank ESS6 and EBRD 2024 ESP, including Critically Endangered (CR), Endangered (EN), or Vulnerable (VU) species, restricted-range species, migratory species, and ecosystem functions.	ESIA/ESMP Supplement; Construction of a bypass tunnel	Annex 3. List of Species: Critically Endangered (CR), Endangered (EN), or Vulnerable (VU), Range-Restricted, Migratory (identified in the K-1 project area)
4.	Link construction activities to biodiversity impact pathways and establish monitoring protocols aligned with ESMP sub-plans (Muck and Spoil Management, Biodiversity Management, Water Quality Management, Construction Activities Tracking).	ESIA/ESMP Supplement; Construction of a bypass tunnel	Annex 2. Brief Description of the Terrestrial Biodiversity Survey Task
5.	Establish management trigger thresholds for adaptive management responses. Clear, quantitative thresholds will be defined for key biodiversity indicators enabling rapid response when monitoring data indicates impacts exceeding acceptable levels.	ESIA/ESMP Supplement	ESIA/ESMP K-1
6.	Provide scientifically robust, audit-ready data suitable for World Bank quality enhancement review, safeguards compliance, and potential Inspection Panel scrutiny. All data collection, analysis, and reporting will meet international standards for environmental impact assessment.	ESIA/ESMP Supplement	ESIA/ESMP K-1
7.	Support development of biodiversity offset and compensation measures if significant impacts are identified. The study will provide technical foundation for designing effective offset strategies consistent with World Bank ESS6 requirements and international best practices.	Construction of a bypass tunnel	ESIA/ESMP K-1

3. Scope of services

The scope encompasses both aquatic and terrestrial monitoring components across a hierarchical spatial framework to capture direct, indirect, and cumulative project impacts.

3.1 Spatial Framework

Tier 1 (Construction Impact Zone): Tunnel inlet/outlet areas, dewatering discharge points, spoil disposal sites, construction haul roads, and portal work areas. Tier 2 (Project Influence Zone): Project footprint and 1-5 km radius, capturing hydrological changes, habitat fragmentation, and wildlife patterns. Tier 3 (Basin Assessment Zone): Tier 1 (Construction Impact Zone): Tunnel inlet/outlet areas, dewatering discharge points, spoil disposal sites, construction haul roads, and portal work areas. Tier 2 (Project Influence Zone): Project footprint including reservoir area and 1-5 km buffer, capturing hydrological changes, habitat destruction fragmentation, and wildlife patterns. Tier 3 (Basin Assessment Zone): (i)The Kokomeren River, the confluence of the Kokomeren and Naryn rivers (ii)the Naryn River (before the first span of the overpass bridge of the North-South highway), (iii)the main channel of the Naryn River to Kambarata HPP-2; (iv)below the Kambarata HPP-2 dam, the Naryn River to the Toktogul HPP reservoir, the Toktogul HPP reservoir.

3.2 Geographic Coverage

Aquatic monitoring includes minimum mainstem nodes (upstream reference sites corresponding to ESIA sites, K-1 upstream/downstream, Toktogul inflow/outflow). plus, construction-focused nodes at tunnel portals, discharge points, and downstream gradients. Terrestrial surveys cover direct habitat loss areas (portals, roads, disposal sites), riparian corridors, and sensitive habitats in the reservoir area, the coastal protection zone (+500 m) and sensitive habitats.

3.3 Temporal Coverage

Four seasonal campaigns (autumn, winter, spring, summer) capture biodiversity dynamics.

3.4 ESIA/ESMP Integration

The findings should be accompanied by for integration in ESIA, with ESMP implementation, providing baseline data for Muck and Spoil Management, Biodiversity Management verification, Water Quality Management compliance, and Construction Activity Tracking protocols, ensuring seamless coordination between monitoring and adaptive management.

3.5 Quality Assurance and Quality Control

The study shall implement rigorous QA/QC protocols meeting international standards and audit requirements to ensure data reliability and scientific integrity throughout all phases of the assessment.

3.5.1 Sampling Protocols

Sampling Replication: Minimum 3 replicate samples per site per sampling campaign for eDNA. Replicate transects or quadrats for terrestrial surveys following statistical power requirements.

Contamination Control: Field blanks (eDNA), negative controls in laboratory analysis, equipment decontamination protocols between sites using 10% bleach solution and UV sterilization.

3.5.2 Laboratory Quality Assurance

Laboratory Standards: Use of accredited laboratories with ISO 17025 certification or equivalent. Independent laboratory audits conducted annually.

Analytical Controls: Positive controls in all PCR runs. PCR replicates (minimum triplicate) for all samples. Sequencing quality metrics monitored including read depth and base quality scores. Bioinformatics validation includes quality filtering, chimera removal, and taxonomic assignment validation.

3.5.3 Data Management

Chain of Custody: Complete documentation of sample collection, transport, storage, and laboratory processing maintained through barcoded sample tracking system.

Metadata Standards: Comprehensive metadata including GPS coordinates (± 5 m accuracy), environmental parameters (temperature, pH, conductivity, turbidity), date/time stamps, collector ID, and photographs. Metadata following Darwin Core standards.

Data Validation: Statistical outlier detection and consistency checks. Automated validation scripts flag anomalies for senior staff review.

3.5.4 Taxonomic Verification

Reference Databases: Taxonomic assignments validated against multiple curated reference databases including NCBI GenBank, BOLD Systems, and regional databases. Expert taxonomic review for critical identifications.

Voucher Collections: Voucher specimens collected where appropriate, preserved following standard protocols, and deposited in recognized natural history collections with unique identifiers.

3.5.5 Compliance and Audit Trail

Independent Review: Internal quality review by senior team members before report submission. External peer review for Critical Habitat determination.

Documentation: Complete audit trail of all field activities, laboratory procedures, analytical decisions, and quality control measures. All records maintained for minimum 10 years.

Standards Compliance: Explicit documentation of compliance with ESS6 requirements, IUCN protocols, and relevant national regulations.

Photo and video materials, maps and survey routes: **mandatory provision of GPS tracks of survey routes and mapping of detection points, provision of photo and video data with GPS positioning.**

State procedures and samples of formal registration cards: provision of established forms of the Ministry of Natural Resources for the registration of fauna and flora.

4. Methodology¹

4.1 Aquatic Biodiversity (eDNA)

Water samples (minimum 3 replicates per site) shall be collected following international eDNA protocols. Sample volume: 2-5 liters filtered on-site through 0.45 µm cellulose nitrate filters. Samples preserved under cold chain for DNA extraction, PCR amplification, and high-throughput sequencing (Illumina platform). Taxonomic identification using validated reference databases (BOLD, GenBank). Bioinformatics pipeline includes quality filtering, denoising, taxonomic assignment, and diversity metrics. This should be supplemented with observational methods for K-1 project influence area, including Toktogul Reservoir. The focus will be on confirming the extent of presence and distribution of key species like the *Aspiolucius esocinus* (Pike asp), *Luciobarbus brachycephalus* (Aral barbel), and *Glyptosternon reticulatum* (Turkestan Catfish);

4.2 Terrestrial Biodiversity

Flora surveys using standardized quadrat methods and vegetation mapping following EUNIS classification, supplemented with specific search for the following species (see Annex 3). Fauna surveys include mammals (camera traps, transect surveys), birds (point counts), reptiles (visual encounter surveys), and amphibians (seasonal surveys), insects (Malez traps, light traps, nets and soil samples). All surveys target identification of CR/EN/VU species per IUCN Red List.

4.3 Impact Pathway Analysis

Explicit linkage of construction activities to impact vectors (suspended solids, pH, chemical discharge, habitat loss) and biodiversity monitoring indicators.

4.4 Critical Habitat and Priority Biodiversity Features Screening

Application of WB ESS6 and EBRD ESR6 criteria including threatened species presence, restricted-range species, migratory corridors, and critical ecosystem functions.

Component	Methods	Key Outputs
Aquatic eDNA	Water sampling, DNA extraction, sequencing	Species lists, diversity metrics
Terrestrial Flora	Quadrat surveys, vegetation mapping	Species inventories, habitat classification
Terrestrial Fauna	Camera traps, transects, surveys	Species inventories, threatened species
Impact Pathways	Activity-impact linkage analysis	Impact matrices, monitoring indicators
Critical Habitat	ESS6 criteria application	Habitat designation, mitigation hierarchy

¹ In case of requirement of any statutory permissions, such as for transport of samples of important/protected species, the PMO will facilitate the coordination with the relevant GoKR entities. The selected consultant must identify such requirements early, preferably in the inception report, but no later than end of the first campaign to allow timely movement of samples for analysis, in compliance with relevant laws.

5. Deliverables end Reporting

5.1 Deliverables

The Consultant shall deliver comprehensive reports, datasets, and documentation as follows:

- (1) **Inception Report (Month 1.5):** Detailed methodology, site locations, sampling protocols, QA/QC procedures, work plan with Gantt chart and key interface timings with the Design schedule in Annex 4, team CVs.
- (2) **Seasonal Biodiversity Reports (4 reports):** One per campaign covering field activities, preliminary findings, taxonomic lists, photographic documentation, georeferenced records highlighting any important features different from anticipated ones based on existing baseline from ESIA.
- (3) **Interim Assessment Note (Month 6):** Synthesis of completed campaigns, preliminary impact analysis including preferred tunnel related footprint activities, Critical Habitat findings, draft specifications for bidding documents, and adaptive management recommendations.
- (4) **Draft Final Assessment Report (Month 14):** Comprehensive analysis integrating all campaigns, complete species inventories with taxonomic verification, Critical Habitat determination with ESS6 compliance, impact pathway matrix, regional baseline comparison, statistical analysis of patterns, trigger thresholds, ESMP integration, biodiversity offset recommendations, full datasets.
- (5) **GIS Datasets and Maps:** Georeferenced sampling locations, habitat classification maps, species distribution maps, Critical Habitat delineation, impact zone mapping, shapefiles and metadata.
- (6) **ESMP Integration Note:** Detailed additions to respective ESMP sub-plans (Muck Management, Biodiversity Management, Water Quality, Construction Tracking) with monitoring indicators and trigger thresholds for contractors' final work planning conformance.
- (7) The Consultant must complete the studies before making any decisions regarding the bypass tunnel project. The schedule of research work must be coordinated with the schedule of early construction work for the Feasibility study described (see Annex 4).

Phase	Months	Key Activities	Deliverables
Inception	1.5	Methodology finalization, site reconnaissance, team mobilization	Inception report
Campaign 1	2-3	Winter sampling: low-flow conditions	Seasonal report 1
Campaign 2	5-6	Spring sampling: aquatic eDNA, terrestrial surveys	Seasonal report 2
Interim Report	5-6		Interim note
Campaign 3	8-9	Summer sampling: peak conditions baseline	Seasonal report 3
Campaign 4	10-11	Autumn sampling: migration patterns	Seasonal report 4 with outline of final report
Final Report	13-14		Final report

Reporting: Seasonal reports delivered within 3 weeks of campaign completion. Interim note at Month 6. Final comprehensive draft report at Month 12. Final report at the end of month 14. Timeline allows overlap between field campaigns and analytical work, ensuring efficient resource use while maintaining scientific rigor.

Note:

In addition to the specified deadlines, up to three months must be added for program approval and review of research results by the relevant ministries and government overseers.

All deliverables should be in English, digital and hard copy formats. Digital datasets in open-source formats with documentation. Digital formats: PDF (final), MS Word (draft for review), Excel (data tables), GIS shapefiles (spatial data). Hard copies: 3 bound copies of final report. Interim reports and draft final reports shall be submitted for Client review with 2-week review period before finalization.

All reports shall follow professional scientific standards with the following structure:

- (1) **Executive Summary** - Non-technical summary for decision-makers with key findings and recommendations;
- (2) **Introduction** - Study context, objectives, and ESS6 compliance framework;
- (3) **Methodology** - Detailed methods, sampling design, analytical protocols, and QA/QC procedures with replication detail;
- (4) **Results** - Comprehensive findings including species inventories, diversity metrics, spatial patterns, statistical analyses, and GIS outputs;
- (5) **Critical Habitat Assessment (part of draft final report)** - Explicit evaluation against ESS6 criteria with evidence;
- (6) **Impact Pathway Analysis** - Linkage between construction activities and biodiversity impacts with ESMP integration;
- (7) **Management Recommendations** - Adaptive management triggers, mitigation measures, monitoring requirements, and biodiversity offset recommendations if applicable;
- (8) **References** - Complete citations of scientific literature, standards, and guidelines;
- (9) **Appendices** - Complete species lists, raw data summaries, QA/QC records, metadata, photographic documentation, and team CVs.

Reports shall maintain professional layout with high-resolution maps and figures, tables formatted for clarity, consistent terminology, SI units, and proper scientific nomenclature (binomial names with authorities). All reports must be in English and Russian.

6. Timeline and Duration

The total study duration is 14 months (plus possible additional three month for program approval and review of research results by the relevant ministries and government overseers) to capture four complete seasonal cycles (spring, summer, autumn, winter) as required for robust biodiversity baseline establishment and ESS6 compliance.

Consultant shall include the following expenses: international and local personnel, field equipment and supplies, eDNA sampling and laboratory analysis, transportation and logistics, accommodation, GIS software, report production, and contingency for event-based sampling.

7. Expertise Requirements and Team Composition

7.1 Consultant Experience and Qualifications Requirements

To be shortlisted the consultant shall cover below minimum qualification requirements.

- Strong knowledge and experience in implementing the World Bank ESF, the World Bank Group's Environment, Health, and Safety (EHSG) General Guidelines, and/or other international financial institutions, as well as international industry best practices.
- **Experience with biodiversity offsets. Experience with transboundary environmental impacts and cumulative impact assessments.**
- **At least seven years** of experience in application of rigorous quality assurance/quality control protocols (QA/QC protocols) for field sampling, laboratory work, and data analysis.
- **Experience developing ESIA and ESMP projects.**
- Experience of work in similar ecosystems or in similar regions with knowledge of local fish species. Experience in Central Asia will be an advantage.
- Proven experience in **eDNA sampling, laboratory analysis, and bioinformatics** for aquatic environments.
- Experience of work with **genetic databases** (e.g., NCBI, BOLD) and tools for **primer design and validation** (e.g., ecoPCR).

7.2 Key Personnel

The Consultant shall assemble a multidisciplinary team with the following expertise and qualifications:

(1) Team Leader (Biodiversity/ESS6 Specialist): PhD preferred in ecology, conservation biology, or environmental science. 10+ years international experience with biodiversity assessments for infrastructure projects. Expertise in World Bank ESS6 compliance and Critical Habitat assessment. Hydropower/dam experience strongly preferred. 3+ previous Team Leader assignments for biodiversity baseline studies.

(2) Aquatic eDNA Lead: MSc/PhD in molecular ecology, aquatic ecology, or related field. 8+/5+ years with eDNA sampling, laboratory protocols, and bioinformatics. Central Asian freshwater experience preferred.

(3) Terrestrial Ecologist: Advanced degree in terrestrial ecology or wildlife biology. 8+ years with multi-taxa surveys (mammals, birds, reptiles, amphibians). Expertise in habitat classification, vegetation mapping, and IUCN Red List protocols.

(4) Botanist: Advanced degree in botany or plant ecology. Expertise in Central Asian flora, vegetation mapping, and habitat assessment.

(5) Hydrologist: Expertise in river hydrology, sediment transport, and construction impact assessment. Experience linking hydrological changes to ecological responses.

(6) Entomologist: PhD preferred in "Entomology". 10 years of international experience conducting multi-species research (terrestrial and aquatic insects, arthropods). Insect/arthropod taxonomy, morphology, and physiology, field research, laboratory analysis, and collection management. Expertise in habitat classification, mapping, and IUCN Red List protocols.

(7) GIS Expert: Proficiency in ArcGIS or QGIS, spatial analysis, and map production. Experience with biodiversity data management.

(8) Field Teams (Local): Trained field assistants with knowledge of local conditions and species.

All team members must provide CVs demonstrating required qualifications. International experts must have prior experience in Central Asia or comparable regions.

8. Management and Coordination

The Consultant shall coordinate closely with the following key stakeholders:

Project Management Office (PMO): Regular progress meetings (monthly minimum), coordination on site access and safety protocols, alignment with construction schedule for event-based sampling: (1) eDNA sampling points will be designated by the PMO and agreed upon by the Consultant; (2) Fauna census transects and flora maps will be proposed by the Consultant and agreed upon with the PMO; (3) Obtaining regulatory permits and preparing stakeholders: (i) All applications for national permits are submitted through the PMO to the Ministry of Natural Resources no later than 30 days before the planned start of field work; (ii) Formal consultations with the Ministry of Natural Resources with the consent of the PMO; (iii) All applications for access to border zones or restricted areas must be submitted through the PMO no later than 30 days before the scheduled start of field work. The PMO shall convene Biodiversity-Design Interface Reviews as per ANNEX P. Participants shall include, as relevant, the PMO, Biodiversity Consultant, tunnel designer, PMO environmental and social team, ESPOE, national authorities, and lender or financier representatives. Participation shall not alter the respective contractual, regulatory, or approval authorities of those parties.

Other Consultants: Coordination with teams responsible for geological investigations and design, cumulative impact assessment, and stakeholder engagement.

National Authorities: Liaison with Ministry of Environment, State Forestry Service, relevant research institutions. Compliance with national permitting requirements for biological sampling.

Environmental and Social Panel of Experts (ESPOE) and World Bank: Coordination with ESPOE, World Bank task team, as directed by the PMO.

Local Communities: Stakeholder engagement regarding study activities, employment of local field assistants where feasible, communication of findings in accessible formats. This can be included as part of the inception report visit/s and then for each campaign meeting local community leaders during the fieldwork.

The Team Leader shall serve as primary point of contact and shall designate a deputy for continuity. Monthly progress reports (brief) shall be submitted to PMO. Immediate notification required for any Critical Habitat indicators or significant findings requiring management response. The Consultant shall maintain flexibility to adjust sampling protocols in response to construction schedule changes while maintaining scientific integrity of seasonal coverage requirements.

9. Payment Schedule

Payment shall be milestone-based linked to deliverable approval:

Number	Deliverable	Payment in % from total contract amount
Payment 1	Approved Inception Report with finalized methodology and team mobilization	15%
Payment 2	Completed Campaign 1 (Autumn) and approval of first Seasonal Report	20%
Payment 3	Completed Campaign 2 (Winter) and approval of second Seasonal Report	20%
Payment 4	Completed Campaign 3 (Spring) and approval of third Seasonal Report with preliminary Critical Habitat screening	20%
Payment 5	Approved Final Biodiversity Assessment Report, GIS datasets, ESMP Integration Note, and all deliverables meeting standards	25%

10. ANNEXES

ANNEX 1. Environmental DNA (eDNA) Feasibility Assessment and Optional Survey for Fish Species Identification

1. Background and Objectives

The objective is to determine whether **environmental DNA (eDNA) assessment** can reliably detect the presence or absence of target fish species in the project area, given potential gaps in genetic reference databases. The assignment is divided into two phases:

- (i) Phase 1: Feasibility Study – Review genetic databases and assess the potential of eDNA to meet the project's needs.
- (ii) Phase 2 (Optional): eDNA Survey – Conduct field and laboratory work if Phase 1 confirms feasibility and informativeness.

The consultant shall present the findings of **Phase 1** to the lenders and the Client for approval before proceeding to **Phase 2**.

2. Scope of Work

Phase 1: Feasibility Study – Database Review and eDNA Potential Assessment

Objective: Determine whether eDNA can identify the presence/absence of target fish species or, at minimum, detect fish DNA that cannot be attributed to known species.

Tasks:

- (i) **Database Audit**
 - Compile from the ESIA and reliable scientific sources a **comprehensive list of fish species** relevant to the project area, including target species and other species likely to be present.
 - Review **global and regional genetic databases** (e.g., NCBI, BOLD, local/regional databases) for coverage of these species.
 - Identify **gaps** in the databases (e.g., missing species, incomplete sequences, or low-quality references).
 - Assess whether **universal fish primers** (e.g., 12S rRNA, COI) can reliably amplify DNA from the target species and other fish in the project area.
- (ii) **Primer Validation**
 - Conduct **in silico testing** (e.g., using ecoPCR or similar tools) to verify that selected primers bind to the target species' DNA.
 - Provide a **report on primer specificity and sensitivity** for the target species and other fish in the project area.
- (iii) **Feasibility Analysis**
 - Evaluate whether eDNA can:
 - **Identify target species** to species-level.
 - **Detect fish DNA** that cannot be matched to known species (e.g., unknown or unsequenced species).
 - **Distinguish between closely related species** (if applicable).
 - Assess **limitations**, including:
 - Potential for **false positives/negatives**.
 - Risk of **contamination** (e.g., from human activity, livestock, or lab processes).
 - **Environmental factors** (e.g., water turbidity, temperature, or flow) that may affect DNA detection.

(iv) **Deliverables for Phase 1**

- A **technical report** summarizing:
 - Database coverage for target and non-target fish species.
 - Primer validation results.
 - Feasibility of eDNA to meet the project's objectives, including **clear statements on what can and cannot be achieved**.
 - **Recommendations** on whether to proceed to Phase 2, including any **preconditions** (e.g., filling database gaps, adjusting survey methods).
- A **presentation** for lenders and the Client, highlighting:
 - Key findings from the database audit and primer validation.
 - Expected outcomes of an eDNA survey (e.g., species-level identification, detection of unknown fish DNA).
 - **Risks and limitations** of using eDNA in the project context.

(v) **Review and Approval**

- Present the **Phase 1 report and recommendations** to the lenders and the Client.
- Obtain **written approval** to proceed to Phase 2 (if deemed feasible and informative).

Phase 2 (Optional): eDNA Survey

Objective: Conduct eDNA sampling and analysis to detect and identify fish DNA in the project area, as approved in Phase 1.

Tasks:

(i) **Survey Design**

- Develop a **sampling plan** based on Phase 1 findings, including:
 - **Sampling locations** (e.g., stratified by habitat type, upstream/downstream).
 - **Sampling frequency** (e.g., seasonal or temporal replication).
 - **Sample volume** (e.g., 1–10L per sample) and filtration protocols.
- Include **negative controls** (field blanks) to detect contamination.

(ii) **Field Sampling**

- Collect water samples according to the approved plan.
- Filter samples **on-site** using 0.22–0.45 µm filters to preserve DNA.
- Document **field conditions** (e.g., water temperature, turbidity, flow) that may affect DNA detection.

(iii) **Laboratory Analysis**

- Extract and amplify DNA using **fish-specific primers** (e.g., MiFish-U/E for 12S rRNA).
- Perform **high-throughput sequencing** (e.g., Illumina MiSeq) with **>100,000 reads per sample**.
- Use **bioinformatics tools** (e.g., DADA2, UNOISE) to:
 - Cluster sequences into **Molecular Operational Taxonomic Units (MOTUs)**.
 - Assign taxonomy by comparing MOTUs to reference databases (e.g., BLAST with >98% similarity for species-level ID).
 - Flag MOTUs with **<90% similarity** as "unknown fish DNA."

(iv) **Quality Control**

- Remove sequences matching **contaminants** (e.g., human, livestock, or lab contaminants).
- Validate results using **replicates and negative controls**.

(v) **Deliverables for Phase 2**

- A **final report** including:
 - **Raw data:** FASTQ files and bioinformatics scripts.
 - **Results:**
 - List of detected fish taxa (with % sequence similarity to reference).
 - MOTUs with **no database match** (potential unknown species).
 - **False-positive/negative rates** (based on controls and replicates).
 - **Interpretation:**
 - Clear statements on **limitations** (e.g., database gaps, environmental factors).
 - **Recommendations** for follow-up actions (e.g., targeted sequencing, traditional surveys).
- A **presentation** summarizing key findings for lenders and the Client.

3. Special Requirements

Detailed location data, GPS coordinates, and movement corridors must be classified as CONFIDENTIAL and not subject to free provision or distribution. This data must not be included in publicly disclosed documents or posted in publicly accessible databases without prior approval from the Ministry of Energy and Ministry of Natural Resources.

(i) Purpose and Regulatory Context

In accordance with (i) World Bank Environmental and Social Standard ESS6 (Biodiversity Conservation and Sustainable Management of Living Natural Resources), and (ii) European Bank for Reconstruction and Development (Priority Biodiversity Features (PBF) and Critical Habitat (CHA) (ESR6)

- The Project applies a precautionary and evidence-based approach to the identification and management of impacts on aquatic biodiversity.
- Environmental DNA (eDNA) analysis has been identified as a complementary biodiversity assessment and monitoring tool, supporting conventional ichthyological surveys, with the objective of improving detection of freshwater fish species, including rare, endemic and migratory taxa, within a mountainous river basin in Kyrgyzstan

(ii) Integration with Best Management Practices and Adaptive Management

eDNA analysis will be integrated into best management practices as an adaptive management tool supporting:

- Refining baseline aquatic biodiversity indicators;
- Verifying the presence or absence of rare or migratory fish species, particularly: - IUCN Red List species with EN status: *Aspiolucius esocinus* (Pike asp²), *Luciobarbus brachycephalus* (Aral barbel), and *Glyptosternon reticulatum* (Turkestan Catfish);
- Informed decision-making regarding ecological flows, fish passage, and biodiversity mitigation measures.
- If the presence of the three target fish species is confirmed:

² ESIA/Volume III. Book 3.1. Appendix 1-A, 8-A, 8-B,10-A. As per the IUCN Red List, this is a habitat-specialist species restricted to large, free flowing and turbid rivers - <https://www.iucnredlist.org/species/39462/156728608>

- an assessment of the feasibility of candidate stretches of river/stream, and organization of proposed compensatory measures (e.g., breeding, fish hatcheries) to achieve "net gain," or
- a proposal of alternative measures.

The task will be adjusted in accordance with the monitoring objectives, available resources, technical feasibility and recommendations of the Panel of Expert.

(iii) **The frequency, spatial coverage, and seasonal scale of eDNA sampling**

The study area for the proposed eDNA monitoring covers the river–reservoir system affected by the Project, including the future reservoir footprint, upstream river sections, tributary influence areas, and the near-dam zone. This system is characterized by pronounced spatial heterogeneity, seasonal hydrological variability, and a transition from lotic (flowing) to lentic (standing) conditions, typical of large hydropower developments.

Given the scale of the Project and its High-Risk classification, a sampling framework that explicitly accounts for habitat heterogeneity is required to ensure representative and defensible coverage under ESS6, ESR6.

The description of the sampling points is given in the table below.

Name of the river/reservoir	Quantity	Description of the sampling point
Toktogul Reservoir		
	1	Naryn River Uzunakmat 41°50'50.43"N 72°43'27.18"E Height 871 m
	1	Naryn River Kotormo 41°49'15.41"N 73°02'28.51"E Height 871.3 m
	1	Naryn River Uchterek 41°46'32.72"N 73°12'23.87"E Height 871.3 m
Kambarata HPP-1		
	1	Naryn River Saimaluutash 41°46'37.81"N 73°23'35.38"E Height 924.38 m
	1	Naryn River Temirkent 41°47'44.09"N 73°29'26.00"E Height 924.38 m
	1	Naryn River (Fault) 41°42'48.47"N 73°50'35.13"E Height 1110.05 m
	1	Naryn River (Kokirim area) 41°25'47.72"N 73°59'59.61"E, Height 1249.17 m
Kokomeran River		
	1	Kokomeran River Kobuksuu 41°43'52.30"N 73°54'33.77"E Height 1149.6 m
Total	8	

(iv) **Experience-based application in comparable river systems**

The approach is further supported by the laboratory's experience in large, complex river systems, including eDNA surveys in Central Asia (including the Syr Darya basin) targeting rare and migratory fish taxa.

This work involved:

- eDNA sampling in a high-flow, transboundary river system;
- detection-focused surveys for rare and migratory fish species; and
- application of metabarcoding and specialist genetic analyses under challenging field conditions.

4. Timeline and Budget

- **Phase 1:** 6 weeks for database review, primer validation, and feasibility analysis.
- **Phase 2 (Optional):** timeline to be proposed by the Consultant.
- Budget to be proposed by the consultant for **each phase separately**, with Phase 2 contingent on Phase 1 approval.

5. Reporting and Communication

- **Phase 1 Report:** Submitted in **draft for review** within 6 weeks, final version within 2 weeks of receiving comments.
- **Presentation of Phase 1 Report** outcomes to PMO and potential lenders, including confirmation whether eDNA is feasible and useful to inform the Project's critical habitat assessments, and, as relevant, a workplan for such eDNA studies.
- **Phase 2 Report:** Submitted in **draft for review** according to the workplan agreed with PMO and lenders.

ANNEX 2. Terrestrial Biodiversity Research Assignment Brief

The ESIA was prepared and published in 2025 and updated in 2026 in accordance with the World Bank ESF and all applicable national regulations. As part of the ESIA, a Biodiversity Management Plan (BMP) was developed as Sub-Plan P10 (ESIA Book 4.1).

The procedure for maintaining records, cadastre, and monitoring of wildlife in the Kyrgyz Republic (hereinafter referred to as the Procedure) is carried out in accordance with the Laws of the Kyrgyz Republic "On Environmental Protection," "On Wildlife," and "On Hunting and Hunting Management," approved by Resolution No. 421 of the Government of the Kyrgyz Republic dated September 7, 2018.

Records, cadastre, and monitoring are maintained for species/subspecies of wild animals (wildlife objects) permanently or temporarily inhabiting the wild within the K-1 territory, grouped into the following:

- 1) wildlife objects classified as game species and used for other purposes;
- 2) wildlife objects included in the IUCN VU and CITES lists;
- 3) wildlife objects listed in the Red Data Book of the Kyrgyz Republic;
- 4) fish and other aquatic wildlife (ichthyofauna) classified as fisheries and used for commercial, recreational, and other purposes;
- 5) forest pests and beneficial insects;
- 6) plant pests (except forest pests) and beneficial insects;
- 7) wildlife carriers of particularly dangerous infectious diseases, within their natural focal areas.

The maintenance of state records, cadastre, and monitoring is divided into two stages: primary and ongoing, ensuring the continuous generation and updating of records, cadastral, and monitoring information. At the K-1 design stage, this task ensures the implementation of the public primary record of wildlife.

Scope of work. Fauna

Component A: Preparation for field work and analysis of initial data

- A1. Literature-based assessment and secondary data collection.
- A2. Modeling the distribution of species
- A3. Landscape connectivity scenario analysis: simulations both without a reservoir (base case) and with the K1 HPP reservoir to quantify the additional barrier effect; in addition, a cumulative scenario with multiple barriers, including the K1 dam.
- A4. Obtaining regulatory approvals and preparing stakeholders.

Component B: Camera trap survey

- B1. Developing a research plan
- B2. Individual identification and population estimation

Recommended parameters of the DVR, software

Recommended design requirements for camera traps and paired stations are outlined below. All methods used in this technical specification must comply with the following standards: IUCN Camera Trap Guidelines, ISO 19115 "Geographic Information Metadata."

DVR parameters:

Characteristics

Video quality: 4K (3840*2160) UHD (2560x1440) 1080 FHD (1920x1080)

Display: 2" built-in color LCD display

PIR Sensor Sensitivity: Adjustable (High / Normal / Low / Off)

PIR sensor response intervals: from 0 sec to 60 min

Camera shutter speed: less than 1 second

Video recording duration: 5-180 sec

Sound recording: yes

Number of IR emitters: 50 pcs. 940 nm

Operating temperature: -20 - +60

Battery life: 400 videos (interval=5 minutes, video length=10 seconds); >500 MMS (8*AA batteries)

Protection class: IP 64

Current consumption: < 0.3 mA (< 7 mAh / day)

External power supply: 6V, G-type connector

Dimensions: 145.1*103.8*82mm

Weight: 400 gr.

GSM, 3G, 4G communication module

MMS, SMTP transfer

External memory: Up to 32GB SD

Darkened IR filter: yes

and photo+video modes

Time Laps: yes

Photo quality: 14, 25, 36 MP

Remote antenna: yes

MOLNUS mobile app support: yes

Loop recording: yes

Russian language: yes

Power Supply: Batteries: 5 x 18650 batteries or 8 x 1.5V AA batteries

Lens viewing angle: 110

PIR sensor response range: up to 30 m

Component C: Prey Assessment

- a) Minimum of 25 linear transects; stratified by habitat type and altitudinal zone; minimum of 2 km per transect; surveyed twice per round.
- b) Minimum of two survey rounds, at least 4 weeks apart, from October to April;
- c) Results: density estimates by strata $\pm$ 95% confidence interval; comparison of the dam zone with the flooded zone; statistical test to detect significant differences.

Component D: Migration/Transport Corridors and Barrier Effects

- D1. Corridor and Barrier Study (applicable to animal populations separated by a dam and reservoir)
- D2. Updated Connectivity Model after Completion of Field Work.

Component E: Risk Assessment

- a) Structured interviews with households in settlements within 5 km of the project's area of influence; minimum 20 interviews; taking into account settlement affiliation, gender, age group, and livelihood type;
- b) Documentation: frequency of predator attacks (over the past 5 years); livestock losses; spatial location (GPS/map); economic value; response strategies; awareness of compensation; attitudes toward nature conservation.
- c) Comparison with a map of pastures (seasonal), paddocks, and grazing routes, comparing them with suitability for use within the framework of a species spatial distribution model and camera trap data;
- d) Assess changes in the distribution of project-related risks in relation to forage and water resources; identify the most problematic areas during the construction phase.
- e) Research on burrowing colonial animals/hibernating/or sedentary species (ground squirrel, badger, forest dormouse, etc.). To detect habitats of burrowing, hibernating/slow-moving animals, their number, with GPS positions of original habitats and proposed relocation sites;
- f) Establish the migratory routes of all bird species, including birds of prey and long-necked birds, that cross the area or roost within a 10-kilometer zone adjacent to it, along with photographs and GPS coordinates of detection points. Establish GPS coordinates of nesting sites of rare birds and birds of prey in the areas of interest.

Special Requirements

Animal census work is carried out along agreed routes and at checkpoints, using approved Ministry of Natural Resources forms recording the route, tracks, and number of animals encountered. Completed forms must be submitted to the Ministry of Energy and Ministry of Natural Resources. Spatial data in ESRI Shapefile (.shp) and GeoPackage (.gpkg) formats, WGS84 (EPSG:4326). Archives of raw camera trap images are provided on external storage media.

Detailed location data, GPS coordinates, and movement corridors must be classified as CONFIDENTIAL and not subject to free provision or distribution. This data must not be included in publicly disclosed documents or posted in publicly accessible databases without prior approval from the Ministry of Energy and Ministry of Natural Resources.

Location data must be presented at a spatial resolution sufficient for best practice management purposes. This requirement applies to all work results and any data exchange with third parties. Security cameras installation work must be completed in accordance with the following checklist. Completed checklists must be attached to the relevant report.

Security camera Control Form

Plot number _____
Applying GPS points to a specific point _____
Camera brand _____ serial number _____
Number of units [_ _ _]

No.	Necessary measures	Completed mark	Note, special note
1	Sketch of the site plan	+	
2	Selection of a new site	+	
3	Installation	+	
4	Applying a GPS point to a specific area	+	
5	Photo with the camera installed	+	

Full name _____ Signature _____

Scope of work. Flora

If rare and endangered plant species are present within the K1 reservoir's allotment, their replantation into adjacent habitats characterized by similar growing conditions (water protection zone: similar soil, exposure, moisture) and meeting the ecological and biological characteristics of the specific plant species must be planned. Transportation to the planting sites, temporary digging of the planting material if necessary, watering of the transplanted plants, and planting of the relocated plants must be performed by qualified specialists, followed by monitoring of the survival of the relocated species with the assistance of specialists in the relevant taxonomic groups of plants. Plants must be replanted immediately after removal.

For replanting most herbaceous plant species, provision must be made for their excavation with the root ball. The root ball should be at least 50 cm x 50 cm x 50 cm in size. In cases of compact growth of members of the same species, it is recommended to dig the group as a single mass, increasing the root ball size. Planting holes are dug 50-60 cm deep and 70-80 cm in diameter. The soil ball is moved into the hole and covered with previously excavated soil, maintaining the top level of the moved soil ball. When replanting, it is important to consider the plant communities of the new replanting site.

It is recommended to select sites with similar environmental conditions near the excavation site for planting. Planting should be done at least 200-300 m from the edge of the planned reservoir. These sites are characterized by similar soil and climatic conditions, the magnitude of anthropogenic load, and the similarity of species composition and phytocoenoses structure.

It is important to remember that each perennial plant requires a different space (up to 3 tall plants per square meter or up to 11 low-growing plants per square meter). The planting plan should be developed with future plant growth in mind. The consultant will be required to complete the tasks described in Table 1. It should be noted that the indications provided in Table 1 have to be seen as general, guideline-type, instructions. Actual requirements for propagating specific plant species may be very different. Examples: for *Tulipa* species it might be adequate to just dig out and replant individual bulbs, while for bush or tree species, like *Ammopiptanthus* and *Crataegus*, which presumably have a very extensive, far reaching and, given the rocky/stony substrate difficult to dig out, root network it will be as good as impossible to dig out the plant without killing it. In both cases, the 50 x 50 x 50 cm procedure may not be applicable. The botany experts will have to propose the best way of propagating these species (actual relocation, propagation of seedlings and planting them at a certain stage, protection of specimens outside of the project footprint, etc.).

Table 1

No.	Stage	Deadlines and minimum requirements for work	Brief description of possible activities
1	Preparatory stage	(1) Inventory: Compilation of a list of rare species with an indication of their exact location (marking on a map-diagram of the site). (2) Health assessment: Determine the health of the plant, its age and size. (3) Analysis of a new site: Determination of cardinal directions, illumination zones (sun/shadow), groundwater levels. (4) Site preparation: Clearing new sites, applying fertilizer, preparing planting holes (consider: slope exposure, drainage, size of root system).	The expected start is April 1, subject to stable weather and necessary security.
2	Transfer schedule	Timing: The best time to transplant most plants is early spring (before active sap flow begins) or early fall	The optimal timing for carrying out compensatory measures may be: April - end of August - September.

No.	Stage	Deadlines and minimum requirements for work	Brief description of possible activities
		(after the end of the growing season, before frost). September (early-mid): Conifers, perennials with a shallow root system. September (end) – October: Deciduous shrubs, fruit trees (apple, pear). October (before frost): Bulbous plants (tulips). Compatibility: Do not plant plants that oppress each other nearby.	The latter circumstance will increase the survival rate as a result of possible damage to the root system during planting.
3	Technical plan of the transplant	Map-scheme: Drawing of the site with old and new places marked, with the installation of a protection status sign. Keeping your distance: (i) Tall trees (>5 m) - 4 m from the border with the neighbor. (ii) Medium-sized (up to 4-5 m) - 2 m from the fence. (iii) Shrubs - 1 m.	
4	Algorithm of the transplant process	Pruning: Reducing the crown to balance damaged roots. Digging: Preserving the root ball (the radius depends on the size of the crown). Planting: Root collar at ground level, abundant watering, mulching Designation of conservation status: Installing a stand	Plant preparation: Water thoroughly the day before repotting. For larger plants, prune some branches to reduce moisture evaporation. Digging: Removing the plant with its root ball. For large specimens, the root ball should be at least 50 x 50 x 50 cm. The root system should be preserved as much as possible. Transportation: Use burlap or film to preserve the root ball Watering: After planting, water the plants with 10 liters of water per plant. Fill the hole with soil and mulch with peat or straw.
5	Activation and approval of works	Preparation of certificates of completion and approval of: (i) certificate of completion of work on the transfer with division into sections of access roads and supports; (ii) an act on the destruction of plants indicating the quantity and payments/fines, divided into sections;	All documents must be submitted in English and Russian.

No.	Stage	Deadlines and minimum requirements for work	Brief description of possible activities
		(iii) coordination of reports with the customer and interested departments and control bodies; (iv) submission of reports to the Ministry of Natural Resources	
6	Monitoring the condition of transplanted plants	Provide monitoring reports with photo and video materials	After replanting the plants, it is necessary to provide watering and fertilization for the first year.

Table 1-A lists rare and valuable plants in the K1 project area and their potential for replantation:

Table 1-A

No	Species	IUCN	Replantable	Comment ³
1	<i>Ammopiptanthus nanus</i>	+	4	Partial replanting of individuals up to 2-3 years old
2	<i>Malus sieversii</i>		13	Partial replanting of individuals up to 2-3 years old
3	<i>Crataegus knorringiana</i>	+	14	Partial replanting of individuals up to 2-3 years old
4	<i>Tulipa tetraphylla</i>		—	**
5	<i>Tulipa toktogulica</i>	+	—	**
6	<i>Juno zenaidae</i>		—	**
7	<i>Gagea sp. nova (new species for science)</i>		—	**
8	<i>Pseudosedum ferganense</i>		—	**
9	<i>Phlomis milkoii</i>		—	**
10	<i>Astragalus duanensis</i>		—	**
11	<i>Chesneya nikitinae</i>		—	**
12	<i>Corydalis kovakensis</i>		—	**
13	<i>Limonium narynense</i>		—	**
14...	useful plants AG, FI, BN (multiple entries)		—	**
	Total		31*	

* - data excluding the number of herbaceous plants from points 4 to 14.

³ Where transplanting could damage or kill the plant, alternative methods should be explored as soon as the survey is complete, such as collection of seeds and identification of nursery lands.

**** - The scale of plant replanting activities depends on the actual representation of protected species in the territories**

Special Requirements

Animal census work is carried out along agreed routes and at checkpoints, using approved Ministry of Natural Resources forms recording the route, tracks, and number of animals encountered. Completed forms must be submitted to the Ministry of Energy and Ministry of Natural Resources.

Detailed location data, GPS coordinates, and movement corridors must be classified as CONFIDENTIAL and not subject to free provision or distribution. This data must not be included in publicly disclosed documents or posted in publicly accessible databases without prior approval from the Ministry of Energy and Ministry of Natural Resources.

Location data must be presented at a spatial resolution sufficient for best practice management purposes. This requirement applies to all work results and any data exchange with third parties.

Work must be completed according to the transfer site checklist below. Completed checklists must be attached to the relevant report.

Checklist of the transplant site

Plot number _____

Applying GPS corner points to a specific area _____

Transplanted species, scientific name *Tulipa toktogulica*

Number of units [_ _ _ _]

No.	Necessary measures	Completed mark	Note, special note
1	Sketch of the site plan	+	
2	Selection and marking of a new site	+	
3	Dig holes and fill them with mulch	+	
4	Transplantation, watering	+	
5	Installation of a conservation status sign plot with description	+	

Full name _____ Signature _____

ANNEX 3. List of species: Critically Endangered (CR), Endangered (EN) or Vulnerable (VU), Range-Restricted, Migratory (identified in the K-1 project area)

Fauna. List of Rare Animals

Table 2 lists the rare animals found in the K1 project area and protected by legally binding and applicable conservation documents:

Table 2

№	Latin name	English name	IUCN	Red Book of the KR
	Mammals			
1	<i>Panthera uncia</i>	Snow leopard	+	+
2	<i>Ursus arctos ssp. isabellinus</i>	Brown Bear		+
3	<i>Lynx lynx</i>	Lynx		+
4	<i>Hystrix indica</i>	Indian porcupine		+
5	<i>Martes foina</i>	Stone marten		+
	Birds			
6	<i>Neophron percnopterus</i>	Egyptian Vulture	+	+
7	<i>Accipiter badius</i>	Shikra		+
8	<i>Gyps himalayensis</i>	Himalayan Griffon		+
9	<i>Aegypius monachus</i>	Cinereous Vulture		+
10	<i>Aquila chrysaetos</i>	Golden Eagle		+
11	<i>Hieraaetus pennatus</i>	Booted Eagle		+
12	<i>Circaetus gallicus</i>	Short-toed Eagle		+
13	<i>Dendrocopos leucopertus</i>	White-winged Woodpecker		+
	Fish			
14	<i>Aspiolucius esocinus</i>	Pike asp	+	+
15	<i>Luciobarbus brachycephalus</i>	Aral barbel		+
16	<i>Glyptosternon reticulatum</i>	Turkestan Catfish		+
	Total		3	16

Flora. List of Rare and Valuable Plants for Replanting and Reproduction

Table 3 lists the rare and valuable plants in the K1 project area that are protected by legally binding and applicable environmental protection documents:

Table 3

№	Latin name	English name	IUCN	Red Book of the KR	Endemic to the KR
1	<i>Ammopiptanthus nanus</i> (Popov) S.H.Cheng	Dwarf Ammopiptanth	+	+	
2	<i>Tulipa toktogulica</i> B.D. Wilson et Lazkov	Tulip Toktogul	+		
3	<i>Crataegus knorringiana</i> Pojark.	Hawthorn Knorring	+	+	
4	<i>Malus sieversii</i> (Ledeb.) M.Roem.	Sievers apple tree		+	
5	<i>Tulipa tetraphylla</i> Regel	Tulip four-leaf		+	
6	<i>Vitis usunachmatica</i> Vass.	Uzun-Akhmat Grape		+	
7	<i>Pseudosedum ferganense</i> Boriss.	Feric's Stonecrop			+

№	Latin name	English name	IUCN	Red Book of the KR	Endemic to the KR
8	<i>Ferula inciso-serrata</i> Pimenov et J. Baranova				+
9	<i>Allium galanthum</i> Kar et Kir				+
10	<i>Corydalis kovakensis</i> Mikhailova	Caucasian crested			+
11	<i>Phlomoidea milkoi</i> Lazkov				+
12	<i>Astragalus duanensis</i> Saposhn. ex Sumn.				+
13	<i>Chesneya nikitinae</i> Lazkov				+
14	<i>Juno zenaidae</i> Vved.				+
15	<i>Limonium narynense</i> Lincz.				+
16	<i>Gagea (Kambarata 1) sp. nova</i>				+
17	<i>Juniperus seravschanica</i>	Juniperus zeravschanica			
	Total		3	5	10

ANNEX 4 Biodiversity Design Integration and Decision Milestones

Purpose

The biodiversity study shall be implemented as an integral input to the planning, design, procurement, and construction of the diversion tunnel and associated facilities. Biodiversity investigations shall not be treated solely as a parallel environmental study or as a post-design verification exercise.

The Consultant shall provide biodiversity information at defined decision points so that the Project Management Office, tunnel designer, environmental and social advisers, and relevant reviewers can demonstrate that the mitigation hierarchy has been applied before design commitments or irreversible site activities occur.

This requirement applies, as relevant, to:

- tunnel alignment and configuration;
- inlet, outlet, portal, adit, access-road, camp, laydown-area, and ancillary-facility locations;
- spoil and muck disposal areas;
- dewatering and discharge arrangements;
- construction methods and seasonal scheduling;
- vegetation clearance and habitat-disturbance limits;
- measures for aquatic and terrestrial biodiversity;
- requirements to be incorporated into bidding documents, works contracts, method statements, and contractor environmental and social management plans.

General Design-Integration Requirements

The Biodiversity Consultant shall:

1. **Maintain a live biodiversity constraints register** identifying confirmed, probable, and precautionary constraints relevant to diversion tunnel design and construction.
2. **Prepare geospatial constraints mapping** showing survey coverage, sensitive receptors, habitats, species records, Critical Habitat and Priority Biodiversity Feature indicators, data-confidence levels, and areas requiring further investigation.
3. **Review available tunnel design information** against the latest biodiversity findings at each decision gate.
4. **Provide early notification** of any finding that may require avoidance, relocation, redesign, seasonal restriction, further investigation, or additional mitigation.
5. **Document application of the mitigation hierarchy**, including:
 - alternatives considered;
 - opportunities for avoidance;
 - minimization measures;
 - residual-impact considerations;
 - reasons for accepting or rejecting alternatives.
6. **Update the preliminary Critical Habitat and Priority Biodiversity Feature screening** after each material biodiversity survey or evidence update rather than awaiting the final assessment report.
7. **Identify outstanding information and uncertainty** that could affect a design or construction decision, including seasonal survey limitations, incomplete eDNA feasibility or testing, inaccessible areas, uncertain species identification, and unresolved spatial boundaries.
8. **Recommend whether each decision gate may be passed**, may be passed subject to conditions, or should remain open pending additional evidence. The recommendation shall be advisory and shall not replace the formal approval authority of the PMO or applicable national authorities and financiers.

The PMO shall ensure that the Biodiversity Consultant receives current design layouts, construction sequencing information, work-area coordinates, and relevant design changes sufficiently early to undertake the required review. The tunnel designer shall maintain a design-response register showing how biodiversity findings and recommendations have been addressed.

Decision Milestones

The following minimum decision gates shall apply. The PMO may establish additional gates if design development, survey findings, or changes in construction sequencing warrant further review.

Milestone	Decision point	Minimum biodiversity evidence required	Required output	Decision status
Gate 0: Mobilization and interface confirmation	Before approval of the Biodiversity Inception Report	Available ESIA baseline; Annex 4 schedule; current tunnel-design information; proposed survey design; known sensitive receptors; data-gap register	Biodiversity-Design Interface Plan, integrated schedule, constraints-register template, notification protocol, and responsibility matrix	Inception Report may be approved only after interface arrangements and information-sharing responsibilities are defined
Gate 1: Survey and alternatives adequacy	Before confirmation of tunnel portals, access routes, spoil disposal sites, camps, and other associated work areas	Reconnaissance results; desktop review; preliminary terrestrial and aquatic constraints; proposed reference and comparison areas; preliminary Critical Habitat/PBF screening; eDNA Phase 1 status	Preliminary Biodiversity Constraints Map and Design Risk Note	Locations remain provisional where evidence is incomplete or a material biodiversity constraint has been identified
Gate 2: Preferred design and footprint selection	Before preferred alignment and principal construction footprint are frozen	Results available from completed seasonal campaigns; targeted surveys of candidate footprints; alternatives comparison; updated Critical Habitat/PBF screening; preliminary impact-pathway analysis	Biodiversity Alternatives and Mitigation Hierarchy Note, with designer response	Design may proceed only where avoidance and minimization opportunities have been documented and outstanding high-risk matters are assigned conditions
Gate 3: Procurement readiness	Before issue or finalization of works bidding documents	Latest survey findings; preliminary management thresholds; spatial exclusion zones; seasonal restrictions; monitoring requirements; chance-find and stop-work provisions; confidential-data handling requirements	Biodiversity Requirements for Works Contracts and updated ESIA/ESMP/BMP inputs	Tender documents shall include enforceable biodiversity requirements and relevant provisional items or contingencies
Gate 4: Construction readiness	Before contractor mobilization, vegetation clearance,	Pre-construction verification surveys; current Critical Habitat/PBF screening;	Construction Biodiversity Clearance Note for each relevant work area	No clearance, vegetation removal, or habitat disturbance in the relevant work

Milestone	Decision point	Minimum biodiversity evidence required	Required output	Decision status
	earthworks, portal works, spoil-area use, or other habitat disturbance	approved method statements; permits; marked exclusion zones; supervisory arrangements; outstanding-actions register		area until the PMO records closure or conditional closure of the gate
Gate 5: Seasonal or event-based release	Before activities in a sensitive season or following a material biodiversity finding	Relevant seasonal data; species-specific evidence; updated risk assessment; proposed timing or method controls	Seasonal or Event-Based Biodiversity Release Note	Activity may proceed, proceed subject to restrictions, or remain deferred
Gate 6: Final design and residual-impact confirmation	Before final acceptance of biodiversity-dependent design provisions and before conclusions on offsets or compensation	Consolidated seasonal dataset; final Critical Habitat/PBF assessment; residual-impact analysis; final mitigation hierarchy record; monitoring and adaptive-management framework	Final Biodiversity Design Integration Report and updated ESIA/ESMP/BMP provisions	Acceptance subject to documented treatment of residual impacts and outstanding long-term actions

Early Warning and Escalation

The Biodiversity Consultant shall notify the PMO promptly upon identifying any finding that could materially affect the location, design, method, timing, procurement, or environmental acceptability of diversion tunnel works.

The early-warning notification shall, as a minimum:

- describe the finding and its evidentiary basis;
- identify the affected location, activity, or design element;
- state the level of confidence and remaining uncertainty;
- identify immediate precautionary measures;
- identify any survey, design, or construction activity that should be paused or kept provisional;
- recommend avoidance, redesign, seasonal restriction, additional study, or other action;
- state when an updated technical recommendation will be provided.

Potential triggers include:

- indication of Critical Habitat or Priority Biodiversity Features;
- confirmed or credible indication of a threatened, restricted-range, migratory, endemic, or nationally protected species;
- previously unidentified nesting, breeding, spawning, migration, roosting, denning, or movement areas;
- sensitive habitat within or adjacent to a proposed work area;
- a material discrepancy between the ESIA baseline and field findings;
- an eDNA or conventional-survey result requiring confirmatory investigation;
- a significant change in tunnel alignment, portal location, spoil area, access road, discharge arrangement, or construction sequence;
- proposed works that would commence before the relevant seasonal evidence is available.

Where a finding could affect compliance with the applicable environmental and social standards, the PMO shall refer the matter to the relevant national authorities and lender or financier representatives in accordance with applicable project arrangements.

Treatment of Uncertainty

Absence of a species record shall not automatically be treated as evidence that a species or sensitive habitat is absent where:

- seasonal coverage is incomplete;
- survey effort is inadequate;
- access was constrained;
- taxonomic identification is unresolved;
- eDNA reference-data limitations remain;
- the species has low detectability;
- habitat conditions indicate credible potential presence.

In such cases, the Biodiversity Consultant shall recommend one or more of the following:

- targeted or repeat survey;
- conventional survey to supplement eDNA;
- precautionary spatial or seasonal restriction;
- maintenance of design flexibility;
- alternative-site investigation;
- provisional contractual requirements;
- pre-construction verification;
- adaptive-management measures.

Records and Audit Trail

For each decision gate, the PMO shall maintain a documented record comprising:

- evidence reviewed;
- Biodiversity Consultant recommendation;
- tunnel designer response;
- agreed design or construction conditions;
- unresolved matters and responsible parties;
- approval, conditional approval, or deferral decision;
- date and basis of gate closure;
- subsequent changes that require the gate to be reopened.

A gate shall be reopened where there is a material change in design, footprint, construction method, schedule, biodiversity evidence, or applicable environmental requirement.

ANNEX 5. Technical Assistance for Kambarata 1 Hydropower Plant Project – Feasibility Study Update

Volume 1.5 Construction Schedule – August 2025.



