Initial Environmental Examination

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Rehabilitation of the Pushkin Tunnel

Prepared by the Ministry of Territorial Administration and Infrastructure for the Asian Development Bank

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CURRENCY EQUIVALENTS

(as of 12 May 2025)

Currency unit	-	Armenian Dram (AMD)
AMD1.00	=	$0.002567
$1.00	=	AMD 389.5

ABBREVIATIONS

ADB	-	Asian Development Bank
AP	-	Affected Person
CCTV	-	Closed-circuit television
CSC	-	Construction Supervision Consultant
DEO	-	Deputy Environmental Officer (of the contractor)
EARF	-	Environmental Assessment and Review Framework
EIA	-	Environmental Impact Assessment
EO	-	Environmental Officer (of the contractor)
ESR	-	Environmental Scoping Report
EMP	-	Environmental Management Plan
GOST	-	Gosudarstvennyy Standart
GRG	-	Grievance Review Group
GRM	-	Grievance Redress Mechanism
HSO	-	Health and Safety Officer
IA	-	Impact Assessment
IEE	-	Initial Environmental Examination
LARP	-	Land Acquisition and Resettlement Plan
MOE	-	Ministry of Environment
MTAI	-	Ministry of Territorial Administration and Infrastructure
NGO	-	Non-Governmental Organisation
PPE	-	Personal Protective Equipment
RA	-	Republic of Armenia
RDF	-	“Road Department” Fund (the Client)
REA	-	Rapid Environmental Assessment
RSA	-	Road Safety Assessment
SEMP	-	Site-Specific Environmental Management Plan
SNCO	-	State Non-Commercial Organization
SPS	-	Safeguard Policy Statement
SQEP	-	Suitably Qualified and Experienced People
TBD	-	To be determined
TLV	-	Threshold Limit Value (TLV)
TOR	-	Terms of Reference
UN	-	United Nations

UNCEC	-	United Nations Economic Commission for Europe
WBG	-	World Bank Group

WEIGHTS AND MEASURES

dB(A)	-	A-weighted decibel
ha	-	hectare
km	-	kilometer
km^2	-	square kilometer
Leq	-	equivalent continuous noise level
µg	-	microgram
m	-	meter
m^2	-	square meter
PM	-	particulate matter of 2.5 micron or 10 micron size

NOTES

(i) The fiscal year (FY) of the Government of Armenia and its agencies begins on 1 January and ends on 31 December. “FY” before a calendar year denotes the year in which the fiscal year ends, e.g., FY2023 begins on 1 January 2023 and ends on 31 December 2023.

(ii) In this report, "$" refers to United States dollars unless otherwise stated.

(iii) Dates are written in the format dd.mm.yyyy

(iv) All measurements are expressed in the International System of Units, unless otherwise stated.

(v) The English language version of this report is considered as the original and prevails over the Armenian language translation.

TABLE OF CONTENTS

PAGE

EXECUTIVE SUMMARY VIII

I. INTRODUCTION 1
A. Project background 1
B. Aim and scope of this report 2

II. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK 4
A. Background 4
B. ADB Safeguard Policy Statement (2009) 4
C. RA legislation on Environment 4
D. Armenian EIA procedures 6
E. RA legislation on OHS 7
F. International Conventions and Protocols 8
G. Administrative Framework 11
Ministry of Environment 11
Ministry of Territorial Administration and Infrastructure 12
Road Department Fund 12
Ministry of Health 12
The Ministry of Education, Science, Culture and Sport 13

III. PROJECT DESCRIPTION AND ACTIVITIES 14
A. Existing situation 14
B. Proposed Project – Tunnel rehabilitation 17
C. Description of key construction activities 20
D. Methodology for muck disposal sites 24
E. Analysis of alternatives 29

IV. PROPOSED SCHEDULE FOR IMPLEMENTATION 33

V. DESCRIPTION OF THE ENVIRONMENT (BASELINE DATA) 34
A. Biological Environment 34
B. Physical Environment 51
Climate Characteristics 51
Climate Change 51
Ambient air quality 52
Hydrology 55
Natural Hazards 66
C. Socio-economic environment 66

VI. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES 69
A. Due Diligence Review of Potential Environmental Impacts 69
B. Methodology 69
C. Positive environmental and social impacts 77
D. Negative environmental and social impacts 78
E. Operation phase impacts 81
F. Design phase mitigation 82
G. Construction phase mitigation measures 83
H. Operation phase mitigation measures 91
I. Environmental reporting requirements 92

VII. PUBLIC CONSULTATION, INFORMATION DISCLOSURE, PUBLIC COMMUNICATION, CONSULTATION AND PARTICIPATION 93
A. Stakeholder Categories and Groups 93

B. Information disclosure requirements 96
C. Public Consultations 96
VIII. GRIEVANCE REDRESS MECHANISM 98
A. Pre-construction stage: 99
B. Construction Stage: 100
C. ADB's Accountability Mechanism 101
IX. ENVIRONMENTAL MANAGEMENT PLAN 101
X. ENVIRONMENTAL MONITORING PLAN 117
XI. CONCLUSIONS AND RECOMMENDATIONS 128
A. Conclusions 128
B. Recommendations 128

APPENDICES:

Appendix A	Rapid Environmental Assessment (REA) Checklist	8 pages
Appendix B	Biodiversity study – flora	11 pages
Appendix C	Biodiversity study – fauna	11 pages
Appendix D	Baseline survey – air quality test reports	18 pages
Appendix E	Baseline survey – water quality test reports	18 pages
Appendix F	Baseline survey – vibration test reports	10 pages
Appendix G	Baseline survey – noise test reports	12 pages
Appendix H	Baseline survey – soil test reports	3 pages
Appendix I	Baseline survey – light test reports	12 pages
Appendix J	Correspondence from MOE on Gulagarak Pine State Sanctuary boundaries	8 pages
Appendix K	Minutes of Public Consultations	17 pages
Appendix L	Correspondence from Gulagarak Community on waste disposal areas	2 pages
Appendix M	Correspondence from Pambak Community on waste disposal areas	4 pages
Appendix N	Incident / Accident Forms	9 pages
Appendix O	Outline for Contractor's Site-Specific Environmental Management Plan	2 pages

LIST OF TABLES

Table 1: Multilateral international environment agreements signed/or ratified by Armenia 9
Table 2: Required environmental permits and agreements 10
Table 3: Equipment requirements for construction at each portal 24
Table 4: Sources of materials for construction 24
Table 5: Considered alternatives for the Project 31
Table 6: Bird species likely to occur the Project area 47
Table 7: Mammals likely to occur in the Project area 50
Table 8: Summary of ambient air quality monitoring 53
Table 9: Summary of water quality monitoring 58
Table 10: Summary of noise, vibration and lighting monitoring 62
Table 11: Summary of soil surveys 63
Table 12: Potential impact significance classification 70
Table 13: Environmental impact significance – (pre-)construction phase 71
Table 14: Environmental impact significance – operation phase 75
Table 15: Positive impacts of the Project 77
Table 16: Permissible noise levels 80
Table 17: Reporting environmental incidents on site – three levels of incident 91
Table 18: Identification of internal stakeholders 93
Table 19: Identification of external stakeholders 96
Table 20: Summary of indicative cost estimates for environmental mitigation measures 103
Table 21: Summary of indicative cost estimates for environmental monitoring 104
Table 22: Environmental management plan 116
Table 23: Environmental monitoring plan for measurement of environmental parameters 119
Table 24: Environmental monitoring plan assessing implementation of environmental management plan activities 127

LIST OF FIGURES

Figure 1: Overview map of road network with Pushkin Tunnel marked (Source: ADB) 1
Figure 2: Flowchart of process for submission of EIA and decision-making by the local authority and the authorized body. 7
Figure 3: Example of damage due to water ingress 16
Figure 4: Example of delamination of the shotcrete protective liner caused by water ingress 16
Figure 5: Completely blocked sidewall drainage manhole 16
Figure 6: Rockfall on bypass road; narrow and poor-quality roadway 16
Figure 7: Extensive localised repair and poor quality of tunnel roadway 16
Figure 8: Parallel tunnel without support (except steel ribs for profile) and fall of large rocks visible 16
Figure 9: Scheme of rehabilitated Pushkin Tunnel (split at km 0+900 for readability) 19
Figure 10: Graphical representation of construction sequence for dismantling and reconstruction of the main tunnel lining 21
Figure 11: Excavation and support cycle for conventional tunnelling by drill and blast 22
Figure 12: Excavation and support cycle drawing for the escape tunnel 23
Figure 13: Excavator with attached slope-work bucket in operation 25
Figure 14: Example of a topsoil heap 25

Figure 15: Compaction of muck 27
Figure 16: Re-cultivation of muck disposal area. Layers visible: Muck (grey); boundary soil layer (light brown); humus layer (dark brown); seeded layer (green) 27
Figure 17: Forest with Carpinus betulus dominance 28
Figure 18: Quercus macranthera (a long staying tree) 28
Figure 19: Oak forest (Quercus macranthera) 28
Figure 20: Acer trautvetteri 28
Figure 21: Lonicera caucasica 29
Figure 22: Sorbus aucuparia 29
Figure 23: Outline project implementation schedule 33
Figure 24: Floristic regions of Armenia (Takhtajan, 1954) 34
Figure 25: Location of the tunnel under Pushkin pass 35
Figure 26: Grass meadow-steppe 36
Figure 27: Forbs meadow-steppe 36
Figure 28: Subalpine meadow 37
Figure 29: Beech forest in the vicinity of the tunnel 38
Figure 30: Oak forest in vicinity of the tunnel 38
Figure 31: Pine forest 39
Figure 32: Boundaries of “Gyulagarak Pine State Sanctuary” on the Forest Enterprise Map 40
Figure 33: Boundaries of “Gyulagarak Pine State Sanctuary” in relation to the tunnel north portal as shown in Google Earth 41
Figure 34: KBAs and IBAs (source: IBAT) 41
Figure 35: River basins in Armenia 55
Figure 36: Location of area and transport route for waste disposal south of Pushkin Tunnel 86
Figure 37: Construction waste disposal area south of Pushkin Tunnel 86
Figure 38: Outline of GRM 99

EXECUTIVE SUMMARY

1. This an initial environmental examination (IEE) prepared for the Rehabilitation of the Pushkin Tunnel, located on the 135-137 kilometer of interstate road M-3 Margara - Vanadzor - Tashir - Georgia border, which forms part of the rehabilitation of the Armenia-Georgia Border Regional Road (M6, Vanadzor-Bagratashen) Improvement Project, for which the Republic of Armenia has received a loan from the Asian Development Bank. A matter of policy of the Bank requires that all projects supported and funded by the ADB must comply with the requirements of the Safeguard Policy Statement (SPS, 2009).

2. The Ministry of Territorial Administration and Infrastructure of Armenia (MTAI) has the overall responsible for implementation of the Project and has delegated implementation functions to the Road Department Fund (RDF). The project will be implemented over a period of 3 years. A Project Implementation Unit (PIU) under the RDF will be setup who will be responsible for day-to-day management of the Project, including implementation of requisite safeguards measures.

3. This IEE has been prepared by JV BERNARD Gruppe ZT GmbH and ACTES Bernard GmbH ("BERNARD – ACTES") on behalf of RDF in accordance with ADB's Safeguard Policy Statement 2009 (SPS 2009). The IEE was carried out based on review of the site and site inspections, technical feasibility reports, collection and review of secondary data, field surveys/investigations and consultations, analysis of data, and preparation of reports.

4. **Project Area and Components.** The southern and northern entrances to the tunnel and the surrounding area are located in the mountainous Lori marz, which is in the north of Armenia bordering Georgia. The provincial capital is Vanadzor, and other towns include Stepanavan, Alaverdi, and Spitak. The project is located well-away from residential areas. The nearest communities are Bazum to the south, and Gargar to the north. The region is prone to earthquakes and landslides.

5. The project will rehabilitate and modernize the entire Pushkin Tunnel section including the tunnel portal areas, the tunnel structure, and the electro-mechanical and safety systems. The significant project components include (i) rehabilitation and improvement of the tunnel lining including the installation of a new waterproofing system to protect the tunnel lining an extend the life of the tunnel; (ii) redevelopment and extension of the existing parallel tunnel including the improvement and addition of cross-passages to provide a means of escape from the tunnel; (iii) rehabilitation/modernization of electro-mechanical systems within the tunnel and supporting infrastructure, these items include power supply redundancy, new lighting and ventilation systems; and (iv) development and implementation for new traffic control and safety systems, including firefighting and detection systems.

6. **Categorization and Legal Framework.** The legal framework in Armenia embraces more than 30 laws and more than 100 supportive legal regulations to protect the environment. The national policies and legislative regulatory framework containing regulations to a greater or lesser extent applicable to the tunnel construction/rehabilitation sector, as well as their practical implementation, were studied as part of screening. The principle applicable laws and regulations, applicable legal obligations related to environmental and social protection and the Impact Assessment (IA) process as required by Armenia are set out within the IEE under the following areas: ADB Safeguard Policy Statement (2009), RA legislation on Environment, RA legislation on OHS.

7. The assessment and implementation of the Project will be governed by laws, regulations, and standards for environmental assessment and management of Armenia. The environment protection

and environmental assessment process in Armenia is governed by the Law on Environmental Impact Assessment and Expertise (new addition dated by 03.05.23 ՀՕ-150-Ս) which requires evaluation of projects on their environmental impacts,).

8. Under ADB's SPS the Project is classified as Category B because the potential adverse environmental impacts are generally site-specific, few if any of them are irreversible, and mitigation measures can be designed readily.

9. **Description of the Environment.** The environmental setting for the Project in terms of the surrounding physical and biological features is described within the IEE including social and economic conditions, livelihoods and quality of life. The project area for the biological environment and landscape resources is described at both tunnel portals and surveys were carried out in June 2024. Data was collected at points of interest or sensitive areas. The ambient air quality monitoring at positions forward of the tunnel portals showed that dust in particular exceeds permissible values. Water quality parameters are within permissible values. Soil quality tests show significant existing contamination at both portals, potential due to transport or background effects. Analysis of the noise and vibration measurements concluded that the main source of noise and vibration was the existing road and its associated traffic. No specific issues relating to landslides in the project area have been identified.

10. The Ministry of the Environment has confirmed that the north portal of tunnel as well as parts of the bypass road over the tunnel lie within the boundaries of the Gulagarak Pine State Sanctuary. It is not expected that tunnel rehabilitation activities will disrupt the viability of the sanctuary ecosystem as there is existing infrastructure and the aim of the project is to rehabilitate this infrastructure. In addition, the majority of the work is carried out underground and key logistics and overground work are done at/from the south portal, which is outside of the sanctuary. The sanctuary (IUCN management category IV) was established in 1958 with the aim of protection of the natural pine forests. No special status fauna appears to be present in the sanctuary. A number of national red book species of flora can however be found in the sanctuary.

11. Further north is the "Tashir" Important Bird Area. In the south of the Marz is the Important Bird Area" Pambak". Since these areas are located at substantially far away from the tunnel entrances, it can be assumed that the tunnel rehabilitation activities will not disrupt the viability of any of the ecosystems present or cause damage to the wildlife populations present in these areas.

12. **Impacts and Mitigations.** It is expected that the Project will provide overall and long term positive environmental and social impacts for nature, ultimately contributing to improved traffic flow and increased social and economic benefits of the nearby communities. The proposed tunnel rehabilitation works will be within the boundaries (footprint) of the existing tunnel and tunnel portal hinterland.

13. The bypass road over the tunnel (which is not suitable for high traffic volume and trucks due to its gradient and alignment) passes through the sanctuary; therefore any measures to improve this road or utilize it for diverting all traffic in the long-term is not considered as practical or a suitable mitigation. The design considers and makes provision for the temporary diversion of light vehicles during the proposed refurbishment of the tunnel; however heavy vehicles will need to divert regionally. Since the bypass road passes through the mountains, it will be serviceable with in the summer and extended summer months. The road will be fully rehabilitated and will only be used as a bypass road once it meets all safety requirements. Since the road already exists, associated impacts such as habitat disruption will be avoided. There is a wind farm is close to the bypass road, which has been assessed and the design team have concluded that there will be no disruption to or from the diversion of traffic

during the construction period. There are no nearby settlements enroute and as such there will not be any adverse effects to people or housing.

14. During construction, major anticipated impacts from project activities include (i) increased congestion, economic impacts, and reduced accessibility for businesses and residents of communities in the region due to tunnel closure; (ii) pollution of water due to construction work and materials used, wastewater from camps, and accidental spills; (iii) workers' health and safety during construction due to demolition of tunnelling being high risk activities; and (iv) generation of solid waste (including demolition waste). Overall, construction-related impacts are localized, short-term, and can be effectively mitigated through the application of good construction and housekeeping practices and implementation of construction phase community and occupational health and safety plans as defined in the EMP.

15. A Biodiversity Management Plan will be prepared by the Contractor to manage works in the bypass. A specific focus will be on the area passing through the Gyulagarak Sanctuary. The plan, which will be routinely monitored by the supervision consultant, will include at a minimum:

    - No encroachment into the Gyulagarak Sanctuary by any workers. Induction training for workers and routine tool box talks will be performed by the Contractors environmental specialist informing them of the sensitivities of the site and to ensure no encroachment into the Gyulagarak Sanctuary.

    - The right of way will be clearly demarcated by bunting throughout the rehabilitation phase in the Gyulagarak Sanctuary. Signposts will be erected along the boundary at 200m intervals warning workers not to enter this area.

    - No permanent or temporary work sites or laydown areas will be permitted in the Gyulagarak Sanctuary. They may be permitted within the right of way.

    - Tree cutting for firewood, or any other use, will be a sackable offence.

    - No campfires, or any type of fire will be permitted within the Gyulagarak Sanctuary, or any other area along the bypass.

16. Transport of commercially sourced construction materials will create continuous dust, noise, and traffic safety concerns throughout the construction. Additionally, there will be trucks carrying gravel, cement, diesel, oil, other, and waste supplies, and vehicles transporting personnel. Construction works are accompanied by the risk of improper waste disposal and deposition of hazardous materials / construction wastes. The IEE and Project documentation identifies these risks and issues and proposes mitigations and specific responsibilities on key Project duty holders to address these risks.

17. **Consultation and Information Disclosure.** Stakeholders have been identified and their needs recognized, their area of interest and the appropriate engagement mechanism has been identified. Within the framework of environmental engagement and due diligence, information disclosure and public consultations meetings were held in the Gargar and Bazum Communities on 05.12.2024, these convened and managed by RDF and the Consultant, and attended by community leaders, community residents, and the village administration head and his employees. In Gargar 25 persons participated; and in Bazum 15 people participated. Issues were raised the details of which are contained within the IEE and supporting documentation as well as the recorded position and where appropriate go forward actions. The project will establish and maintain a project-specific grievance redress mechanism (GRM)

to address public complaints related to project activities during project implementation and operation. Consultation and participation will continue throughout project implementation and any environmental complaints or disputes will be handled in accordance with the GRM.

18. **Environmental Management Plan.** An EMP has been developed for the design and pre-construction, construction, and operation phases of the project. The EMP sets out (i) actions to implement mitigation measures; (ii) entities responsible for the implementation; (iii) a monitoring and reporting program; (iv) institutional/organizational arrangements; and (v) cost estimates.

19. The EMP identifies sensitive receptors and provides necessary measures to reduce impacts during construction and operation. The final EMP will be included as a separate annex in all bidding documents. The Contractor will be made aware of its obligations to implement the EMP, to budget EMP implementation costs in their bids, and to develop a Site-Specific EMP fully responsive to the project EMP. The SSEMP is to include all mitigation measures and monitoring requirements to be carried by the Contractor.

20. The PIU (within RDF) will be responsible for ensuring environmental supervision of the implementation of the EMP. The PIU will be supported by a Construction Supervision Consultant that will directly supervise the implementation of the SSEMP by the Contractor. The Contractor will be required to have permanent staff on site with responsibility for environmental management, health and safety, and social safeguards, reporting to the CSC and government counterparts.

21. An environmental monitoring program will be conducted in pre-construction, construction and post-construction phases. Environmental monitoring includes the monitoring of physical and ecological parameters, as well as ensuring the compliance of the Contractor with the SSEMP.

22. **Conclusion and Recommendations.** No particular difficulties were encountered by the Consultant in compiling the IEE. The Project construction is restricted to areas within the road and tunnel corridor. The impacts from construction and operation will be manageable and no significant or unmanageable impacts are predicted because all the mitigation measures in the EMP will be included in the contract documents and will be implemented thoroughly. RDF shall ensure that the EMP is included in the contract documents, and the EMP provisions are implemented and monitored to their full extent.

I. INTRODUCTION

A. Project background

23. The Republic of Armenia has received a loan from the Asian Development Bank to finance rehabilitation of the Armenia-Georgia Border Regional Road (M6, Vanadzor-Bagratashen) Improvement Project and intends to apply the part of the proceeds for rehabilitation of 2 vehicular tunnels: Dilijan tunnel located on the 80-83 kilometer of interstate road M-4 Yerevan Sevan Ijevan - Azerbaijan border and Pushkin tunnel located on the 135-137 kilometer of interstate road M-3 Margara - Vanadzor - Tashir - Georgia border.

Figure 1: Overview map of road network with Pushkin Tunnel marked (Source: ADB)

24. The Ministry of Territorial Administration and Infrastructure of Armenia (MTAI) has the overall responsibility for implementation of the Project and has delegated implementation functions to the Road Department Fund (RDF).

25. The Road Department Fund has signed Contract. No. ADB/M6/CS/QCBS/03 with the JV BERNARD Gruppe ZT GmbH and ACTES Bernard GmbH ("BERNARD – ACTES") for provision of consultancy services for Armenia-Georgia Border regional Road (M6 Vanadzor – Bagratashen) Improvement Project: Preparation of Detailed Designs for Rehabilitation of Pushkin Tunnel, Environmental Evaluation / Assessment Documentation and Technical Part of Bidding Documents for Civil Works Procurement.

26. BERNARD – ACTES has associated with subconsultants Transproject CJSC and MC Mobility Consultants GmbH to carry out the assignment.

27. The Pushkin tunnel (length: 1803 m, width: 8 m, height: 4.s+2.2m) connects Vanadzor to Stepanavan and is of great importance for the route Yerevan-Spitak-Vanadzor-Tashir-Georgia border. The tunnel was constructed in 1971. It was damaged by the 1988 earthquake and rehabilitated in 2000. A parallel tunnel starting at the south portal was constructed for water supply but never utilized. It extends from the south portal for 876 m in parallel to the road tunnel, with cross-passages between the tunnels at 240 m and 520 m from the south portal. Over the years of operation, the tunnel has suffered limited investment in safety systems as well as mechanical and electrical systems, which have aged and lost functionality. Many safety systems which would be considered standard in road tunnels are missing in their entirety.

B. Aim and scope of this report

28. As part of the project screening activities a Rapid Environmental Assessment (REA) Checklist has been prepared. It is included in the IEE as Appendix A. Within the Project Categorization Proposal, the rapid assessment of the Project concluded a category 'B'. The social and ecological condition of the project area proposed works such as rehabilitation activities and indicated possible impacts were considered. Impacts through rehabilitation of tunnel are low to moderate and can be avoided or at least minimized by defining effective mitigation measures within the EMP.

29. The Project categorization as 'B' results in the requirement of an initial environmental examination (IEE) to determine whether significant environmental impacts warranting an EIA are likely. If an EIA is not needed, the IEE is regarded as the final environmental assessment report.

30. This IEE is part of the process of compliance with the ADB Safeguard Policy Statement (2009). it reviews the existing environmental and engineering documentation prepared to date; reports on visits to the project site to inspect the existing condition and status of the project site; provides a verification that the design complies with international standards and best practice, especially the environmental requirements, and proposes improvement measures where appropriate.

31. An Environmental Management Plan (EMP) has been prepared for the project. The EMPs are included as part of this IEE and include (i) mitigation measures for potential environmental impacts during the design, construction and operation phases of implementation, (ii) an environmental monitoring program, and (iii) identification of the responsible entities for mitigation, monitoring, and reporting.

32. Mitigation will be assured by a program of environmental monitoring to be conducted during the

construction stages. The environmental monitoring program will ensure that all mitigation measures proposed in the EMPs are implemented and will determine whether the environment is protected as intended. Any requirements for remedial action will be reported to the ADB.

33. Project stakeholders were consulted during preparation of the IEE and invited to express any environmental and social concerns they had regarding the project. No significant environmental and social concerns were raised, and all stakeholders consulted strongly support the project and are looking forward to the benefits of the improved tunnel. The IEE will be made available at public locations and will be disclosed to a wider audience via the ADB and RDF websites in both English and Armenian. The consultation process will be continued during project implementation to ensure that stakeholders are fully engaged in the project and have the opportunity to participate in its development and implementation.

II. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

A. Background

34. The legal framework in Armenia embraces more than 30 laws and more than 100 supportive legal regulations to protect the environment. The national policies and legislative regulatory framework containing regulations to a greater or lesser extent applicable to the tunnel construction/rehabilitation sector, as well as their practical implementation, were studied as part of screening. The principle applicable laws and regulations, applicable legal obligations related to environmental and social protection and the Impact Assessment (IA) process as required by Armenia are set out in subchapters C and D:

B. ADB Safeguard Policy Statement (2009)

35. The present study has been undertaken in accordance with the ADB Safeguard Policy Statement (SPS) (2009). Internationally recognized standards and guidelines have been applied where local standards were not available. This includes World Bank Group (WB) Environmental, Health, and Safety General Guidelines (2007).

36. A matter of policy the Bank requires that all projects supported and to be funded by the ADB must comply with the requirements of the SPS that describes common objectives of ADB's safeguards, lays out policy principles, and outlines the delivery process for ADB's safeguard policy. In particular the Environmental Safeguard Policy Principles are to be applied.[1]

37. The SPS sets the requirements of IAs for all projects supported by the ADB. An Impact Assessment Report is required for all environment category "A" and "B" projects. The level of detail and comprehensiveness of the Impact Assessment Report is directly related with the significance of potential impacts and risks to the environment. One of the main Policy Principles is to use a screening process for each proposed project, as early as possible, to determine the appropriate extent and type of environmental assessment so that appropriate studies are undertaken commensurate with the significance of potential impacts and risks.

C. RA legislation on Environment

38. Environment: Laws and codes

- The Law on Environmental Impact Assessment and Expertise (new addition dated by 03.05.23 ՀՕ-150-Ն) requires evaluation of projects on their environmental impacts, screening and categorisation according to activity type, expert examination of evaluation reports and issue of expert examination conclusion. This Law serves as a framework for the Ministry of Environment (MOE) to grant approval of various development projects in the country. In accordance with Chapter 3 Article 12, the categories of the economic activities subject of EIA[2] and Expertise for any activity or project included in the specified lists shall undergo environmental impact

[1] ADB SAFEGUARD POLICY STATEMENT (2009) A. Overarching Statement on ADB's Commitment and Policy Principles, page 14, 1. Environmental Safeguards, Policy Principles, page 16.
[2] Armenian legislation doesn't differentiate the terms of impact assessment for the project environmental categories both A and B categories require an EIA, while the ADB SPS (2009) foresees the Environmental Impact Assessment for A category and Initial Environmental Examination (IEE) for B category projects.

assessment on the design stage prior to their implementation, and only after MOE approval is issued project activities may start. Furthermore, the Chapter 4 Procedures and requirements to the Environmental Impact Assessment and Expertise process, as well as Chapter 7 Procedures and requirements to the public notification and meetings, are applicable.

- The Law on Wastes (2004) regulates the collection, transportation, storage, treatment, recycling and disposal of the wastes including construction-related ones.
- The Law on Environmental Oversight (2005) regulates the organization and enforcement of the oversight over the implementation of environmental legislation of the Republic of Armenia.
- The Law on Organization and Implementation of Inspections in Armenia (2014) regulates the procedures on performance of inspections over the economic activities.
- The Law on Atmospheric Air Pollution (1994) regulates the emission permits and provides maximum allowed loads/concentrations for atmospheric air pollution etc.
- The Water Code (2002) provides the legal basis for the protection of the country's water resources, and for the effective management of water resources and safeguarding the protection for future generations. The following regulations and procedures of the Water Code (2002) are relevant: (a) water use permitting procedures, (b) environmental flows, (c) drainage water, (g) reservation of underground water sources, and (i) public awareness and publicity of the documents developed by WRMA and other normative documents which provide guidelines directly linked with water and environmental issues.
- The Law on Flora (1999) and the Law on Fauna (2000) outline the national policies for the conservation, protection, use, regeneration, and management of natural populations of plants and animals, and for regulating the impact of human activities on biodiversity. The laws provide for assessing and monitoring the species, especially rare and endangered species.
- The Law on the Preservation and Use of Historical and Cultural Immovable Monuments and Protection of Historical Areas (11.11.1998).
- The RA Law on Special Protected natural areas (2006), provide the state policy and legal basis of proper development, restoration, protection, reproduction and use of specially protected natural areas of the Republic of Armenia as ecosystems, natural complexes and individual objects of environmental, economic, social, scientific, educational, historical-cultural, aesthetic, health, recreational value.

39. Environment: Other legal acts

- RA Government Decree N 1325-Ն "On the procedures of information disclosure and public consultations" (19.11.2014)
- RA Government Decree N 121-Ն "On the procedures of treatment, utilization, storage, transportation and disposal of hazardous waste in RA" provides for regulations on handling hazardous waste generated in Armenia including those in urban development sector (2003)
- RA Government Decree N 1404-Ն "On the determination of topsoil stripping norms and on the requirements to the topsoil preservation and utilization and on recognizing the RA Government

Decree N 1026-Ա

- Sanitary Norms № 2-III-11.3 "Noise in the workplaces, in residential and public buildings and in residential construction areas" adopted by the order of RA Minister of Health № 138 on 06.03.2002
- GOST 17.2.4.05-83. "Environmental protection. Atmosphere. Gravimetric method for determination of suspended dust particles"
- RA Government Decree № 160- Ն. "Norms of maximum permissible concentrations (MPC) of atmospheric air pollutants in residential areas" (02.02.2006)
- RA Government Decree N438 on the Order on State Registration, Study, Preservation, Repair, Rehabilitation and Use of Historical and Cultural Immovable Monuments (20.04.2002)
- RA Government Decree N 43-Ն on “Reconstruction or expansion or technical or technological renovation or reprofiling/ reinforcement or conservation or relocation or discontinuation or closing or demolition or project change on approval of the procedure for determining the need for environmental impact assessment and expertise.
- Soil quality assessment is carried out in accordance with the Order of the Minister of Health of the Republic of Armenia No. 01-N of January 25, 2010.

D. Armenian EIA procedures

40. The environmental impact assessment procedure in Armenia is regulated by the Law on Environmental Impact Assessment and Expertise (03.05.23 ՀՕ-150-Ն). The list of activities and strategic papers subject to an EIA is set out in Article 12 of the Law. According to point 3, subpoint 10) -Infrastructure sector of Article 12: “Construction of tunnels or subways or railways with a length of 500 meters or more, or construction of bridges with a load capacity of 25 tons or more” is subject to an EIA. In addition, Article 4, which defines all definitions used in the law mentions that planned activities also includes reinforcement.

41. Therefore, it is important to understand that rehabilitation is not subject of EIA if there is no change to the tunnel capacity. However, the location of the construction camp may have an additional impact. Exact coordinates of construction camp and storage areas should be submitted to the Ministry of Environment.

42. The final decision on the necessity of an EIA and expertise belongs to the Ministry of Environment (Authorized body) and it will be provided on design stage, based on the procedure described in the RA Government Decree N 43-Ն, adopted on 11 January, 2024 according to the Law on Environmental Impact Assessment and Expertise (03.05.23 ՀՕ-150-Ն) article 8, 1st part point 5. According to the procedure provided by RA Government Decree N 43-Ն the application includes:

    i. Name and place of residence of the initiator.

    ii. the name of the type of activity planned and the name of the planned change in accordance with Article 12 of the law.

iii. the date, month, year and number of the state expertise conclusion (if available).

iv. description of the area, buildings and structures subject to the planned activity.

v. description of the intended activity (production capacities, technical and technological solutions).

vi. comparative analysis of the current state and planned changes.

vii. the table describing the possible effects of changes on the environment of this Decree,

viii. the document certifying the payment of the state duty.

43. The chart below shows how the Ministry of Environment (Authorized body) considers an EIA report and provides a final conclusion of an EIA.

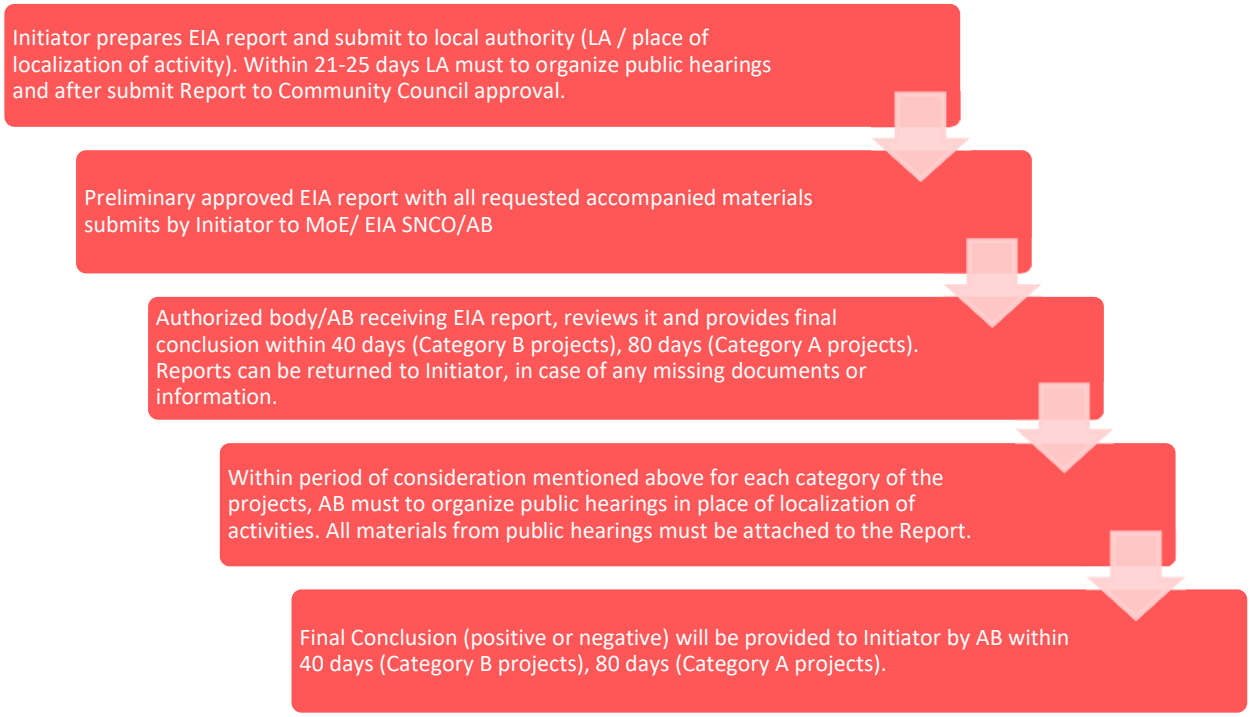


Figure 2: Flowchart of process for submission of EIA and decision-making by the local authority and the authorized body.

E. RA legislation on OHS

44. Occupational safety and health regulations

- **Civil Code of the Republic of Armenia** prescribes among others the main principles of labour relations.
- **The Criminal Code of the Republic of Armenia** provides for adequate penalties for violations of occupational safety and health laws and regulations.
- **Code of the Republic of Armenia on Administrative Offenses** prescribes the main principles of administrative liability, and administrative offenses (misdemeanours) of labour legislation**.**

- The Law of the RA On Organizing and Conducting Inspections in the Republic of Armenia outlines the labour inspectors' functions, rights, and duties.
- **The Law of the RA On State Regulation of Ensuring Technical Safety.** The purpose of this law is to establish the principles of the state strategy in the sphere of technical safety and mechanisms of their realization directed to the prevention of technogenic accidents, elimination of their effects, and decrease in risks of damage caused to society and economy owing to such accidents and also protection of the population and the environment.
- **The Law of the RA On Employment** regulates economic and organizational situations and the legal basis of stimulation of employment of the population in the Republic of Armenia, establishes the realization of the rights of citizens in the sphere of employment of the population, types of services rendered by the state, types of social assistance in case of unemployment.

45. GOST (Russian: ГОСТ)

- GOST 17.2.4.05-83. Environmental protection. Atmosphere. Gravimetric Method for Determination of Suspended Dust Particles.
- GOST 12.0.004-2015 Organization of training on labour protection.
- GOST 12.0.230-2007 General requirements for the organization of labour protection.
- GOST 12.0.002-2014 System of occupational safety standards.

F. International Conventions and Protocols

46. In addition to the above presented list and summaries of laws, numerous strategies, concept frameworks, and national programs related to the nature protection and OHS have been developed as well as a number of international agreements and conventions have been signed and ratified by the Republic of Armenia. The most relevant are listed below.

TITLE, PLACE AND DATE ADOPTED	RATIFIED BY NATIONAL ASSEMBLY	IN FORCE FOR RA
GLOBAL CONVENTIONS		
Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar, 1971) - aka Ramsar Convention	Acceded as assignee by the request of MFA RA 1993	1993
UN Convention on Biological Diversity (Rio de Janeiro, 1992)	31 Mar 1993	14 May 1993
Cartagena Protocol on Bio-safety (Montreal, 2001)	16 Mar 2004	29 Jul 2004
UN Framework Convention on Climate Change (New York, 1992)	29 Mar 1993	21 Mar 1994
Kyoto Protocol (Kyoto, 1997)	27 Dec 2002	16 Feb 2005

TITLE, PLACE AND DATE ADOPTED	RATIFIED BY NATIONAL ASSEMBLY	IN FORCE FOR RA
Convention Concerning the Protection of the World Cultural and Natural Heritage (Paris, 1972)	Acceded as assignee by the request of MFA RA in 1993	1993
UN Convention on the Control of Trans-boundary Movements of Hazardous Wastes and Their Disposal (Basel, 1989)	26 Mar 1999	01 Oct 1999
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (Washington, 1979)	10 Apr 2008	21 Jan 2009
Convention on the Conservation of Migratory Species of Wild Animals (Bonn, 1979)	27 Oct 2010	01 Mar 2011
C087 - Freedom of Association and Protection of the Right to Organise Convention	02 Jan 2006	1948
C098 - Right to Organise and Collective Bargaining Convention	12 Nov 2003	1949
C100 - Equal Remuneration Convention	29 Jul 1994	1951
C105 - Abolition of Forced Labour Convention	17 Dec 2004	1957
C111 - Discrimination (Employment and Occupation) Convention	29 Jul 1994	1958
C138 - Minimum Age Convention	11 Nov 1996	1973
C182 - Worst Forms of Child Labour Convention	02 Jan 2006	1999
REGIONAL (EUROPEAN) CONVENTIONS		
UNECE Convention on Environmental Impact Assessment in a Trans-boundary Context (Espoo, 1991)	14 May 1996	10 Sep 1997
Protocol on Strategic Environmental Assessment (Kiev, 2003)	25 Oct 2010	24 Apr 2011
UNECE Convention on access to information, public participation in decision making and access to justice in environmental matters (Aarhus, 1998)	14 May 2001	01 Aug 2001
European Landscape Convention (Florence, 2000)	23 Mar 2004	01 Jul 2004
Convention on the Means of Prohibiting and Preventing the Illicit Import, Export and Transfer of Ownership of Cultural Property	22 Jun 1993	
Convention Concerning the Protection of World Culture and Natural Heritage	22 Jun 1993	
European cultural convention	22 Jun 1993	
Convention for Protection of Non-material Cultural Heritage	20 Mar 2006	
Bern Convention - Council of Europe Convention on the Conservation of European Wildlife and Natural Habitats (Bern, 1979)	26 Feb 2008	01 Aug 2008

Table 1: Multilateral international environment agreements signed/or ratified by Armenia

47. **Permitting Requirements:** Environmental permits, agreements, conclusions necessary for accomplishing the works envisaged by rehabilitation of Pushkin Tunnel, including data on issuing authorities and tentative timing of obtaining the permit are summarized in the table below:

NAME OF PERMIT, AGREEMENT, ETC.	ISSUING AUTHORITY	OBTAINING STAGE
Technical Expertise conclusion	Licensed organization	During design stage
Construction license	Urban Development Committee	After design stage, prior to bidding
State Traffic Police Permit Traffic Police of RA	Permit obtained during the design stage. Traffic Management Plan to be approved prior to commencement of civil works in each section during implementation stage.	Prior to construction
Lease agreement or ownership documents for construction site	Property owner	Before establishment of the construction site
Mining license	Ministry of Territorial Administration and Infrastructure	During construction stage, in case of extraction of construction materials
Purchase documents for purchased construction materials (such as crushed stone, gravel, cement, sand, etc.)	Authorized seller	During construction stage for purchase of the construction materials
Conclusion of Technical Security Expertise	Urban Development, Technical Standards and Fire Safety Inspectorate (UTFSIB)	During construction stage (required for some types of heavy machinery, technological processes that require use of a compressor or compressor stations, fuel storages exceeding certain capacity, etc.)
Maximum permissible discharge permit	Ministry of Environment	During construction stage
Agreement for disposal of construction waste	Head of the Gulakarak community	During construction stage, before disposal of the waste off-site
Agreement for disposal of dangerous and hazardous materials and waste	Ministry of Environment	During construction stage, before disposal of the dangerous and hazardous materials and waste off-site

Table 2: Required environmental permits and agreements

48. Though all the permits identified in the table are relevant for the Project implementation, some of them might not be necessary depending on the nature of works and their organization (e.g., contractor is not required to hold a mining license when crushed stone is purchased; however, the company producing the crushed stone should possess a valid mining license).

G. Administrative Framework

49. This section briefly presents the roles of entities that may have involvement in the Project, primarily but not exclusively from an environment perspective.

Ministry of Environment

50. The Ministry of Environment (MoE) is responsible for the protection, sustainable use, and regeneration of natural resources as well as the improvement of the environment in the Republic of Armenia. In those areas, the Ministry of Environment authority includes overseeing national policy development, developing environmental standards and guidelines, and enforcement. The MoE implements those functions through the following structural departments:

- Legal Department.
- Department of International Cooperation.
- Department of Waste and Atmospheric Emissions Management
- Department of Specially Protected Areas of Nature and Biodiversity Policy
- Department of bioresources management,
- Department of water resource management.
- Department of water policy.
- Department of Climate policy.
- Department of Atmospheric policy.
- Department of Forest policy.
- Department Strategic policy.
- Department of Hazardous Substances and Waste policy.
- Department of Land and Underground Resources policy.
- Hydro-meteorological and Monitoring Service SNCO is the structural entities acting within the Ministry of Environment
- "Armforest" SNCO is structural entities acting within the Ministry of Environment.

51. The key departments within the MoE that have administrative authority over EIA and the project approval process are:

    i. The «Environmental Impact Expertise Center» (EIEC), the State Non-commercial Organization (SNCO) is responsible for reviewing and issuance of assessment conclusion reports required for implementation of a project and adding conditions when necessary to protect the environment.

ii. The «Environmental Protection and Mining Inspection Body» (EPMIB) is responsible for inspecting projects to ensure compliance with conditions imposed by the EIEC and with the Project EMP.

52. To satisfy relevant regulations and to gain a positive assessment conclusion from the Ministry of Environment, the EIA report should be prepared in accordance with the Law on Environmental Impact Assessment and Expert Examination (July 22, 2014, new addition dated by 03.05.23 ՀՕ-150-Ն) and the legislative provisions relevant to environmental protection should be considered accordingly.

53. The MoE is also the Government authorized body in the area of waste management of the RA. Article 8 of the Law on Waste (24.11.2004) sets authorities of the environmental sector (Ministry of Environment of RA) as the state authorized body mandated with the tasks and responsibilities in the area of waste management.

Ministry of Territorial Administration and Infrastructure

54. The Ministry of Territorial Administration and Infrastructure of the Republic of Armenia is a central body of executive authority that develops and implements the policy of the Government of the Republic of Armenia in the field of territorial administration and infrastructure management.

55. Regional administration bodies are responsible for administration of public roads of local significance falling under the regional jurisdiction. Bodies of local self-government (communities) are responsible for administration of public roads of local significance registered as ownership of communities. The Ministry of Territorial Administration and Emergency Situations also elaborates and implements the policies of the Republic of Armenia Government in the area if civil defence and protection of population in emergency situations. The RDF is the main structural involved in road sector, and mainly in implementation of the investment projects.

Road Department Fund

56. According to the RA Government Decree, in 2021 the "Road Department" state non-commercial organization was reorganized into the "Road Department" Fund. “Road Department” SNCO was considered to be the legal successor of “Transport Projects Implementation Unit” State Institution and “North-South Road Corridor Investment Program Implementation Organization” State Non-Governmental Organization.

57. The main scope and goals of the Fund are to ensure effective implementation of projects in transport sphere of the Republic of Armenia.

58. The RDF environmental specialist is ensuring good environmental and social performance under the project.

Ministry of Health

59. Within the structure of the Ministry of Health of National Centre of Disease Control is responsible for coordination of all issues related to health (including those on noise and vibration) and for supervision over implementation of sanitary norms, hygienic and anti-epidemiological measures implementation by organizations and citizens.

The Ministry of Education, Science, Culture and Sport

60. The Ministry of Culture is a republican body of executive authority, which elaborates and implements the policies in the culture sector. The purpose of the ministry is to maintain and replenish the cultural heritage, promotion and development of contemporary art. The Ministry also includes two separately structures:

    - Agency of Protection of Cultural Heritage,
    - Historical and Cultural Heritage Protection Agency.

III. PROJECT DESCRIPTION AND ACTIVITIES

A. Existing situation

61. The Pushkin Tunnel on the M3 highway connects Vanadzor to Stepanavan and is of great importance to the Yerevan-Spitak-Vanadzor-Tashir-Georgia border road. The tunnel portals are located at elevations of approx. 1750 m (south) and 1780 m (north) and the tunnel has a length of 1803 m portal to portal. The maximum overburden is approx. 270 m. The tunnel alignment was designed as a straight line on plan.

62. The tunnel was constructed in 1971. It was damaged by the 1988 earthquake and rehabilitated in 2000. There is a parallel tunnel for most of the length of the road tunnel; however, construction was never completed. The parallel tunnel is unsupported and unsafe to enter due to the hazard of falling rock.

63. Over the years of operation, the tunnel has suffered limited investment in safety systems as well as mechanical and electrical systems, which have aged and lost functionality. Many safety systems which would be considered standard in road tunnels are missing in their entirety, leading to non-compliance with the applicable GOST 33153-2014 as well as the EU Directive 2004/54/EC.

64. The results of tunnel surveys and studies carried out by the Consultant allowed the following conclusions to be made regarding the existing condition of the tunnel:

- The tunnel concrete lining appears to be unreinforced and damaged.
- The tunnel lining does not provide the necessary waterproofing function in significant areas; and there was no waterproofing membrane previously constructed. Constantly occurring periodic water flows have led to considerable surface concrete deterioration (see photographs and details in survey reports).
- Water penetration has adversely affected the shotcrete protective liner (constructed at some point in the past but not shown on any available as-built drawings) and large wall surfaces have undergone delamination and in some cases have failed completely with large panels separating from layer behind.
- The original drainage system designed to remove ground water behind the tunnel liner and manage this to prevent water penetrating the liner along the tunnel wall face appears to have very limited functionally. Ground water ingress along the tunnel length and water penetration generally within the tunnel is a major and significant problem.
- All manholes for sidewall drainage are completely blocked. The central drainage collector is damaged but functional.
- The surface of the walkway is with concrete covers. Some concrete covers are open, missing, or damaged. This poses a trip hazard for tunnel workers and persons using the walkway in the case of an emergency.
- Although the pavement is intact, it shows high-wear and distress, with local repair and patching which has created a variable and uneven driving surface. It is much thinner than current practice and is very thin at the portals.

- The parallel tunnel is completely unsupported for almost all of its length and therefore only safe to enter at the portal, after which the first approx. 10 m is lined, and at the cross-passage at 520 m where the rock mass is stable and there is no evidence of rockfall.
- There is a complete lack of tunnel safety systems.
- The ventilation system is ineffective.

65. Existing tunnel surface water drainage: The system is blocked in multiple locations, all manholes for the sidewall drainage are blocked, and the system has very limited functionality. In addition, this system does not have any provision to manage flammable and toxic liquids as required by the EU Directive and GOST standards. Currently in areas where the drainage system is functional, clean ground water as well as polluted road-surface water is discharged in the same system out of the tunnel and thus untreated water is discharged into to receiving watercourses such as rivers and streams, which imposes an environmental and pollution hazard.

66. Tunnel groundwater drainage and waterproofing: This is normally assured by a waterproofing membrane within the liner construction. This membrane does not exist within the existing tunnel construction and as noted above the original tunnel design utilized a series of drain holes that have been designed to allow water at the rear of the tunnel liner to pass through the liner and into the existing tunnel surface water system. However, this system is blocked and has failed in multiple locations which has resulted in a build-up of water on the rear of the liner which has caused local water penetration and mechanical damage to the liner.

67. Typically, tunnel linings are divided into primary liners support (for rock / soil support measure) and secondary linings (for tunnel finish, fire-resistance, operation). Such a system also enables installation of a waterproofing membrane between the primary and secondary linings which enables groundwater to be managed and separated from vehicle-polluted water. In the case of the Pushkin Tunnel, this system is not provided within the original design and there is only a single lining which serves the purpose of primary and final lining combined. Throughout the entire tunnel length, an additional wall / surface finish of the sidewalls with a thickness of a few centimetres was observed. This wall / surface finish is not shown on any available as-built drawing.

68. The ventilation system is a semi-transverse system with false ceiling over the entire tunnel length. The ventilation system should be designed for two main operational cases – normal operation (to ensure the levels of pollutants are controlled) and the fire case (controlling smoke and heat during a fire incident).

69. Bypass road: In general, a full closure of the Pushkin Tunnel for all rehabilitation works is foreseen. Therefore there is full interruption of traffic on the M3 on section Stepanavan – Darpas. Information boards warning of the route closure, dates of the closure, and advising alternative routes are necessary throughout the region. For persons living in the project area it is be possible to provide cars (not trucks) with a route via the H23 over the Pushkin pass; although this route requires significant safety upgrades and will not be traversable in winter conditions. The existing road is affected by rockfall, safety measures such as crash barriers are non-existent, and fences will be required to prevent animals accessing the road. The pavement quality is very poor, lane width is narrow, and there are hairpin bends. At the intersection with the main road on the south side of the tunnel there is a short bridge over a watercourse which will require upgrading. To control access to be bypass road, the M3 shall be blocked with fixed, immovable barriers after the turn-off for the bypass road on each side of the tunnel.

These locations shall be well lit. Information boards shall be provided at these locations and restrictions implemented to ensure that no long or heavy vehicles attempt to utilise the bypass road. A movable barrier shall be provided to enable closure of the bypass road when necessary.

70. Photographs illustrating current situation are shown below:

Figure 3: Example of damage due to water ingress

Figure 4: Example of delamination of the shotcrete protective liner caused by water ingress

Figure 5: Completely blocked sidewall drainage manhole

Figure 6: Rockfall on bypass road; narrow and poor-quality roadway

Figure 7: Extensive localised repair and poor quality of tunnel roadway

Figure 8: Parallel tunnel without support (except steel ribs for profile) and fall of large rocks visible

71. The current condition of the tunnel requires urgent refurbishment which could range from limited and local refurbishment to significant rehabilitation. The extent of refurbishment work will ultimately determine the life extension and improved functionality of the structure, and this must be considered against the refurbishment duration and resulting traffic disruption together with the client's budget.

72. A further consideration is the presence of an incomplete and disused water supply tunnel to the west of the main tunnel, which will be upgraded to form part of the tunnel scheme. In addition, the local bypass road is difficult for heavy vehicles to traverse.

73. Based on the requirements of the EU Directive (2004/54/EC) and the nationally applicable GOST Standard (33153-2014), a light-refurbishment approach is unlikely to address the significant construction defects and issues and resolve the structural and functional problems affecting the tunnel and furthermore they are not considered sufficient to significantly extend the tunnel's service life. Apart from lighting, E&M systems are non-existent.

74. The reduction in residual strength and damage to the tunnel lining is largely linked to water ingress which itself is a result of the absence of a waterproofing system within the liner matrix. Options to add a new waterproofing system and a new liner over the existing liner are not deemed practical and would have the adverse effect of reducing the internal dimensions of the tunnel, encroaching on the traffic clearance profile, limiting space to address drainage, and impacting walkway widths.

75. It is recommended that a complete overhaul of the tunnel civil infrastructure will provide the opportunity to significantly extended the service life. This approach would support other primary and secondary areas of refurbishment and allow the tunnels to be returned to a serviceable state that improves operability, functionality, and safety. These items would include the refurbishment of safety niches and the redevelopment of an appropriate surface water drainage system and a secondary drainage system for flammable and toxic liquid.

B. Proposed Project – Tunnel rehabilitation

76. The proposed Project is a complete refurbishment of the tunnel to bring it back into a safe operational service condition in which traffic can safely transit through tunnel and people can be assured better means of escape and protection with improved safety and firefighting systems and capabilities. The Project will extend the operational life of the tunnel and improve traffic flow to support better transit along this key arterial corridor. The key improvements are:

- Complete rehabilitation of the road tunnel civil works of the complete 1803 m length including drainage systems, lining and pavement;
- Creation of a safe tunnel system through rehabilitation and extension of the parallel tunnel (876 m plus 449 m respectively), rehabilitation of existing cross-passages and construction of new cross-passages between the road and parallel tunnels;
- Construction of fire-fighting systems including 150 mm diameter pipes, 17 hydrants, a water supply basin at each portal, and detection systems;
- Renewal of tunnel power supply and introduction of an uninterruptable power supply for emergency situations;
- Renewal of ventilation equipment, with 10 new reversible jet fans, 4 new supply fans and

sensors;

- Introduction of tunnel control systems and communications;
- Renewal of lighting with energy-efficient LEDs as well as guidance lighting to improve road safety;
- Renewal of traffic safety installations, including signage, LED-lit emergency signs, road markings, and an average speed-control system.

77. The intended updated tunnel scheme is shown in Figure 9 below. The rehabilitated tunnel system shall comply with the requirements of the EU Directive (2004/54/EC) and the nationally applicable GOST Standard (33153-2014). Four cross-passages provide escape routes to safe areas and lay-bys are provided at spacings of 350 – 400 m.

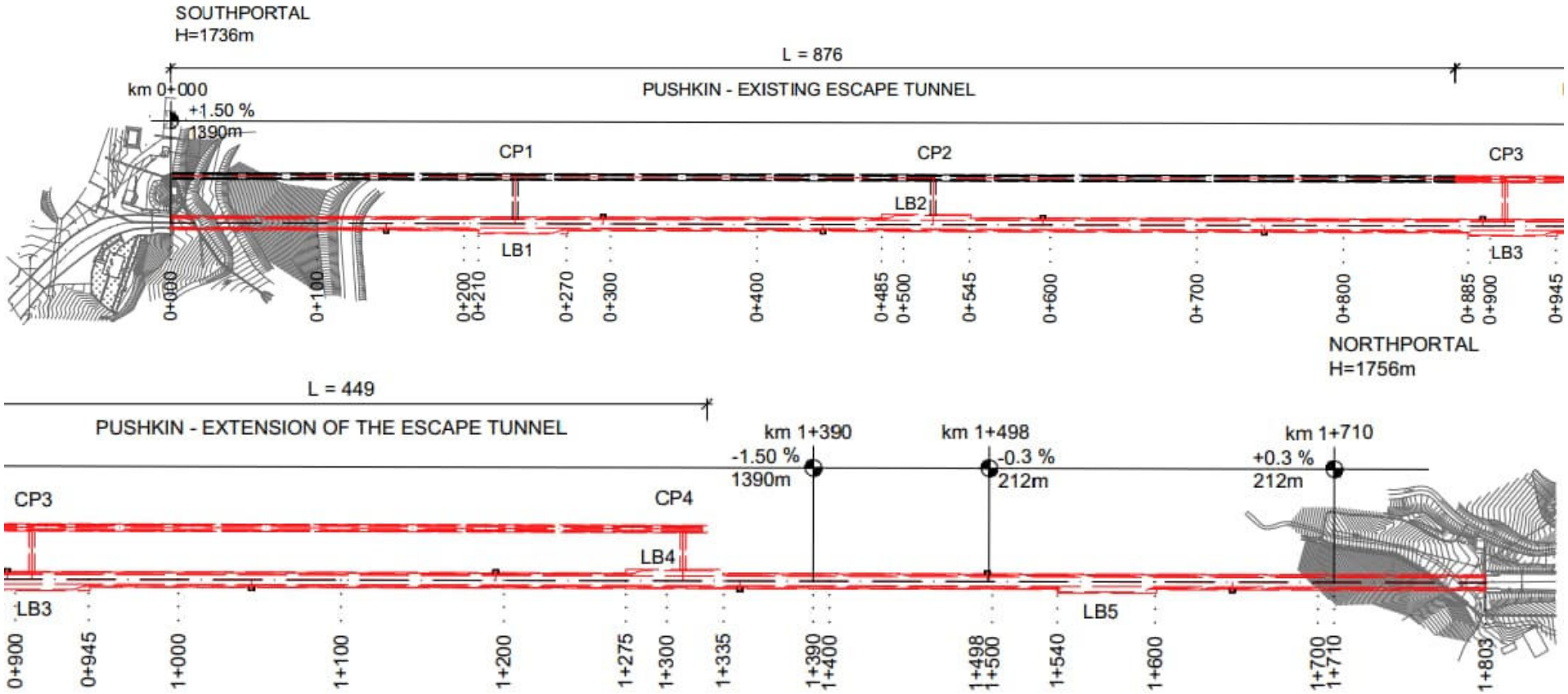


Figure 9: Scheme of rehabilitated Pushkin Tunnel (split at km 0+900 for readability)

C. Description of key construction activities

78. Key construction activities are the careful dismantling of the existing lining to the extent necessary to enable sufficient clearance for construction of a new lining protected by a waterproofing membrane, and excavation and support of the parallel tunnel extension.

79. The process for dismantling and reconstruction is summarised as follows and shown in the subsequent figures:

i. Decommissioning and removal of utilities from the tunnel interior for the full tunnel length.

ii. Removal of the false ceiling for the full tunnel length.

iii. Installation of ceiling rock anchors (as soon as the false ceiling for a section has been demolished and debris removed).

iv. Reprofiling of ceiling arch in 3 m sections to provide space for installation of the liner whilst maintaining the required clearance profile (replacement of rock anchors if necessary).

v. Demolition of vertical walls and invert in 3 m sections including existing drainage pipes and road surface.

vi. Profile control and re-profiling if necessary.

vii. Support of sidewalls and ceiling arch with sprayed concrete.

Note: Steps iv – vii are repeated in short sections (max. 3 m) until the full length of the tunnel is supported.

i. Construction of reinforced concrete abutment.

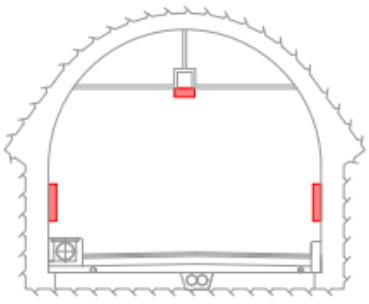
ii. Construction of sidewall drainage.

iii. Construction of geotextile layer and waterproofing membrane.

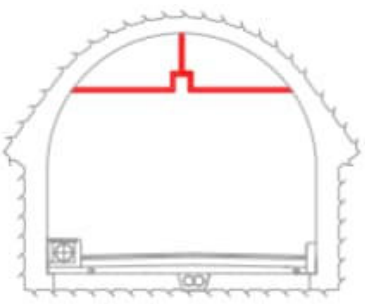
iv. Construction of concrete inner-liner with standard 10 m block length.

v. Construction of the invert.

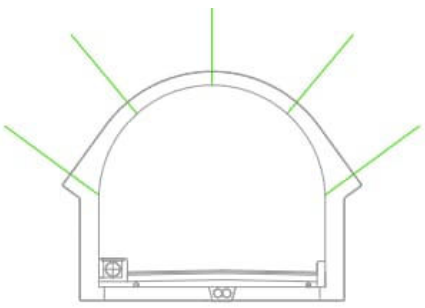
Step i: Utilities removal



Step ii: Removal false ceiling



Step iii: Install ceiling anchors



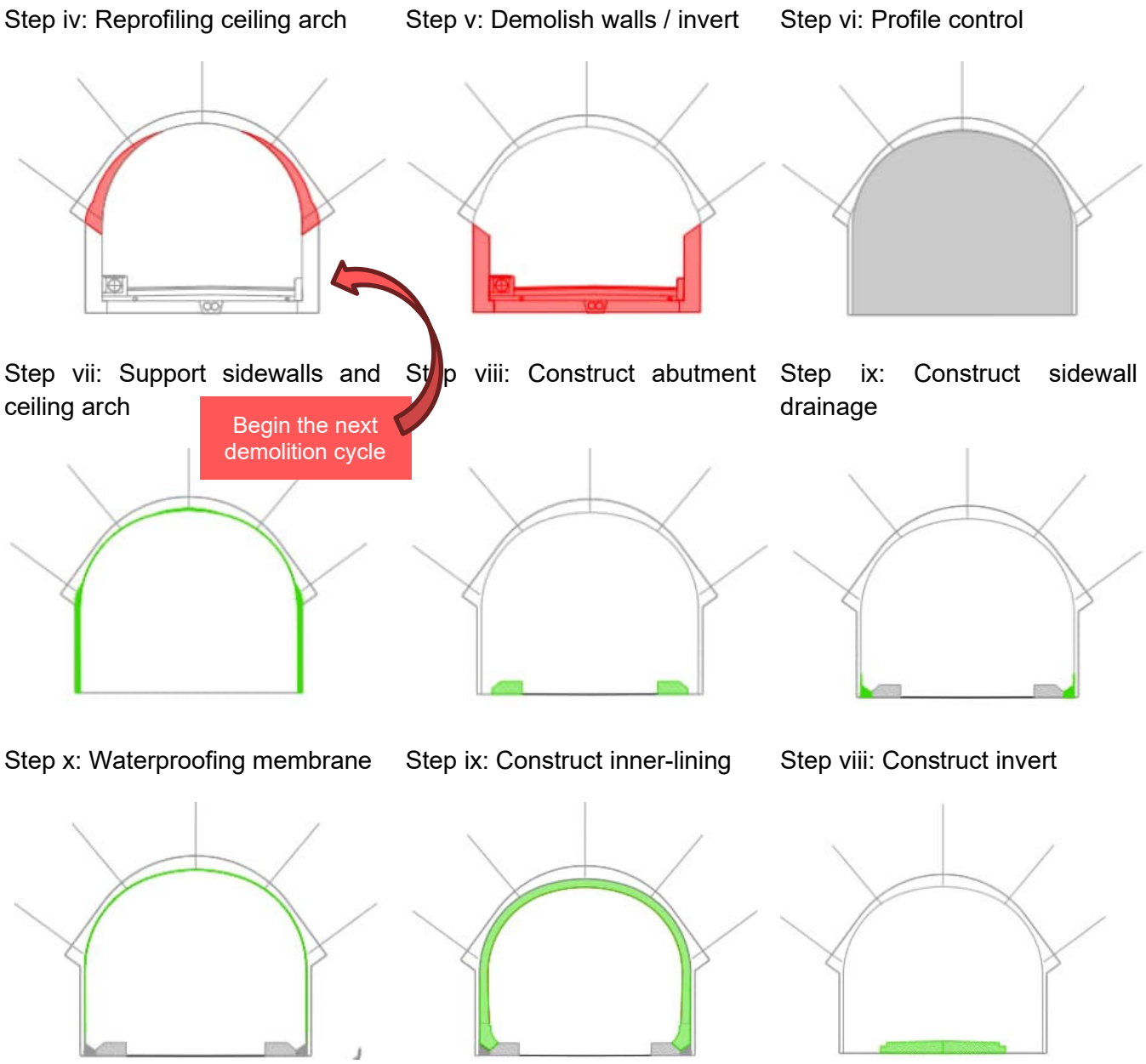


Figure 10: Graphical representation of construction sequence for dismantling and reconstruction of the main tunnel lining

80. Excavation and support of the parallel tunnel extension is by a conventional, cyclical process, e.g., the New Austrian Tunnelling Method (NATM). This is based on the concept that the ground around the tunnel acts as a load-bearing element. Excavation must keep the surrounding ground intact to the greatest extent possible, e.g., by techniques such as smooth blasting. Typically excavation and support are continuously adjusted to the ground conditions under consideration of the requirements. The support and sprayed concrete lining of the tunnel are intended to be ductile, allowing controlled ground deformation, therefore allowing the ground to form a load-bearing ring. This ground reaction, resulting in lining displacements is continuously monitored in the cross-sectional and longitudinal directions in order to check the stability of the opening and to optimize excavation and support. NATM can therefore be considered an economical tunnelling method; therefore causing less environmental impact than other conventional tunnelling methods. Almost all tunnel excavation will be carried out by the “drill and blast” technique, for which the work cycle is shown below:

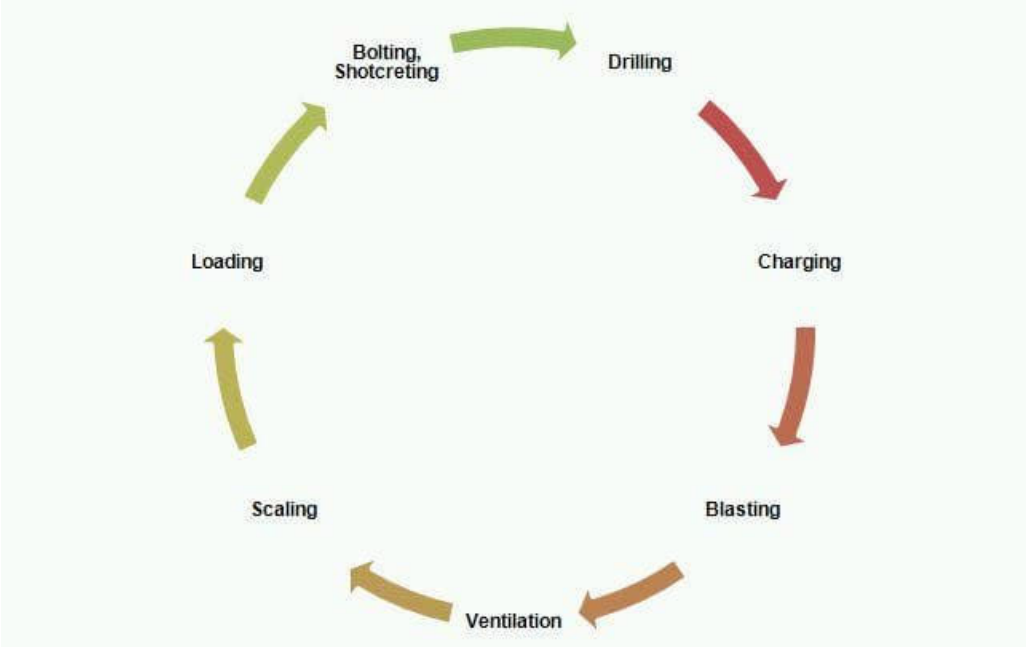


Figure 11: Excavation and support cycle for conventional tunnelling by drill and blast

81. Excavation is represented by the first steps of the cycle: *Drilling, charging and blasting*. The face is drilled using a "hydraulic drill jumbo" to a pre-determined pattern and with a pre-determined number of holes depending on the Support Class. The depth and diameter of the holes are also determined by the Support Class. The holes are then "charged" by inserting explosives into certain holes (approximately half of those drilled). Only non-electric blasting is permissible and "smooth-blasting" techniques are to be applied, whereby micro-, milli- and half-second delay detonators are used.

82. Before blasting it may also be necessary to reinforce the ground ahead of the excavation face, e.g., in loose ground or in ground conditions which tend to produce overbreak, collapses or material inflows immediately following excavation. This can be done either by forepoling (spiles, forepoling bars or pipes, grouted or ungrouted) or pipe roof (grouted steel pipes). Drillholes are bored by a hydraulic drill jumbo; pipe roofs require an attachment mounted onto the jumbo.

83. To clear the dust caused by blasting, and to ensure visibility and a breathable atmosphere in the tunnel, *ventilation* is provided by means of a tube at the top of the tunnel profile which blows fresh air to the excavation face.

84. *Scaling* after blasting using a backhoe removes any loose material from intact rock surfaces and helps to correct the tunnel profile.

85. The process of *loading* involves the removal of muck from the excavation face. Payloaders shift the excavated material onto dumpers, which then transport the material out of the tunnel to pre-defined disposal areas.

86. The final step of the cycle is supporting the freshly exposed ground by bolting and shotcreting. Support elements include wire mesh, steel ribs / lattice girders, sprayed concrete, rock bolts etc.. Figure 12 shows an example of the excavation and support cycle for the escape tunnel for fractured rock conditions.

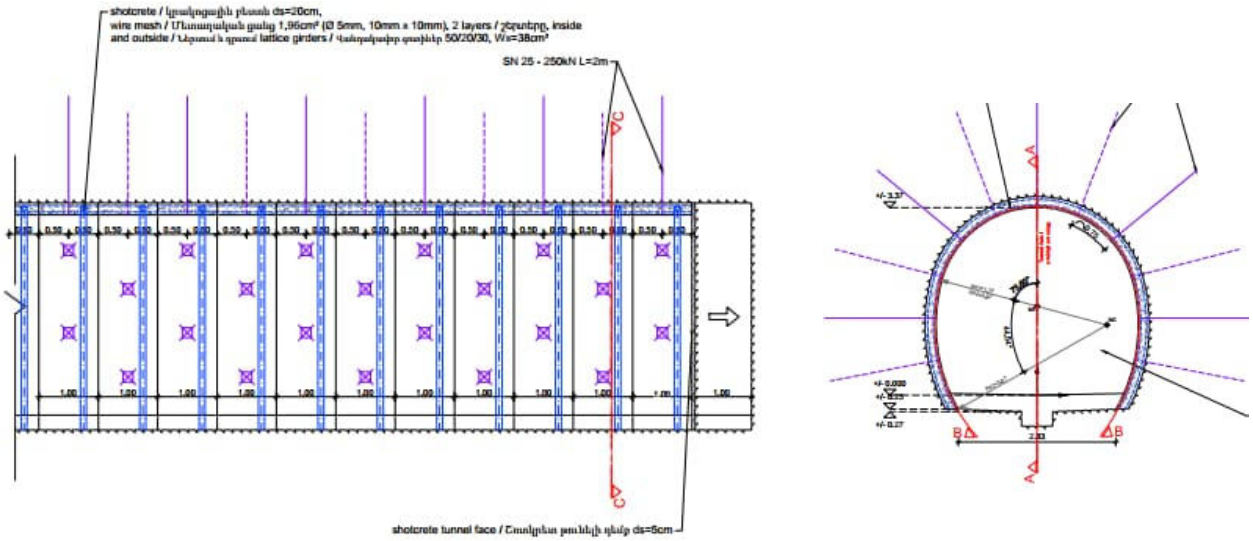


Figure 12: Excavation and support cycle drawing for the escape tunnel

87. Geotechnical works such as e.g., the construction and rehabilitation of tunnels and all related works involve risks because soil and existing structure behaviour is difficult to predict. Regular monitoring of displacements of the structure during rehabilitation works and of excavated tunnel profiles is essential. The monitoring program requires: The definition of structures to be monitored; the definition of parameters to be monitored; time schedule for monitoring (e.g., every hour, every day, every week); predefined tolerance limits; the definition of permissible limits in form of values and criteria for warning and alarm, ensuring that there is still time to take action when these limits are reached; and the definition measures in case permissible limits are reached

88. Camp / labour sites: The contractor will require labour sites at both portals to support the southern and northern tunnel drives. Due to the north portal being located within the boundaries of the Dilijan National Park, the north portal site will be as small as possible, only with installations to support the tunnel drive. No labour camp will be located here. The main labour camp and work site shall be in the south portal area.

89. Required equipment and installations in portal areas: The main equipment and installations (other than for the main camp) are summarised below:

South portal only	North portal only	North and south portal
Concrete batching plant Crusher Site laboratory Tyre washing facility for vehicles exiting the escape tunnel	Portable chemical toilet	Workshops and material storage areas Temporary water treatment facility Ventilation system with compressor Workers' equipment and rest container Access control for entering the

South portal only	North portal only	North and south portal
		tunnel Guardhouse and access control at the diversions from the M3

Table 3: Equipment requirements for construction at each portal

90. Staffing: The peak staffing for permanent deployment is estimated as: Contractor's personnel – 30; CSC personnel 7.

91. Sources of materials are summarised in the table below:

Source	Distance from tunnel
JSC Beton Vanadzor	50-55 km
Debet sand-gravel mixture mine	38 45 km
Mount Salkar basalt mine	40-70 km
Pobedy basalt and andesite basalt mine / "western" site	42–43 km

Table 4: Sources of materials for construction

D. Methodology for muck disposal sites

92. Due to the excavation of the parallel tunnel extension as well as reprofiling of the road tunnel for lay-bys and niches, a relatively small volume (approx. 12,000 m³ in its compacted state, approx. 16,800 m³ in its deposited, re-compacted state) of muck will be generated by the project. This section sets out the methodology for the preparation, construction, and recultivation of muck disposal sites.

93. Temporary deposit areas

To the greatest extent possible, excavated material should be removed from site (portal areas and cuttings for access roads) and transported to its final position at the muck disposal site in one action. However, there may be instances in which this is not possible, and excavated material needs to be dumped at a temporary deposit area.
In order to avoid mixing of different types of muck at temporary deposit areas, deposits of different types of muck are to be separated with a 3 m wide drivable strip. The strip is to be compacted and surfaced appropriately.

94. Removal and deposit of topsoil

Topsoil consists of humus (containing organic material) and a boundary layer (soil beneath the humus layer which still contains some organic material). These two layers are to be removed and deposited separately, and their thicknesses are to be documented. Large areas of these layers shall not be removed, rather, small areas are removed as required by progress of further excavating the ground

below. Freshly exposed surfaces are to be drained appropriately. For surfaces which are only used temporarily, topsoil layers shall be replaced in their original thicknesses.

Topsoil shall be removed and deposited with an excavator with an attached slope-work bucket. Bulldozers shall not be used for stripping or placing topsoil. Work with topsoil may only be carried out in dry ground and dry weather conditions.

If possible, excavated topsoil material from the site strip or excavation should be immediately used to cover newly created deposit areas and seeded to limit erosion. Temporary spoil deposits shall have maximum dimensions of 2x base width to 1x the height dimensions. This height to base width ration must not be exceeded unless specific temporary work calculations have been produced by a competent engineer and are available on site for inspection. The stability of spoil piles will remain the responsibility of the contractor. The contractor must ensure the foundation of the spoil pile/ excavated material is adequate to prevent collapse movement and/ or secondary effects on adjacent structures, systems, and components. Topsoil heaps shall be assessed, designed and maintained by the contractor to assure stability and preclude soil slip or movement. The base to height ratio shall not exceed 2:1 (as noted above).

Figure 13: Excavator with attached slope-work bucket in operation

Figure 14: Example of a topsoil heap

Spoil heaps/ storage areas which will be required for more than 6 weeks shall be prepared with a trough-shaped surface to allow managed drainage, surface run off water will be managed and collected and not allowed to contaminate adjacent facilities such as rivers, water courses or land. Furthermore, the topsoil heaps shall be sowed with seeds and planting typical to the region to prevent erosion. The heaps are to be mown at least twice a year.

Temporary deposits of topsoil or any other ground surfaces with a topsoil layer shall not be compacted unnecessarily. Measures, such as fences, shall be implemented to ensure that these surfaces are not driven over be heavy vehicles.

95. Preparation of ground surface for deposit of muck

Removal of topsoil should only be carried out shortly before main excavation work to prevent ground below becoming soaked by precipitation.

The ground surface for the deposit area shall be carefully compacted in compliance with the Technical Specifications.

The ground surface shall be inspected by a geologist. Any excavation or ground improvement work determined necessary shall be carried out before muck is deposited.

After precipitation events, prepared ground surfaces which have not yet been covered by muck shall be tested as described above to ensure the compactness of the ground. If the values determined by tests do not conform to the above values, the ground shall be re-compacted and re-tested until it does conform.

Appropriate measures shall be taken to capture and divert any water due to water-bearing geological layers away from the deposit area (i.e., into a stream). This prevents soaking of the deposited muck. The surface water run-off from all spoil storage areas, including areas containing high concentrations of suspended solids or chemical concentrations shall be managed to prevent land cross contamination or the contamination of ground water and water courses.

96. Properties of deposited material

Contaminated material may not be deposited. Care must be taken to assess and control the work for contaminated elements and chemicals that are hazardous to health and the environment. These may include (but are not limited to) lead, zinc, asbestos fibre board, heavy metal elements and contaminated blended / unblended hydrocarbon elements.

The mechanical properties of excavated material should allow its use as landfill material. Should this not be the case, the material shall be prepared or improved by the Contractor so that it meets the requirements for deposit. For example, crushing may be necessary.

The maximum diameter of material to be disposed shall be limited to 250 mm.

Before and during the construction, the shear strength and bulk density of the material shall be determined by large shear test (shear area of at least 30 x 30 cm). The test shall be carried out for each change of material.

Where testing and visual inspections indicate that material should not be used for landfill due to contamination or similar issues then this material must be segregated, contained, and disposed of to an approved/ certified disposal site. The contractor must keep and provide spoil test records as part of the as-built documents to demonstrate that fill material has been tested and is suitable.

97. Placement methodology

Placement of muck shall be in layers of maximum compacted thickness 60 cm. To prevent potential soaking of the loose muck, compaction shall take place immediately after placement to the following minimum values:

- Degree of compaction (proctor) ≥ 100 %
- Deformation module with a 700 cm² load plate ≥ 30 MN/m²

Compaction machinery shall be chosen so that the above values are achieved. Particular care should be taken at the edges of the landfill body.

A 3 m high earth embankment shall be constructed directly at the boundary of the muck disposal site as visual, noise and dust protection. The outer slope of the embankment shall be covered with

topsoil layers.

The surface of each muck layer shall have a slope of 2 %. And the top layer shall be sloped to ensure that rain can run-off the surface to an appropriate designed collection and water management system.

Figure 15: Compaction of muck

Figure 16: Re-cultivation of muck disposal area. Layers visible: Muck (grey); boundary soil layer (light brown); humus layer (dark brown); seeded layer (green)

98. Re-cultivation of the muck disposal sites

To minimise exposed surfaces which are not re-cultivated, topsoil should be placed on compacted terraces or slopes after completion of each compacted layer and before starting the next layer. Boundary layer topsoil and humus are to be placed separately. Re-cultivation is completed with sowing of seed. The seed type and composition should be determined by local specialists and must be shown to be free of invasive plant species.

Layer thicknesses are:

- Boundary layer topsoil 50 cm
- Humus 30 cm

99. Local plant species

The hereafter mentioned plant species, which grow in the region, are adapted to the local conditions and fit well for reforestation and rehabilitation conception. The mentioned species occur frequently in the mapped vegetation and would replace the lost vegetation the best possible way.

It is proposed to restore forest vegetation in disturbed areas, primarily in terms of hornbeam-oak forest. The choice of hornbeam (*Carpinus betulus*) is determined, first of all, by its unpretentiousness and good seed germination, rapid growth and independent reproduction in place (Figure 17). Efforts should also be made to plant oak (*Quercus macranthera*) seedlings (Figure 18, Figure 19) to create a more natural ecosystem, but poor oak seed germination may be a problem. It is, of course, possible to purchase planting material from nurseries.

It is proposed to use shrubs and low trees as undergrowth, the seeds of which can be collected in the surrounding ecosystems:

- *Acer trautvetteri* (Figure 20)
- *Lonicera caucasica* (Figure 21)
- Pyrus caucasica
- Rubus idaeus
- Sambucus ebulus
- *Sorbus aucuparia* (Figure 22)
- Viburnum lantana
- The grass cover must recover naturally.

Figure 17: Forest with Carpinus betulus dominance

Figure 18: Quercus macranthera (a long staying tree)

Figure 19: Oak forest (Quercus macranthera)

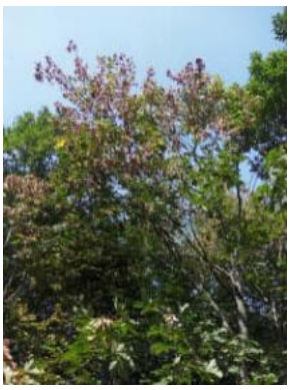


Figure 20: Acer trautvetteri

Figure 21: Lonicera caucasica

Figure 22: Sorbus aucuparia

E. Analysis of alternatives

100. This section presents the compared feasible alternatives to the proposed project, and the how the environmental and social impacts were carefully considered in the analysis of alternatives.

ALTERNATIVE	DESCRIPTION	SUMMARY OF WORKS REQUIRED	ENVIRONMENTAL AND SOCIAL IMPACT	OTHER FACTORS
Do nothing	Routine maintenance as currently carried out	No investment beyond current operation and maintenance expenditure	Tunnel will continue to deteriorate and could result in lower traffic flows/ one way traffic and traffic standing at portals waiting to pass the tunnel. Ultimately the tunnel will deteriorate, transit will not be possible, and traffic will need to use alternative routes and diversions, increasing journey times and overall emissions.	The tunnel system does not comply with applicable standards (EU Directive and GOST 33153-2014). It is therefore not acceptable to the Client. The alternative results in lost economic opportunities, suboptimal regional transit (therefore trade), and long-term negative environmental and socioeconomic impacts.
A	Rehabilitation of existing tunnel and upgrade of system to fulfil EU Directive requirements except for escape routes	Demolish (to the extent necessary) existing liner, minor re-profiling, introduce waterproofing, new inner-liner, reconstruct	This alternative limits the environmental impacts by addressing the areas of defects and brings the tunnel closer to the required standard.	This alternative does not address the safe means of escape. It is therefore not acceptable to the Client.

ALTERNATIVE	DESCRIPTION	SUMMARY OF WORKS REQUIRED	ENVIRONMENTAL AND SOCIAL IMPACT	OTHER FACTORS
		roadway, install systems	Closure of the existing tunnel means trucks need to divert regionally, resulting in increased vehicle emissions.	
B	Alternative A plus finishing works for the parallel escape tunnel over the existing length	As Alternative A plus lining of the parallel tunnel	The impact is similar to Alternative A; however, more construction waste is generated by clearing the parallel tunnel of debris and obsolete steel profiles.	This alternative does not offer safe means of escape over the complete tunnel length in compliance with the EU Directive. It is therefore not acceptable to the Client.
C (the Project)	Alternative A plus finishing works and extension of the parallel escape tunnel for 427 m from south portal to north	As Alternative B plus excavation, support and equipment for parallel tunnel extension	The environmental impact is greater than Alternative B due to the generation of muck from excavation.	The tunnel system would comply with applicable standards. The technical complexity is greater than Alternative B due to tunnel excavation and support.
D	Rehabilitation of existing tunnel (E&M to EU Directive) and full length extension of parallel escape tunnel (927 m)	As Alternative C plus more excavation and breakthrough of the parallel tunnel on the north side. excavation, support and equipment for parallel tunnel extension	Increased muck generated from tunnel excavation in comparison to Alternative C plus works to establish a new portal on the north side within the Gulagarak Pine State Sanctuary; thereby increasing environmental impact.	The tunnel system would comply with applicable standards. Access to the parallel tunnel from both north and south offers operational benefits.
E	New tunnel and subsequent decommissioning of existing tunnel	Excavation, support and all civil works to construct a new tunnel; new E&M systems; make existing tunnel safe and decommission	The excavation of a new tunnel would result in significant excavation material and require a new road alignment that would have additional land take and environmental impact. This option potentially would have significant environmental impacts and require	The traffic forecast would not support this option within the operational lifetime horizon. The tunnel system would not comply with applicable standards. An operational benefit is that the existing tunnel remains open

ALTERNATIVE	DESCRIPTION	SUMMARY OF WORKS REQUIRED	ENVIRONMENTAL AND SOCIAL IMPACT	OTHER FACTORS
			work in the Gulagarak Pine State Sanctuary.	duration construction; therefore no diversions are necessary.
F	New tunnel; conversion of existing tunnel to an escape tunnel by construction of additional concrete lining	New tunnel as described for Alternative E; new inner-lining of the existing tunnel with clearance profile for escape on foot and access for emergency vehicles; new cross-passages between the two tubes	Impacts as for Alternative E	As for Alternative E, except that the tunnel system would comply with applicable standards.
G	New tunnel plus rehabilitation of existing tunnel with only a single lane for general traffic	New tunnel as described for Alternative E; new waterproofing and inner-lining of the existing tunnel with clearance profile for one traffic lane; new cross-passages between the two tubes	Impacts as for Alternative E. Slightly improved road safety due to introduction of uni-directional traffic scheme through the tunnel.	As for Alternative F. Single-lane tunnel not recommended from a safety / emergency situation perspective.
H	New tunnel plus rehabilitation of existing tunnel as Alternative A	New tunnel as described for Alternative E; full rehabilitation of the existing tunnel as described for Alternative A; new cross-passages between the two tubes	Highest environmental impact of any alternative due to the greatest volume of work. Greatest socio-economic and road safety benefit due to provision of a high-quality bi-tube tunnel system.	The traffic forecast would not support this option within the operational lifetime horizon. The alternative enables future maintenance without closure of the route, since one tube can be closed and traffic is diverted to the other.

Table 5: Considered alternatives for the Project

101. Summarising the presented alternatives:

- New tunnel options enable continued operation and therefore greater socio-economic benefits; however, the cost of a new tunnel is significantly higher than rehabilitation.
- Closure of the existing tunnel has a negative impact on total vehicle emissions as the local

bypass road cannot be traversed by trucks, and regional diversions will be necessary.

- The environmental impact of a new tunnel is significantly higher than rehabilitation due to disposal of excavated materials as well as construction within the Gulagarak Pine State Sanctuary.
- The rehabilitation of the existing lining technically more challenging than new tunnelling work. The risk of problems during implementation is higher, which increases the risk of an extended construction duration / closure.
- The construction durations of tunnel rehabilitation alternatives are shorter than new tunnel alternatives.

IV. PROPOSED SCHEDULE FOR IMPLEMENTATION

102. The project implementation schedule is shown below. It considers the period from contract signing to project completion. The winter period is assumed as December to March, during which time work outside of the tunnel should not be scheduled.

103. The complete project duration for is estimated at 30 months, and the road closure period as 24 months.

Pos.	Activity	Duration (days)	Approx. Month Start	Approx. Month End
1	**Contract award**			
1.1	Signing of contract	0	3	3
1.2	Ensure all necessary permits are in place	30	3	4
1.3	Commencement date (42 days after signing)	42	4	4
2	**Mobilisation phase**			
2.1	Notification of road diversions	0	3	3
2.2	Handing over of portal areas and demarcation of site	14	3	3
2.3	Establishment of muck disposal area	14	4	4
2.4	Mobilisation of contractor to site and establish contractor camp	30	4	5
2.5	Implementation of road diversions	0	5	5
3	**Construction phase**			
3.1	**Dismantling and support work**			
3.1.1	Disconnection of power supply to tunnel and installations	0	5	5
3.1.2	Strip-out of utilities from the tunnel interior	14	5	5
3.1.3	Removal of the false ceiling for the full tunnel length	68	5	7
3.1.4	Installation of ceiling rock anchors	68	5	7
3.1.5	Reprofiling of ceiling arch in 3 m sections	342	7	18
3.1.6	Demolition of vertical walls and invert	342	7	18
3.1.7	Support of sidewalls and ceiling arch with sprayed concrete	342	7	18
3.2	**Road tunnel lining**			
3.2.1	Construction of abutments	205	13	19
3.2.2	Construction of waterproofing system and sidewall drainage	205	13	20
3.2.3	Construction of concrete inner-lining	205	13	20
3.2.4	Walkways, drainage manholes	102	17	20
3.2.5	Civil works in niches and lay-bys	60	20	22
3.2.6	Tunnel pavement construction	68	20	22
3.3	**Securing of existing escape tunnel**			
3.3.1	Clearance of rubble from portal and establish safe entry	14	8	8
3.3.2	Removal of rubble and steel profiles from existing escape tunnel	85	8	11
3.3.3	Sprayed concrete lining of existing escape tunnel	85	8	11
3.3.4	Removal of wall / blockage of cross-passage 1	5	10	10
3.4	**Escape tunnel extension and cross-passages**			
3.4.1	Exacavation and support of escape tunnel extension	174	11	17
3.4.2	Excavation and support of cross-passages 3 and 4	30	17	18
3.4.3	Reprofiling and support of cross-passages 1 and 2	30	18	19
3.4.4	Tunnel pavement construction	103	19	22
3.5	**Portal area works**			
3.5.1	Rehabilitation of existing buildings	180	16	22
3.5.2	Establishment of new buildings	180	16	22
3.5.3	Construction of basins for water treatment and fire-fighting water	180	16	22
3.5.4	Connection of escape tunnel portal to road	30	22	23
3.6	**Electromechanical works**			
3.6.1	Selection of systems and approval by Engineer	90	13	16
3.6.2	Procurement of electromechanical systems	180	16	22
3.6.3	Installation of electromechanical systems	150	22	27
4	**Testing and commissioning**			
4.1	Testing of all systems	30	27	28
4.2	Training of operational personnel and emergency services	14	28	28
5	**Completion**			
5.1	Tunnel opening	0	28	28
5.2	Reinstatement of surfaces including muck disposal area	30	28	29
5.3	Demobilisation of contractor	30	29	30
5.4	Completion of project	0	30	30

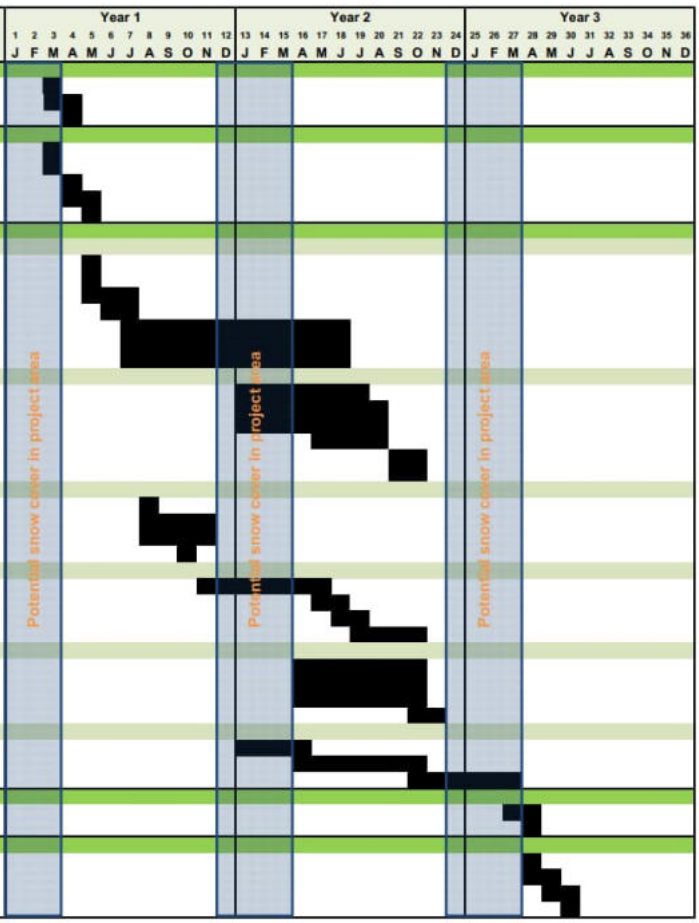


Figure 23: Outline project implementation schedule

V. DESCRIPTION OF THE ENVIRONMENT (BASELINE DATA)

A. Biological Environment

104. Lori is a province (marz) of Armenia which located in the north of the country, bordering Georgia. Situated in the north of Armenia, Lori covers an area of 3,789 square kilometres. It is bordered by Tavush Province in the east, Kotayk Province in the southeast, Aragatsotn Province in the southwest and Shirak Province in the west.

Flora and vegetation

105. The tunnel and its surrounding area are located in the Lori marz, which belongs to the Lori floristic region (Figure 24, Figure 25).

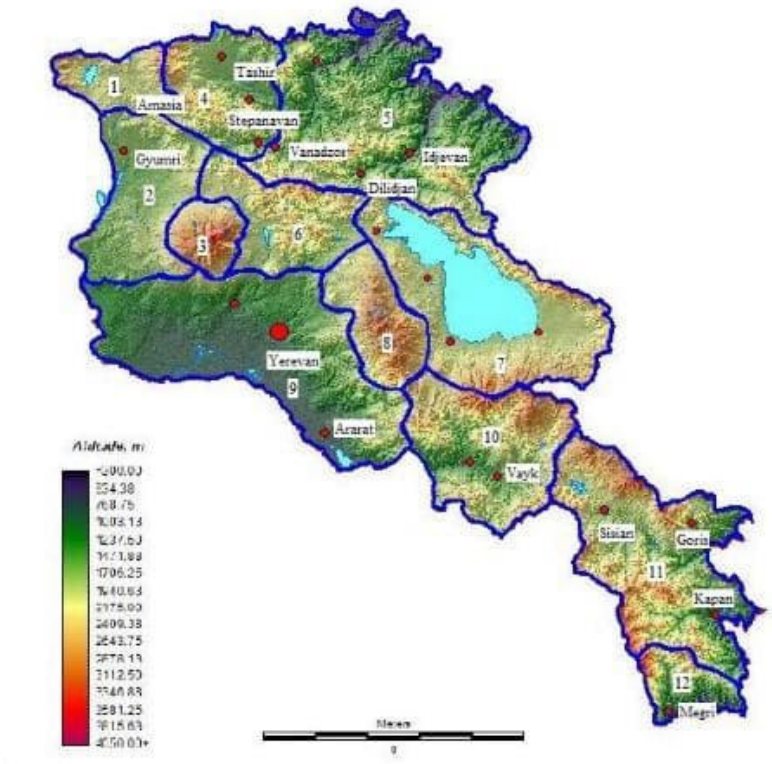


Figure 24: Floristic regions of Armenia (Takhtajan, 1954)

1 – Upper Akhuryan, 2 – Shirak, 3 – Aragats, 4 – Lori, 5 – Ijevan, 6 – Aparan, 7 – Sevan, 8 – Gegham, 9 – Yerevan, 10 – Darelegis, 11 – Zangezur, 12 – Meghri

Figure 25: Location of the tunnel under Pushkin pass

106. The Lori floristic region (1280 species) covers the entire Lori plateau, in the east by the foothills of the Lalvar and Lejan mountain ranges it is delimited from the Ijevan floristic region. In the west the border with the Upper Akhuryan floristic region runs along the Javakheti ridge. The northern border coincides with the state border of Armenia with Georgia. In the south the region covers the upper reaches of the Pambak River on the Pambak ridge, and in the southwest it borders the Shirak floristic region. Administratively, the region almost completely coincides with the Lori region of Armenia, with the exception of its south and east. The vegetation is represented mainly by meadows and forests (oak and beech), as well as wetland vegetation of the relict lakes of the Lori Plateau. The altitudes of the area are from 1300 to 2550 m above sea level. m. Endemic species – 6 (Fayvush, 2007). Species included in the Red Book of Plants of Armenia (2010) – 30.

107. The vegetation in the vicinity of the tunnel consists of meadow-steppes, subalpine meadows, and oak and beech forests. The Lori Plateau presents a whole series of rare ecosystems associated with relict lakes and wetlands. In addition, on the Pambak ridge in the subalpine belt there is a rare ecosystem of *Rhododendron caucasicum* heaths in Armenia (F2.2261 according to the EUNIS classification), and in the vicinity of Gyulagarak the ecosystem of Ponto-Caucasian Scots pine forests (G3.4E) is well defined.

108. Meadow-steppes are represented in the vicinity of southern entrance to the tunnel. There are Grass meadow-steppes (E2.161) with *Festuca valesiaca, Stipa tirsa, Elytrigia intermedia ssp. trichophora, Poa densa, Phleum phleoides, Koeleria macrantha, Dactylis glomerata* dominance (Figure 26), and Forbs meadow-steppes (E2.162) with *Scabiosa bipinnata, Trifolium ambiguum, Anthriscus nemorosa, Achillea setacea, Artemisia absinthium, Serratula radiata* (Figure 27).

Figure 26: Grass meadow-steppe

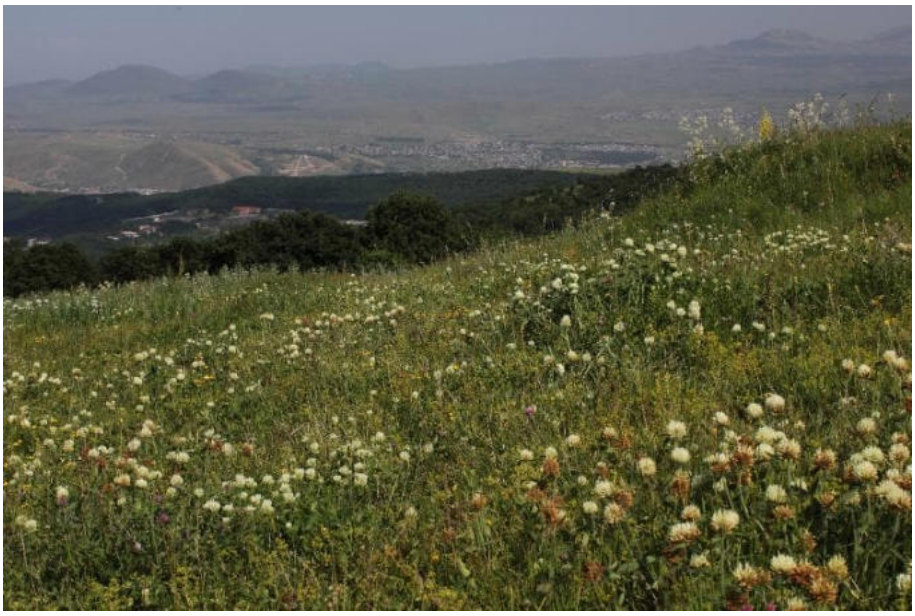


Figure 27: Forbs meadow-steppe

109. Subalpine meadows are represented by forb subalpine meadows (E2.322), where the dominants are most often Scabiosa caucasica, Betonica macrantha, Rhinanthus pectinatus, Pimpinella saxifraga, Centaurea cheiranthifolia, Astrantia maxima, Tanacetum coccineum, (Figure 28).

Figure 28: Subalpine meadow

110. Meadow ecosystems are used primarily as pastures; in relatively flat areas they are plowed and used for growing grain crops.

111. In the vicinity of southern entrance of the tunnel meadow-steppes are infested by expanding plant species: *Astragalus galegiformis* and *Heracleum sosnovskyi.*

112. Forest vegetation is represented mainly by beech and oak forests.

113. Caucasian beech forests (G1.6H) are very good represented in the vicinity of the northern entrance to the tunnel by beech and beech-hornbeam varieties (Figure 29). In Armenia, beech forests (*Fagus orientalis*) can be divided into three categories - beech forests in dry, fresh and wet habitats, in the territory we describe all three categories are found (Yaroshenko, 1962). Here beech forests are almost pure, less often there are joined to beech (usually in the form of individual trees) *Quercus macranthera, Fraxinus excelsior, Carpinus betulus, Ulmus elliptica, Prunus divaricata,* in understory *Viburnum lantana, Euonymus latifolius, Daphne mezereum.*

114. Oak forests are represented by ecosystems G1.A1D2 – Oak forests of Armenia dominated by *Quercus macranthera* (Figure 30). *Quercus macranthera* completely dominates here, and the composition of the tree stand is usually represented by single *Fraxinus excelsior, Acer hyrcanicum, Pinus kochiana, Viburnum lantana, Prunus divaricata, Lonicera caucasica*, and the composition of the herbage is dominated by cereals and representatives of forbs – *Poa nemoralis, P. pratense, Brachypodium sylvaticum, Dactylis glomerata, Primula macrocalyx, Origanum vulgare, Teucrium pollium, Galium verum, Filipendula vulgare, Achillea micrantha, Trifolium alpestre, T. pratense, Coronilla varia, Medicago sativa, M. lupulina.*

Figure 29: Beech forest in the vicinity of the tunnel

Figure 30: Oak forest in vicinity of the tunnel

115. Among the rare ecosystems, Ponto-Caucasian Scots pine forests (G3.4E) are found here (Figure 31), the majority of this ecosystem is included in the “Gjulkagarak” State Sanctuary. Here *Pinus kochiana* usually completely dominates, which can be joined in small quantities by *Quercus macranthera, Sorbus aucuparia, Populus tremula, Fagus orientalis*. The undergrowth is usually almost undeveloped; species of *Rosa, Crataegus*, and *Rubus* are occasionally found in it. The habitats are included in Resolution 4 of the Berne Convention.

Figure 31: Pine forest

Protected Areas

116. The north portal of tunnel is located just within the boundaries of the Gyulagarak Pine State Sanctuary as can be seen on the figures below. MOE has confirmed (Appendix J) that the north portal of tunnel lies just within the boundaries of the Gulagarak Pine State Sanctuary. The sanctuary (IUCN management category IV) was established in 1958 with the aim of protection of the natural pine forests. No special status fauna appears to be present in the sanctuary. A number of national red book species of flora can however be found in the sanctuary. The Sanctuary is located on Northern slopes of Bazum Mountain Range surrounding Lori Mount from North, in Lori Marz of Northern Armenia. It is located in former Stepanavan Region of RA Lori Marz at the elevations ranging from 1400 to 1900 m. The Sanctuary is located in forest plot named “Mec Sochut”, at 4 km distance from Gyulagarak community.

117. The Sanctuary has a status of State Sanctuary according to the RA Law on Specially Protected Nature Areas (2006). It meets the requirements of the International Union for Conservation of Nature (IUCN) IV category (protection through active management of species and their habitats). The main objective of the Sanctuary is provision of conservation, protection, regeneration, reproduction and sustainable use of landscape and biological diversity of relict pine forests of Bazum Mountain Range in Northern Armenia. The main conservation object of the Sanctuary is Pinus kochiana forest, as well as species registered in the Red Book of Armenia, such as Acer trautvetteri, Platanthera chlorantha.

118. The Sanctuary area stands out for its rich biological diversity conditioned by strictly expressed vertical zonation, climate conditions and relief peculiarities. The main forest forming species are beech, oak, hornbeam and pine. The accompanying species are ash, lime maple, mountain ash and others. They form mixed stands with beech and oak and occasionally also small clean stands. Natural pine stand of around 125 ha is also located within Gyulagarak Sanctuary, neighbouring the arboretum where 400 tree and bush species grow. The most common shrubs are hawthorn (Grataegus orientalis), raspberry (Rubus), rose (Rosa canina), and rarely- euonymus (Euonymus gen.), dewberry (Rubus caesius), Cornelian cherry (Cornus mas). In the middle and upper forest zone wild apple and pear are

frequently observed. From herbs Campanula glomerata, Myosotis alpestris, Lotus caucasicus, Trifolium ambiguum, Elytrigia trichophora, Koeleria cristata can be found.

119. From mammal species wolf, fox, rabbit, marten, hedgehog, squirrel and others are observed in the area, from birds Northern Goshawk, wild duck, partridge, quail, pecker and others are known. There are many insects in the area, such as grasshoppers, crickets, and others.

120. The total forest covered area in the enterprise is 5674,9 ha (85, 4%), including 1231,6 ha forest cultures (21, 7%). Non-forest covered area is 298,3 ha (0, 5%), including 347,7 ha sparsely stocked areas, including 109 ha of anthropogenic origin and 238,7 ha of biological origin. Total non-forest area is 280,5 ha (4, 2%), including 220,6 ha pastures. The small area of pastures is due to transferring these areas within the administrative boundaries of the communities to community ownership by respective RA Government Decrees. The total area of the forests of protection significance comprises 49,9% of the total area (3325 ha), including 3208,8 ha (96.8%) forest lands, of which 2743,9 ha (82,8%) is forest covered including 952,9 ha forest cultures.[3]

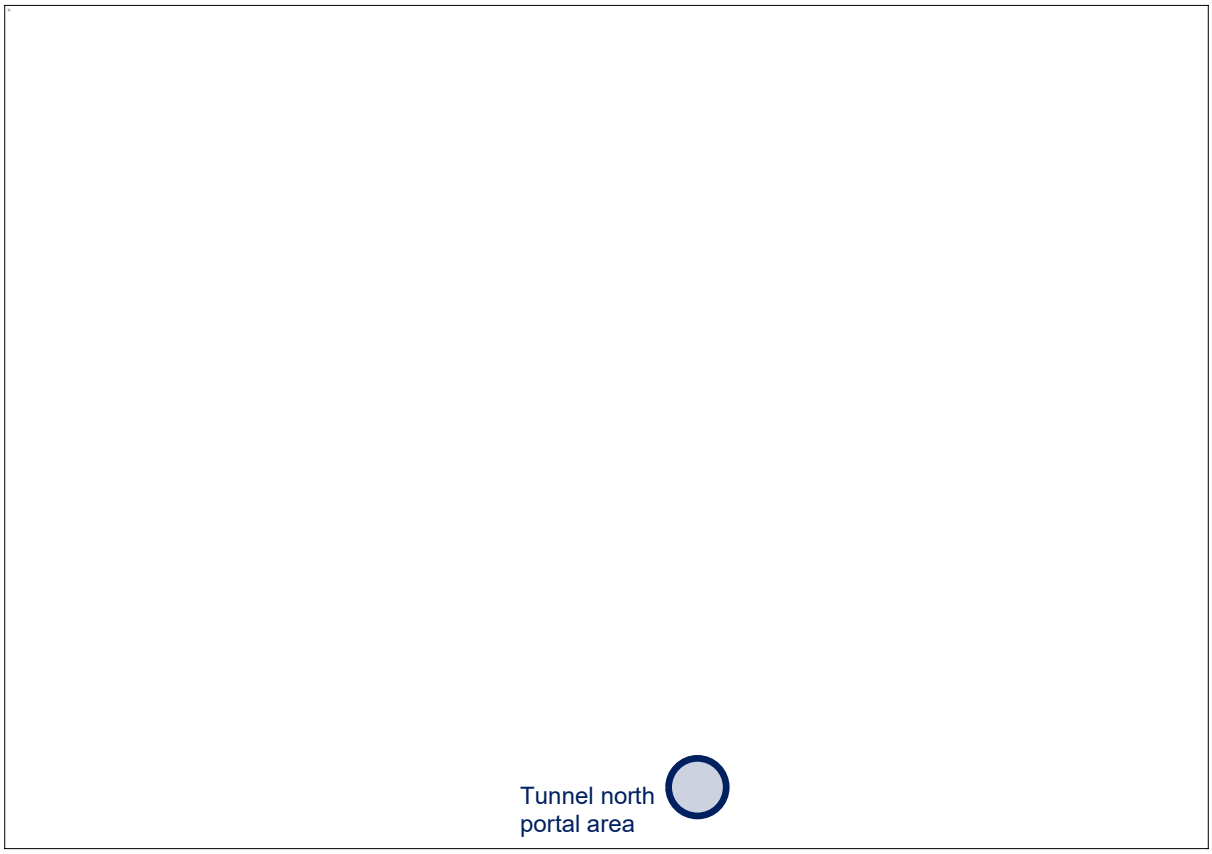


Figure 32: Boundaries of "Gyulagarak Pine State Sanctuary" on the Forest Enterprise Map [4]

[3] "Gyulagarak Pine" State Sanctuary Management Plan Structural Model (concept) Draft February, 2011. WWF Armenia
[4] Draft structural model of "Gyulagarak Pine" State Sanctuary management plan prepared by WWF Armenia: https://fleg1.enpi-fleg.org/fileadmin/ufs/04.%20Program%20Information/4.02%20Program%20Components/4.02.01%20General/4.02.01.Armenia/Gyulagarak_MP_eng-1.pdf retrieved 06.02.2024

Figure 33: Boundaries of "Gyulagarak Pine State Sanctuary" in relation to the tunnel north portal as shown in Google Earth

121. Further north is "Tashir" Important Bird Area (IBA) / Key Biodiversity Area (KBA). In the south of the Marz is the Important Bird Area " Pambak" and "Desgh". Since these areas are located at substantially far distances from the tunnel entrances, it can be assumed that the tunnel rehabilitation activities will not disrupt the viability of any of the ecosystems present or cause damage to the wildlife populations present in these areas. More importantly, the Alliance for Zero Extinction (AZE) site Dsegh - Haghartsin - Pombak chain and Dilijan National Park can be found where the endangered Armenian birch mouse can be found. The AZE is however more than 10km from the tunnel portal.

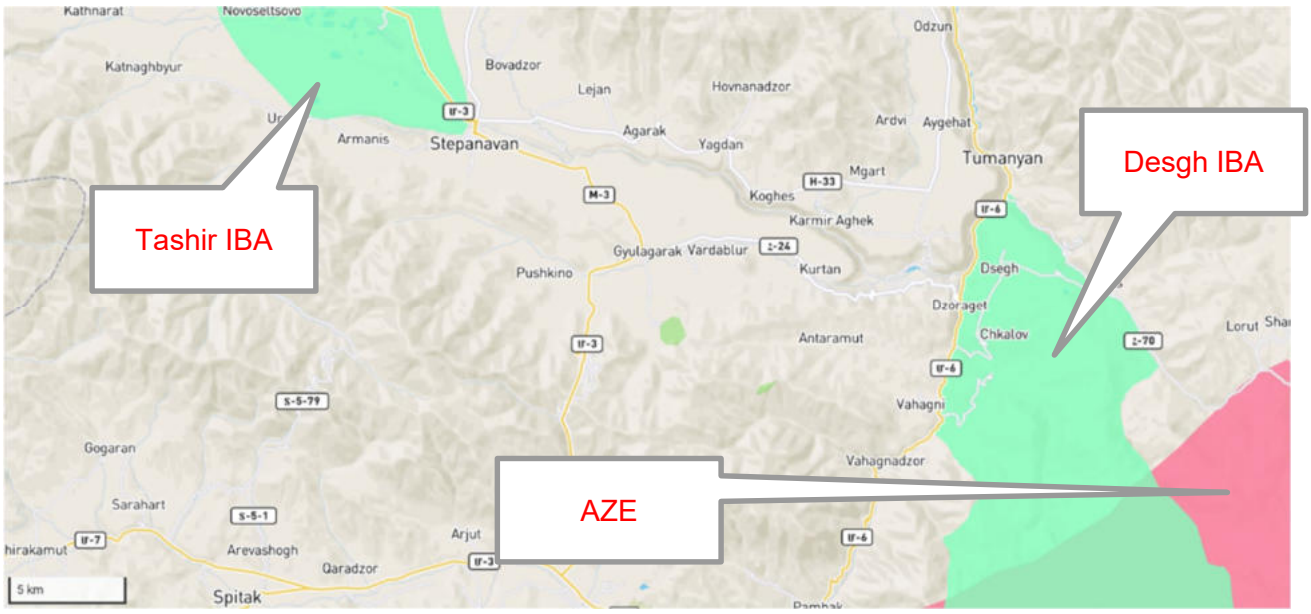


Figure 34: KBAs and IBAs (source: IBAT)

Fauna

122. A wide variety of ecosystems within Marz support a high diversity of bird species in the area. Passerine birds such as redstarts, flycatchers, tits and alike predominate in wooded areas with well-

developed undergrowth. Different species of pigeons, thrushes, woodpeckers occur both in dense mature forests and in small residual open woodlands growing along shallow ravines. Woodland areas also harbor a variety of both diurnal and nocturnal birds of prey. Goshawk, Sparrowhawk, Honey and Common Buzzard, Long-eared Owls are common in the forests of Lori. The mountain-steppe landscapes in the region, supporting both ground- and shrub-nesting species are also teeming with life here. Larks, wheatears, wagtails, various shrikes thrive abundantly here building nests in shrubs and on the ground just under the herbaceous growth. Almost all members of the grouse family inhabit the mountains of the Marz. The Caspian snowcock up in the highlands, the Caucasian grouse at the upper tree line in subalpine areas, Gray partridge and Common Quail are abundant in meadows and mountain steppes. Species such as Long-legged Buzzard, Common Kestrel, the endangered Vultures, Golden Eagle and Peregrine Falcon nest in rocky outcrops of mountains and in river gorges. Small lakes and swampy areas support the many species of waterbird fauna both breeding and migratory, including herons, geese, ducks, and waders passing through the Marz. During the autumn and spring migration, large birds of prey and both species of endangered cranes are seen soaring high in the sky throughout the Marz.

123. Mammals living within the boundaries of Lori Marz include most of the bird families found throughout the territory of Armenia. Among the large predators, bears are found across wooded areas and high-mountain regions. Wild boars and roe deer are also common. Lynx, Stone marten and Badger are found in both forested and mountain-steppe regions. Wolves, foxes, and hares are common across almost all landscape zones, ranging from high mountains to the lowest plateaus. Jackals, which have become widespread in recent times throughout the country, are mainly found in river valleys and wetland areas, frequently venturing into inhabited areas. And of course, small members of the animal world, insectivores and rodents are also widely distributed. The Four-toed Hedgehog and Forest dormouse are found both in small tree plantations and in fruit orchards. The Persian Squirrel is an abundant in the forests of the Marz. Ural field mouse, Major's pine vole and Common vole are widespread in across many habitats in the Marz. The Gray dwarf hamster is a permanent resident in populated areas. At dusk and during night hours in the mid-altitude areas of the marz and in some settlements, one can encounter several species of bats hunting nocturnal insects. One such species is the Brown Long-eared Bat listed in the Red Data Book of Armenia.

Birds

124. Table 6 shows the checklist of bird species likely to occur in the areas around the southern and northern entrances of the Pushkin Tunnel.

	Armenian name	English name	Scientific name	South	North	IUCN, RB
	Ciconiidae					
1	Սև արագիլ	Black Stork	Ciconia nigra	M	M	**RB**
2	Սպիտակ արագիլ	White Stork	Ciconia ciconia	M	M	
	Accipitridae					
3	Կրետակեր	European Honey-buzzard	Pernis apivorus	Br?	Br	
4	Սև ցին	Black Kite	Milvus migrans	S	M	
5	Մորուքավոր անգղ	Lammergeier	Gypaetus barbatus	S	S	**NT, RB**

	Armenian name	English name	Scientific name	South	North	IUCN, RB
6	**Գիշանգղ**	**Egyptian Vulture**	**Neophron percnopterus**	**Br?**	**S**	**EN, RB**
7	Սպիտակագլուխ անգղ	Griffon Vulture	Gyps fulvus	S	?	**RB**
8	Օձակեր արծիվ	Short-toed Snake-eagle	Circaetus gallicus	S	Br?	**RB**
9	Դաշտային մկնաճուռակ	Hen Harrier	Circus cyaneus	M	M	
10	Տափաստանային մկնաճուռակ	Pallid Harrier	Circus macrourus	M	M	**NT, RB**
11	Մարգագետնային մկնաճուռակ	Montagu's Harrier	Circus pygargus	S	S	**RB**
12	Ցախաքլորառոս	Northern Goshawk	Accipiter gentilis	S	Br?	**RB**
13	Լորաճուռակ	Eurasian Sparrowhawk	Accipiter nisus	Br	Br	
14	Սովորական ճուռակ	Eurasian Buzzard	Buteo buteo	S	Br	
15	Տափաստանային ճուռակ	Long-legged Buzzard	Buteo rufinus	S	S	
16	Թավշատ ճուռակ	Rough-legged Buzzard	Buteo lagopus	W	W	
17	Փոքր ենթարծիվ	Lesser Spotted Eagle	Clanga pomarina	S	Br	**RB**
18	Մեծ ենթարծիվ	Greater Spotted Eagle	Clanga clanga	M	M	**VU, RB**
19	**Տափաստանային արծիվ**	**Steppe Eagle**	**Aquila nipalensis**	**M**	**M**	**EN, RB**
20	Գերեզմանաարծիվ	Eastern Imperial Eagle	Aquila heliaca	M	M	**VU, RB**
21	Քարարծիվ	Golden Eagle	Aquila chrysaetos	S	M	**RB**
	Falconidae					
22	Տափաստանային հողմավար բազե	Lesser Kestrel	Falco naumanni	M	M	**RB**
23	Սովորական հողմավար բազե	Common Kestrel	Falco tinnunculus	Br	Br?	
24	Աղավնաբազե	Merlin	Falco columbarius	W	W	**RB**
25	Սապսան	Peregrine Falcon	Falco peregrinus	S	S	**RB**
	Phasianidae					
26	Կովկասյան մայրեհավ	Caucasian Grouse	Lyrurus mlokosiewiczi	S	Br?	**NT, RB**
27	Մոխրագույն կաքավ	Grey Partridge	Perdix perdix	Br	Br?	
28	Լոր	Common Quail	Coturnix coturnix	Br	Br	

	Armenian name	English name	Scientific name	South	North	IUCN, RB
	Rallidae					
29	Մարգահավ	Corncrake	Crex crex	M	M	**RB**
	Gruidae					
30	Մոխրագույն կռունկ	Common Crane	Grus grus	M	M	**RB**
31	Գեղանի կռունկ	Demoiselle Crane	Anthropoides virgo	M	M	**RB**
	Laridae					
32	Սովորական որոր	Black-headed Gull	Larus ridibundus	M	M	
33	Սևագլուխ քրքջան	Pallas's Gull	Larus ichthyaetus	M	M	
34	Հայկական որոր	Armenian Gull	Larus armenicus	M	M	**RB**
35	Գետային ջրածիծառ	Common Tern	Sterna hirundo	M	M	
36	Սպիտակաայտ ջրածիծառ	Whiskered Tern	Chlidonias hybrida	M	M	**RB**
37	Սպիտակաթև ջրածիծառ	White-winged Tern	Chlidonias leucopterus	M	M	
	Columbidae					
38	Թխակապույտ աղավնի	Rock Pigeon	Columba livia	Br	Br?	
39	Անտառային աղավնի	Common Woodpigeon	Columba palumbus	S	Br	
40	Սովորական տատրակ	European Turtle-dove	Streptopelia turtur	S	Br	**VU**
	Cuculidae					
41	Սովորական կկու	Common Cuckoo	Cuculus canorus	Br	?	
	Strigidae					
42	Բվեճ	Eurasian Eagle-owl	Bubo bubo	Br	S	**RB**
43	Տնային բվիկ	Little Owl	Athene noctua	Br	Br?	
	Apodidae					
44	Սև մանգաղաթև	Common Swift	Apus apus	S	S	
	Meropidae					
45	Ոսկեգույն մեղվակեր	European Bee-eater	Merops apiaster	Br	S	
	Coraciidae					
46	Ներկարար	European Roller	Coracias garrulus	Br	S	**NT, RB**
	Upupidae					
47	Հոպոպ	Eurasian Hoopoe	Upupa epops	Br	S	
	Picidae					

	Armenian name	English name	Scientific name	South	North	IUCN, RB
48	Խայտաբղետ փայտփոր	Great Spotted Woodpecker	Dendrocopos major	S	Br	
	Alaudidae					
49	Անտառային արտույտ	Wood Lark	Lullula arborea	Br	Br	
50	Դաշտային արտույտ	Eurasian Skylark	Alauda arvensis	Br	Br?	
51	Եղջրավոր արտույտ	Horned Lark	Eremophila alpestris	S	S	
	Hirundinidae					
52	Գյուղական ծիծեռնակ	Barn Swallow	Hirundo rustica	Br	S	
53	Քաղաքային ծիծեռնակ	Northern House-martin	Delichon urbicum	M	M	
	Motacillidae					
54	Դաշտային ձիուկ	Tawny Pipit	Anthus campestris	S	?	
55	Անտառային ձիուկ	Tree Pipit	Anthus trivialis	S	S	
56	Մարգագետնային ձիուկ	Meadow Pipit	Anthus pratensis	Br	S	
57	Լեռնային ձիուկ	Water Pipit	Anthus spinoletta	S	S	
58	Դեղին խաղտտնիկ	Yellow Wagtail	Motacilla flava	Br	S	
59	Լեռնային խաղտտնիկ	Grey Wagtail	Motacilla cinerea	Br?	S	
60	Սպիտակ խաղտտնիկ	White Wagtail	Motacilla alba	Br	Br	
	Troglodytidae					
61	Եղնջաթռչնակ	Winter Wren	Troglodytes troglodytes	Br	Br	
	Muscicapidae					
62	Արշալուսիկ	European Robin	Erithacus rubecula	S	Br	
63	Սևուկ կարմրատուտ	Black Redstart	Phoenicurus ochruros	Br	Br	
64	Սովորական կարմրատուտ	Common Redstart	Phoenicurus phoenicurus	S	Br	
65	Մարգագետնային չքչքան	Whinchat	Saxicola rubetra	Br	?	
66	Սևագլուխ չքչքան	Common Stonechat	Saxicola torquatus	Br	Br	
67	Սովորական քարաթռչնակ	Northern Wheatear	Oenanthe oenanthe	Br	?	
	Turdidae					
68	Սև կեռնեխ	Eurasian Blackbird	Turdus merula	Br	Br	

	Armenian name	English name	Scientific name	South	North	IUCN, RB
69	Սոսնձակեռնեխ	Mistle Thrush	Turdus viscivorus	S	Br	
	Sylviidae					
70	Մոխրագույն շահրիկ	Common Whitethroat	Sylvia communis	Br	S	
71	Կովկասյան գեղգեղիկ	Mountain Chiffchaff	Phylloscopus sindianus	Br	M	
72	Ծնկլտան գեղգեղիկ	Common Chiffchaff	Phylloscopus collybita	M	M	
73	Գարնանային գեղգեղիկ	Willow Warbler	Phylloscopus trochilus	M	M	
	Reguliidae					
74	Դեղնագլուխ արքայիկ	Goldcrest	Regulus regulus	W	W	
	Muscicapidae					
75	Մոխրագույն ճանճորս	Spotted Flycatcher	Muscicapa striata	Br	Br	
76	Կիսասպիտակավիզ ճանճորս	Semi-collared Flycatcher	Ficedula semitorquata	S	Br	**NT, RB**
	Paridae					
77	Երկնագույն երաշտահավ	Blue Tit	Cyanistes caeruleus	Br	?	
78	Մեծ երաշտահավ	Great Tit	Parus major	S	Br	
	Laniidae					
79	Ժուլան	Red-backed Shrike	Lanius collurio	Br	Br	
80	Սևաճակատ շամփրուկ	Lesser Grey Shrike	Lanius minor	Br	Br?	
	Corvidae					
81	Անտառային կաչաղակ	Eurasian Jay	Garrulus glandarius	Br?	Br	
82	Սովորական կաչաղակ	Black-billed Magpie	Pica pica	Br	S	
83	Սովորական ճայ	Eurasian Jackdaw	Corvus monedula	M	M	
84	Սերմնաքաղ	Rook	Corvus frugilegus	M	M	
85	Մոխրագույն ագռավ	Hooded Crow	Corvus corone	S	S	
86	Սև ագռավ	Common Raven	Corvus corax	S	S	
	Sturnidae					
87	Սովորական սարյակ	Common Starling	Sturnus vulgaris	Br	?	
	Passeridae					

	Armenian name	English name	Scientific name	South	North	IUCN, RB
88	Տնային ճնճղուկ	House Sparrow	Passer domesticus	Br	Br	
89	Ամուրիկ	Eurasian Chaffinch	Fringilla coelebs	S	Br	
90	Սովորական սերինոս	Brambling	Fringilla montifringilla	W	W	
91	Կանաչ սերինոս	European Greenfinch	Carduelis chloris	S	Br	
92	Կարմրակատար	European Goldfinch	Carduelis carduelis	Br	S	
93	Կանեփնուկ	Eurasian Linnet	Carduelis cannabina	Br	Br	
94	Լեռնային վշասարեկ	Twite	Carduelis flavirostris	Br	M	
95	Եղևնու խաչկտուց	Red Crossbill	Loxia curvirostra	?	Br	**RB**
96	Սովորական ոսպնուկ	Common Rosefinch	Carpodacus erythrinus	Br	S	
	Emberizidae					
97	Սովորական դրախտապան	Yellowhammer	Emberiza citrinella	W	M	
98	Լեռնային դրախտապան	Rock Bunting	Emberiza cia	Br	S	
99	Կորեկնուկ	Corn Bunting	Miliaria calandra	Br	Br	

Table 6: Bird species likely to occur the Project area

South = southern entrance of the tunnel
North = northern entrance of the tunnel
Br = Breeding
Br? = Probable breeding
? = Likely to occur
S = species that are regularly seen in the area, or visit occasionally in search of food or are rare visitors
M = migrant
W = winter visitor
IUCN = IUCN Red List
RB = Red Data Book of Armenia

125. According to Table 6, a total of 99 bird species from 29 families can be observed in the vicinity of the southern and northern tunnel entrances and their immediate surroundings. Passerines are the dominant group at both southern and northern entrances, with the highest number of nesting birds found near the tunnel entrances. Raptors are the second most abundant group, however despite their high species diversity the nesting population of raptors in these areas is relatively low. The group of breeding and potentially breeding (probable breeders) species on both sides of the tunnel is nearly equal, but their species composition is somewhat different. Ground- and shrub-nesting birds predominate in the outskirts of the southern entrance, while tree-nesting species and those using the tree understory prevail near the northern side of the tunnel. Also, the diversity of bird species which do not nest in the area but are regularly or periodically seen at both sides of the tunnel differ both in the number and the species composition. Their numbers prevail at the southern side of the tunnel over those at the northern side. There are 29 species of birds recorded at the southern entrance of the

tunnel and only 24 species observed on the northern side. The difference in numbers and species composition is explained by variations in habitat landscapes on the northern and southern sides of the tunnel. Birds of prey and species which require more open spaces for search for food are found mainly on the southern side, while the forested northern slopes make it difficult for them to forage. The group of migratory birds are identical in numbers and species composition, which is explained by their passage over the ridge during the spring and autumn migrations. Raptors are the dominating group among migrant birds, with six species of Laridae crossing the ridge during their stopover or passage across the territory of the country. Wintering birds are lowest in number in this area which is due to harsh winter conditions on the southern side of the tunnel and the overall low number of birds wintering in the forest zone both in this region and elsewhere in the country.

126. 9 bird species are listed in the IUCN Red List and 26 species are included in the Red Data Book of Armenia. As shown in Table 6, these species primarily include birds which migrate across the ridge, mainly large size eagles or species visiting the area occasionally in search of food such as Griffon Vulture, Bearded Vulture and Golden Eagle. Rare species nesting directly in the vicinity of both sides of the tunnel include Eurasian Eagle-owl. Semi-collared Flycatcher nests on the northern side and the European Roller on the southern side of the tunnel. No impacts on the species are anticipated due to the tunnel construction work and there are no nesting sites known in the Project area.

Mammals

127. Table 7 shows the checklist of mammals likely to occur in the vicinities of the southern and northern entrances of the Pushkin Tunnel.

No	Scientific name	Armenian Name	English name	South	North	IUCN RB
	Erinacedae					
1.	Erinaceus concolor	Սպիտակափոր ոզնի	Southern white-breasted hedgehog	+	+	
	Talpidae					
2.	Talpa levantis	Փոքր խլուրդ	Levant mole	-	+	
	Soricidae					
3.	Crocidura gueldenstaedtii	Կովկասյան երկարագի սպիտակատամ	Gueldenstaedt's shrew	+	-	
4.	Crocidura leucodon	Սպիտակափոր սպիտակատամ	Bicolored shrew or bicoloured	+	-	
5.	Sorex minutus	Փոքր գորշատամ	Eurasian pygmy shrew	+	+	
	Vespertilionidae					
6.	Myotis blythi	Սրականջ գիշերաչղջիկ	Lesser mouse-eared bat	+	+	
7.	Myotis mystacinus	Բեղավոր գիշերաչղջիկ	Whiskered bat	+	-	

No	Scientific name	Armenian Name	English name	South	North	IUCN RB
8.	Plecotus auritus	Գորշ ականջեղ չղջիկ	Brown long-eared bat	+	+	RB
	Leporidae					
9.	Lepus europaeus	Նապաստակ	European hare	+	+	
	Cervidae					
10.	Capreolus capreolus	Այծյամ եվրոպական	Roe deer	-	+	
	Suidae					
11.	Sus scrofa	Վայրի խոզ	Wild boar	-	+	
	Mustelidae					
12.	Martes foina	Քարակզաքիս	Beech marten	+	+	
13.	Mustela nivalis	Աքիս	Least weasel	+	+	
14.	Meles meles	Գորշուկ	European badger	+	-	
	Ursidae					
15.	Ursus arctos	Գորշ արջ	Brown Bear	-	+	RB
	Canidae					
16.	Canis lupus	Գայլ	Gray wolf	+	+	
17.	Canis aureus	Չախկալ, սովորական շնագայլ	Jackal, Golden jackal	+	-	
18.	Vulpes vulpes	Սովորական աղվես	Fox	+	+	
	Felidae					
19.	Felis silvestris	Անտառային կատու	Wild cat	+	+	RB
20.	Lynx lynx	Կովկասյան լուսան	Caucasian lynx	-	+	
	Sciuridae					
21.	Sciurus anomalus	Կովկասյան կամ պարսկական սկյուռ	Caucasian or Persian squirrel	-	+	

No	Scientific name	Armenian Name	English name	South	North	IUCN RB
	Gliridae					
22.	Myoxus glis	Մեծ քնամոլ (պոլչոկ)	Edible dormouse	-	+	
23.	Dryomys nitedula	Անտառային քնամոլ (քնամուկ)	Forest dormouse	-	+	
	Cricetidae					
24.	Cricetulus migratorius	Գորշ համստերիկ	Gray dwarf hamster	+	+	
25.	Microtus daghestanicus	Դաղստանական դաշտամուկ	Dagestan pine vole	+	+	
26.	Microtus majori	Թփուտային դաշտամուկ	Major's pine vole	+	-	
27.	Microtus arvalis	Սովորական դաշտամուկ	Common vole	+	+	
	Muridae					
28.	Sylvaemus uralensis	Փոքր անտառային մուկ	Ural field mouse	+	+	
29.	Rattus norvegicus	Մոխրագույն առնետ	Brown rat	+	-	

Table 7: Mammals likely to occur in the Project area

South = southern entrance of the tunnel
North = northern entrance of the tunnel
IUCN = IUCN Red List
RB = Red Data Book of Armenia

128. As can be seen from Table 7, a total of 29 species of mammals from 15 families can be encountered on the southern and northern sides of the tunnel and their immediate proximities. The number of species observed at the southern and northern entrances is nearly identical, being 21 on the southern side and 22 on the northern side of the tunnel. However analyzing the research data it can be determined that the species diversity of animals inhabiting either sides of the tunnel is somewhat different. Species favoring more gentle hillsides with arid mountain steppe and meadows and low shrubbery growths and forested areas such as Bicolored shrew, Badger and Major's pine vole resort to the southern side of the tunnel. Northern sides of the tunnel are more abundant with species like Bear, Roe-deer, Wild Boar, Lynx, Persian squirrel, dormice, i.e., species which are mainly typical of forest habitats. Other species featured in the Table such as Wolf, Fox, Hare, Dagestan pine vole can be seen both on the northern and the southern sides of the tunnel. A total of 3 species of bats are known to occur on both sides of the tunnel, however their sightings inside the tunnel are less likely because of the persistent emission of exhaust gases.

129. Red-listed mammals are not documented here, however some species listed in the Red Data Book of Armenia may occur in the vicinities of both southern and northern entrances. These include Brown long-eared Bat and Wild Cat, as well as Brown Bear in areas adjoining the northern side of the Tunnel.

130. The biodiversity studies carried out for flora and fauna are enclosed with this report as Appendices B and C.

B. Physical Environment

Climate Characteristics

131. Lori has a humid continental, no dry season, warm summer climate. The yearly temperature is 7.32ºC and it is -3.08% lower than Armenia's average. Lori typically receives about 104 millimetres of precipitation and has 177.46 rainy days annually.

132. The valley of Dzoraget occupies the southeastern part of the Lori depression, the region of the lower reaches of Dzoraget with the adjacent plateaus. The climate of this sub-region is quite mild. The annual variation of air temperature is 21°C. Summer is cool with an average of 17°C. Winter is mild: the average temperature is -2 to 3 -degrees (Stepanavan, Gulagarak), the absolute minimum is -28 to -31°C. The duration of winter is 3-3.5 months. The frost-free period lasts 150-160 days. The annual atmospheric precipitation is quite abundant, about 700 mm. However, the height of the snow cover is insignificant. The average ten-day rainfall in January-February is 9-10 cm.

133. Winters in the Pambak Valley are mild, the average temperature in January is -4 to -5°C, and the minimum is -25 to -30°C. The snow cover is not stable and forms an insignificant layer. The average ten-day height in the Vanadzor region is 4-9 cm, the maximum is 24-38 cm, and in Lermontovo it is 16-19 cm and 74 cm, respectively.

134. Wind directions in the region are defined in the direction of the Pambak, Debed rivers and their tributary valleys. The average annual velocity ranges from 1.4 m/s (Shnogh) to 3.4 m/s (Spitak). The windiest part of the region is the Pushkin Pass, where southern winds prevail in the winter months and northern winds in the summer. The average annual speed here is quite high at 6.3 m/s, reaching 10.3 m/s in January. The maximum speed in the mountain pass is 43 m/s, and the gust is 53 m/s. Storms are often observed here. The number of cloudy days is significant.

135. Fog is often observed at the Pushkin Pass, with an annual average of 139 days and a maximum of 203 days. Thunderstorms are also common. The annual number of days with thunderstorms is 50-70 days, and the maximum is 108 days (in Tashir). Thunderstorms are sometimes accompanied by hail, causing great damage to agriculture.

Climate Change

136. Armenia's NC4 reports that it experienced an average temperature rise of 1.23°C between 1929–2016. This historical rise in temperatures has resulted in the rapid shrinking of the glaciers in Armenia's mountain regions, with spatial extents retreating at around 8 m per year. Trends suggest climate variability is increasing and in 2018, Yerevan experienced a new record July temperature, reaching 42°C. Armenia's NC4 reported a 10% reduction in average annual precipitation volume was documented over the period 1935–2012. The spatial distribution of precipitation changes is irregular: the northeast and central regions have become more arid. However, precipitation has increased in the southern and northwestern regions and in the western region of the Lake Sevan Basin. Additionally,

the number of days with heavy rainfall and hailstorms has increased. [5]

Ambient air quality

137. The Hydrometeorology and Monitoring Center monitors atmospheric air quality in Lori Marz in the cities of Vanadzor and Alaverdi with stationary active sampling and mobile passive sampling observatories. The assessment of atmospheric air quality is performed in comparison with the limit permissible concentrations of pollutants (MPC) approved by the RA Government's decision N 160-N of February 2, 2006. Observations of dust, sulphur dioxide and nitrogen dioxide are made in the city of Vanadzor. There are 3 fixed observation stations and 24 mobile observation stations in the city.

138. Ambient air quality monitoring has been completed at both tunnel portals, per the table below.

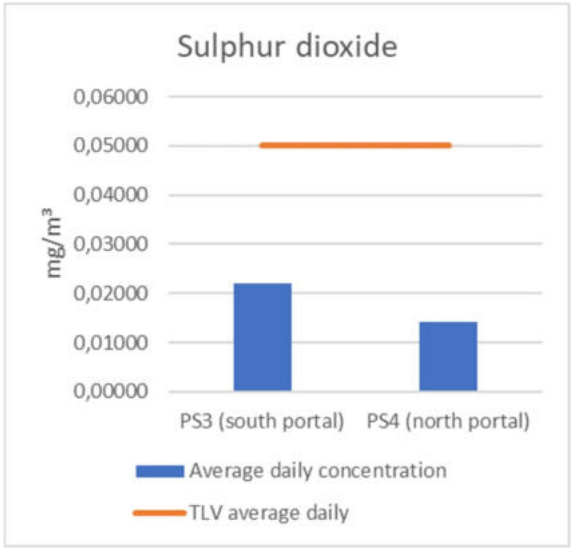
SURVEY	MEASUREMENT PARAMETERS	METHODS	LOCATION	REMARKS
Air quality 05-20.06.2024 25.06.2024	Measurement of ambient air quality (inorganic dust, SiO_2, soot, NO_2, SO_2, As, Cr). Consultation with officials from the Department of Public Health in the Ministry of Health and Sports regarding their air quality monitoring data and experiences with respect to the project area (Consultations also held with the Dep. of Meteorology and Hydrology) Name of sampling and research organization: "National Center for Disease Control and Prevention" "Reference Laboratory Center" branch of the Ministry of Health Testing laboratory of "Hydrometeorology	Air quality measurements were carried out by means of aspirator measurement. Sampling was carried out according to the limitation permitted concentrations of atmospheric air pollutants in residences (concentrations-LPC) and approval of the limit permissible norms of the content of harmful materials in the gas produced by motor vehicles operating in the territory of the Republic of Armenia. February 2, 2006, Decision N 160-Ա. NO_2, SO_2 sampling was done by passive sampling, for 15 days. Average daily concentrations were calculated in mg/m^3. Air quality samples	See Appendix D 50-60 m from the tunnel's southern and northern entrances, for inorganic dust, SiO_2, soot, As and Cr. Air sampling sites for NO_2 and SO_4 were done in 85 m from the Pushkin tunnel's southern entrance and 140 m from the Pushkin tunnel's north entrance.	As a result of the conducted air quality research, exceeding the permissible values in the following parameters was observed: • south entrance - dust, soot, Cr • north entrance - dust In general, the dust concentration exceeded the limit permissible concentration by 3.28 to 4.4 times at south entrance, and at the north entrance, it exceeds from 1.94 to 2.9 times. The concentration of soot exceeded the limit permissible concentration by 1.3 to 2 times at the south entrance. The concentration of Cr exceeded the limit permissible concentration by 1.05 to 1.23 times at the south entrance. Still, at the north entrance, the Cr concentration value is approximately equal to the limited permissible concentration. **The test locations and test reports are enclosed in Appendix D.**

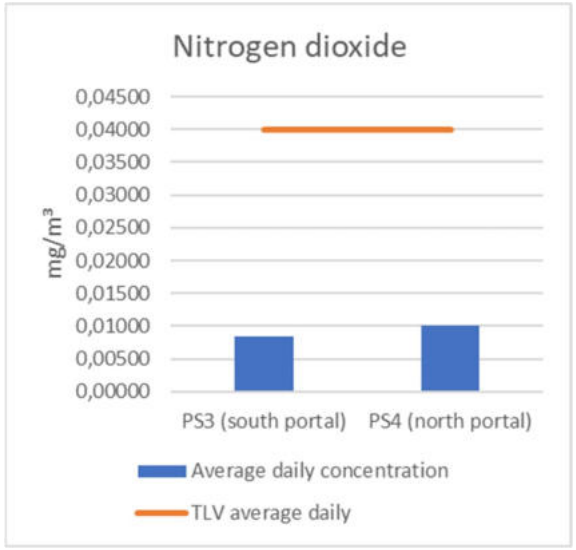
[5] https://climateknowledgeportal.worldbank.org/sites/default/files/2021-06/15765-WB_Armenia%20Country%20Profile-WEB.pdf

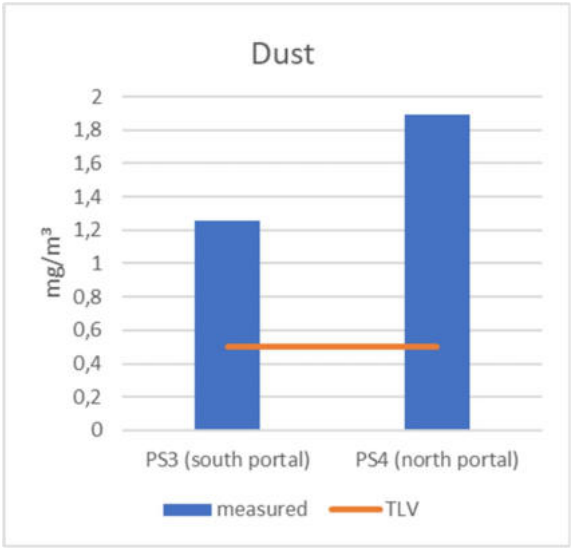
SURVEY	MEASUREMENT PARAMETERS	METHODS	LOCATION	REMARKS
	and Monitoring Center" SNCO of MoE of RA	were taken and analysed by the following parties Air sampling – Samples collected by Transproject CJSC and analysis undertaken by "Hydrometeorology and Monitoring Center" SNCO of MoE of RA (sampling taken at 4 locations)		

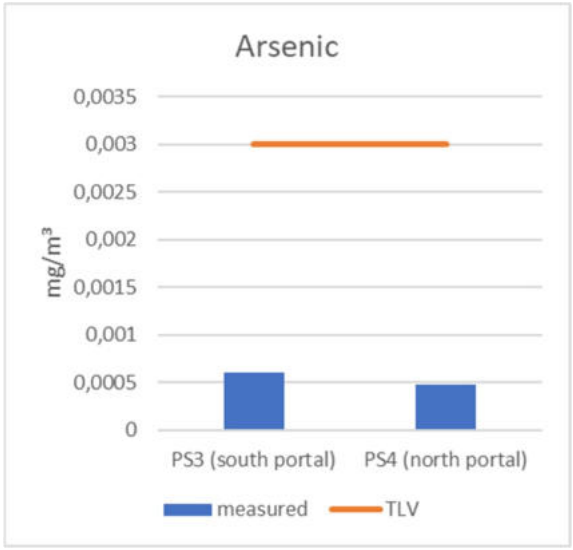
Table 8: Summary of ambient air quality monitoring

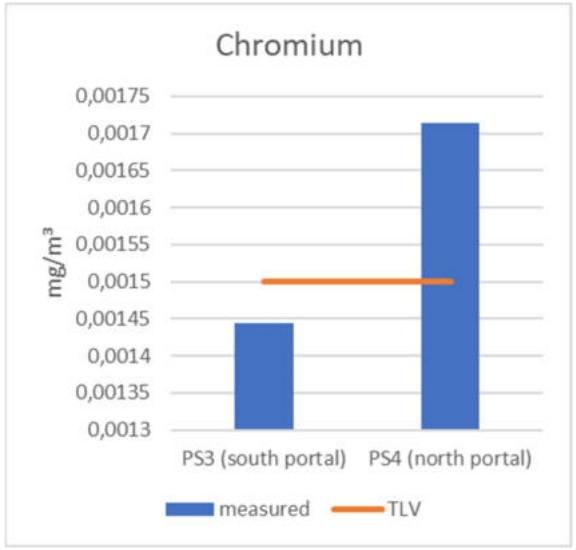
139. The measurements for air quality at tunnel portals are shown graphically below in comparison to Threshold Limit Values (TLVs). Dust concentrations exceed the TLV at all locations; chromium and soot exceed the TLV at the tunnel's south portal.

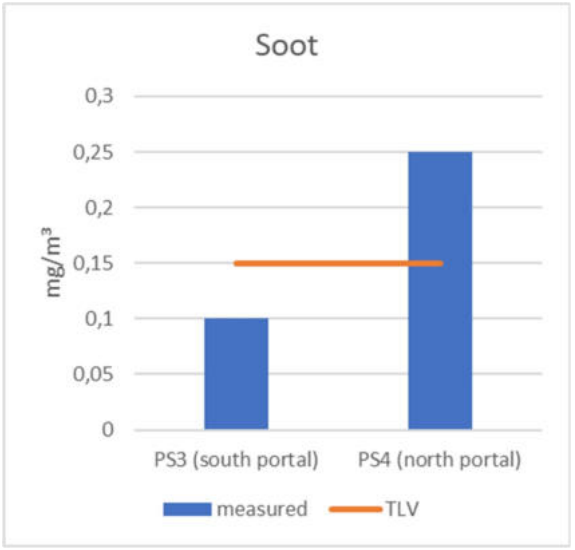

Sulphur dioxide
0,06000
0,05000
0,04000
0,03000
0,02000
0,01000
0,00000
mg/m³
PS3 (south portal)
PS4 (north portal)
Average daily concentration
TLV average daily


Nitrogen dioxide
0,04500
0,04000
0,03500
0,03000
0,02500
0,02000
0,01500
0,01000
0,00500
0,00000
mg/m³
PS3 (south portal)
PS4 (north portal)
Average daily concentration
TLV average daily


Dust
2
1,8
1,6
1,4
1,2
1
0,8
0,6
0,4
0,2
0
mg/m³
PS3 (south portal)
PS4 (north portal)
measured
TLV


Arsenic
0,0035
0,003
0,0025
0,002
0,0015
0,001
0,0005
0
mg/m³
PS3 (south portal)
PS4 (north portal)
measured
TLV


Chromium
0,00175
0,0017
0,00165
0,0016
0,00155
0,0015
0,00145
0,0014
0,00135
0,0013
mg/m³
PS3 (south portal)
PS4 (north portal)
measured
TLV


Soot
0,3
0,25
0,2
0,15
0,1
0,05
0
mg/m³
PS3 (south portal)
PS4 (north portal)
measured
TLV

Hydrology

140. Debed River Basin belongs to the Northern Watershed Management Area.

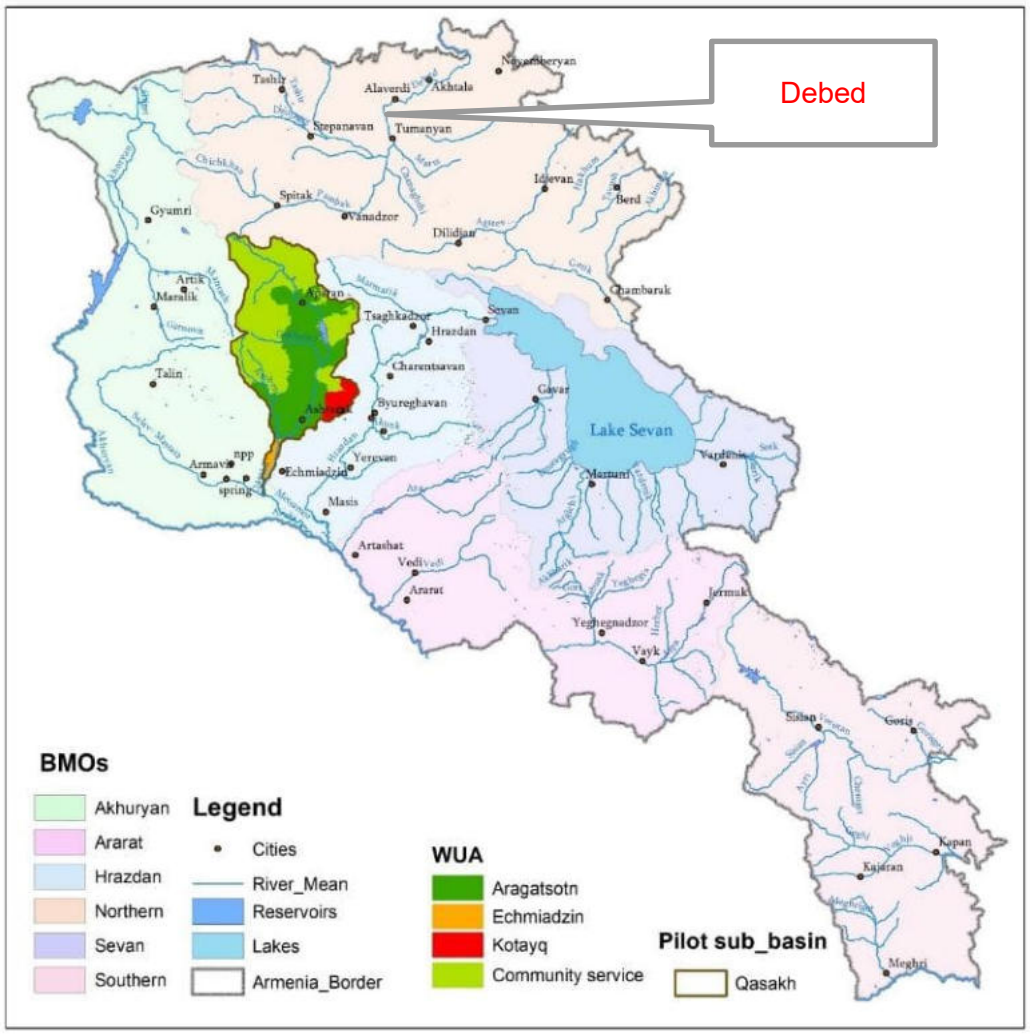


Figure 35: River basins in Armenia

141. The river is the main river of Lori region it is one of the largest rivers of the Republic of Armenia. The length of the river together with the Pambak tributary is 154 km, the catchment area is 3790 km². The biggest tributaries are Pambak and Dzoraget.

- ***Pambak River*** is the main tributary of the Debed River. The river originates from the Shirak Mountains at an altitude of 2100 m, it has a length of 84 km, the catchment area is 1370 km^2.
- ***Dzoraget River*** is the main tributary of the Debed River. The river originates from the Javakhq Mountains at an altitude of 2320 m, it has a length of 67 km, the catchment area is 1460 km^2.
- ***Gargar*** (or Gergerka) ***river*** is the right tributary of Dzoraget. It starts from the northeastern slopes of the Bazum mountain range, at an altitude of 2300 m. The length is 28 km, the catchment area is 129 km².

142. The Debed River has mixed feeding. The following stages are typical for the Debed River water regime: spring- high water, summer-autumn low water. On an annual basis over 32% of the flow runs during the flood season (from March to June), 27% rain flow, and 41% groundwater.

143. Spring floods usually begin in mid-March and continue until mid-June and have a well-expressed wave. The average duration is about 90-110 days, depending on the river feeding regime, air temperature, liquid precipitation in snow melting period, water reserve present in snow, conditions of formation and disappearance of stable snow cover. In the Debed basin, a stable snow cover is formed at the end of the second decade of December, and it disappears at the end of March or early April; the maximum thickness of snow cover is observed in late February or early March. Snow reserves take part in the freshets in the second decade of March and in some years, in the third decade of March.

144. The largest surface water body near the Pushkin tunnel area is the Gargar river, which originates from the northeastern slopes of the Bazum mountain range at an altitude of 2300 m. The length is 28 km, and the catchment area is 129 km². The river valley is V-shaped in the upper and middle reaches, and canyon-like in the lower reaches. It is one of the right-hand tributaries of Dzoraget. The flow is mixed, the overflow occurs in March-June, during which 62 % of the annual flow is formed. The average discharge over the year is 1.14 m³/s; the maximum is 75 m³/s; the flow is 36 million m³.

145. The other surface water body near the Pushkin Tunnel is the Bazum (or Chalari) River, which originates from the Pushkin Pass (2038 m), on the southern slopes of the Bazum Range and flows to the south and empties into the Pambak River. About 40 % of the river's water is used for irrigation.

146. Two more streams flow from the right and left sides of the northern entrance to the Pushkin tunnel, which merges 150-200 meters north of the tunnel entrance. However, they dry up in the absence of snowmelt and 10-15 days of rainfall.

As a result of the conducted research, the surface water bodies adjacent to the Pushkin tunnel, in accordance with the RA Government's decision N 75 of January 27, 2011, "Depending on the characteristics of the location, on determining the water quality standards of each watershed management area", the quality of water in the Bazum river was assessed as class I; and in the streams flowing from both sides of the northern entrance, class II according to iron and barium content and class III according to nitrate content.

147. The Hydrometeorology and Monitoring Center carries out quantitative and qualitative monitoring of surface waters. The ecological flow in 30 hydrological observation points of the "Hydrometeorology and Monitoring Center" operating and closed in the Northern RBD was calculated according to the 2018 regulation of the Government of the Republic of Armenia. of the requirements of the annex to the decision No. 57-N of January 25. There are no watercourses with calculated ecological flow in the immediate project area.

148. Water quality is characterized by 40-65 physicochemical indicators (main anions and cations, nutrients, heavy metals, primary organic pollutants), with a frequency of 5-12 times per year, in 17 sampling sites. The assessment of water quality is carried out in accordance with the 2011 Government of the Republic of Armenia to the decision N75-N of January 27.

149. The ground water resources of the Northern BRD are 27.1 m³/s or 854.7 million m³, of which the flow of springs is 3.67 m³/second or 115.8 million m³, the drainage flow is 14.6 m³/s or 459.5 million m³ and the deep flow is 6.3 m³/s or 198.7 million m³: The sources and drainage flows of the underground

water resources of the Northern BRD take part in the river flow, coming out to the surface. The Debed basin is relatively rich in underground water resources, where the underground water body of Pliocene fissured basalts is widespread.

150. The delineation of groundwater bodies (GWB) was implemented based on the approaches presented in EU WFD CIS Guidance Document N2. In the conditions of cut relief, the main part of groundwater is discharged to the surface of the earth in the form of concentrated (springs) and scattered, linear, drainage flow. For drinking water supply in the Debed river basin, mainly the waters of lacustrine formations formed in volcanic rocks and intermountain depressions are used.

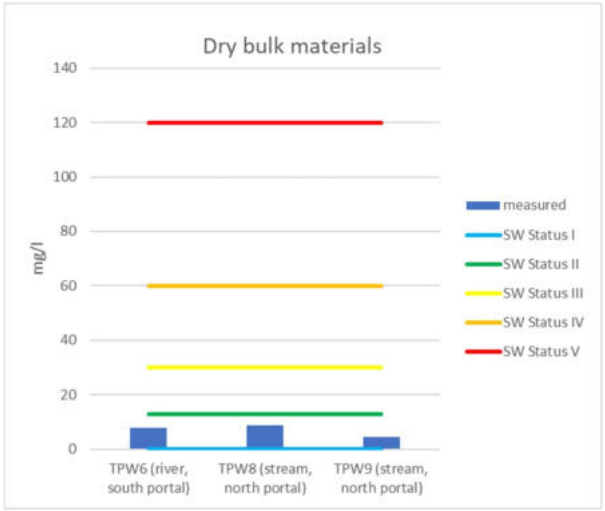
151. Baseline ground water and surface water sampling at locations within the project area have been completed. The following table summarizes the results.

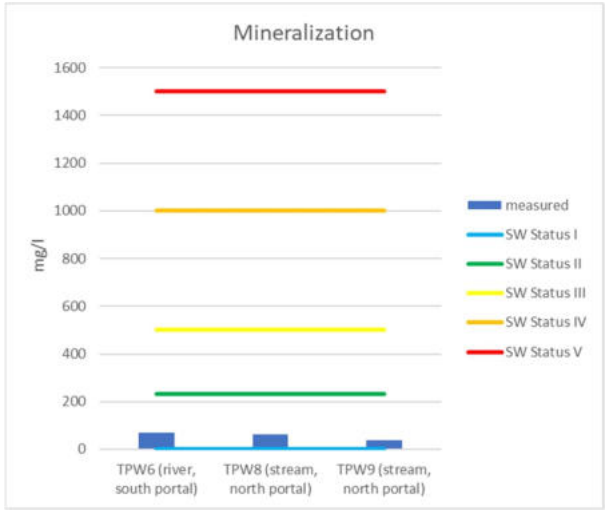
SURVEY	MEASUREMENT PARAMETERS	METHODS	LOCATION	REMARKS
Water Quality 05.06.2024 20.06.2024	Water quality Suspended solids, Mineralization, conductivity, TDS, pH, nitrate ion, sulphate ion, chloride ion, bromide ion, Li, Be, B, Na, Mg, Al, P (total), K, Ca, Ti, V, Cr, Fe, Mn, Co, Ni, Cu, Zn, As, Se, Sr, Mo, Cd, Sn, Sb, Ba, Pb and Petroleum products Name of sampling and research organization: "National Center for Disease Control and Prevention" "Reference Laboratory Center" branch of the Ministry of Health Testing laboratory of "Hydrometeorology and Monitoring Center" SNCO of MoE of RA	On site measurement of physical parameters and sample collection and laboratory analysis of chemical parameters Samples were taken and analysed by the following parties Water sampling – Samples collected by Transproject CJSC and analysis undertaken by "Hydrometeorology and Monitoring Center" SNCO of MoE of RA (sampling taken at 9 locations)	See Appendix E Bazum river, 170 m from Pushkin tunnel south entrance. Drinking water source, approximately 160 m from Pushkin tunnel south entrance. Stream, on the right side of Pushkin tunnel north entrance. Stream, on the left side of Pushkin tunnel north entrance.	The Bazum River originates from the area near the Pushkin Pass and flows to the south and empties into the Pambak River. A drinking water source emerges from the rock approximately 160 m from the Pushkin Tunnel south entrance. A memorial spring has been built near the area for easier access to water. Two streams are coming from both sides of Pushkin tunnel north entrance witch spill into each other approximately 180 meters from the entrance. These do not have a constant flow and in case of lack of precipitation, they dry up. The permissible limit concentrations of dangerous substances in surface waters are defined in accordance with "Depending on the characteristics of the location, on determining water quality assurance standards for each water basin management area" RA Government Decision N 75 dated January 27, 2011. The permissible limit concentrations of dangerous substances in drinking water are defined in accordance with "Drinking water: hygienic requirements for water quality of centralized water supply systems. Quality control" N 2-III-Ա 2-1 on approval of sanitary

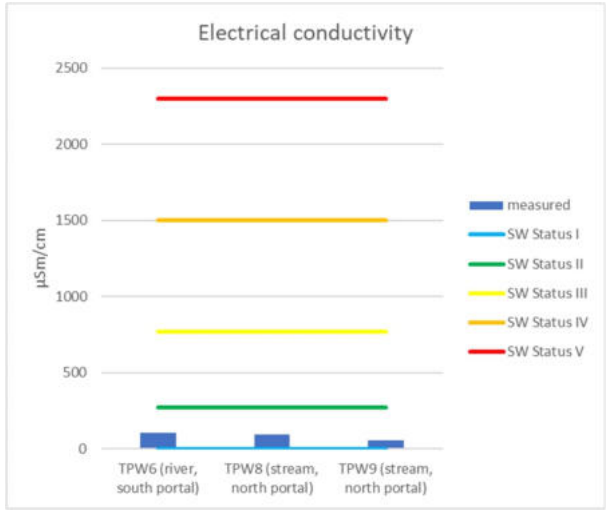
SURVEY	MEASUREMENT PARAMETERS	METHODS	LOCATION	REMARKS
				norms and rules RA Order of the Minister of Health N 876 dated December 25, 2002. As a result of the conducted rivers and drinking waters quality research, no exceedances of the permissible values were observed. Additional information - the results of some parameters of the drinking water source, approximately in 160 m from Pushkin tunnel south entrance, are higher than in rivers (mineralization, conductivity, sulphate ion, chloride ion, Na, Mg, Ca, Sr, Mo), however, they did not exceed the permissible values. Chemical composition analyses show that these waters do not contain dangerous amounts of toxic or hazardous substances that could have any negative effects later on. **The water test locations and test reports are enclosed in Appendix E.**

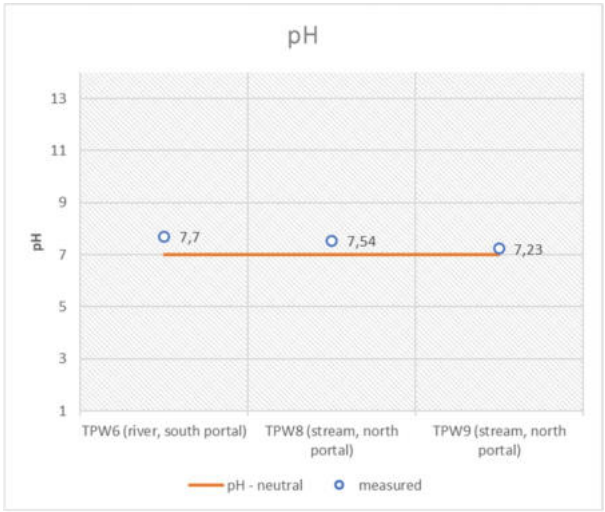
Table 9: Summary of water quality monitoring

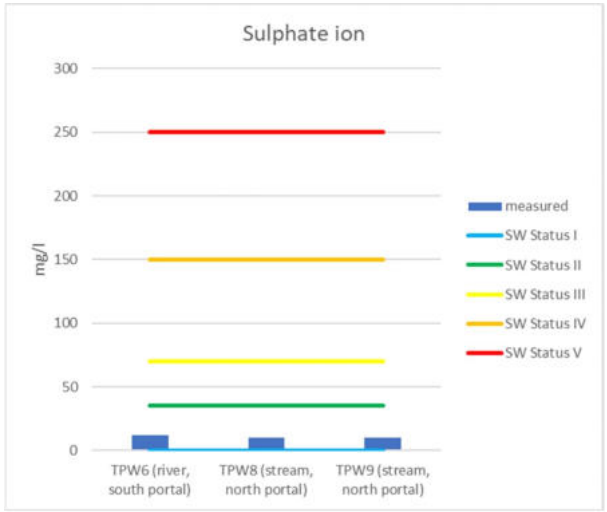
152. The measurements for surface water quality are shown graphically below in comparison to permissible limit concentrations (“SW Status” means status of surface water bodies). No exceedances of the permissible values were observed.

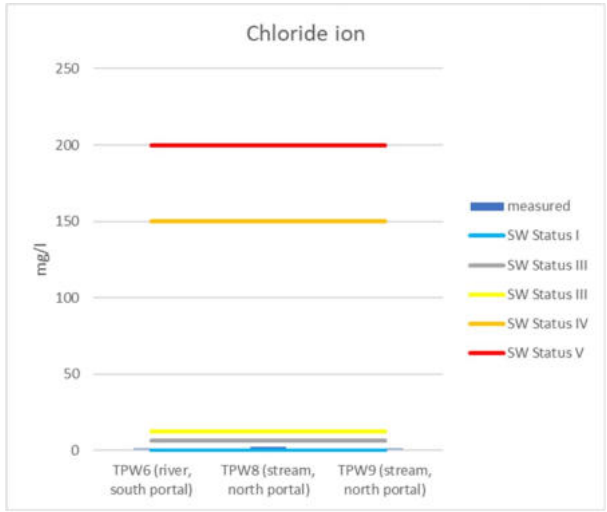

Dry bulk materials
mg/l
140
120
100
80
60
40
20
0
TPW6 (river, south portal)
TPW8 (stream, north portal)
TPW9 (stream, north portal)
measured
SW Status I
SW Status II
SW Status III
SW Status IV
SW Status V

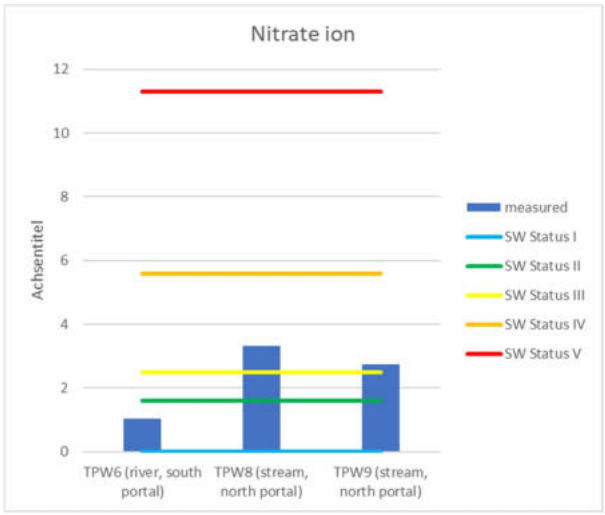

Mineralization
mg/l
1600
1400
1200
1000
800
600
400
200
0
TPW6 (river, south portal)
TPW8 (stream, north portal)
TPW9 (stream, north portal)
measured
SW Status I
SW Status II
SW Status III
SW Status IV
SW Status V

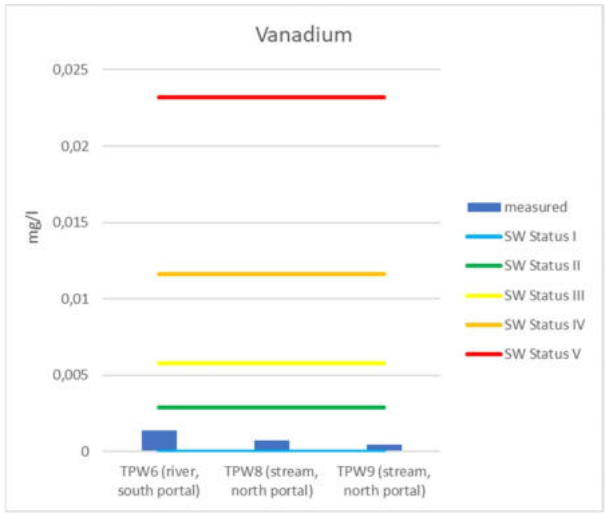

Electrical conductivity
µSm/cm
2500
2000
1500
1000
500
0
TPW6 (river, south portal)
TPW8 (stream, north portal)
TPW9 (stream, north portal)
measured
SW Status I
SW Status II
SW Status III
SW Status IV
SW Status V

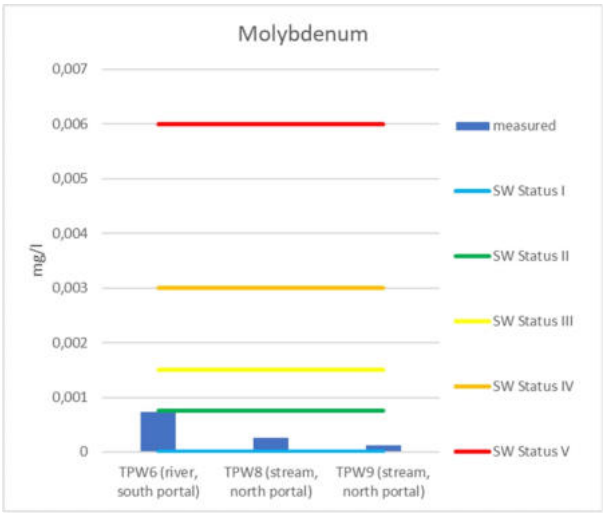

pH
pH
13
11
9
7
5
3
1
7,7
7,54
7,23
TPW6 (river, south portal)
TPW8 (stream, north portal)
TPW9 (stream, north portal)
pH - neutral
measured


Sulphate ion
mg/l
300
250
200
150
100
50
0
TPW6 (river, south portal)
TPW8 (stream, north portal)
TPW9 (stream, north portal)
measured
SW Status I
SW Status II
SW Status III
SW Status IV
SW Status V

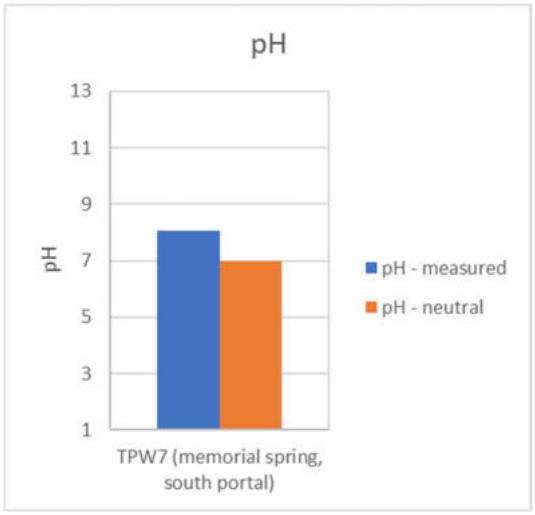

Chloride ion
mg/l
250
200
150
100
50
0
TPW6 (river, south portal)
TPW8 (stream, north portal)
TPW9 (stream, north portal)
measured
SW Status I
SW Status III
SW Status III
SW Status IV
SW Status V

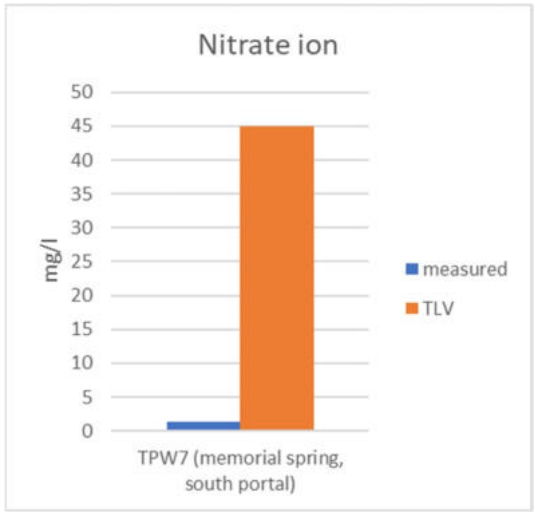


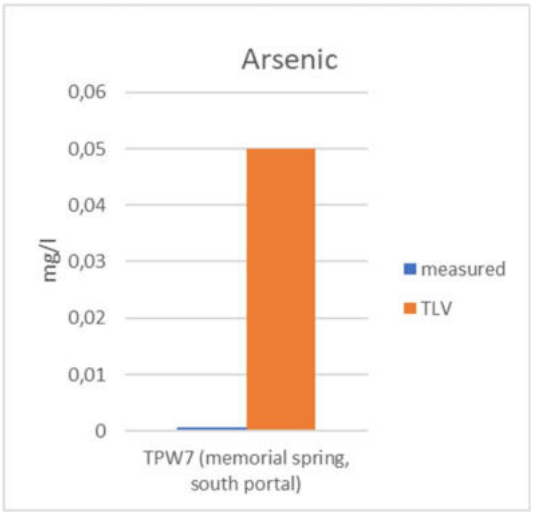




153. The measurements for drinking water quality for the memorial spring at the south portal are shown graphically below in comparison to permissible limit concentrations. The tested samples do not contain dangerous amounts of toxic or hazardous substances. In comparison to surface water measurements the concentration of nitrate is lower.







Noise, Vibration and Lighting

154. Baseline noise and vibration monitoring has been undertaken for the Project. The following table summarises the findings.

SURVEY	MEASUREMENT PARAMETERS	METHODS	LOCATION	REMARKS
Vibration 25.06.2024	Measuring the velocity of vibrations at emission point Name of research organization: "National Center for Disease Control and Prevention" "Reference Laboratory Center" branch of the Ministry of Health	Measurement using field equipment OKTABA-110A	50-70 m from Pushkin tunnel south entrance 50-70 m from Pushkin tunnel north entrance	The test reports are enclosed in **Appendix F**.
Noise 25.06.2024	Noise measurement of ambient noise level daytime Name of research organization: "National Center for Disease Control and Prevention" "Reference Laboratory Center" branch of the Ministry of Health	Measurement using field equipment OKTABA-110A Noise samples were taken and analysed by the following parties Noise sampling – Samples collected by the National Center for Disease Control and Prevention of the Ministry of Health and analysis completed within their Testing Laboratory	50-70 m from Pushkin tunnel south entrance 50-70 m from Pushkin tunnel north entrance	The main sources of noise are vehicles. The noise was measured at distances of 50-70 m from the tunnel's entrances. In most observation points, the noise exceeded even the maximum value equivalent to the one-hour permissible sound level in the commercial and industrial areas - 70 dB. The results are compared with - SN N2 III -11.3 Order of the RA Minister of Health[6] The test reports are enclosed in **Appendix G**.
Lighting 25.06.2024	Measurement of artificial illuminance and natural illuminance	Technical measuring tool Testo 540 Samples collected by the National Center for Disease Control and Prevention of the Ministry of Health	Measurements were carried out at 2 different sites from each tunnel portal: 0 and 25 m from the Pushkin tunnel south entrance 0 and 25 m from the Pushkin tunnel	Lighting levels very from 70 – 80 lx. The test reports are enclosed in **Appendix I**.

[6] The permissible sound levels are aligned with international best practices, including the IFC Guidelines on Noise Levels.

SURVEY	MEASUREMENT PARAMETERS	METHODS	LOCATION	REMARKS
		and analysis completed within their Testing Laboratory	north entrance	

Table 10: Summary of noise, vibration and lighting monitoring

Soils

155. Grey forest and brown mountainous soils as well as mountainous dark soils are prevailing in the area. Mountainous, grey forest soils are characterized by low segregation of genealogical horizons, medium ingestion, low intenseness and absence of lime in their composition. Brown mountainous soils are prevailing at the altitudes of up to 1700 m; they extent up to 2100m while on the slopes exposed to sun. These soils are characterised by low, in some areas by moderate segregation of horizons, high concentration of clay, moderate proportion of humus in the top layer, medium and higher level of ingestion, neutral or weak acid–base reaction. Mountainous dark soils are characterized by clear segregation of genealogical horizons, cloddy structure, powerful profile and high proportion on humus in the upper layers. Major parts of soils have small volume, high porosity and moisture-resistance.[7]

156. Soil Surveys have been completed at locations close to each tunnel portal. The following table summarises the survey process and findings

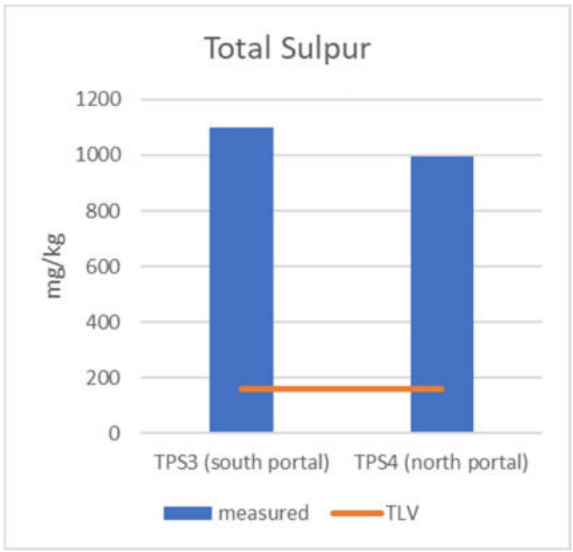
SURVEY	MEASUREMENT PARAMETERS	METHODS	LOCATION	REMARKS
Soil 19.06.2024	Soil quality Salinity, conductivity, pH, nitrate ion, sulphate ion, chloride ion, fluoride ion , bromide ion, phosphate ion, Li, Be, B, Na, Mg, Al, P (total), Sulphur (total), Chlorine (total), K, Ca, Ti, V, Cr, Fe, Mn, Ni, Cu, Zn, As, Se, Rb, Sr, Y, Zr, Nb, Mo, Ag, Cd, Sn, Sb, W, Hg, Pb, Bi, Th, Silicon Name of sampling and research organization: Testing laboratory	Soil sampling and laboratory analysis using XRF methods Samples were taken and analysed by Transproject CJSC and analysis "Hydrometeorology and Monitoring Center" SNCO of MoE of RA sampling taken at 4 locations	See Appendix H 75 m from Pushkin tunnel south entrance 140 m from Pushkin tunnel north entrance	The permissible limit concentrations of dangerous substances in soil are defined in accordance with: "Hygienic requirements for soil quality" N 2.1.7.003-10 on approval of sanitary rules and norms RA Order of the Minister of Health N 01-Ն dated January 25, 2010. As a result of the conducted soil quality research, exceeding the permissible values in the following parameters was observed: 75 m from Pushkin tunnel south entrance - Cr-9.6, Mn-1.2, Ni-7, As-6.5, Cu-16, Zn-3.8 times 140 m from Pushkin tunnel north entrance - Cr-3.6, Mn-1.25, Ni-6.25, As-10.5, Cu-18.3, Zn-3

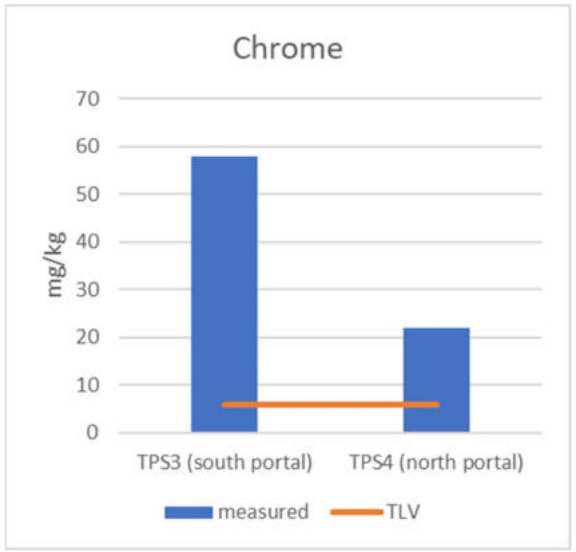
[7] "Gyulagarak Pine" State Sanctuary Management Plan Structural Model (concept) Draft February, 2011. WWF Armenia

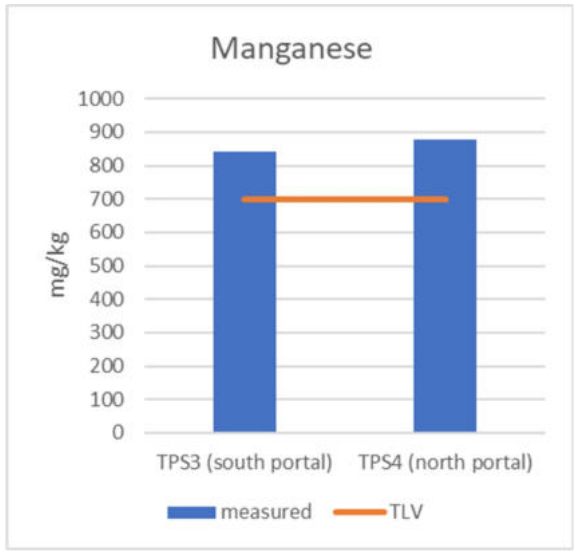
SURVEY	MEASUREMENT PARAMETERS	METHODS	LOCATION	REMARKS
	of "Hydrometeorology and Monitoring Center" SNCO of MoE of RA			times. These high concentrations may be due to transport effects or may also be background. The test reports are enclosed in **Appendix H**.

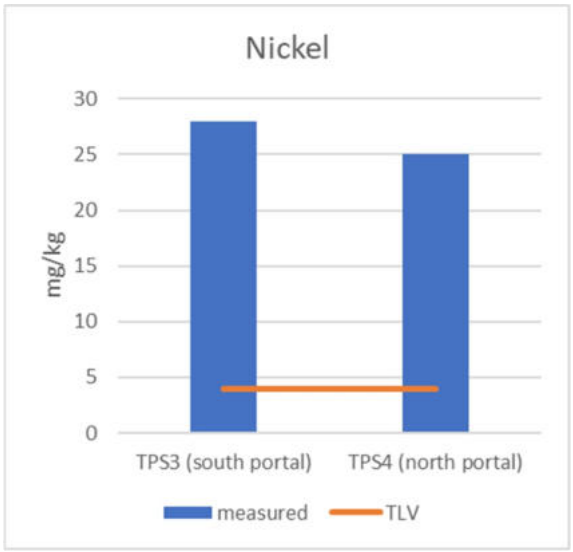
Table 11: Summary of soil surveys

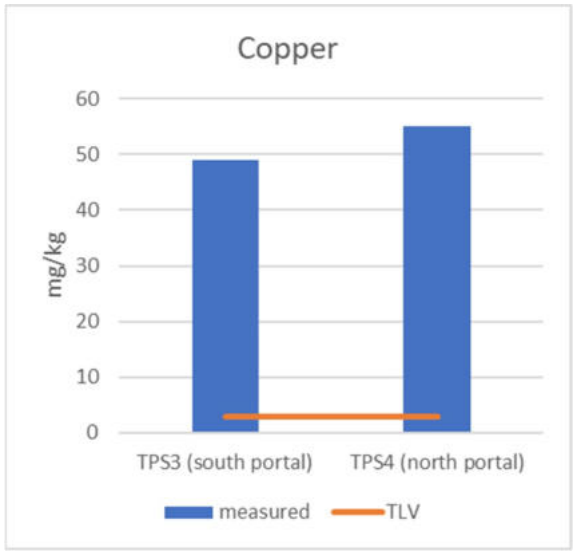
157. The measurements for soil quality are shown graphically below in comparison to TLVs. Higher than permissible values were detected at both locations for many parameters. These high concentrations may be due to transport effects or may also be background.

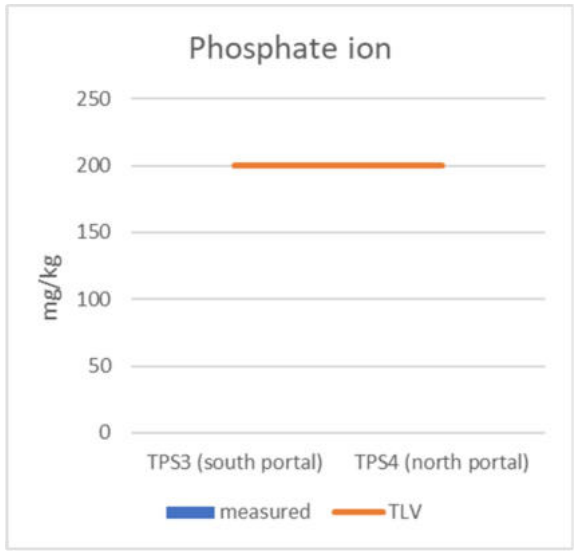

Total Sulpur
1200
1000
800
600
400
200
0
mg/kg
TPS3 (south portal)
TPS4 (north portal)
measured
TLV

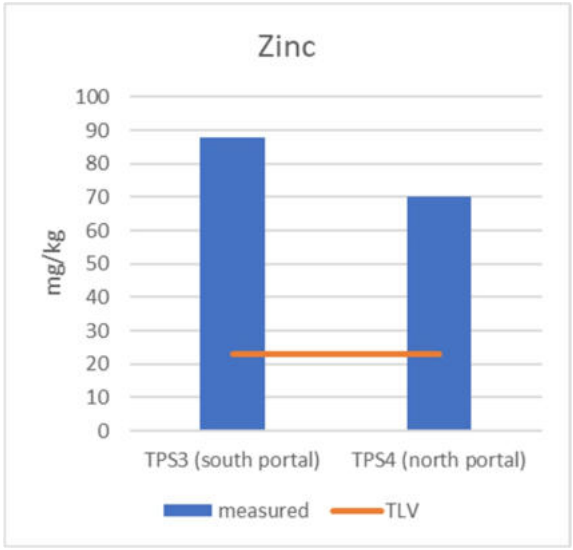

Chrome
70
60
50
40
30
20
10
0
mg/kg
TPS3 (south portal)
TPS4 (north portal)
measured
TLV

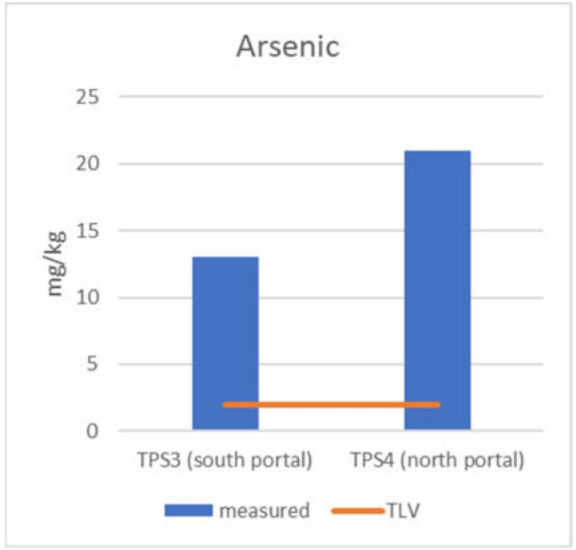

Manganese
1000
900
800
700
600
500
400
300
200
100
0
mg/kg
TPS3 (south portal)
TPS4 (north portal)
measured
TLV

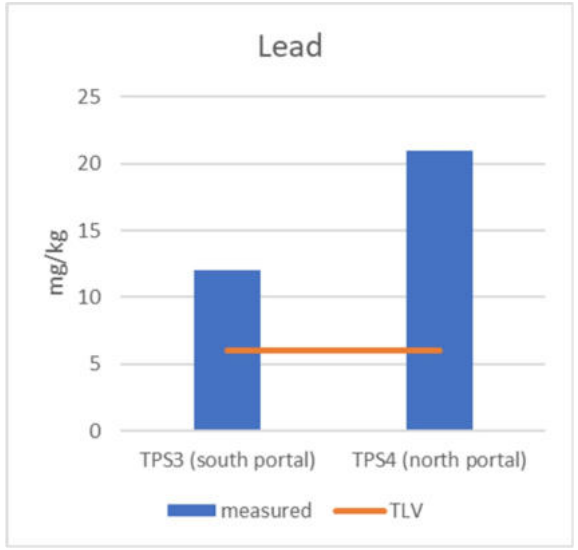

Nickel
30
25
20
15
10
5
0
mg/kg
TPS3 (south portal)
TPS4 (north portal)
measured
TLV


Copper
60
50
40
30
20
10
0
mg/kg
TPS3 (south portal)
TPS4 (north portal)
measured
TLV


Phosphate ion
250
200
150
100
50
0
mg/kg
TPS3 (south portal)
TPS4 (north portal)
measured
TLV


Zinc
100
90
80
70
60
50
40
30
20
10
0
mg/kg
TPS3 (south portal)
TPS4 (north portal)
measured
TLV


Arsenic
25
20
15
10
5
0
mg/kg
TPS3 (south portal)
TPS4 (north portal)
measured
TLV


Lead
25
20
15
10
5
0
mg/kg
TPS3 (south portal)
TPS4 (north portal)
measured
TLV

Natural Hazards

158. Among natural disasters in Debed RBD mudflows, landslides, and dramatic fluctuations of river water level (floods) are common, which often cause a significant damage to economy.

159. Landslides, which are one of the main disasters causing damage to society, have certain distribution in Lori marz. A landslide event is normally the result of the combined influence of several of the above-mentioned factors. The damage caused by landslides impact particularly on rural territories, thus causing damage to housing sector, local and community roads, bridges, and water supply and irrigation systems.

160. There are about 50 more or less active registered landslides in the territory of Lori region. Among the landslides in Debed River Basin the most active ones are distributed in the Martz, Tandzut, Gargar and Akhtala River Basins. About 1900 hectares of land is influenced by landslides in Lori Marz. The reasons for rockfall are as follows: Flowing water, windfall of rocks or overwetting from precipitation and groundwater, as well as earthquake, human economic activity, when the geological conditions of the place were not taken into account, and deforestation. Landslide phenomena were observed in different periods in Gyulagarak, Gargar communities in the Pushkin tunnel area, as well as in separate sections of the Vanadzor-Stepanavan highway.[8] There are no observed landslides directly affecting the immediate project, in particular the portal areas.

Floods can also be induced by sudden outbursts of artificial lakes that accumulate in the Debed Canyon due to landslides blocking the normal waterway of Debed. In Lori marz, mudflows occur in the valleys of the southern and western slopes of the Bazum and Pambak mountain ranges, and the southern and western slopes of the Lalvar and Lejan mountains. In general, maximum costs in the Debed River with catastrophic consequences are repeated once every 8-10 years. The Gargar River has an average mudslide activity, but it stands out for its long duration and intensity of mudslides. The floodplain is located on the northern slopes of the Bazum mountain range through which the Pushkin tunnel passes.

C. Socio-economic environment

Population

161. According to the 2011 official census, Lori has a population of 235,537 (111,675 men and 123,862 women), forming around 7.8% of the entire population of Armenia. The urban population is 137,784 (58.5%) and the rural is 97,753 (41.5%). The province has 8 urban and 105 rural communities. The largest urban community is the provincial centre of Vanadzor, with a population of 86,199. The other urban centres are Alaverdi, Stepanavan, Spitak, Shamlugh, Tashir, Akhtala and Tumanyan. The average population density of the Lori region is approximately 50 people/km². 53.8% of the population are women, 46.2% are men. The proportion of children and economically active population is quite large in terms of age group, which is natural.

Ethnic groups and religion

8 2014-2017 Social-economic development program of the Lori Region of the RA

162. The majority of Lori are ethnic Armenians who belong to the Armenian Apostolic Church. However, small communities of ethnic Russian Molokans are mainly found in the villages of Fioletovo and Lermontovo, and in less numbers in the villages of Sverdlov, Mikhayelovka, Privolnoye, Pushkino, Medovka and the town of Tashir. The total number of Molokans in Lori is 3,882 individuals. There are a few Orthodox Russians and Ukrainians in Vanadzor, Stepanavan and the village of Amrakits.

163. 793 individuals of the Yazidi community are found in the southern villages of the province including Lermontovo and Lernantsk.

164. Lori is also home to a small Greek community of 655 individuals who speak the Pontic dialect. Small Greek communities can also be found in the towns of Alaverdi, Akhtala, Stepanavan and Vanadzor. The majority of the Yaghdan village is Greek.

Influenced communities

165. Bazum settlement of Vanadzor municipality, Gyulagarak community with its villages of Gyulagarak, Amrakits, Gargar and Pushkino may be the communities influenced by the Pushkin tunnel rehabilitation. Drinking water supply is considered to be the most important community issue. Five settlements of the community are provided with round-the-clock water, but in two settlements (Gargar and Pushkino water supply is problematic and is included in the 2023-2027 development plan of the Gyulagarak community "Water to Gargari and Pushkino". Although the volumes of water flowing from out from the tunnel north portal are expected to be low (0.5 l/s measured flow), it may be possible to arrange the diversion of water to the settlements.

166. Bazum village is part of Pambak community of Lori marz. The community is located in the high seismic risk zone of the Spitak earthquake center. The community is located on the south side of the tunnel. According to assumptions, the village has a history of 370 years. According to the results of the 2011 census of Armenia, the permanent population of Bazum was 1116; the current population is 988 people. The terrain is mostly mountainous, the soil is scarce, the climate is highly variable and is not immune to hailstorms, mudslides, there are frequent years of drought, which greatly damages the production of agricultural products. The Chalari river (which originates from the Pushkin Pass) flows through the village, irrigates about 40 % of the village's cultivated areas. The village is mostly engaged in farming and animal husbandry. Due to the lack of irrigation water, the community finds it difficult to organize the production of rural products. They are mainly engaged in the production of potatoes, cabbage, and other vegetable crops.

167. Gyulagarak is a community in Lori marz. It includes the villages of Gyulagarak, Amraktis, Gargar, Kurtan, Hobardzi, Pushkino and Vardablur. The community was established on June 9, 2017 in the RA National Assembly by the bill on enlargement of communities. The centre is the village of Gulagarak.

168. The Gargar settlement is located north of the tunnel. The geographical location of the village is very favourable, because the Yerevan-Tbilisi highway of republican importance passes through it. The village is rich in cold water, pastures, arable land, and in the last few years there is also an experimental field in the village, where non-traditional crops are cultivated, such as broccoli, physalis, patison, etc. The climate of the village is cold in winter and cool in summer. Precipitation is sometimes excessive, which affects the villagers, not being able to organize the works on time. The lands of the community are arid. That is why the community organizes the production of agricultural products with difficulty. In drought years, farmers lose 70-80 % of their harvest. In the village, they are mainly engaged in the

production of wheat, potatoes, and vegetable crops. Livestock breeders produce milk, meat, wool, eggs, honey.

169. In the territory of the community there is a primary health care centre in a comfortable building built by the German "Red Cross".

Cultural Heritage

170. In the Gargar village there is St. Hovhannes church, and there are three pilgrimage sites: Subnishan, Yamaj and Amenaprkich. There are 6 khachkars, one church, one chapel and one cemetery in the village and its surroundings. The Pushkin memorial is located approximately 50 m from the southern tunnel portal on the east side of the road. In terms of landscape, there is a viewing point close to the wind farm on the ridge line of the Pushkin Pass. The pass is also known for its hiking trails.

VI. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

A. Due Diligence Review of Potential Environmental Impacts

171. At the commencement of the environmental study a due diligence review was undertaken on all project components and a Rapid Environmental Appraisals (REA) prepared (Appendix A).

172. The due diligence entailed:

i. Site visits on the proposed project area
ii. Review of project information provided by RDF
iii. Development of Environmental Scoping Report
iv. Preparation of REA
v. Professional opinion and experience of Environment Specialist
vi. Preparation of an EMP
vii. Preparation for Public Consultations

173. The expected overall positive environmental and social impacts from the proposed project will be long term and cumulative in nature, ultimately contributing to the increased social and economic benefits of the nearby communities.

174. The proposed tunnel rehabilitation works will be within the boundaries (footprint) of the existing tunnel.

175. In relative proximity to the tunnel there is a specially protected natural area, the Gulagarak Pine State Sanctuary. The MOE's response (Appendix J) confirms that the north portal of the tunnel lies within the sanctuary.

176. The bypass road over the tunnel (which is not suitable for trucks due to its gradient and hairpin bends) passes through the sanctuary; therefore any measures to improve this road or utilise it for diverting traffic may impact the sanctuary. It is therefore essential to provide regional traffic diversions for trucks, and the project design includes this. This also means that only passenger vehicles and smaller transport vehicles will use the bypass diversion.

177. Since the bypass road passes through the mountains it will be used mainly in summer. The road will be fully rehabilitated and will only be used as a bypass road once it meets all safety parameters. Since the road already exists, associated impacts such as habitat disruption will be largely avoided. Specific measures have been provided in this IEE to ensure that there are no tree cutting in this area, or any impacts beyond the boundary of the roadside. A wind farm is close to the bypass road, but it will not be disturbed by additional traffic. There are no nearby settlements; therefore additional disturbance by traffic is not expected.

B. Methodology

178. The methodology used for assessing the environmental impacts from the proposed Project involves the following steps:

i. identifying the environmental components that will be impacted;

ii. identifying the type of impacts;
iii. identifying the assessment area where the impacts will be felt;
iv. defining the criteria for assessing the significance of each type of impact;
v. screening of project impacts during (pre-)construction (C), and operation (O) stages of the project; and
vi. identifying the significance of impacts (minor, moderate and major) to guide development of mitigation measures and ensure that there are no or minimal residual impacts.

179. The potential adverse impacts are screened to identify their relative significance, reflecting the requirements set out in ADB's SPS (2009). Impacts during (pre-) construction and operation phases are considered separately. Impacts are considered in terms of the receptor, sensitivity of the receptor and magnitude of impacts:

i. "**Receptor**" (asset): The resource (human / natural environment / economic / social) which is potentially affected by an impact.
ii. **"Sensitivity"**: The ability to cope with specific impact and/or its importance to Armenia. It is generally accepted that human health is always a high sensitivity receptor. However, in terms of physical / natural resources, ecology, landscape and livelihood the sensitivity varies according to the receptor, e.g., scrubland with no significant biodiversity is considered less sensitive than a mature forest which supports ecosystems and livelihoods.
iii. **"Magnitude"**: The size of the potential impact. Impacts may be short-term and considered low magnitude (e.g., noise or temporary reduction of income during a short construction project) or long-term and high magnitude (e.g., permanent loss of income). The same impact factor can cause a different magnitude. e.g., the land take of 100 m² does not endanger the livelihood of a farmer, but could cause the loss of income for illegal shop holders.

180. The overall significance of each impact was classified as major, moderate or minor as demonstrated in Table 12. The overall impact significance is assessed qualitatively in Table 13 and Table 14. The residual impact significance is the significance of the impact remaining after mitigation has taken place. Mitigation measures cannot always eliminate all impacts and this is reflected in the screening. However, residual impact significance more accurately describes the impacts of the project as it is anticipated that the requirements of the EMP will be followed and impacts satisfactorily mitigated.

		MAGNITUDE OF IMPACT		
		LOW	MEDIUM	HIGH
RECEPTOR SENSITIVITY & IMPORTANCE	LOW	Low	Low	Medium
	MEDIUM	Low	Medium	High
	HIGH	Medium	High	High

Table 12: Potential impact significance classification

Table 13: Environmental impact significance – (pre-)construction phase

Impact factor	Asset / Receptor	Impact Yes / No	Receptor sensitivity	Magnitude (LT – long term, ST – short team)	Potential Impact Significance	Residual Impact Significance	Reasoning
Land consumption – *clearing of land for access roads and construction sites; use of land for temporary construction sites*	Vegetation	Yes	High Some tree cutting /vegetation clearance maybe required around tunnel portals in PA. Bypass located in PA known for its sensitive flora.	Medium, ST	Medium	Low	By compensation of trees at 1:10 ratio at tunnel portal, and avoidance of tree cutting in the PA the residual impact is low
	Wildlife	No	-	-	-	-	Special status species have been identified in the vicinity, e.g. Egyptian Vulture; however, they are not breeding in the Project area.
Noise – *from construction activities since traffic along the road already exists*	Public health and safety	Yes	Low No communities close to the site, waste disposal area is on the outskirts of Vanadzor in a non-residential area	Low, ST Only from vehicles transporting construction waste and therefore time limited	Low	Low	No communities close to the site; only transport to waste disposal area is a factor Limit hours when waste can be disposed
	Wildlife	Yes	Low The sensitivity of wildlife to noise is low (no permanent relevant noise level)	Low, ST Location limited to portal areas as most of the work is carried out inside the tunnel	Low	Low	-

Impact factor	Asset / Receptor	Impact Yes / No	Receptor sensitivity	Magnitude (LT – long term, ST – short team)	Potential Impact Significance	Residual Impact Significance	Reasoning
Air quality	Public health and safety	Yes	Low Site not located close to existing population centres. Transport of waste by truck. Road already exists.	Medium, ST Most works are underground but works at portals and truck movements will cause air pollution	Low	Low	Some effective measures can be taken to reduce propagation of dust and particular matter (e.g., watering of transport routes, tyre washing, covering of trucks with tarpaulins)
	Climate	Yes	Medium Pre-load of dust exceeding permissible concentrations	Medium, ST Activities will generate further dust	Medium	Medium	
Water quality – *pollution from construction work and materials used, camps, accidental spills*	Vegetation	Yes	Medium Potential for effect of polluted water from many sources	Medium, ST Potential for impact on vegetation in the state sanctuary	Medium	Low	Remaining impacts are low due to water treatment measures, spillage prevention and restriction of site to already used land.
	Wildlife	Yes	High Wildlife sensitive to polluted water	Medium, ST Effect of spillages and hazardous materials on water sources	High	Low	
	Public health and safety	Yes	High Potential for contamination of water sources	High, LT Significant impact if drinking water sources contaminated	High	Low	
	Surface water	Yes	High Potential contamination of water courses	High, LT Significant impact if surface water contaminated	High	Low	
	Groundwater	Yes	Medium	Medium, ST	Medium	Low	

Impact factor	Asset / Receptor	Impact Yes / No	Receptor sensitivity	Magnitude (LT – long term, ST – short team)	Potential Impact Significance	Residual Impact Significance	Reasoning
			Potential contamination of groundwater due to chemicals used and disturbance of contaminated ground for underground works				
	Soil	Yes	Low Land already utilised and soil already contaminated	Medium, ST	Low	Low	
Vibration – *from vehicle movements and works (e.g., blasting)*	Structures	No	-	-	-	-	Highly unlikely there is any effect on the windfarm above the tunnel or existing portal buildings
	Public health and safety	No	-	-	-	-	Route already exists
Visual impact	Landscape	Yes	Low Tunnel and road already exist, and works are constrained to existing used areas, however some minor impacts will occur during bypass rehabilitation	Low, LT Impacts at the surface are limited to provision of extra buildings	Low	Low	Minimal impact compared to existing situation
Traffic and transportation – *increased congestion, disruption due to*	Public – social aspects	Yes	Medium People are able to adapt to the closure	High, ST	High	Medium	Closure inevitably will cause disruption. Time works to start only when the bypass

Impact factor	Asset / Receptor	Impact Yes / No	Receptor sensitivity	Magnitude (LT – long term, ST – short team)	Potential Impact Significance	Residual Impact Significance	Reasoning
tunnel closure, economic impact, reduced accessibility for businesses			and alternative routes will be provided				road is upgraded and after winter. Good signposting of alternative regional routes essential.
Collisions and accidents – *impact on mostly on construction workers rather than public as site will be closed to the public*	Public health and safety	Yes	High Worker safety issues	High Demolition and tunnelling are high risk activities	High	Medium	Effective measures can be taken to reduce accident rates (e.g., good practice construction techniques, use of specialised equipment for demolition, etc.)
Cultural heritage – *damage due to works*	Religious monuments and buildings	No	-	-	-	-	None known in the project area which will be affected
	Other monuments	Yes	Low Pushkin monument located on the east side of the south portal	Medium, ST Potential of damage due to construction activities or disturbance by workers	Low	Low	Construction not intended directly at monument; possible to fence of area

Table 14: Environmental impact significance – operation phase

Impact factor	Asset / Receptor	Impact Yes / No	Receptor sensitivity	Magnitude (LT – long term, ST – short team)	Potential Impact Significance	Residual Impact Significance	Reasoning
Noise – *from traffic*	Public health and safety	Yes	Low No communities close to the site	Low, LT Road already exists; traffic can be expected to increase over time	Low	Low	No significant change from pre-existing condition
	Wildlife	Yes	Low The sensitivity of wildlife to noise is low	Low, LT Road already exists; traffic can be expected to increase over time	Low	Low	No significant change from pre-existing condition
Air quality – *from traffic*	Public health and safety	Yes	Low Site not located close to existing population centres.	Low, LT Road already exists; traffic can be expected to increase over time although vehicle emissions reduce over time	Low	Low	Introduction of functional ventilation system will improve atmosphere in the tunnel and at portals
	Climate	Yes	Medium Pre-load of dust exceeding permissible concentrations	Low, LT Traffic can be expected to increase over time although vehicle emissions reduce over time	Low	Low	No significant change from pre-existing condition
Water quality	Vegetation	No	-	-	-	-	Positive impact of introduction of separate drainage systems, water treatment facilities, and spills not
	Wildlife	No	-	-	-	-	
	Public health and safety	No	-	-	-	-	
	Surface water	No	-	-	-	-	

Impact factor	Asset / Receptor	Impact Yes / No	Receptor sensitivity	Magnitude (LT – long term, ST – short team)	Potential Impact Significance	Residual Impact Significance	Reasoning
	Groundwater	No	-	-	-	-	entering clean water system
	Soil	No	-	-	-	-	
Vibration	Structures	No	-	-	-	-	No significant change from existing condition
	Public health and safety	No	-	-	-	-	
Visual impact	Landscape	No	-	-	-	-	Minimal impact compared to existing situation
Traffic and transportation	Public – social aspects	No	-	-	-	-	Benefit to local economy once the tunnel is re-opened to traffic
Collisions and accidents	Public health and safety	No	-	-	-	-	Road safety improved compared to existing situation
Cultural heritage	Religious monuments and buildings	No	-	-	-	-	None known in the project area which will be affected
	Other monuments	No	-	-	-	-	Monument at south portal remains

C. Positive environmental and social impacts

181. Tunnel rehabilitation, while challenging during the process, can have several positive impacts once completed. These benefits can be seen in terms of safety, economic growth, environmental sustainability, and overall infrastructure resilience. Here are the key positive impacts of tunnel rehabilitation:

IMPACT	DESCRIPTION
Enhanced safety of the tunnel	✓ **Improved structural integrity:** Rehabilitation strengthens the tunnel's structure, reducing the risk of collapse or other structural failures, which enhances safety for all users. ✓ **Modern safety features:** Updating tunnels with modern safety features such as improved ventilation systems, better lighting, fire suppression systems, and emergency exits ensures a safer environment for motorists and workers. ✓ **Reduced accident rates:** By addressing wear and tear, fixing potholes, and improving signage, the rehabilitation reduces the likelihood of accidents within the tunnel.
Economic benefits	✓ **Job creation:** The rehabilitation process creates jobs for construction workers, engineers, and other professionals, providing a temporary economic boost to the local economy. ✓ **Increased efficiency:** Once rehabilitated, the tunnel can handle traffic more efficiently, reducing delays and improving the flow of goods and services, which supports local and regional economies. ✓ **Attracting investment:** Improved infrastructure can attract businesses and investors to the area, particularly if the tunnel is part of a critical transportation corridor.
Environmental benefits	✓ **Energy efficiency:** Modernizing the tunnel with energy-efficient lighting and ventilation systems reduces its overall energy consumption, contributing to a lower carbon footprint. ✓ **Pollution control**: Improved ventilation systems help to better manage and reduce air pollution inside the tunnel, leading to a healthier environment for users and surrounding areas. ✓ **Sustainable materials:** The use of sustainable, eco-friendly materials during rehabilitation can reduce environmental impact and promote sustainable construction practices.
Community and social benefits	✓ **Improved accessibility:** Enhanced tunnel infrastructure can improve access for emergency services, enabling quicker response times in case of emergencies. ✓ **Increased property values:** Properties and businesses in the vicinity of a rehabilitated tunnel often see an increase in value due to improved accessibility and infrastructure reliability. ✓ **Public confidence:** Successfully completed rehabilitation projects can boost public confidence in local government and infrastructure management, leading to greater public support for future projects.

Table 15: Positive impacts of the Project

D. Negative environmental and social impacts

182. In general, the potential adverse environmental impacts associated with the works to carried out on project area lie within the existing tunnel and are expected to be small, short-term and localized.

183. The majority of the potential adverse impacts will be applicable during the construction/rehabilitation period only and will mainly occur within the tunnel area, where the works are implemented. With references to the Project activities identified in Section III of this report, the likely adverse environmental impacts during the construction phase will include, but not be limited to the following:

- degradation of soil, landscape and soil erosion due to improper disposal of excavated materials and construction waste;
- clearing land for access roads and construction sites can lead to the loss of trees and vegetation, reducing biodiversity and contributing to soil erosion;
- spillage of fuel (hydrocarbons) and chemicals associated with construction during the construction period;
- pollution of water resources from construction work, camps, and accidental spills;
- use of temporary construction sites (camps, machinery sites, storage facilities, etc.);
- temporary air pollution related to increased truck traffic during the construction;
- noise and vibration disturbances from vehicle movements and operation of construction plant;
- construction activities generate dust and particulate matter, contributing to air pollution, although this is minimised to a certain extent because the majority of work is inside the tunnel;
- traffic due to tunnel closure;
- closing the tunnel for the rehabilitation period will increase the time of traveling on alternative roads and increase transportation costs;
- reduced accessibility for local businesses.
- tourism decline, affecting local businesses such as hotels, restaurants, and attractions;
- job losses in sectors directly or indirectly dependent on the tunnel;
- inconvenience to residents;
- increased traffic congestion.

184. **Degradation of landscapes and soil erosion.** Some of the areas where bypass will be rehabilitated are sensitive to soil erosion; therefore, when undertaking earth works and levelling the area anti-erosive measures will be implemented during the recultivation period. These will all be completed within the existing right of way and will avoid any tree cutting in the Gyulagarak Sanctuary.

185. **Generation of excavated materials and construction wastes.** Demolition debris will be

generated during the rehabilitation works of tunnel and associated infrastructure. These effects will be localized, and must be minimised by means of appropriate removal and disposal procedures.

186. **Impacts from temporary access roads and work sites.** Regional diversions are necessary and light vehicles may use the steep and windy bypass road over the Pushkin Pass during construction. Establishment of temporary earth roads to access construction materials storage and waste temporary accumulation sites, camps, machinery sites, storage facilities can enhance soil erosion, and degrade the landscape.

187. **Pollution by construction run-offs.** As a result of oil leakage from machinery and stockpiled construction materials and asphalt, oil products and chemicals can penetrate to the soil and/or ground water or run off to water recipients.

188. **Impacts on biodiversity.** No major impacts on biodiversity are expected due to rehabilitation of tunnel within the existing site, since the tunnel was built and intensively operated for several decades now and throughout this period ecosystems were significantly transformed and already carry significant anthropogenic footprint. There may be a requirement for removal of some trees around the northern tunnel portal which is quite densely forested. It is estimated that a maximum of 0.25 hectares of land may need to be cleared which represents a tiny fraction of the 5,700 hecatres of forested Gyulagarak Sanctuary. However, the bypass will be rehabilitated through the Gyulagarak Sanctuary, the lowest category of protected area in Armenia. The portion of bypass running through the sanctuary is just under 5km. Another 2km or so pass through vegetated slopes close to the southern portal, but outside of the sanctuary. Road upgrading works will be constrained to the existing pavement and according to the design team there will be no road widening in this area meaning no direct impacts to the forest area itself. Notwithstanding the above, it is possible that careless works could encroach into the forest, and therefore works in these areas should be strictly monitored.

189. **Egyptian Vulture.** The status marked in the Table 6 as (Br?) for the Egyptian Vulture (Neophron percnopterus) in the vicinity of the southern entrance was determined based on the periodic appearance of this species in the vicinity of the southern portal to the tunnel. The frequency of birds appearing with food in their beaks allowed it to be classified as nesting (Br?) in the vicinity, despite the fact that no nesting sites were found. Unpublished data from studies conducted with this species by installing transmitters in previous years in the northern regions of Armenia were also taken into account. However, it should be noted that information on RB species, specific coordinates, and maps are not published and not transparent.

190. **Noise, vibration, and emissions.** Noise, vibration, and emissions will be generated during the transportation of construction materials and truck traffic. Emission of inorganic dust from digging-loading works, emission of harmful substances and dust from combustion of diesel used by transportation means and machinery, as well as bitumen smoke arising from road construction work occur during the construction works. Welding works cause welding aerosol and manganese monoxide emissions. Concrete mixers work result in concrete dust emissions. If mobile asphalt plants are used they could cause negative impact on water, ground water and air if not properly managed. This type of asphalt plant should be avoided. All asphalt plants should be certified and inspected according to Armenian norms before they are allowed to be used for the rehabilitation. No camp sites, asphalt plants, or temporary camps/storage areas will be permitted within the Gyulagarak Sanctuary.

	TIME (HOURS)	MAXIMUM PERMISSIBLE NOISE LEVELS	REPUBLIC OF ARMENIA /

		L_{Aeq} 15 min [dB]	L_{Amax}15 min [dB]	WORLD BANK STANDARDS
Near residential dwellings and institutional buildings	06.00 ~ 22.00	55	70	RA and WB
	22.00 ~ 06.00	45	60	
Industrial and commercial	06.00 ~ 22.00 & 22.00 ~06.00	70	70	WB

Table 16: Permissible noise levels

191. In assessing construction phases impacts the report focuses on five areas of potential impact:

- Noise from groundbreaking
- Noise from milling
- Noise from asphalting
- Noise from drilling (demolition of tunnel walls)
- Noise from camp activities

Noise generating Powered Mechanical Equipment (PME) has been identified for each activity. Sound Power Levels (SPL) have been assigned based on Appendix A of the Australian Standard AS 2436—2010 Guide to noise and vibration control construction, demolition and maintenance sites[9] which lists typical noise levels generated by construction plant.

192. **Dust** arising from construction works will have negative impact on the ambient air quality, and it is necessary to take effective protective measures to minimize the negative impact, especially in settlements and protected areas.

193. **Disposal of excavated materials and construction wastes.** Demolition debris will be generated during the rehabilitation works of the tunnel. These effects will be localized and will be minimized by means of appropriate removal and disposal procedures, which may include but not be limited to careful selection of waste temporary accumulation sites, clear delineation of these sites to exclude their expansion, prevention of washout of such sites, obtaining written agreement on permanent disposal site with local authorities and timely transportation of waste to the designated dump site.

194. **Safety hazards from construction activities.** Safety hazards can occur due to violation of proper health and safety practices and may lead to injuries and accidents. Tunnelling work involves significant risks which need to be carefully managed through the application of proper construction practices and safety procedures are applied.

195. **Community health and safety.** The project can change the community's exposure to risks and

[9] The table is derived from information in AS 2436—1981 Guide to noise control on construction, maintenance and demolition sites and British Standard BS 5228-1, Code of practice for noise and vibration control on construction and open sites. Noise

impacts arising from accidents and structural failures. Impacts on the health and safety of the community may also arise during rehabilitation works as a result of noise, dust and other emissions from earthmoving, blasting and operation of equipment and vehicles. The negative social impacts of the project arising during construction however can be mitigated through correct organization of the construction process and implementing suitable mitigation measures.

E. Operation phase impacts

196. Improved road safety and tunnel operational safety due to upgrade safety systems.

197. **Impact on provision of transportation services.** Rehabilitation of the tunnel will result in significant improvement of provision of transportation services and will allow to ensure reliable, safe and speedy transportation of passengers and goods without interruptions possible due to the dilapidated state of the existing infrastructure.

198. **Traffic noise and air quality impact.** Rehabilitation of the tunnel will not significantly change traffic movement. It is anticipated that traffic movements may increase slightly due to the improved running surfaces.

199. **Impacts from drainage system.** The separated drainage system is a positive impact on water quality. Polluted water from roadway is treated at each portal before release into a stream; and groundwater is in a separate drainage system so doesn't mix with polluted water. However, improper and non-timely maintenance and cleaning of drainage network can lead to clogging and malfunction of the system, thus contributing to deterioration of pavement and worsening of sanitary-hygienic conditions in nearby area.

200. **Impacts from waste along the road.** Impacts from waste inside and nearby tunnel. Adverse consequences may constitute worsening of sanitary-hygienic conditions due to accumulation of waste inside of the tunnel. Cleaning the tunnel area is important, because improper and non-timely collection, removal and disposal of waste can lead of odour inside of tunnel.

201. **Impacts on population.** The project will create temporary and some permanent job opportunities for the local population (both men and women), as they could be employed during rehabilitation and maintenance. There is a possibility of impacts to communities in terms of construction traffic, farmers who use nearby lands (e.g., north side of the bypass road above the tunnel) for pasture of herded animals may also be impacted to some degree through social conflicts with workers and traffic over the bypass, but generally these impacts would be of low significance. Local businesses may also be affected around the southern portal, including potential conflicts with workers and traffic delays, but in general they are also likely to benefit during the construction phase as demand for goods and services from workers will in increase. The wind farm operator above the tunnel around the bypass is unlikely to be significantly affected by construction traffic.

202. **Safety hazards during operation.** Safety hazards can occur due to violation of proper health and safety practices and may lead to injuries and accidents. Maintenance of tunnels may involve significant risks if tunnels are not closed to traffic. During the operation period negative impacts might occur as a result of driving with higher speed, but an average speed control system is recommended.

203. Based on initial observations, all of the mentioned potential adverse environmental and social impacts revealed during scoping process can be prevented and/or minimized as a result of proper and

timely implementation of mitigation measures as well as best management practices (identified in the EMP) for the project and to be implemented during construction works and further operation of the rehabilitated road.

204. At this stage of analysis, it should be noted that the positive social and economic impacts of the rehabilitation of will outweigh potential environmental and social risks.

F. Design phase mitigation

205. In the design phase it is important for the RDF to ensure that the mitigation measures identified in this IEE are incorporated into bidding and contract documentation. The EMP tables clearly identify items that will need to be included. This allows the contractor to clearly understand the environmental requirements of the project, in particular their monitoring and reporting responsibilities. Following award of the Contract the Contractor shall prepare a Site Specific Environmental Management Plan (SEMP) 28 days prior to works commencement date, that takes the proposals in the IEE and develops them with the Contractor's working methods and construction programme. The Contractor shall gain approval of the SEMP from the Construction Supervision Consultant (CSC) and prepare checklists for regular onsite audit of environmental performance (including compliance) by linking the checklists back to the SEMP. In addition, the Contractor shall provide environmental information on environmental performance in the monthly and quarterly project reports. An outline of Contractor's SEMP presented in the Appendix O.

206. The Contractor will be responsible for ensuring that all subcontractors abide by the conditions of the SEMP.

207. To ensure that there are adequate and suitably qualified environmental staff engaged on the project, RDF shall include requirements for an International Environmental Specialist to be employed for one month of each year during the construction period. The role of the environment specialist will be to coordinate and strengthen the safeguards activities of the Client, CSC and the Contractor to ensure that design construction and operation will proceed following the requirements of the EMP. Both on-the-job training and in-house workshops on specific environmental management issues relating to ADB safeguard policy and the requirements of this IEE and its implementation will be provided to the Client through this support. The specialist will also be responsible for ensuring the biodiversity management plan and mitigation measures in the Gyulagarak Sanctuary are strictly followed, accordingly, he will provide training to the Client, CSC and the Contractor on these tasks.

208. To ensure that there are adequate and suitably qualified health and safety staff engaged on the project, RDF shall include requirements for an International OHS to be employed for four months of each year during the construction period. OHS is critical during tunnelling work due to the unique hazards associated with underground construction. The role of OHS in tunnelling work is to ensure that all activities are conducted in a safe and healthy environment, minimizing risks to workers. Many of the risks are managed by good tunnelling practice, following work cycles and geotechnical monitoring. This is covered by key technical personnel, i.e., experienced forepersons and shift-leaders.

209. In addition, a National Environmental Specialist and National Health and Safety Specialist, with a strong background of environment, health and safety should be employed for seven months of each year of project construction within the CSC team.

G. Construction phase mitigation measures

210. Mitigation measures that could be used where appropriate are separately defined for the design, construction and operation phases and included in the EMP.

211. The construction phase is the period when most disturbances to the environment will occur. This will include clearing of vegetation, excavations, establishment of base camps for the storage of fuel, oil, bitumen, chemicals and the emission of dust and noise during working hours at work sites. To minimize potential degradation of landscapes and soil erosion and pollution from disposal of excavated materials and construction wastes, existing quarries for materials will be used where possible and suitable excavated and graded soils shall be reused to limit the need for new quarries. Work areas shall be clearly delineated and closely monitored, so that they do not expand during construction. Workers should be assigned appropriate safety equipment for their personnel security. Dust and noise from the construction site should be minimized where activities are close to sensitive uses. Construction concrete waste, debris and spoils shall be transported and disposed in approved landfills/dump sites. After completion of construction and rehabilitation works landscape shall be restored to quasi-original conditions. Details of proposed mitigation measures are presented below.

212. **Preserving landscapes and minimizing soil erosion.** To minimize degradation of landscapes and soil erosion the Contractor(s) will use, where possible, existing quarries for required additional materials. Suitable excavated and graded soils will be preferably used, thus limiting the need for old and new quarries. The permits from the Ministry of Territorial Administration and Infrastructure, as needed, from the local regional authorities will be obtained if the opening and/or use of quarries are required. Access roads will be carefully chosen and delineated to minimize impacts on landscape and soil erosion, and will be closely monitored to eliminate their unduly expansion during construction works. After completion of construction and rehabilitation works and after use of quarries, landscape shall be restored to quasi-original conditions, and plant species specific for the project area shall be preferably used. No quarries, borrow pits, or access roads to these sites will be permitted within the Gyulagarak Sanctuary or any other nationally or internationally designated sites. Further, no borrow pit or quarry shall be used that is within 500m of residential properties.

213. **Managing construction run-off.** Existing access roads will be used where possible, minimizing the need for establishing the new ones. The top surface of access roads and work areas will be compacted to facilitate water runoff and avoid flooding the area. This may require digging drainage ditches and connecting them to natural drainage rainwater discharge system. These works will be confined to the existing right of way and under no circumstances shall trees in the Gyulagarak Sanctuary be cut to accommodate these works.

214. **Work sites, machinery maintenance areas and construction camps.** These shall be located away from rivers to prevent adverse impact on water quality. Noise activities in the manufacturing area – rock and gravel processing, crushing, concrete batching and asphalt plant, will be located at least 500 m from sensitive receivers and shall only operate during the daytime. None of these sites shall be permitted within the Gyulagarak Sanctuary or any other nationally or internationally designated sites.

215. **Prevention of spillages.** To reduce the likelihood of oil spillage from construction equipment, well maintained machinery and equipment shall be used to reduce likelihood of oil drips, excessive exhaust gas emissions and noise. In addition, sand or fine gravel should be spread on the ground in the locations designated for parking, and servicing construction machinery. In case of spillage the contaminated layer should be removed to a designated waste disposal site and the affected area

replaced with clean sand or fine gravel. If no sewerage system connection is available, the contractor shall ensure no faecal contamination from construction camp waste e.g. septic tank system regularly emptied by a licensed organization.

216. **Water treatment.** A water treatment facility shall be provided at each portal to ensure that water flowing from the tunnel during construction is treated before it is released into streams or re-used. Wastewater from camps can either be treated at the water treatment facility or septic tanks are to be provided. They shall be made of impermeable material and will be emptied regularly in accordance with applicable rules/ calculated allowable inflow. The wastewater will be transported by a special truck to a centralized wastewater collector, based on agreement obtained from the local authorities during the design phase.

217. **Preserving biodiversity.** The impact on biodiversity will be minimal, as the works will be carried out within the footprint of the existing area. The existing right- of-way will be preferred for establishment of work sites and camps, storage of construction materials, preliminary accumulation of wastes, which will remove impact to the vegetation cover and other components of the environment. Sourcing construction materials from already operating quarries will be encouraged to minimize the negative impacts of new quarries on landscapes and biodiversity.

218. However, there may still be requirements for some tree cutting and vegetation removal around tunnel portals as they are rehabilitated, notably around the northern portal. It is estimated that around 0.25 hectares of land may need to be cleared around the portal. In this instance any trees cut from this area will be replaced on a 1:10 basis at a location within the Gyulagarak Sanctuary determined by the sanctuary management. Tree replanting and maintenance shall be completed by the Contractor during the course of the construction phase. A tree planting management plan, approved by ArmForest, will form part of the Contractors SEMP and will describe the native species to be replanted, locations and the tree maintenance activities. Should any tree die during the first two years from planting, the Contractor will be obliged to replant on a 1:2 basis. Given the above, tree planting should commence at the alternative location as soon as detailed designs have been prepared, the exact areas calculated for clearance and the tree planting plan approved by Armforest and the CSC.

219. Regarding the bypass, a Biodiversity Management Plan will be prepared by the Contractor to manage works in the bypass. A specific focus will be on the area passing through the Gyulagarak Sanctuary. The plan, which will be routinely monitored by the supervision consultant, will include at a minimum:

- No encroachment into the Gyulagarak Sanctuary by any workers. Induction training for workers and routine toolbox talks will be performed by the Contractors environmental specialist informing them of the sensitivities of the site and to ensure no encroachment into the Gyulagarak Sanctuary.
- The right of way will be clearly demarcated by bunting throughout the rehabilitation phase in the Gyulagarak Sanctuary. Signposts will be erected along the boundary at 200m intervals warning workers not to enter this area.
- No permanent or temporary work sites or laydown areas will be permitted in the Gyulagarak Sanctuary. They may be permitted within the right of way.
- Tree cutting for firewood, or any other use, will be a sackable offence.

- No campfires, or any type of fire will be permitted within the Gyulagarak Sanctuary, or any other area along the bypass.

220. **Managing noise, vibration, and emissions.** Dust-suppression measures aimed at prevention of air pollution will include watering of access and bypass earth roads and construction sites. During construction, air pollution in the form of dust from earthworks and vehicle emissions will increase. Regular water sprinkling and enforcement of low-speed limits (suggested, 20 km/h or lower) during construction will alleviate dust impacts. Dust at construction sites and on transport routes will be minimized by using closed/covered trucks for transportation of construction materials (especially loose construction materials such as gravel, sand, soil, etc.) and debris. To minimize impacts on nearby residents all vehicles will be equipped with exhaust mufflers and regularly inspected to ensure they are operating efficiently. In addition, overground works sites will only operate during daytime hours if close to sensitive receptors. Other measures planned to maintain good air quality include locating asphalt plants and concrete mixing sites and stockpiles in isolated areas, as well as confining working vehicles to designated routes away from sensitive receptors. Noise and vibration impact can adversely impact on sensitive receivers close to the works. At all times the contractor shall minimize noise impact by use of natural topographic barriers or by placing physical barriers between noise generating activities and sensitive uses and only work during daytime hours. Blasting shall only be used where alternatives are not available and utilize minimum charge necessary. Blasting should not be carried out in the early morning or evening when background noise levels are low and potentially affected residents should be informed of the date and time of blast well in advance. Blasting should preferably be carried out at the same time each day.

221. **Topsoil management.** If a vegetated area is used for establishment of a construction site, the topsoil will be carefully removed and stored in piles as described in para. 94 and will be used on completion of works for site restoration.

222. **Waste management.** Construction concrete rubble, debris and spoil will be transported and disposed in approved disposal sites. Permits from the local regional authorities or contracts with specialized entities will be signed to carry out transportation and disposal of excavated materials and construction waste. Restoration to quasi-original conditions will be carried out after completion of renovation works and after use of quarries. A large area for disposal of waste is sought on the southern side of the tunnel since ideally most operations will be from this side to minimise impacts on the northern side in the Gulagarak Pine State Sanctuary. The Pambak Community offers a suitable area for disposal of construction waste and excavated material, and is 8 km by road from the tunnel south portal at the northern edge of Darpas. The area is approx. 16,500 m² and accessible by existing roads. Figure 36 and Figure 37 identify the location of the area.

The letter concerning this area from the Pambak Community is enclosed with this report in Appendix M.

It is noted that the relatively small volume of excavated soil and rock can be used within the south portal site installation area for landscaping.

An area for disposal of construction waste is also offered by the Gulagarak authority as described in Appendix L.

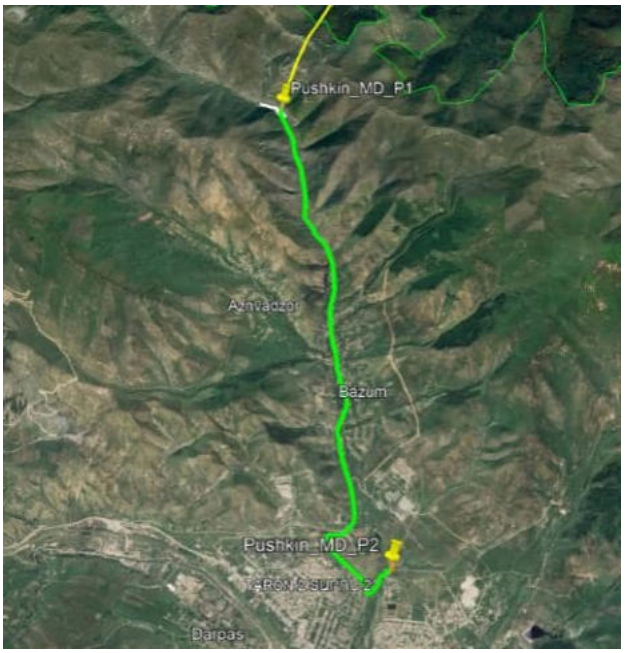


Figure 36: Location of area and transport route for waste disposal south of Pushkin Tunnel

Figure 37: Construction waste disposal area south of Pushkin Tunnel

223. **Managing safety hazards.** Tunnelling work involves significant risks which need to be carefully managed through the application of proper construction practices and safety procedures

The Contractor will be required to ensure that all works are planned and coordinated. In planning the works the contractor must undertake task planning and ensure that the planned work is supported by a risk assessment. In addition, the Contractor must ensure that his workforce is trained and competent to undertake the planned tasks. Both the risk assessment and work planning (in the form a construction phase plan and task method statements, both written documents) will be briefed to the workforce prior to undertaking work. Daily briefings must be undertaken by the work supervisor to ensure that the workforce understand the work, the coordination requirements, and any residual risks. The Contractor shall ensure that people are provided with training, supervision, personal protective equipment and suitable welfare facilities including rest.

Tunnelling work involves significant risks, and the contractor shall remain responsible for planning the safe execution of all work both inside and outside of the tunnel. In addition, he will remain responsible for all supporting systems and temporary works. The following high-risk activities will receive additional planning and detailed risk assessment

- Demolition works
- Working near rivers or open water
- Work at height
- Confined spaces (air and environmental issues together with access / egress issues)

- Fire protection and emergency planning
- Excavations and excavation work including the use of explosives
- Issues associated with collapse, rock bursting and water inflow.

The Contractor shall follow the International Tunnelling and Underground Space Association (ITA) "Guidelines for Good Occupational Health and Safety Practice in Tunnel Construction"[10] and also utilise the ITA's publication "Safe Working in Tunnelling"[11] for induction of its workforce and World Bank Group (IFC) Environmental, Health and Safety General Guidelines[12].

224. The work sites and camps shall be clearly delineated (preferably by barriers and fence); access to construction sites and camps shall be strictly controlled and limited to authorised personnel. Personal protective equipment must be available and be used during implementation of works. If works require drilling or blasting, the works will be implemented only by specially trained personal using specialized personal protective equipment. In addition, all workers shall receive appropriate orientation and instruction (including first aid training) prior to commencing their involvement in construction works.

225. Managing the construction camp.

The Contractor shall comply with the joint publication by the international Finance Corporation (IFC) and European Bank for Reconstruction and Development (EBRD) on Workers' Accommodation: Processes and Standards[13].

To ensure the well-being of workers, minimize environmental impact, and maintain good relations with nearby communities, the Contractor will ensure the site has all necessary infrastructure within his construction camp, such as water supply, waste management systems, electricity, and access roads, parking, and storage. The Contractor will provide safe, comfortable, well-ventilated/heated accommodation for workers, with drinking water and sanitary-hygienic facilities such as showers, toilets, and laundry areas. In addition, these facilities must be kept clean and free from defects. The Contractor will manage his workforce and ensure that the needs and sensitivities of the local community is acknowledged and respected. The Contractor will liaise with local authorities/ police and ensure good relations with local communities. The Contractor must undertake induction training with each member of the workforce (including day visitors) part of this induction must establish standards and expectations and address social issues such as drugs and alcohol standards on site.

226. **Managing waste in camps.** Waste containers will be placed near the construction camp and sites to collect the household waste generated during tunnel rehabilitation works. Agreements / contracts will be signed with the appropriate authority / entity to ensure timely transportation and disposal of waste.

227. **Preserving historic and/or cultural monuments.** Since the works are envisaged to be carried out within existing site, no impacts on historical and/or cultural monuments are expected. However,

[10] Available at https://about.ita-aites.org/publications/wg-publications/94/guidelines-for-good-occupational-health-and-safety-practice-in-tunnel-construction

[11] Available at https://about.ita-aites.org/publications/wg-publications/95/safe-working-in-tunnelling in multiple languages including English and Russian

[12] Available at https://www.ifc.org/content/dam/ifc/doc/2000/2007-general-ehs-guidelines-en.pdf

[13] Available at https://www.ifc.org/en/insights-reports/2000/publications-gpn-workersaccommodation

during the pre-construction phase the Contractor will confirm that there are no cultural heritage sites that may be affected. If any are identified the Contractor will locate optional construction sites/activities away from them. They will also provide training to workers on this topic. If the proposed construction passes close to historical / cultural areas, the contractor will employ temporary fences to restrict machines and activities from encroaching in the area. Photographic records of the condition of the item/ area will be taken before the start of construction and the historical / cultural areas and artifacts will be inspected every 6 months and a short condition assessment reported to the client.

228. In the case of discovery during construction activities, the works shall be immediately stopped, and the Ministry of Education, sport, culture and youth be informed

The Contractor shall implement the 'Chance-Finds Procedure' and ensure the presence of an archaeology specialist within his team.

Works will proceed following discussion and guidance obtained from the Ministry.

229. **Public awareness.** To mitigate the disturbance to the population, appropriate information on the project (including duration of construction works) shall be regularly provided to affected communities. The local population should be appropriately informed about the commencement of construction works/ phases of construction (information on proposed construction activities should be available on the website of the Ministry of Territorial Administration and Infrastructure, RDF, local authorities, and also through community newsletters, local TVs and from community leaders). Notification on commencement of construction works, limitations of vehicle movement, alternative access and detour arrangements shall be provided to affected communities in advance of commencement of construction works.

230. The wind farm operator above the tunnel around the bypass is unlikely to be significantly affected by construction traffic, although they should be consulted and informed of potential delays during road upgrading works so they can access their plant as and when needed.

231. The project shall have an established **grievance redress mechanism** that will allow affected parties to raise their concerns and obtain feedback. Information on steps of grievance review and redress procedure as well as parties involved in grievance resolution shall be made publicly available and disclosed in affected communities.

232. **Contractor Environmental and Health and Safety Staff.** The Contractor shall appoint a dedicated full time Health and Safety Officer (HSO), Environmental Officer (EO) and Deputy Environmental Officer (DEO) responsible for undertaking health, safety and environmental management tasks as set out in the Contract and lead the monitoring team. The Environmental team will report directly to the Project Manager.

233. The responsibilities of the EO will include:

- Ensuring the contractor implements the environmental protection and management specifications set out in the Contract, EMP and the SEMP;
- undertaking day-to-day environmental management tasks as required for the Project and weekly environmental audits;
- maintaining a daily Site Diary recording all relevant matters concerning environmental

management on the Site including protections and controls, audits, inspections, and related incidents. Making the Site Diary available for inspection by the Engineer upon request;

- participating in joint inspections to be undertaken by RDF, ADB and other environmental missions;
- preparing and submitting the reports as required by the Contract, EMP and the SEMP;
- conducting EHS orientation/specialized trainings/instructions for the Contractor's and sub-contractor's staff on the topics detailed in Training Programme (Plan);
- implementing the environmental mitigation measures and their related monitoring activities on a daily basis;
- monitoring baseline data surveys as required in the Technical Specifications and the EMP;
- carries on site visits and inspections on a weekly basis, and documents monitoring activities and results in a weekly environmental report, completes weekly inspections of the Gyulagarak Sanctuary to monitor compliance with the biodiversity management plan;
- in case of inadequate monitoring results, identifying the necessary corrective actions through a Corrective Action Plan as soon as possible;
- preparing monthly environmental report as part of Contractor's monthly progress report;
- carrying out regular visits (at least 2 visits) during the defects liability period and providing a site status report.

234. The DEO will support the EO in his daily duties and assume the EO responsibilities when the EO is not on site or otherwise engaged.

235. The responsibilities of the HSO will include:

- Ensuring the contractor implements the health and safety objectives and legal requirements to provide a safe construction environment and assure a safe place of work;
- ensuring the Contractor complies with its Health and Safety Plan, as well as applicable guidelines (as identified in para. 223);
- undertaking day-to-day health and safety management tasks as required for the Project and weekly/ regular safety audits;
- undertake workforce and stakeholder engagement meetings and incident investigations where required;
- contributing to the daily Site Diary recording all relevant matters concerning health and safety management on the site including protection and controls, audits, inspections, and related incidents;

- participating in joint inspections to be undertaken by RDF, ADB and other EHS missions;
- conducting HS orientation/specialized trainings/instructions for the Contractor's and sub-contractor's staff;
- ensuring the Contractor implements geotechnical monitoring as required in the Technical Specifications and takes immediate actions as may be necessary;
- carries on site's visits and inspections on a weekly basis, and documents monitoring activities and results in a weekly safety report.
- in case of inadequate performance, identifying the necessary corrective actions through a Corrective Action Plan as soon as possible;
- in cases of accidents/incidents notifying the CSC immediately: The initial notification might be verbal, but must be followed by a written report within 24 hours after the incident or accident occurred;
- coordinating and reporting to the CSC, including a report on all accidents/ incidents and the near misses immediately according to the format attached in Appendix N (Incident / Accident Forms);
- contribution monthly health and safety report as part of Contractor's monthly progress report;
- carrying out regular visits (at least 2 visits) during the defects liability period and providing a site status report.

236. In order to introduce reasoned analysis of incidents identified on-site it is proposed that their levels of incident reporting are available:

- Observation: No discernible environmental impact on the site.
- Opportunity for Improvement: Minor impact that is reversible with minor intervention.
- Non-conformity: Major incident requiring significant resources to rectify.

237. In carrying out site inspections the EO and HSO will record any environmental and health and safety incidents, under three levels of severity:

Non-Compliance		What it means on site	Reported by?	On-site reporting as:
Level I	A non-compliance situation not consistent with the requirements of the EMP, but not believed to represent an immediate or severe social or environmental risk. Repeated Level I	An unplanned and undesirable event is observed where there was no damage to the environment but there could have been.	Everyone on site. Responsibility of the Environmental Officer to educate the workforce	"**Observation**"

	concerns may become Level II concerns if left unattended.			
Level II	A non-compliance situation that has not yet resulted in clearly defined damage or irreversible impact, but which potential significance requires expeditious corrective action and site specific attention to prevent severe effects. Repeated Level II concerns may become Level III concerns if left unattended.	An unplanned and undesirable event is observed where there was no damage to the environment but there could have been.	The teams responsible for carrying out the regular site audits. Includes CSC's environmental officer, Contractor's Environmental Officer, etc.	"**Opportunity for Improvement**"
Level III	A critical non-compliance situation, typically including observed significant social or environmental damage or a reasonable expectation. of very severe impending damage. Intentional disregard of specific prohibitions is also classed as a Level III concern.	Where a situation exists, or with potential to create a situation, where there is damage to the environment.	The teams responsible for carrying out the regular site audits. Includes CSC's environmental officer, Contractor's Environmental Officer, etc.	"**Non-conformity**"

Table 17: Reporting environmental incidents on site – three levels of incident.

238. When an incident is identified the observer assigns it as an Observation, Opportunity for Improvement or a non-conformity. Only a non-conformity requires the issue of a Corrective / Preventative Action Request generated by the CSC. Incidents / accidents shall be recorded using the forms provided in Appendix N. Observations and Opportunities for improvement are relayed verbally to the supervisor at site, recorded on the site audit sheet and summarised in monthly reporting.

H. Operation phase mitigation measures

239. During the operation phase emphasis should be on better vehicle maintenance and emission checks to minimize negative environmental impact from traffic. The drainage system of tunnel should be properly maintained to ensure drainage to prevent flooding and damages caused by water.

240. **Waste management.** Waste containers will be placed nearby tunnel. As a part of an operation and maintenance programme, agreement should be reached with appropriate authorities / entities to

ensure timely regular cleaning tunnel and collection, transportation, and disposal of waste to an approved disposal site.

241. **Maintenance of drainage system.** Proper maintenance of drainage system and other utilities must be carried out during operation of the tunnel, including regular inspections and repairs as needed.

242. **Managing safety hazards.** Proper operation and maintenance of tunnel and associated infrastructure will ensure risk is minimized. Roads signs, marking and safety elements (including guardrails, speed bumps, etc.) shall be regularly inspected and kept in appropriate working condition. A speed control system must be installed.

I. Environmental reporting requirements

243. The Contractor will prepare a SEMP (outline attached in the Appendix O) that will take on board the environmental concerns identified in this IEE and detailed in the EMP. The SEMP is the Contractor's opportunity to address the environmental concerns identified in the IEE and their own experience and site practices to state clearly how environmental issues will be addressed. From the SEMP a series of checklists will be derived by the Contractor with CSC input for use in auditing the Contractor Environmental performance and offering early identification of any deteriorating environmental standards.

244. The Contractor will produce monthly engineering reports and these must include information on environmental performance. Reporting will include but not be limited to:

- Status of the SEMP;
- status of any other contractor prepared environmental documents;
- status of environmental permits (e.g. asphalt plant, borrow areas if appropriate);
- recording any physical environmental monitoring results (e.g. air, noise, water quality, vibration);
- results of contractor and joint contractor / CSC site audits;
- grievance redress mechanism;
- interaction with the public – public consultations and complaints;
- training of site staff in environmental matters.

245. RDF will prepare a semi-annual Environmental Monitoring Report drawing on the Contractors monthly environmental monitoring information and reporting the Environmental Performance of the project. This document will be disclosed on the ADB project website.

VII. PUBLIC CONSULTATION, INFORMATION DISCLOSURE, PUBLIC COMMUNICATION, CONSULTATION AND PARTICIPATION

A. Stakeholder Categories and Groups

246. The Project stakeholders have been grouped into the following two major categories:

- Internal stakeholders representing the organizations that undertake the Project and those who work within them such as management, staff, owners, shareholders, as well as contractors and subcontractors involved in the Project implementation and benefiting from it (investors and shareholders); and
- External stakeholders representing the groups or individuals that are not part of the organizations implementing the Project but are affected in some way by the decisions and actions of such organizations.

INTERNAL STAKEHOLDER	ROLE
Road Department Fund	Executing agency with overall responsibility for the project and communications with other stakeholders
Ministry of Territorial Administration and Infrastructure	Ministry with overall responsibility for implementation of the Project and has delegated implementation functions to the Road Department Fund
Asian Development Bank	Donor
M3 Road Operator / Tunnel Operator	Day-to-day operation and maintenance of the road and tunnel
Design consultant (JV BERNARD Gruppe ZT GmbH and ACTES Bernard GmbH)	Responsible for development of ESR and IEE, as well as support of RDF in stakeholder consultations
Contractors and their subcontractors	Responsible for construction of the project and compliance with all legal, environmental, social and health and safety requirements
Other consultants (e.g. supervisors)	Responsibilities as defined in their contracts

Table 18: Identification of internal stakeholders

247. **External stakeholders:** In order to ensure effective and meaningful engagement, the Project's external stakeholders have been clustered into the following groups:

- Potentially affected parties/facilities (if any);
- Potentially vulnerable groups (if any);
- Non-commercial organizations (Non-Governmental Organizations (NGOs), mass media, academia etc.);
- State authorities;

- Local government authorities;
- Infrastructure management authorities

EXTERNAL STAKEHOLDERS	INTEREST / ROLE	ENGAGEMENT TOOL
Potentially affected parties/facilities		
Residents of nearby communities (e.g., Gargar and Bazum)	May be potentially affected by: • construction traffic May be interested in: • employment opportunities during the construction works	Community meetings Focus groups Individual consultation meetings
Farmers who use nearby lands (e.g., north side of the bypass road above the tunnel) for pasture of herded animals	May be potentially affected by: • social conflicts with the workers • construction • traffic over the bypass road	Community meetings Individual consultation meetings
Local business, located near to the project site, e.g., the café close to the south portal (which is not open)	May be potentially affected by: • social conflicts with the workers • construction May be interested in: • impacts associated with extension of the parallel tunnel	Community meetings Individual consultation meetings
Wind farm (above the tunnel) operator	May be potentially affected by: • traffic over the bypass road	Individual consultation meetings
Non-commercial organizations		
Nationally relevant NGOs	May be interested in: • monitoring the project progress and tracking how their views / suggestions regarding the project implementation have been taken into account; • positive E&S changes associated with the implementation of the Project.	Meetings
Scientific, research and educational organizations, i.e., the RA National Polytechnic University	May be interested in: • information about the Project, its progress and its E&S impacts; • participating in the project consultations	Study tours for students
State authorities		

EXTERNAL STAKEHOLDERS	INTEREST / ROLE	ENGAGEMENT TOOL
Ministry of Environment (MoE)	Responsible for the sustainable management, preservation, protection, of the subsoil, lands, water resources, atmosphere, flora and fauna, as well as protected areas (Gulagarak Pine State Sanctuary), forests, and for proper use and reproduction of natural resources (except for mineral resources). Within the structure of the MoE, the Environmental Impact Expertise Center SNCO conducts environmental expert examinations of designs for reconstruction, rehabilitation and maintenance activates according to the requirements of the Armenian legislation.	Meetings and consultation
ArmForest	Management of the Gulagarak Pine State Sanctuary.	Meetings and consultation
Ministry of Emergency Situations	The Ministry of Emergency Situations elaborates and implements the policies of the Republic of Armenia Government in the area if civil defence and protection of population in emergency situations. To organise fire drills with tunnel operator.	Meetings and consultation
Ministry of Health	Within the structure of the Ministry of Health the National Center for Disease Control and Prevention (NCDC), among other functions is responsible for coordination of issues related to health (including those on noise and vibration) and for supervision over implementation of sanitary norms, hygienic and anti-epidemiological measures implementation by organizations and citizens.	Consultation Official announcements of NCDC
Ministry of Labor and Social Affairs	To assure stable workplaces	Reports
Health and labour inspection body of the Republic of Armenia	To ensure safe workplaces for employees and visitors	Inspections Consultations
Environmental Protection and Mining Inspection Body of the Republic of Armenia	Reasonable use and reproduction of subsoil and mineral resources.	Inspections Consultations
Road police	Responsible for traffic safety and road diversions.	Inspections Consultations
“National Center of Technical Security” SNCO	Responsible for technical safety at hazardous production facilities (including tunnels)	Inspections Consultations
Regional / community authorities		
Regional Lori Province, Vanadzor and Stepanavan communities	May be interested in: • stable workplace to hire from local community. • communication with the communities.	Community meetings Consultations
Infrastructure management authorities		

EXTERNAL STAKEHOLDERS	INTEREST / ROLE	ENGAGEMENT TOOL
Veolia Jur CJSC	Responsible as the Unified Operator for managing water and wastewater systems in Armenia.	Consultations
CJSC Electric Network of Armenia (ENA)	Responsible for the regulated distribution and sale of electrical energy in Armenia, including in the project area. Power supply for the tunnel during construction and operation.	Consultations

Table 19: Identification of external stakeholders

B. Information disclosure requirements

248. The main methods for stakeholder engagement and information disclosure include meetings with identified stakeholders, consultations, disclosure on project internet websites (i.e., RDF's website), through local government authorities, social networks, notice boards in communities, distribution of leaflets, and announcements in the local media.

249. Public consultation/stakeholder meetings organized in project area (e.g. regional centres) in publicly accessible places and open for attendance by all stakeholders. The information about upcoming events should be disseminated at least 7 working days before the event date.

250. Documents concerning the project should be published on the Client's website as well as on the Armenian e-procurement platform.

251. The IEE should be disclosed on the RDF and ADB websites.

C. Public Consultations

252. Public consultations were held in the Gargar and Bazum Communities on 05.12.2024. They were held by RDF and the Consultant, and attended by community leaders, community residents, and the village administration head and employees. In Gargar 25 persons participated; and in Bazum 15 persons participated. The minutes of the consultations are enclosed in this report as Appendix K.

253. A summary of the key issues raised in Gargar is as follows:

- Availability of the water emerging from the tunnel for irrigation and drinking water supply: It was explained to participants that at present the water emerging from the tunnel is polluted as groundwater is mixed with water from the roadway. After tunnel rehabilitation polluted and clean water will be separated and polluted water will be treated; however, it is not within the scope of the project to utilise this water as a water supply system. As part of the project a water collection reservoir will be built for use in the fire protection system and excess water could be used by residents. However, this will require a pumping station and is out of the scope of this project.

- Start of the rehabilitation works and their duration: RDF clarified that works will only start once the bypass road has been rehabilitated and improved, which itself is expected to take 2 years.

The tunnel works are expected to take 36 months. The tunnel may be opened during winter when the bypass road is unavailable.

- Possibility of employment for local persons during construction.

254. A summary of the key issues raised in Bazum is as follows:

- Availability of the water emerging from the tunnel for drinking water supply: It was explained to participants that at present the water emerging from the tunnel is polluted as groundwater is mixed with water from the roadway. After tunnel rehabilitation polluted and clean water will be separated and polluted water will be treated; however, it is not within the scope of the project to utilise this water as a water supply system. With additional investment the water could be purified, chlorinated and pumped to the village.
- Start of the rehabilitation works and their duration: Response given as in Gargar.

VIII. GRIEVANCE REDRESS MECHANISM

255. In order to receive and facilitate the resolution of affected persons (APs), concerns, complains and grievances about project performance an environmental and social Grievance Redress Mechanism (GRM) is proposed for the project. When and where the need arises, this mechanism will be used for addressing any complaints that may arise during the implementation of project. The grievance mechanism is scaled to the risks and adverse impacts of the project. It addresses AP's concerns and complaints promptly, using an understandable and transparent process that is gender responsive, culturally appropriate, and readily accessible to all segments of the affected people at no costs and without retribution. The mechanism does not impede access to the Armenia's judicial or administrative remedies. The project proponent will appropriately inform the affected people about the mechanism before start of commencement of any civil works.

256. The process for solving environmental complaints that may arise in the Project is the GRM, which will be established in the district where the Project will be implemented.

257. The procedural steps of the GRM for the Project are provided below. Note that the processing times refer to the maximum time allowed at each stage. If an issue is not resolved within the processing time it automatically passes to the next stage.

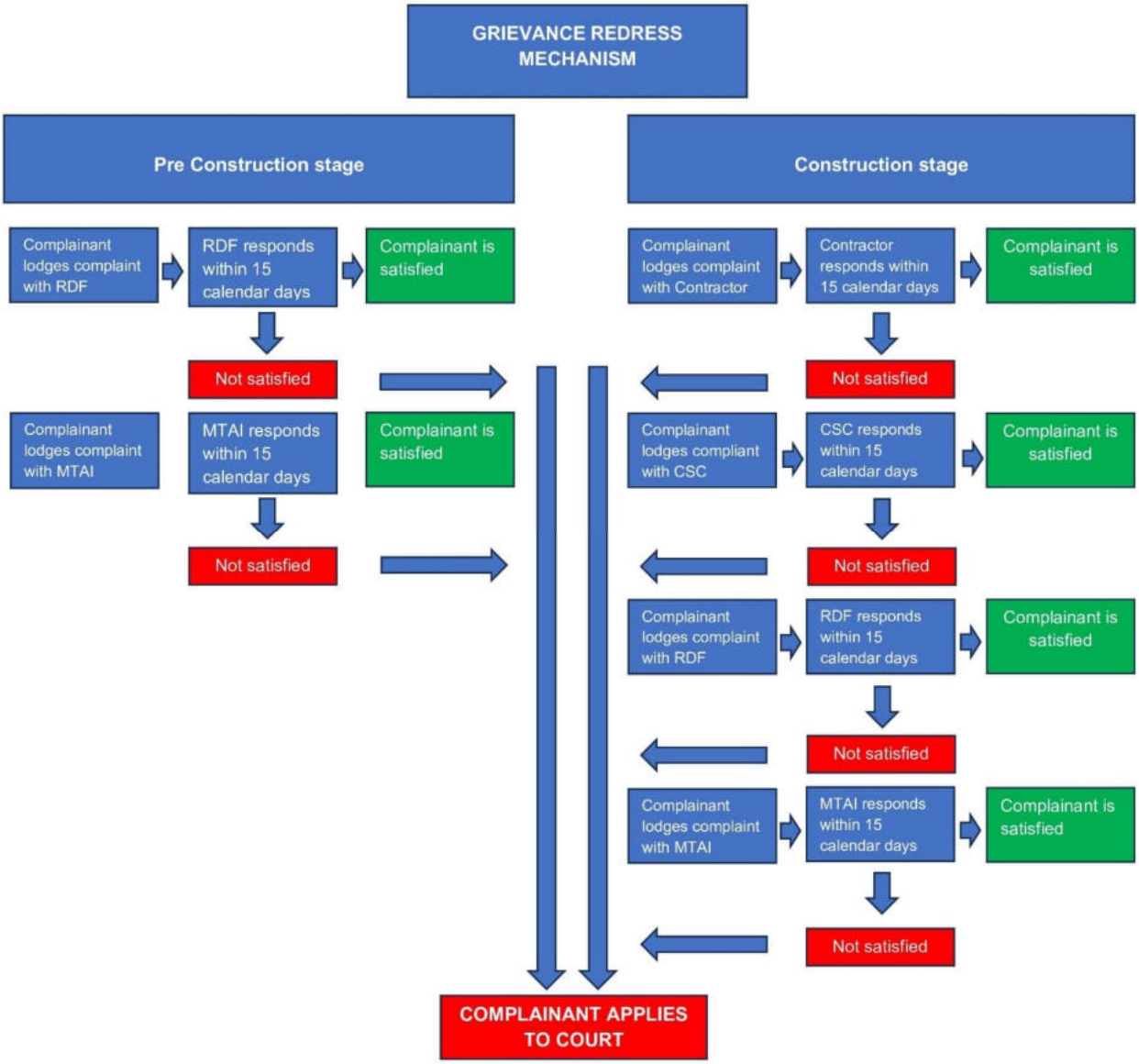


Figure 38: Outline of GRM

258. The following are the procedural steps to file a complaint, pose an inquiry on matters relating to Project implementation, environmental concerns and other issues regarding the Project.

A. Pre-construction stage:

259. **Step 1.** The person affected by the Project could raise their suggestions/concerns/complaints first of all to RDF, which receives and resolves/replies to the AP's grievances.

260. If an AP is not satisfied with the response or RDF responsible staff needs additional capacity to response the APs' grievance, the Grievance Review Group (GRG) can be formulated to ensure comprehensive, equitable and transparent discussion of the case. To establish legitimacy of the GRG to review and judge on the substantive merit of the AP's complaint, the composition of the GRG should be balanced and include an independent observer to ensure the impartiality and transparency of the complaint review process. The following composition of the GRG is proposed:

Representative of RDF	Chairperson
Representative Safeguard Team of RDF	Member
Representative of Local Government	Member
Representative of Engineer/Contractor	Member
Representative of AP	Member
Independent party / NGO	Member
Certified Technical Expert	Member

261. To ensure effective complaint processing, the role and responsibilities of each GRG member should be carefully described and explained to them.

262. **Step 2.** If AP is not satisfied with RDF's decision even after the GRG's review of the grievance, then s/he can lodge the grievance to the RA Ministry of Territorial Administration and Infrastructure. MTAI follows Public Administration RA law for registration, revision and resolving the case.

B. Construction Stage:

263. **Step 1.** The person affected by the Project could raise their suggestions/complaints firstly through the Project's initiative. In order to maintain transparency and accountability to affected communities and to make information, assistance and grievance resolution services accessible to the APs, RDF will establish the GRM Committee.

i. An AP's application to the Contractor's representative (engineer, social or environmental specialist) on-site and/or register their suggestion /complain into the grievance register book kept by Contractor at the field office established in the construction camp located nearby. The template for recording grievance, content and format of the application shall be in accordance with the Employer's EMP.

ii. The Contractor ensures the provision of contact information (field office location, operating hours, names of responsible contact persons, phone numbers, regular mail and email addresses, etc.) via posters and Project information boards.

264. The Contractor should immediately inform the CSC and RDF if an AP raises a grievance and should send the copy of written complaint to them. Verbal complaints should be recorded by the Contractor's representative, and the relevant information must be immediately shared with the Engineer. The Contractor should implement appropriate mitigation measures to resolve the issue and send the written response/reply to the AP with copies to the CSC and RDF.

265. **Step 2.** Should the AP not be satisfied with the Contractor's solution to his/her complaint, further opportunities are available. The AP could next apply to the CSC by raising the complaint within one month after receiving/not receiving a response from the Contractor.

266. The incoming suggestions/ complains shall be considered and classified into environmental and

social/resettlement items. The social/resettlement safeguard related complaints shall be handled in the scope of the CSC and RDF LARP specialists.

267. The environmental specialists of the CSC in collaboration with the Contractor(s) shall establish an office at the Project site, where environmental complaints of APs regarding EMP and projects operation impacts can be raised. This Project site will be used for supervision of the EMP to ensure the mitigation measures are timely and properly implemented; disclosing all safeguard documents; and receiving and responding to the comments/feedback from the community. The CSC shall respond to complaints within 15 days.

268. **Step 3.** Should the Engineer fail to resolve the complaint, the AP could apply to RDF, MTAI and ADB AM. The complaint in the construction stage at the RDF level will be preceded with the same scheme as in the pre-construction stage. All the contact information shall be provided by the Contractor on posters and on the Project information board. The Contractor shall serve as an entry point in this stage and provide the necessary explanations and assistance in application to the mentioned entities, if needed through the personal contact with the AP.

269. If not possible, attempts will be made to resolve the issues at the MTAI level to avoid/minimize litigation as much as possible. All complaints regardless of the outcome and solutions will be properly documented and made available for review, monitoring and evaluation purposes. Finally, the AP can always seek attention and interference of the court.

C. ADB's Accountability Mechanism

270. ADB's website presents the Accountability Mechanism (AM) as a forum where people adversely affected by ADB-assisted projects can voice and seek solutions to their problems and report alleged noncompliance of ADB's operational policies and procedures.

271. ADB remains firmly committed to the principle of being accountable for complying with its operational policies and procedures, and solving problems of project-affected people and ensures high standards of accountability, transparency, openness, and public participation. The AM policy of 2012 which, as presented in their website (http://www.adb.org/documents/accountability-mechanism-policy-2012), is designed to:

i. enhance ADB's development effectiveness and project quality;
ii. be responsive to the concerns of project-affected people and fair to all stakeholders;
iii. reflect the highest professional and technical standards in its staffing and operations;
iv. be as independent and transparent as possible; and
v. be cost-effective, efficient, and complementary to the other supervision, audit, quality control, and evaluation systems at ADB.

272. The ADB AM executes the tasks via the problem-solving function which assists people who are directly, materially, and adversely affected by ADB-assisted projects to find solutions to their problems. Contractor shall inform the APs on the ADB AM as an alternative opportunity for solving of problems.

IX. ENVIRONMENTAL MANAGEMENT PLAN

273. The EMP should be implemented in three stages: (i) before construction, (ii) during construction,

and (iii) during operation and maintenance. The EMP is a dynamic document and will be updated and adjusted in line with ongoing data collection, contractors' performance and monitoring results. The Implementing Agency will be responsible for introducing modifications to the EMP and include them in the report which will be submitted to ADB twice a year.

274. The tables at the end of this section present an Environmental Management Plan (EMP) that identifies feasible and cost-effective measures to be taken to reduce potentially significant adverse impacts to acceptable levels. The tables reflect the various stages of the project cycle: pre-design, design, rehabilitation, operations, and maintenance. The last set of tables describe environmental monitoring activities at the pre-design, construction, and operations stages.

275. This EMP is site-specific and is focused on the rehabilitation and upgrading of the Project area. The Contractor will be responsible for preparing more comprehensive EMPs based on this EMP to match the Contractors working methods. These documents will be called Site Specific Environmental Management Plans (SEMP).

276. 28 days before construction activities commence, the Contractor will prepare and submit proposals and method statements consistent with the EMP to the CSC who will in turn submit to RDF (as the Implementing Agency) for review and approval.

277. The tables below summarize the cost estimates for environmental mitigation measures and monitoring.

Description	Unit	Quantity	Unit Rate (AMD)	Amount (AMD)
Contractor's EO	Months	26	4,000,000	104,000,000
Contractor's DEO	Months	26	4,000,000	104,000,000
Contractor's HSO	Months	26	4,000,000	104,000,000
Design muck disposal	Lump sum	1	4,400,000	4,400,000
Establishment and securing of muck disposal area including signage and fencing	Lump sum	1	6,600,000	6,600,000
Tree planting	No. trees	200	20,000	4,000,000
Vertical barriers	No.	2	2,000,000	4,000,000
Horizontal barriers	No.	2	500,000	1,000,000
PPE	No. sets	30	230,000	6,900,000
Dust control	Months	24	330,000	7,920,000
Protection of water sources against pollution around construction sites	Months	24	220,000	5,280,000
Water supply, sanitary facilities and water treatment facilities at the labour camp	Months	24	440,000	10,560,000
Establishment of traffic diversions	Lump sum	1	4,400,000	4,400,000
Maintenance of traffic diversions	Months	24	440,000	10,560,000
Removal of traffic diversions	Lump sum	1	4,400,000	4,400,000
Solid waste management facilities at the labour camp and on construction sites	Months	24	110,000	2,640,000
Implementation of waste separation and recycling at the	Months	24	66,000	1,584,000

Description	Unit	Quantity	Unit Rate (AMD)	Amount (AMD)
labour camp and on construction sites				
Reinstatement and landscaping of site	Lump sum	1	6,600,000	6,600,000
Landscaping and re-vegetation of muck disposal area	Lump sum	1	22,000,000	22,000,000
Total				**AMD 414,844,000**

Table 20: Summary of indicative cost estimates for environmental mitigation measures

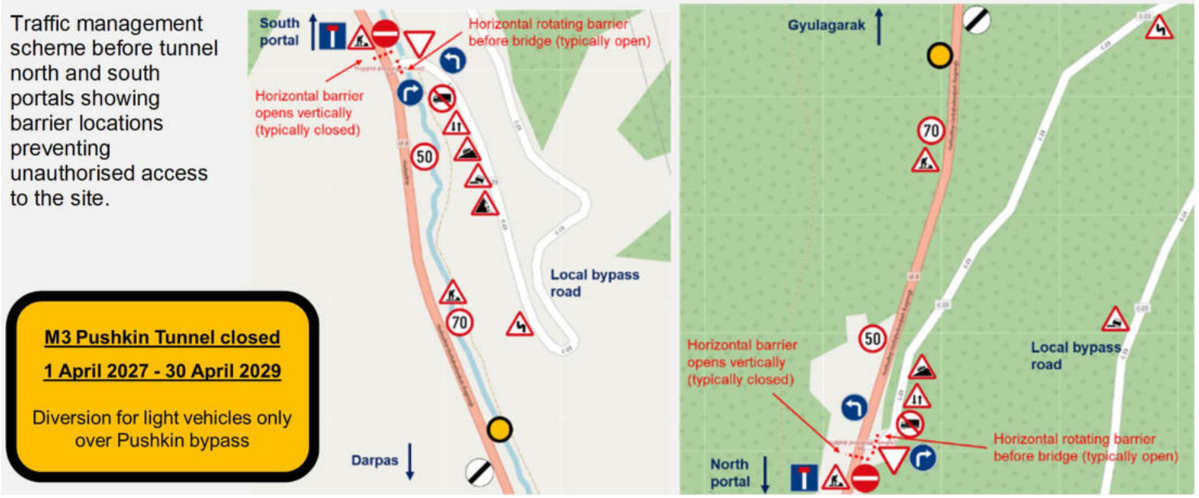
Contractor			
	Quantity	**Unit Rate (AMD)**	**Amount (AMD)**
Pre-Construction			
Ambient air quality monitoring (4 locations, once)	4	30,000	120,000
Surface water quality monitoring (4 locations, once)	4	150,000	600,000
Soil quality monitoring (6 locations, once)	4	22,000	132,000
Noise monitoring (4 locations, once)	4	13,000	52,000
Vibration monitoring (4 locations, once)	4	55,000	220,000
Construction			
Ambient air quality monitoring (4 locations every 2 weeks = 4 x 2 x 24)	192	30,000	5,760,000
Surface water quality monitoring (8 locations every 2 weeks = 8 x 2 x 24)	384	150,000	57,600,000
Soil quality monitoring (6 locations once per quarter = 6 x 24/3)	48	22,000	1,056,000
Noise monitoring (4 locations every 2 weeks = 4 x 2 x 24)	192	13,000	2,496,000
Vibration monitoring (4 locations once per quarter = 6 x 24/3)	32	55,000	1,760,000
Post-Construction			
Ambient air quality monitoring (4 locations, twice)	8	30,000	240,000
Surface water quality monitoring (8 locations, twice)	16	150,000	2,400,000
Soil quality monitoring (6 locations, twice)	12	22,000	264,000
Noise monitoring (4 locations, twice)	8	13,000	104,000
Vibration monitoring (4 locations, twice)	8	55,000	440,000
Total			**73,244,000**
Construction Supervision Consultants (CSC)			
Remuneration			
	Months	**Unit Rate (AMD)**	**Amount (AMD)**
National Environmental Specialist	12	3,000,000	36,000,000

National Social Specialist	12	3,000,000	36,000,000
National Health and Safety Specialist	24	3,000,000	72,000,000
Total			**144,000,000**
Project Management Unit (PMU)			
Remuneration			
	Months	**Unit Rate (AMD)**	**Amount (AMD)**
Safeguards Specialist	12	2,000,000	24,000,000
Monitoring success of re-vegetation and tree health	2 visits	900,000	1,800,000
Total			**25,800,000**

Table 21: Summary of indicative cost estimates for environmental monitoring

PROJECT ACTIVITIES	EXPECTED IMPACT / RISK	PROPOSED MITIGATION MEASURES	RESPONSIBLE ENTITIES	INDICATIVE COST OF MITIGATION
DESIGN PHASE				
Identification of cultural heritage issues	Negative impact on special protected historical/ cultural areas and monuments	The designer will identify potential historical / cultural sites that could be affected by onsite or offsite construction activity. The Contractor will locate optional construction sites/activities away from them. Ensure construction personnel are aware of locations of historical / cultural areas and avoid them. If the proposed construction passes close to historical / cultural areas, the contractor will employ temporary fences to restrict machines and activities from encroaching in the area. Photographic records of the condition of the item/ area will be taken before the start of construction and the historical / cultural areas and artifacts will be inspected every 6 months and a short condition assessment reported to the client.	Designer will identify areas to be protected. Contractor will ensure that on site mitigation measures are employed.	None
Incorporation of environmental issues in design	Design does not adequately address environmental issues	Ensure that all designers and contractors are fully aware of the environmental need and requirements through good, clear structured communication and project documentation. Design provides proper well engineered solutions for environmental protection. Specific to this project this includes: - Treatment of polluted water emerging from tunnel - Appropriate drainage solutions - Use adequate design, sitting, and sizes of drainage structures - Utilise existing infrastructure to the greatest extent possible - Minimise surface impacts - Constrain development to areas already impacted	Designer	None
Design of drainage solutions	Erosion of earthworks, watercourses and slopes	Site drainage structures are designed avoid a cascade effect and to ensure that runoff is conveyed into natural drainage lines with controlled velocities. -The receiving areas are designed and lined with stones or concrete to protect soils at outflow areas. -Incorporate sufficient number of drainage outlets so that flow from any individual outlet is not excessive	Designer to design and Contractor to implement	None
PRE-CONSTRUCTION PHASE (Mobilisation stage)				
Procurement	Environmental requirements are not communicated or fully addressed in bid documents or construction documents	EMP to be included as an integral part of the bid documents. The bidding documents shall have an Environment Protection section and include this EMP so that the bidder is aware of the environmental requirements for the Project. The bidding documents will also include the baseline survey data and a requirement to measure and report ongoing results against the baseline data/ data locations during the work and identify threshold values. SEMP will be prepared by Contractor 28 days before construction activities with the content identified in Appendix O of this IEE. This will be reviewed by the Client and/or CSC (depending on timing of engagement).	Client will manage the bidding process and documentation	None
Procurement	Contractor not capable of managing environmental issues.	Qualification criteria require bidders to demonstrate competence in managing environmental issues. Bidders (and subsequently the Contractor) required to included dedicated staff and resources for managing environmental issues. Bidders required to outline their approach to managing environmental issues in their proposals.	Client will manage the bidding process and documentation	None
Obtaining permits	Permits not in place or fully discharged	Ensure that all permits are identified, and the Client and Contractor shall obtain permits for which they are respectively responsible.	Client Contractor	None
Contractor's methodologies for safe and environmentally friendly working methods	Contractor's methodologies are unsafe, inappropriate for the nature of the works, do not consider known environmental issues, or create new environmental problems	Client to set out its requirements for the Contractor's methodologies in bidding documents. Client and/or CSC (depending on timing of engagement) to thoroughly review methodologies and require Contractor to make improvements where necessary. CSC to ensure that Contractor is implementing its approved methodologies during construction.	Contractor to prepare its methodologies Client and/or CSC to review	None
Establishing environmental baseline	Baseline (pre-construction)	Contractor to carry out pre-construction environmental monitoring in compliance with the Environmental Monitoring Plan.	Contractor	Air quality: Noise:

PROJECT ACTIVITIES	EXPECTED IMPACT / RISK	PROPOSED MITIGATION MEASURES	RESPONSIBLE ENTITIES	INDICATIVE COST OF MITIGATION
	environmental conditions are not captured	Client and/or CSC (depending on timing of engagement) to review intended locations for monitoring, the Contractor's methods and equipment, and the results.	Client and/or CSC to review	Water quality:
Siting of contractor's site installations	Inappropriate location of contractor' camp and other site installations	Contractor shall position all its intended installations within the project area to the greatest possible extent on surfaces already impacted. Contractor shall demarcate the limits of its site installation area and install fencing. Client and/or CSC (depending on timing of engagement) to review site installation planning and ensure that the Contractor complies with its approved plans. No site installations, temporary or permanent, shall be located in the Gyulagarak Sanctuary.	Contractor Client and/or CSC to review	None
Siting of construction waste and muck disposal areas	Improper disposal of contaminated materials and other waste generated by the Project	In advance of construction the locations for disposal of construction waste and muck (i.e., uncontaminated soil and rock excavated from the tunnel) shall be agreed upon with the local authorities. The areas shall be sited away from surface water bodies (at least 50 m). The areas shall be demarcated / fenced by the Contractor, access established and signs posted to secure the areas for use. No site shall be located in the Gyulagarak Sanctuary.	Client Contractor	Design of muck disposal area AMD 4.4 million Establishment and securing of muck disposal area including signage and fencing AMD 6.6 million
Sources of construction materials	Procurement of materials from illegal sources	Contractor to prepare and implement a resource management plan which identifies the sources of all materials for the Project and quantities from each source. Client and/or CSC (depending on timing of engagement) to review Contractor's submission. Maximise reuse of materials to minimise use of new resources. Ensure that construction materials will only be obtained from sources that have the required government environmental approvals. Secure and submit to the Client and CSC proof that quarries and other facilities such as batching plants possess all necessary environmental permits. No quarry or borrow pit shall be located in the Gyulagarak Sanctuary	Contractor Client and/or CSC to review	None
Tree retention	Trees unnecessarily cut down by Contractor, in particular within the Gulagarak Pine State Sanctuary on the north side of the tunnel	No trees shall be cut in the Gyulagarak Sanctuary Identify and label all trees on the project site to be removed and obtain necessary permission for their removal. Every tree removed shall be replanted with a compensation factor of at least 1:10 Tree planting shall only be carried out in collaboration with the Armforest.	Contractor	AMD 20,000 per tree including planting Maximum 20 trees estimated, therefore 200 to be planted giving a total cost of AMD 4,000,000
Public consultation and engagement	Lack of information and understanding by stakeholders and affected parties about the Project may lead to frustration and complaints, which in turn could result in delays for the Project.	1. Organize the discussion meetings with key stakeholders and the public consultation/ hearing events on the Project 2. Present the GRM which shall be established for the Project in accordance with the mechanism described in the Section I. GRM. 3. Place the information on the project and the final IEE/EMP at the RDF and ADB websites	Client	None
CONSTRUCTION PHASE				
1. Environmental and Health & Safety Orientation Plan				
Mobilisation and induction of workforce	Workers not able to understand environmental and health and safety risks arising from the works.	Workers shall be provided with appropriate equipment to protect the environment and assure their own health and safety, such as spill kits and personal protective equipment (PPE) such as safety shoes, hard hats, safety glasses, ear plugs, gloves, etc. The contractor shall provide a full induction to workers on camp rules, environmental and health and safety issues related to their activities as well as on the proper use of PPE and equipment. Training shall also be provided on biodiversity aspects (specifically relating to the Gyulagarak Sanctuary) and cultural heritage. The Contractor will establish a rolling programme of health and safety briefings and behavioural safety workshops.	Contractor	PPE cost identified under No. 2 below.

PROJECT ACTIVITIES	EXPECTED IMPACT / RISK	PROPOSED MITIGATION MEASURES	RESPONSIBLE ENTITIES	INDICATIVE COST OF MITIGATION
Mobilisation of workforce	Negative impact on the health and social wellbeing of local population due to the introduction of workforce from other places.	Conduct special briefing or on-site training on environmental, and health requirements of the project workers. Strictly supervise workers not to interfere with local affairs or quarrel with local people. Code of conduct to be prepared by contractor and disseminated to workers, In case of complaints from local people on the issues caused by workers, complaints will be solved as soon as possible with collaboration of the CSC's social specialist, per the project GRM.	Contractor	None (included in the Contractor's construction costs)
Site establishment	Public health and safety risks	Due to the location of the site away from any residential areas it is possible to completely block access to the site and minimise risks to public health and safety. Barriers (e.g., temporary fences and signage), shall be installed after the bypass road to prevent access as depicted below. The public/local residents shall not be permitted on the construction site especially in high-risk areas, e.g., excavation sites and areas where heavy equipment is in operation. The contractor shall hold dialogue and give clear instructions to any non-worker who may be permitted to access the site. Speed restrictions shall be imposed on project vehicles and equipment when traversing areas with sensitive receptors (such as residential, schools, temples, etc.) and drivers will be trained to be considerate and respectful to other road users especially vulnerable road users such as pedestrians and cyclists. Traffic management scheme before tunnel north and south portals showing barrier locations preventing unauthorised access to the site. 	Contractor	Installation of vertical barriers AMD 2 million per barrier Installation of horizontal barriers AMD 0.5 million per barrier Total cost approx. AMD 5 million
Demolition and construction works	Demolition works hold significant health and safety risks which must be planned managed and mitigated.	The Contractor must undertake necessary additional structural assessments and plan the temporary works and demolition works in writing prior to briefing the workforce of the plan and residual risks. The plan shall include construction sequences and monitoring systems. The contractor must remain vigilant throughout the works for latent defects and hazards that may be encountered during the demolition, these may include but are not limited to structural elements with embodied energy, prestressed, post tensioned elements, live electrical supplies and chemicals/ elements that are hazardous to health including asbestos fibres, lead and animal faeces that could present a health and safety /environmental hazard. The CSC shall be responsible for reviewing the Contractor's plan, monitoring the Contractor's compliance with its plan and stopping any unsafe work.	Contractor CSC for review and monitoring	None (included in the Contractor's construction costs)
Maintenance, and refuelling of vehicles Storage of materials hazardous to health	Risks to the environment resulting from the use of site plant and machinery and the need to store diesel on site.	The Contractor will ensure that its Health and Safety Management Plan includes details of the refuelling procedure which must be done in a dedicated and bunded area that is operated by trained staff who have access to spill kits and the appropriate plant and materials to manage spills. Chemicals that are hazardous to health will be stored in a dedicated and protected store which reflects the manufactures safe storage requirements and appropriate firefighting, and emergency arrangements will be developed. Staff must ensure that chemicals and chemical products are not disposed of in a way that could adversely affect the environment. The CSC shall be responsible for reviewing the Contractor's plan, monitoring the Contractor's compliance with its plan	Contractor CSC for review and monitoring	None (included in the Contractor's construction costs)
2. Occupational Health, and Safety Plan				

PROJECT ACTIVITIES	EXPECTED IMPACT / RISK	PROPOSED MITIGATION MEASURES	RESPONSIBLE ENTITIES	INDICATIVE COST OF MITIGATION
Health and safety planning / responsibilities	Contractor needs to take responsibility for occupational health and safety	The Contractor shall nominate an Environment Officer (EO), Deputy Environment Officer (DEO) and a Health and Safety Officer (HSO) who shall develop, implement and supervise a Health and Safety Management Plan (HSMP), as well as ensure that the requirements of the EMP are implemented. The Contractor shall instruct its workers using the Guideline "Safe Working in Tunnelling" published by the International Tunnelling und Underground Space Association.[14] and the World Bank Group (IFC) Environmental, Health and Safety General Guidelines.[15]	Contractor	Assuming a 26-month deployment of an EO, DEO and HSO, at a tentative rate of AMD 4,000,000 per month, the total cost would be AMD 312 million.
Health and safety planning / responsibilities	Lack of information on applicable health and safety regulations for the Project may lead to sickness, injury or death or workers, as well as Project affected persons, and other people near the site caused by exposure to substances, slips, trips, falls and falling objects.	The Contractor shall prepare its Health and Safety Management Plan with the following minimum content: a) HEALTH & SAFETY ORIENTATION PROGRAM 1. Ensure all the staff is undergone Occupational Health & Safety orientation trainings on the OHS-related topics, particularly for demolition and underground works. 2. Responsible officers for Health & Safety are appointed for every working section their contacts are placed in visible places. 3. Regular job-specific instructions on safe working of the whole staff as per Armenian legislation, ITA and WBG guidelines and prior starting the new work, as well as newly hired workers prior starting the job are implemented. The register is maintained and is available for inspection. b) PERSONAL PROTECTIVE EQUIPMENT 1. Provide the staff and ensure everybody on-site is wearing the uniform and PPE appropriate for the type of work being undertaken. 2. Health and safety accidents/ incidents to be recorded and reported to the CSC, PIU and the relevant authorities when needed. 3. Toolbox talks to be provided to reinforce the importance of use. 4. The Contractor must ensure that people are visible to moving vehicles and appropriate PPE must be provided. c) TOOLS & AUXILIARY FACILITIES 1. Provide safety tools and establish intrinsically safe auxiliary facilities (e.g. ventilation, electrical supplies etc). 2. Exclude unsafe working practices and unsafe tools at the construction site. Work and working practices are to be assessed at each workface. 3. All the excavated tranches, pits, manholes, all dangerous and risky areas, etc., are fenced-off, covered and protected during and by the end of the working day. Any underground excavations are never left unsecured and unsupported. 4. Exclude unsafe working practices and unsafe tools from the construction-site. 5. Fire-fighting system (including appropriate types of fire-extinguishers) is established and available, and easily accessible in all operating machinery, field camps and in all sections of the construction site. d) WORKPLACE HEALTH CARE 1. Regular medical check-ups of worker's and other personnel's health by the medical professional and records available on-site for inspection (if permitted in compliance with data protection laws). 2. First aid kits are available and easily accessible in all operating machinery and in all sections of the construction site. 3. Provide the Contractor's Personnel, with sufficient health education materials, condoms, regular STI/HIV testing, and for necessary cases, STI treatments and AIDS treatments, all free of charge. 4. Develop an Infectious Diseases (such as Covid-19) Health & Safety Plan. Ensure availability of Infectious Diseases (such as Covid-19) control means, tools and facilities at all the working areas. e) PUBLIC SAFETY MEASURES	Contractor for preparation and implementation CSC for review and monitoring	Preparation of Plan included in the Contractor's costs. Cost of 30 sets of PPE estimated at AMD 230,000 per set = AMD 6.9 million total

[14] Guideline is available online in English, German, Russian, Czech, Portuguese and Norwegian: https://about.ita-aites.org/publications/wg-publications/95/safe-working-in-tunnelling
[15] Guideline is available online: https://www.ifc.org/content/dam/ifc/doc/2000/2007-general-ehs-guidelines-en.pdf

PROJECT ACTIVITIES	EXPECTED IMPACT / RISK	PROPOSED MITIGATION MEASURES	RESPONSIBLE ENTITIES	INDICATIVE COST OF MITIGATION
		1. Take all reasonable precautions (protective, signal and temporary fencing, guard points, prohibiting posters, etc.) to isolate the working area and prevent unauthorized entry to the construction site. 2. Visibly install the signs/ posters informing on the ongoing works and warning of the dangers. 3. Provide a bypass route for the local residents and other people to ensure they don't enter the working area. Install the signs indicating the bypass route where needed. 4. Register any local persons who unavoidably must access the site to reach their land, and provide them with access passes and health and safety orientation. 6. Keep the pathways used by people/visitors clean and exclude the surface became sloppy from muck from construction sites. f) PROTECTION FROM POISONOUS REPTILES 1. Correct use of PPE: work with high boots and protective gloves. 2. As much as possible keep safe distance from any kind of snakes and other reptiles. 3. Hold toolbox talks and awareness training including first aid protocols will be communicated to the workforce. 3. Involve a reptile specialist (herpetologist) at the beginning of the works, who will train the staff how to recognize them and will capture the individuals of the reptiles found in the working area and release them in a safe place favourable for inhabiting of those animals. 4. Consider travel times and liaise with local hospitals on their capability. Arrange with the hospitals to have anti-snake serum or other medicines ready for used in case of poisonous snake bites. 5. Have designated vehicle available on site to enable a victim to be taken to the nearest capable hospital as soon as possible.		
Construction works and traffic management	Health and safety risks arising from demolition and construction works together with traffic on and off site. This is of particular importance in a tunnel as a confined space with limited space for vehicular movement	The Contractor will install traffic management systems (e.g., traffic cones and barrels) to delineate the work zone, regulate traffic on site and especially in the tunnel. Workers shall be provided with appropriate personal protective equipment (PPE) such as safety shoes, hard hats, safety glasses, ear plugs, gloves, etc. The contractor shall use the appropriate trainings, inductions and instructions to ensure workers are aware of health and safety issues related to their activities as well as on the proper use of PPE. Workers shall be provided with potable water supply and sunscreen. Workers will be supplied with reflective clothing or reflective devices as part of PPE to ensure they are visible to moving vehicles. Vehicles will have reversing cameras and a banksman will be in attendance with each machine.	Contractor	None (included in the Contractor's construction costs)
Construction works and traffic management	Transportation and control of dust, there is a risk that in the summer and dryer months that air born dust can become a significant issue	Existing tracks/roads are to be used for hauling of materials. Dust suppression by water tankers with sprinkling systems are to be deployed along the haul routes. The vehicles deployed for material transportation will be spill proof to avoid or minimize the spillage of the material during transportation. Transportation links are to be inspected daily to clear accidental spillage, if any. Precaution will be taken to avoid inconvenience to the local community due to movement of materials. Dry materials stored on site and dry materials being transported shall be covered by tarpaulins to prevent dust blow. Drivers to be educated on using appropriate speed limits when transporting material.	Contractor	Cost of measures AMD 0.33 million per month = AMD 7.92 million total (24 months)
3. Public Consultation and Communications Plan				
Public consultation and engagement	Social or community concerns are not captured or fully understood / addressed.	The Contractor will develop a stakeholder and community engagement plan and undertake regular public consultations in accordance with its plan. The Contractor will advise the local community of project plans in advance of construction and capture their issue and concerns and where possible mitigate these issues as necessary.	Contractor	None (included in the Contractor's construction costs)
Mobilisation of workforce	Impacts on local wildlife by workforce	Carry out training and awareness training campaigns on wildlife value, for workers. Any worker found hunting, or buying wildlife from local people, will be dismissed from the job. Supply workers with sufficient food.	Contractor	None (included in the Contractor's construction costs)

PROJECT ACTIVITIES	EXPECTED IMPACT / RISK	PROPOSED MITIGATION MEASURES	RESPONSIBLE ENTITIES	INDICATIVE COST OF MITIGATION
Damage to third party property	Ensure that damage to personal community property is minimised and adequately addressed in terms of rectification or compensation	Ensure works are restricted to the site, and to the right-of way of the existing road for off-site activities. Ensure projected impacts and proposed measures have been discussed in advance with the affected community. Contactor to work with local government officers and non-governmental organizations.	Contractor	None (included in the Contractor's construction costs)
4. Cultural Heritage Management Plan				
Execution of construction	Cultural Heritage and archaeological finds on site. While the site has been heavily disturbed by original road and tunnel construction there is potential to find unexpected archaeologically material of national interest.	Work to be stopped immediately in the area of the find, barriers erected to prevent casual access. The Contractor shall then engages a national archaeologist to assess the find and determine next steps. Engineer informed of find and progress of archaeological assessment on a daily basis. All parties shall comply with national regulations on chance finds.	Contractor	None (work stoppages due to chance finds may result in Extension of Time and related additional costs)
5. Surface and Underground Water Protection plan				
Execution of demolition and construction	There is a risk that underground water is contaminated through demolition and construction activities.	The Contractor shall implement a system which channels and diverts all water run-off from the tunnel during construction to a temporary water treatment facility. Only water which has been treated may be released into watercourses. Water purity shall be ensured through monthly testing in compliance with the Environmental Monitoring Plan. Construction water run-off must be collected and not permitted to migrate over natural surfaces or enter the underground water system.	Contractor	None (included in the Contractor's construction costs) Costs for monitoring of water quality covered in the Environmental Monitoring Plan
Construction camp operations / surface construction measures	There is a risk that surface water is polluted through operation of the construction camp and activities at the surface.	The Contractor shall implement a system which channels and diverts all water from surface construction areas during construction to a temporary water treatment facility. Only water which has been treated may be released into watercourses. Water purity shall be ensured through monthly testing in compliance with the Environmental Monitoring Plan. Similarly, wastewater from the construction camp shall also be treated before release into watercourses. Tyres of vehicles entering the tunnel shall be washed close to the tunnel portal to prevent spread of dirt. Install water collection basins and sediment traps in all areas where construction equipment is washed. Divert contaminated water to treatment facilities.	Contractor	Protection of water sources against pollution around construction sites AMD 0.22 million = total cost (over 24 months) AMD 5.28 million Costs for monitoring of water quality covered in the Environmental Monitoring Plan
6. Biodiversity Management Plan				
Site clearance and establishment of contractor's welfare	Removal of vegetation and land clearing activities at portal areas, Contractor's camp, muck disposal area and construction waste area	The area requiring clearing will be clearly demarcated on ground as per alignment plan. During land clearing operations, topsoil will be collected, preserved, and reused as a base for turfing of embankment slopes or development of barren areas along roadside. Tree felling (if any) within the area will be agreed with the landowner and client prior to being cut. No tree felling in Gyulagarak Sanctuary	Contractor	None (included in the Contractor's construction costs)
Work in protected areas	Negative impacts on Gyulagarak Pine State Sanctuary	Base Contractor's camp and major site installations on the south side of the tunnel, i.e., outside of the Gyulagarak Pine State Sanctuary. It is estimated that around 0.25 hectares of land may need to be cleared around the portal. In this instance any trees cut from this area will be replaced on a 1:10 basis at a location within the Gyulagarak Sanctuary determined by the sanctuary management. Tree replanting and maintenance shall be completed by the Contractor during the course of the construction	Contractor	None

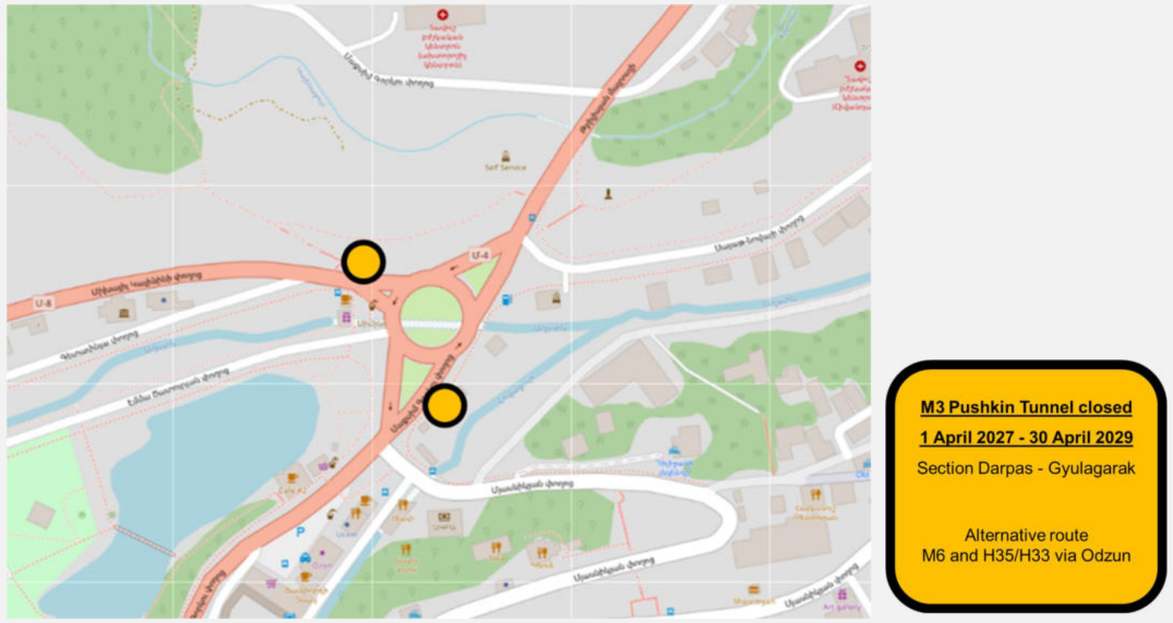
PROJECT ACTIVITIES	EXPECTED IMPACT / RISK	PROPOSED MITIGATION MEASURES	RESPONSIBLE ENTITIES	INDICATIVE COST OF MITIGATION
		phase. A tree planting management plan, approved by ArmForest, will form part of the Contractors SEMP and will describe the native species to be replanted, locations and the tree maintenance activities. Should any tree die during the first two years from planting, the Contractor will be obliged to replant on a 1:2 basis. Given the above, tree planting should commence at the alternative location as soon as detailed designs have been prepared, the exact areas calculated for clearance and the tree planting plan approved by Armforest and the CSC. Biodiversity Management Plan will be prepared by the Contractor to manage works in the bypass. A specific focus will be on the area passing through the Gyulagarak Sanctuary. The plan, which will be routinely monitored by the supervision consultant, will include at a minimum: • No encroachment into the Gyulagarak Sanctuary by any workers. Induction training for workers and routine toolbox talks will be performed by the Contractors environmental specialist informing them of the sensitivities of the site and to ensure no encroachment into the Gyulagarak Sanctuary. • The right of way will be clearly demarcated by bunting throughout the rehabilitation phase in the Gyulagarak Sanctuary. Signposts will be erected along the boundary at 200m intervals warning workers not to enter this area. • No permanent or temporary work sites or laydown areas will be permitted in the Gyulagarak Sanctuary. They may be permitted within the right of way. • Tree cutting for firewood, or any other use, will be a sackable offence. • No campfires, or any type of fire will be permitted within the Gyulagarak Sanctuary, or any other area along the bypass.		
7. Utilities Protection and Relocation Plan				
Utility removal and relocation	There is a risk that utilities may be damaged during the works which could affect people living in the local area or the environment more generally	All public utilities like power transmission cables, telephone cables, water/sewerage lines, drains, tube wells etc. falling within road land width will be recorded and arranged for relocation /shifting to adjacent areas in consultation with the respective utility providers and authorities. Prior to starting any construction works the contractor must undertake a utility desktop survey from historic records and all known services must be marked on the ground / surface where they are believed to exist and wherever possible these must be isolated and proved dead. Where there are mechanical services these must be depressurised and drained prior to removal. Care must be taken to ensure that any oils or hydraulic fluids are collected and not permitted to escape into the environment. These fluids must be sent for specialist disposal and processing to a licenced site. Prior to undertaking any excavation or invasive work including demolition the area must be scanned with a cable avoidance tool (CAT). The contractor must ensure that temporary services designed to run on a low voltage system designed for construction site use is deployed and commissioned within the tunnel and postal areas prior to removing and decommissioning the existing system.	Contractor	Included in the Contractor's construction costs
8. Environmental Protection Plan				
Execution of works	There is a risk that the environment could be contaminated or damaged during the works and as such an environmental protection plan will be required	To manage environmental risks and issues an environmental protection plan will be required. The Contractor will compile this plan and identify the risks and mitigations in the form a risk assessment and mitigation plan and ensure that the hazard and probability are scored such that risks can be prioritised and managed accordingly. The Environmental Protection Plan shall identify limit values for the concentration of pollutants in air, water and soil, and maximum noise emissions. It shall further identify measures to be implemented should maximum values be exceeded. The Contractor shall implement its SEMP and the CSC shall monitor implementation. The Contractor shall restrict its activities to site.	Contractor CSC for monitoring	None (included in the Contractor's construction costs)

PROJECT ACTIVITIES	EXPECTED IMPACT / RISK	PROPOSED MITIGATION MEASURES	RESPONSIBLE ENTITIES	INDICATIVE COST OF MITIGATION
		The Contractor shall identify the boundaries of the Gulagarak Pine State Sanctuary and restrict its activities within this area per this EMP.		
9. Construction Work Camps Plan				
Establishment of construction camp sites (offices, workshops, temporary installations and residential accommodation)	Social, health and environmental risks associated with construction site accommodation and large populations of people.	As identified the Contractor's office and accommodation camp location must be agreed with the Client. The construction camps will be located away from any local human settlement areas and preferably located on land areas, which are disused or waste lands. The area to the west of the tunnel south portal is suitable for use by the Contractor and the use of existing buildings shall be discussed with the Client. Workers' accommodation shall comply with the IFC and EBRD guidance note [16] on this subject. The Contractor shall develop a Camp Management Plan to be reviewed by the CSC. The Contractor's office and accommodation camps will be supplied with adequate water supply, sanitation, and all requisite infrastructure facilities. Washing facilities or showers shall be provided at the workers' camps. Toilets/sanitation facilities with proper flushing provisions in accordance with local regulations to prevent any hazard to public health or contamination of land, surface or groundwater. This will minimize dependence on outside resources, presently being used by local population and minimize social community friction. The Contractor's office and accommodation camps will have septic tank/soak pit of adequate capacity so that it can function properly for the entire duration of its use. The Contractor's office and accommodation camps will be provided with electricity /LPG/ or ideally natural gas to remove the practice of using firewood for cooking. Accommodation for taking meals and for shelters during interruption of work due to adverse weather conditions. Fire-extinguishing equipment should be provided at construction camps, asphalt plants, storage areas for combustible materials and other areas where fire hazards are found. After completion of the construction works, the contractor's office and accommodation establishment will be restored to its previous state by undertaking clean-up operations (or otherwise developed into operational buildings). During the operation of the Contractor's office and accommodation establishment all litter and waste must be collected and disposed of. No site, litter or waste is permitted to escape into the natural environment. Special attention must be paid to plastic waste. The Contractor must employ a programme of weekly litter picks and ensure that the environment is kept clean and clear of waste material.	Contractor	Provision of water supply, sanitary facilities and water treatment facilities at the labour camp AMD 0.44 million = total cost (over 24 months) AMD 10.56 million
Establishment of construction camp sites (offices and residential accommodation)	Occupational health and safety hazards at work and camp sites	The Contractor shall comply with National Labor Law. Children and pregnant women will not be allowed to work under any circumstances. Moreover, no personnel will be allowed to work at site for more than 10 hours per day (8-hour makes one work shift). In addition, each worker must be given at least two days per week rest and provided with a minimum of 20 days per year holiday. All personnel at work sites will be provided with protective gears like helmets, boots, etc. so that injuries to personnel are avoided or minimized. Workforce, likely to be exposed to noise levels beyond regulatory stipulated limits, will be provided with protective gears like ear plugs etc and regularly rotated.[17] The Contractor must undertake a hand arm vibration assessment and ensure people are protected from harmful effects.[18] Dust suppression measures such as spraying, or the use of water sprinklers will be used at all operations areas. The construction camps will have health care facilities for all workers and provide occupational screening advice and emergency medical care. All construction personnel will be subjected to routine vaccinations and other preventive/healthcare. The work and campsites will have suitable facilities for handling any emergency like fire, explosion, etc. All areas intended for storage of hazardous materials will be quarantined and provided with adequate facilities to combat emergency situations. All required permits for storage of inflammable/hazardous materials are to be obtained. The personnel in charge of such areas will be properly trained, licensed and with sufficient experience. The operational areas will be access controlled and entry will be allowed only under authorization.	Contractor	None (included in the Contractor's construction costs)

[16] Available at: https://www.ifc.org/en/insights-reports/2000/publications-gpn-workersaccommodation
[17] Guidance available at: https://www.hse.gov.uk/pubns/indg362.htm
[18] Guidance available at: www.hse.gov.uk/vibration/hav/index.htm

PROJECT ACTIVITIES	EXPECTED IMPACT / RISK	PROPOSED MITIGATION MEASURES	RESPONSIBLE ENTITIES	INDICATIVE COST OF MITIGATION
Establishment of construction camp sites (offices and residential accommodation)	Cleaning work sites and waste disposal	All operational areas (office/storage area, work force camps, and borrow pit areas) will be cleaned up and restored to its original state (or better) as soon as possible after operations have completed. All construction waste will be disposed of in approved disposal sites and in no case will it be permitted for waste to escape into the natural environment. Local district authorities will be consulted to determine disposal sites and implement any conditions imposed within specific permits.	Contractor	See 14 [Site Reinstatement, Landscaping, and Revegetation Plan]
10. Site Management Plan (quarry and borrow pit, dumping sites, concrete batching, and asphalt plants)				
Operation of quarries and borrow pits	Environmental and health and safety risks arising from earthworks and operating of quarries and borrow pits. Erosion and instability of cut faces and borrow pits. (Noted that borrow pits are unlikely to be required; materials for concrete brought to site rather than opening a project-specific quarry)	Minimize major earthworks during the rainy season, to the extent feasible. Collect and store topsoil from borrows pits carefully to one side, where it can be later used for reinstatement. During construction, employ erosion prevention measures such as the use of hay bales. At the end of the construction phase, re-contour/ reprofile borrow pit walls, replace topsoil, and re-vegetate. Provide vegetative cover on erosion-prone areas. Install intercepting ditches at the top and at the bottom of slopes. Use gutters and spillways to control the flow of the water down slopes. Provide retaining structures such as gabions, riprap, or rock material embedded in a slope face, in combination with vegetation measures, as appropriate. Reinforce earth embankment walls as the earth fill is placed, with anchors compacted into the fill material. For re-vegetation purposes, use native varieties according to the soil type, climate, and ease of maintenance. Saplings shall be planted to coincide with appropriate season to ensure early establishment. No borrow pit or quarry within Gyulagarak Sanctuary	Contractor	None (included in the Contractor's construction costs)
Temporary material storage and processing areas	Environmental and health and safety risks arising from the establishment of temporary material storage and processing areas (crushing, concrete batching, asphalt plant)	The Contractor's temporary storage and processing areas for construction works will be located away from human residential areas (minimum 500 m). (It is noted that this is already ensured as the project site is located away from residential areas.). None permitted within Gyulagarak Sanctuary The office and storage areas will preferably be located on barren/waste lands and conversion of agricultural/cultivable lands for office and storage areas will not be allowed. All fuel oil/lubricants loading, unloading and storage areas will be paved (impermeable), and have separate storm water collection system with facility for separation of oil/lubricants prior to discharge. Storage areas shall be bunded at 110% capacity to contain rupture of largest tank. The temporary office and storage area will be provided with adequate water supply, sanitation, septic tank/soak pit of adequate capacity so that it functions properly for the entire duration of its use.	Contractor	Contractors' costs will be included within preliminaries and are expected to be minimal
Storage of materials hazardous to health	Pollution due to use and storage of hazardous substance	Hydrocarbon, toxic material and will be stored in adequately protected sites to prevent soil and water contamination. Storage areas shall be bunded at 110% capacity to contain rupture of largest tank. While vehicle maintenance and refuelling will be confined to a local designated area, used oil and other toxic and hazardous materials shall be disposed of in an authorized facility off-site. The personnel in-charge of these sites will be properly trained. Spill kits are available and staff will be trained in their use.	Contractor	None (included in the Contractor's construction costs)
Storage of materials hazardous to health	Improper disposal of solid waste	Segregation of waste shall be observed. Organic (biodegradable) shall be collected and disposed of onsite by composting (no burning on site). Recyclables shall be recovered and sold to recyclers. Residual and hazardous waste shall be disposed of in disposal sites approved by local authorities. The Contractor shall comply with applicable national regulations.	Contractor	None (included in the Contractor's construction costs)
Handling of explosives	Environmental and health and safety risks arising from the storage and use of explosives that may be used for the excavation and	Explosives shall be transported, stored, and secured in strict compliance with national regulations and away from other facilities. Access shall only be permitted to authorised persons. A safe system of work must be employed and the contractor must consider the use of a permit office to manage the use of explosives. All explosive work, handling transport and storage and use must be undertaken by specialist and people who are qualified in the use of explosives.	Contractor	None (included in the Contractor's construction costs)

PROJECT ACTIVITIES	EXPECTED IMPACT / RISK	PROPOSED MITIGATION MEASURES	RESPONSIBLE ENTITIES	INDICATIVE COST OF MITIGATION
	extension of the escape tunnel			
11. Traffic and Access Management Plan				
Construction works and traffic management	Health and safety risks arising from construction traffic during the construction works	The Contractor will install traffic management systems (e.g., traffic cones and barrels) to delineate the work zone. Workers will be supplied with reflective clothing or reflective devices or otherwise conspicuously visible material for workers to moving vehicles. Existing tracks/roads are to be used for hauling of materials. Dust suppression by water tankers with sprinkling systems are to be deployed along haul routes. The vehicles deployed for material transportation will be spill proof to avoid or minimize the spillage of the material during transportation. Transportation links are to be inspected daily to clear accidental spillage, if any. Precaution will be taken to avoid inconvenience to the local community due to movement of materials. Dry materials in trucks to be covered with tarpaulins to avoid dust blow. Drivers to be educated on using appropriate speed limits when transporting material.	Contractor	None (included in the Contractor's construction costs)
Construction works and traffic management	Temporary traffic diversions	Where required prepare appropriate traffic diversion plans (in specific stretches as per progress of construction work) and implemented to avoid inconvenience due to construction works to present road users. Due to the nature of the Pushkin Tunnel on the international route Yerevan-Spitak-Vanadzor-Tashir-Georgia border, the implications of tunnel construction on the wider road network as well as local roads are considered. In general, a full closure of the Pushkin Tunnel for all rehabilitation works is foreseen. Therefore there is full interruption of traffic on the M3 on section Stepanavan – Darpas. Information boards warning of the route closure, dates of the closure, and advising alternative routes are necessary and shall be installed well in advance of commencement of construction.	Client and Contractor	Establishment of traffic diversions: AMD 4.4 million Maintenance of traffic diversions: AMD 0.44 million per month = AMD 10.56 million over 24 months Removal of traffic diversions: AMD 4.4 million
		 Overview of locations where information boards should be provided for road users		

PROJECT ACTIVITIES	EXPECTED IMPACT / RISK	PROPOSED MITIGATION MEASURES	RESPONSIBLE ENTITIES	INDICATIVE COST OF MITIGATION
		 *Example of information board to be provided at Location 1 (roundabout in Dilijan) in English and Armenian*		
12. Emergency Response Plan				
Emergency responses for demolition and construction works	Emergency plans are required to support demolition and construction	Emergency plans to be developed for all construction activity, but in particular demolition, tunnel excavation and support, work for electrical and mechanical equipment, and power supply. Construction and demolition work plan shall include provisions for emergency air, service supply and rescue. These emergency plans must assess potential emergency situations and natural and manmade hazards and devise plans and emergency arrangements to rescue and recover people. Once established the contractor must consider combined events and ensure that his plans are adequate to address combined events such as an earthquake / partial tunnel collapse combined with a loss of power and ventilation. The Contractor must ensure the people on site are trained to enact these recovery plans and they have the tools, equipment, and resources necessary. The Contractor must ensure that there is pre-planning and coordination with the local emergency services, including an established direct line of contact with the nearest hospital.	Contractor	None (included in the Contractor's construction costs)
Execution of demolition works	There are specific risks associated with demolition and demolition within a historic tunnel and existing buildings poses additional non-standard risks	A dedicated demolition plan is required which should be produced by a demolition expert in consultation with a tunnelling expert. The plan shall include deformation monitoring and measures to able to quickly recognise problems and react to developing events such as provision of immediate support of structures. The demolition sequence should be developed to ensure that all temporary works and enabling works are considered and incorporated to ensure a safe place of work. The CSC shall ensure close control and permanent observation of high-risk work.	Contractor CSC for control and permanent observation of high-risk work	None (included in the Contractor's construction costs)
13. Waste and Material Management Plan				
Execution of demolition and construction works	Waste arising from the construction work can accumulate quickly and overwhelm the disposal routes or site.	The Contractor will be required to develop a waste and material management plan which will identify the type and volume (over time) of material and list a disposal route for each waste stream. These waste streams will include but are not limited to: - Office and welfare waste	Contractor	Provision of solid waste management facilities at the labour camp and on construction sites AMD 0.11 million = total

PROJECT ACTIVITIES	EXPECTED IMPACT / RISK	PROPOSED MITIGATION MEASURES	RESPONSIBLE ENTITIES	INDICATIVE COST OF MITIGATION
		- Waste arising from the accommodation camps. - Waste arising from the electrical and mechanical strip out of the tunnel. - Waste arising from the structural strip out and demolition of the tunnel, including the removal of the existing pavement and rock excavation for the escape tunnel. The overview list above provides an example of the types of waste that will be expected. All waste arisings must have a waste disposal stream and the work areas and natural environment must be kept clean and clear of all waste.		cost (over 24 months) AMD 2.64 million Implementation of waste separation and recycling at the labour camp and on construction sites AMD 0.066 million = total cost (over 24 months) AMD 1.584 million
14. Site Reinstatement, Landscaping, and Revegetation Plan				
Reinstatement, landscaping following the tunnel reconstruction works	Following the tunnel refurbishment the project close out is not afforded the time and resources needed and site reinstatement is not completed satisfactorily.	The site close out including the reinstatement and landscaping is vital to ensure that surface water run-off is managed and that any remaining or waste material is removed from site. The Contractor must ensure that the reinstatement plan is submitted to the client early and that this plan demonstrates that the site will be returned to the minimum original condition while incorporating and accommodating the new buildings and infrastructure.	Contractor	AMD 6.6 million
Landscaping and re-vegetation of the muck disposal area	Following the tunnel refurbishment the project close out is not afforded the time and resources needed and reinstatement is not completed satisfactorily.	Contractor's plan for landscaping and re-vegetation of muck disposal area	Contractor	AMD 22 million
POST-CONSTRUCTION PHASE				
Defect liability period Operation and maintenance period	These is a risk that building defects and unresolved issues present environmental issues	The works contract shall include a defects liability period and retention clause to ensure that there are sufficient mechanisms in place to manage and rectify any close-out issues and defects such that the environment can be protected	Contractor during DLP Client during O&M	-
Defect liability period Operation and maintenance period	Functionality of the water treatment plant	Regular inspection and maintenance (as defined by the Contractor) to ensure the continued functionality of the constructed water treatment plant which treats polluted water from the roadway of the tunnel before release into watercourses	Contractor during DLP Client during O&M	Carried out by tunnel operator on site, so no extra cost
Defect liability period Operation and maintenance period	Functionality of electrical and mechanical equipment for environmental quality issues, e.g., ventilation	Regular inspection and maintenance (as defined by the Contractor) of key systems which support environment, such as ventilation which ensures sufficient air quality in the tunnel	Contractor during DLP Client during O&M	Inspections carried out by tunnel operator on site, so no extra cost Maintenance costs depend on repairs necessary (if any)
Operation and maintenance period	Unsuccessful re-vegetation of areas used during construction and trees planted	Monitor the success of re-vegetation and tree health 2 and 5 years after planting	Client	Carried out by tunnel operator on site, so no extra cost

Table 22: Environmental management plan

X. ENVIRONMENTAL MONITORING PLAN

ACTIVITY	PARAMETERS TO BE MONITORED	MONITORING LOCATION(S)	MONITORING METHOD	ENVIRONMENTAL PERFORMANCE INDICATOR	RESPONSIBLE ENTITIES	FREQUENCY (FORMAL MONITORING)	INDICATIVE COST
PRE- CONSTRUCTION PHASE (Mobilization stage)							
Air quality	Dust, soot, nitrogen dioxide, sulphur dioxide, arsenic, chromium, silicon	About 100 m from each entrance to the tunnel, ideally at the previous survey locations shown in Appendix D. At areas to be used by the contractor, i.e., site installation areas, labour camps.	Sampling according to limitation permitted concentrations of atmospheric air pollutants in residences (concentrations-LPC) and approval of the limit permissible norms of the content of harmful materials in the gas produced by motor vehicles operating in the territory of the Republic of Armenia. February 2, 2006	Variance from parameter values measured in this report. Record current preload of air quality (1 x per location)	Contractor with checking by CSC	Within 3 months before starting any construction activities	Estimated 4 locations AMD 30,000 per location Total AMD 120,000
Water quality	pH, conductivity, mineralization, toxic elements / heavy metals (mercury, arsenic, cadmium, lead, manganese, molybdenum, nickel, copper, zinc, chromium, cobalt), petroleum, suspended matter	In streams or gullies close to each tunnel portal, ideally at the previous survey locations shown in Appendix E. Spring east of the south portal of the tunnel	Sampling to assess permissible limit concentrations of dangerous substances in surface waters are defined in accordance with "Depending on the characteristics of the location, on determining water quality assurance standards for each water basin management area" RA Government Decision N 75 dated January 27, 2011. Sampling to assess the permissible limit concentrations of dangerous substances in drinking water are defined in accordance with "Drinking water: hygienic requirements for water quality of centralized water supply systems. Quality control" N 2-III-Ա 2-1 on approval of sanitary norms and rules RA Order of the Minister of Health N 876 dated December 25, 2002.	Variance from parameter values measured in this report. Record current preload of water quality (1 x per location)	Contractor with checking by CSC	Within 3 months before starting any construction activities	Estimated 4 locations AMD 150,000 per location Total AMD 600,000
Soil quality	Toxic elements / heavy metals (mercury, arsenic, cadmium, lead, manganese, molybdenum, nickel, copper, zinc, chromium, cobalt)	About 100 m from each entrance to the tunnel, ideally at the previous survey locations shown in Appendix H. On areas to be used by the contractor, i.e., site installation areas, labour camps, disposal areas.	Sampling to test permissible limit concentrations of dangerous substances in soil are defined in accordance with "Hygienic requirements for soil quality" N 2.1.7.003-10 on approval of sanitary rules and norms RA Order of the Minister of Health N 01-Ա dated January 25, 2010.	Variance from parameter values measured in this report. Record current preload of air quality (1 x per location)	Contractor with checking by CSC	Within 3 months before starting any construction activities	Estimated 6 locations AMD 22,000 per location Total AMD 132,000
Ambient noise	Noise measurement of ambient noise level daytime	At the same locations as soil quality and any sensitive receptors in the project area	Measuring of dB(A) at receptors outside and inside (if any). Maximum permissible noise levels according to World Bank standards for industrial and commercial premises L_{Aeq} 15 min and L_{Amax}15 min = 70 dB.	Variance from parameter values measured in this report. Record current preload of ambient noise (1 x per location)	Contractor with checking by CSC	Within 3 months before starting any construction activities	Estimated 4 locations AMD 13,000 per location Total AMD 52,000
Vibration monitoring	Vibration levels	At the same locations as soil quality and any sensitive receptors in the project area (e.g., wind farm above tunnel).	Measuring of ground accelerations at the construction site and any sensitive receptors.	Variance from parameter values measured in this report.	Contractor with checking by CSC	Within 3 months before starting any construction activities	Estimated 4 locations AMD 55,000 per location Total AMD 220,000
CONSTRUCTION PHASE							
Air quality	Dust, soot, nitrogen dioxide, sulphur dioxide, arsenic, chromium, silicon	About 100 m from each entrance to the tunnel, ideally at previous survey the locations shown in Appendix D.	Sampling according to limitation permitted concentrations of atmospheric air pollutants in residences (concentrations-LPC) and approval of the limit permissible norms of the content of harmful materials in the gas produced by motor vehicles	Variance from parameter values measured during the pre-construction phase. Compliance with limit	Contractor with checking by CSC	At least every two weeks during the construction phase- especially near the sensitive receptors	Estimated 4 locations AMD 30,000 per location Total AMD 240,000 per month

ACTIVITY	PARAMETERS TO BE MONITORED	MONITORING LOCATION(S)	MONITORING METHOD	ENVIRONMENTAL PERFORMANCE INDICATOR	RESPONSIBLE ENTITIES	FREQUENCY (FORMAL MONITORING)	INDICATIVE COST
	Visual observation for dust around the site, on transport routes and at disposal areas	At areas used by the contractor, i.e., site installation areas, labour camps.	operating in the territory of the Republic of Armenia. February 2, 2006	values as set in applicable regulations.		Visual check on a daily basis	Total AMD 5,760,000 for construction phase
Ambient noise	Noise measurement of ambient noise level daytime	At the locations where pre-construction phase surveys were undertaken	Measuring of dB(A) at receptors outside and inside (if any). Maximum permissible noise levels according to World Bank standards for industrial and commercial premises L_{Aeq} 15 min and L_{Amax}15 min = 70 dB.	Variance from parameter values measured during the pre-construction phase. Compliance with limit values as set in applicable regulations.	Contractor with checking by CSC	At least every two weeks during the construction phase- especially near the sensitive receptors	Estimated 4 locations AMD 13,000 per location Total AMD 104,000 per month Total AMD 2,496,000 for construction phase
Water quality	pH, conductivity, mineralization, toxic elements / heavy metals (mercury, arsenic, cadmium, lead, manganese, molybdenum, nickel, copper, zinc, chromium, cobalt), petroleum, suspended matter Visual observation for water clarity	At the locations where pre-construction phase surveys were undertaken The spring near the south portal of the tunnel. At the water course upstream of the construction camp. At the water course downstream of the construction camp. In any watercourse upstream and downstream of the north portal. From other culverts, if water is present in them.	Sampling to assess permissible limit concentrations of dangerous substances in surface waters are defined in accordance with "Depending on the characteristics of the location, on determining water quality assurance standards for each water basin management area" RA Government Decision N 75 dated January 27, 2011. Sampling to assess the permissible limit concentrations of dangerous substances in drinking water are defined in accordance with "Drinking water: hygienic requirements for water quality of centralized water supply systems. Quality control" N 2-III-Ա 2-1 on approval of sanitary norms and rules RA Order of the Minister of Health N 876 dated December 25, 2002.	Variance from parameter values measured during the pre-construction phase. Compliance with limit values as set in applicable regulations.	Contractor with checking by CSC	At least twice per month during the construction phase- especially near the sensitive receptors Visual check weekly at each current work site	Estimated 8 locations AMD 150,000 per location Total AMD 2,400,000 per month Total AMD 57,600,000 for construction phase
Water flow	Total outflow from the tunnel in m^3/s	In channels or pipes at tunnel portals	Dependent on channels / pipes installed by the contractor for temporary drainage.	Day-to-day variance in flow	Contractor with checking by CSC	Continuous or at least daily	Included in Contractor's construction costs
Soil quality	Toxic elements / heavy metals (mercury, arsenic, cadmium, lead, manganese, molybdenum, nickel, copper, zinc, chromium, cobalt)	At the locations where pre-construction phase surveys were undertaken On areas used by the contractor, i.e., site installation areas, labour camps, disposal areas.	Sampling to test permissible limit concentrations of dangerous substances in soil are defined in accordance with "Hygienic requirements for soil quality" N 2.1.7.003-10 on approval of sanitary rules and norms RA Order of the Minister of Health N 01-Ա dated January 25, 2010.	Variance from parameter values measured during the pre-construction phase. Compliance with limit values as set in applicable regulations.	Contractor with checking by CSC	At least once per quarter during the construction phase with the last test upon completion of works	Estimated 6 locations AMD 22,000 per location Total AMD 132,000 per quarter Total AMD 1,056,000 for construction phase
Vibration monitoring	Vibration levels	At the locations where pre-construction phase surveys were undertaken In the main tunnel during blasting activities in the parallel tunnel as required by the Contractor's plan	Measuring of ground accelerations at the construction site and any sensitive receptors. Maximum permissible vibration levels will be assessed and set by the Contractor based on his activities and set to assure that the main tunnel and sensitive structural elements and receptors are not adversely affected by blasting in the parallel tunnel.	Variance from parameter values established by the Contractor prior to the commencement of work	Contractor with checking by CSC	At least once per quarter during the construction phase	Estimated 4 locations AMD 55,000 per location Total AMD 220,000 per quarter Total AMD 1,760,000 for construction phase
POST-CONSTRUCTION PHASE (Defect Notification Period)							
Monitoring of replaced trees and re-vegetated areas	Monitor the success of re-vegetation and tree health	At locations where re-vegetation and tree planting were carried out	Inspection and reporting	Healthy vegetation and trees as assessed by subject specialists	Client	2 and 5 years after planting	Two days for inspections and travel by a specialist Two days for reporting AMD 200,000 per day for an expert

ACTIVITY	PARAMETERS TO BE MONITORED	MONITORING LOCATION(S)	MONITORING METHOD	ENVIRONMENTAL PERFORMANCE INDICATOR	RESPONSIBLE ENTITIES	FREQUENCY (FORMAL MONITORING)	INDICATIVE COST
							AMD 100,000 per trip for expenses and accommodation Total AMD 1,800,000
Air quality	Dust, soot, nitrogen dioxide, sulphur dioxide, arsenic, chromium, silicon	About 100 m from each entrance to the tunnel, ideally at previous survey the locations shown in Appendix D.	Sampling according to limitation permitted concentrations of atmospheric air pollutants in residences (concentrations-LPC) and approval of the limit permissible norms of the content of harmful materials in the gas produced by motor vehicles operating in the territory of the Republic of Armenia. February 2, 2006	Variance from parameter values measured during the pre-construction phase. Establish post-construction baseline. Compliance with limit values as set in applicable regulations.	Contractor with checking by CSC	Once after completion of construction and opening of tunnel to traffic 1 year after completion of construction works	Estimated 4 locations AMD 30,000 per location Total AMD 120,000 per monitoring event Total in phase AMD 240,000
Ambient noise	Noise measurement of ambient noise level daytime	At the locations where pre-construction phase surveys were undertaken	Measuring of dB(A) at receptors outside and inside (if any). Maximum permissible noise levels according to World Bank standards for industrial and commercial premises L_{Aeq} 15 min and L_{Amax}15 min = 70 dB.	Variance from parameter values measured during the pre-construction phase. Establish post-construction baseline. Compliance with limit values as set in applicable regulations.	Contractor with checking by CSC	Once after completion of construction and opening of tunnel to traffic 1 year after completion of construction works	Estimated 4 locations AMD 13,000 per location Total AMD 52,000 per monitoring event Total in phase AMD 104,000
Water quality	pH, conductivity, mineralization, toxic elements / heavy metals (mercury, arsenic, cadmium, lead, manganese, molybdenum, nickel, copper, zinc, chromium, cobalt), petroleum, suspended matter	At the locations where construction phase surveys were undertaken	Sampling to assess permissible limit concentrations of dangerous substances in surface waters are defined in accordance with "Depending on the characteristics of the location, on determining water quality assurance standards for each water basin management area" RA Government Decision N 75 dated January 27, 2011. Sampling to assess the permissible limit concentrations of dangerous substances in drinking water are defined in accordance with "Drinking water: hygienic requirements for water quality of centralized water supply systems. Quality control" N 2-III-Ա 2-1 on approval of sanitary norms and rules RA Order of the Minister of Health N 876 dated December 25, 2002.	Variance from parameter values measured during the pre-construction phase. Establish post-construction baseline. Determine the effectiveness of the treatment of the polluted water from the tunnel road drainage. Compliance with limit values as set in applicable regulations.	Contractor with checking by CSC	Once after completion of construction and opening of tunnel to traffic 1 year after completion of construction works	Estimated 8 locations AMD 150,000 per location Total AMD 1,200,000 per monitoring event Total in phase AMD 2,400,000
Soil quality	Toxic elements / heavy metals (mercury, arsenic, cadmium, lead, manganese, molybdenum, nickel, copper, zinc, chromium, cobalt)	At the locations where construction phase surveys were undertaken On areas used by the contractor, i.e., site installation areas, labour camps, disposal areas.	Sampling to test permissible limit concentrations of dangerous substances in soil are defined in accordance with "Hygienic requirements for soil quality" N 2.1.7.003-10 on approval of sanitary rules and norms RA Order of the Minister of Health N 01-Ս dated January 25, 2010.	Variance from parameter values measured during the pre-construction phase. Compliance with limit values as set in applicable regulations.	Contractor with checking by CSC	Once after completion of construction and opening of tunnel to traffic 1 year after completion of construction works	Estimated 6 locations AMD 22,000 per location Total AMD 132,000 per monitoring event Total in phase AMD 264,000
Vibration monitoring	Vibration levels	At the locations where pre-construction phase surveys were undertaken	Measuring of ground accelerations at the construction site and any sensitive receptors.	Variance from parameter values measured during the pre-construction phase. Establish post-construction baseline.	Contractor with checking by CSC	Once after completion of construction and opening of tunnel to traffic 1 year after completion of construction works	Estimated 4 locations AMD 55,000 per location Total AMD 220,000 per monitoring event Total in phase AMD 220,000

Table 23: Environmental monitoring plan for measurement of environmental parameters

ACTIVITY	PARAMETERS TO BE MONITORED	MONITORING LOCATION(S)	MONITORING METHOD	ENVIRONMENTAL PERFORMANCE INDICATOR	RESPONSIBLE ENTITIES	FREQUENCY (FORMAL MONITORING)
PRE-CONSTRUCTION PHASE (Mobilization stage)						
Permits obtained	Permits required for the Project's implementation obtained	n/a	Project permit register	All necessary permits obtained	Contractor: Obtain permits for which it is responsible. CSC: Maintain permit register PIU: Ensures RDF has obtained all permits under its responsibility.	Continuously until all permits are obtained.
Work opportunities for local workers, unskilled workers and women	Hiring policy of Contractor Numbers of local workers, unskilled workers and women hired	All construction sites / Contractor's camps	One-time audit of the Contractor's documents which shall include employment records and details of job postings.	Number of local workers, unskilled workers and proportion of genders hired for the Project. There must be gender pay and condition equality. The employment and project culture shall respect all people equally.	Contractor: Develops the hiring programme for local and unskilled workers and for gender equality. He will ensure that information is available in a clear and unambiguous document. Supporting information will be made available on request. CSC: Social specialist will review the Contractor's hiring programme and information via audit and provide feedback. PIU: Supervises the CSC.	Once during mobilisation when the Contractor is planning its recruitment.
Suitably Qualified and Experienced People	General: Employees must be SQEP in their area of work (e.g. machine driver, tunnelling operatives etc.) as well as having general site awareness activities and process/ procedures (including but not limited to safety requirements, emergency arrangements). Persons responsible for Safeguards: Persons responsible for management, environmental and health and safety safeguards will be fully trained and experienced. All staff are to be appropriately trained and qualified.	All construction sites / Contractor's camps	Review of CVs of Key Personnel; ensure consistency with personnel nominated by Contractor in its bid.	Compliance with Work's Requirements for Key Personnel as set out in the bidding documents. All persons must be trained and suitably qualified for their intended positions. CVs of employees will be provided together with a staff/ sub-contractor summary table showing clear information such as name position, responsibilities training completed and qualifications together with details of training gaps and planned completion dates.	Contractor: Provides CVs, overview table, and deployment plan. Maintains training matrix and underpinning training record with copy of certificates. CSC: Reviews all documents provided by the Contractor and approves Key Personnel including for Safeguards. PIU: Supervises the CSC.	Once during mobilisation when the Contractor is planning its recruitment. Review of CV(s) prior to mobilization of the person(s).
Pre-construction meetings about the planned works	Pre-construction public meetings will be undertaken	In communities on the north and south sides of the tunnel.	Information disclosed to the public by posters, invitations,	Written evidence record file of undertaken pre-construction	Contractor: Prepares, organises and	Once during mobilization period on each side of the

ACTIVITY	PARAMETERS TO BE MONITORED	MONITORING LOCATION(S)	MONITORING METHOD	ENVIRONMENTAL PERFORMANCE INDICATOR	RESPONSIBLE ENTITIES	FREQUENCY (FORMAL MONITORING)
	GRM presented Information available on RDF and ADB websites		presentations, hand-outs and information boards. Meeting records, attendance sheets and photographs.	meetings.	carries out meetings. Prepares written record. CSC: Reviews Contractor activities and approves information to be disclosed. Informs the PIU of activities. Attends meetings. PIU: Monitors activities and participates in meetings. Ensures information and IEE is placed in RDF and ADB websites.	tunnel.
Orientation, awareness raising and training on environmental, health and safety, and social safeguards	Training session is organized and implemented	All construction sites / Contractor's camps	Review of Contractor's training program including the training material Attendance of the training course organized by the Contractor Meeting records and attendance sheets will be retained as part of the site record. These will be made available for the Clients or his nominated representatives' inspection. The absence of an authenticated record will be deemed as a non-compliance Photographic documentation of training sessions.	All site personnel have attended the training course. Written evidence record file of complete, regular and comprehensive engagement for orientation awareness training.	Contractor: Implements orientation awareness training and keeps record file. Invites CSC to attend. Training to be undertaken for each person attending site. CSC: Reviews Contractor's training program. Attends training. Reviews Contractor's records. PIU: Supervises the process.	Once during mobilisation for each person deployed to site.
On-site mobilization activities	Information boards installed Camp area established Traffic diversions and signage prepared Construction waste disposal areas fenced Trees to be removed identified and labelled	Approach roads Locations for installation of signs for alternative routes Construction waste disposal area Construction sites Contractor's camp	Review of Contractor's mobilization plan Site visits to monitor activities	Compliance with the Contractor's mobilisation plan and SSEMP	Contractor: Prepares and submits mobilization plan and SSEMP. Organizes Road Police review and approval of installed signs. CSC: Reviews and approves Contractor's plans. PIU: Supervises the process.	Once during mobilisation
Occupational health and safety	Appropriate work clothing and full PPE issued to Contractor's personnel as required by their activities Safety equipment installed and tests at construction sites	All construction sites / Contractor's camps	Review of Contractor's Health and Safety Management Plan (HSMP) Site visits to monitor activities	HSMP approved and included in SSEMP. Work clothing and PPE issued Safety equipment installed	Contractor: Prepares and implements HSMP. CSC: Reviews and approves Contractor's plans.	Once during mobilisation

ACTIVITY	PARAMETERS TO BE MONITORED	MONITORING LOCATION(S)	MONITORING METHOD	ENVIRONMENTAL PERFORMANCE INDICATOR	RESPONSIBLE ENTITIES	FREQUENCY (FORMAL MONITORING)
					PIU: Supervises the process.	
CONSTRUCTION PHASE						
Environmental and safety orientation	Appropriate work clothing and full PPE issued to Contractor's personnel as required by their activities Safety equipment installed and tests at construction sites	All construction sites / Contractor's camps	Review of Contractor's Occupational Health and Safety activities and documentation (compiled in accordance with its HSMP) Inspections and documentation of health and safety on site Inspection of Contractor's accident register	HSMP available Safety posters and instructions available on site Regular training given to workers and documented, along with list of attendees PPE utilised correctly Reports, registers and documents available for review	Contractor: Implements HSMP. Acts to resolve non-compliances with corrective actions. CSC: Reviews and monitors Contractor's plans; carries out inspections. Identifies non-compliances in a register and reviews corrective actions implemented by the Contractor. PIU: Supervises the process.	Plan developed and approved prior to construction Inspections according to monitoring schedule Reporting on activity in Contractor's Progress Reports as well as CSC's Monthly Reports
Public consultation and communications	Stakeholder and community engagement plan implemented through regular public consultations Worker and community grievance registers	All construction sites / Contractor's camps	Public consultations Review of grievance registers	Consultations held in accordance with plan GRM implemented	Contractor: Implements Public Consultation and Communications Plan. Acts to resolve non-compliances with corrective actions. CSC: Reviews and supervises Contractor's plans; attends public consultations. Identifies non-compliances in a register and reviews corrective actions implemented by the Contractor. PIU: Supervises the process and attends consultations as appropriate.	Plan developed and approved prior to construction Reporting on activity in Contractor's Progress Reports as well as CSC's Monthly Reports
Cultural heritage management	Implementation of mitigation measures set out in the Cultural Heritage Management Plan	All construction sites	Site inspections	Contractor has developed Cultural Heritage Management Plan Chance finds procedure implemented	Contractor: Implements Cultural Heritage Management Plan. Acts to resolve non-compliances with corrective actions. CSC:	Plan developed and approved prior to construction Reporting on activity in Contractor's Progress Reports as well as CSC's Monthly Reports

ACTIVITY	PARAMETERS TO BE MONITORED	MONITORING LOCATION(S)	MONITORING METHOD	ENVIRONMENTAL PERFORMANCE INDICATOR	RESPONSIBLE ENTITIES	FREQUENCY (FORMAL MONITORING)
					Reviews and supervises Contractor's plans. Identifies non-compliances in a register and reviews corrective actions implemented by the Contractor. <u>PIU:</u> Supervises the process.	
Surface and underground water protection	Implementation of mitigation measures set out in the Surface and Underground Water Protection Plan, in particular the treatment of water run-off from the tunnel, surface and wastewater from the camp.	All construction sites, in particular tunnel portals / Contractor's camps Tyre washing locations Water treatment facilities	Site inspections Water quality monitoring data	Refer to Environmental Monitoring Plan for water quality	<u>Contractor:</u> Implements Surface and Underground Water Protection Plan. Acts to resolve non-compliances with corrective actions. <u>CSC:</u> Reviews and supervises Contractor's plans. Identifies non-compliances in a register and reviews corrective actions implemented by the Contractor. <u>PIU:</u> Supervises the process.	Refer to Environmental Monitoring Plan for water quality Reporting on activity in Contractor's Progress Reports as well as CSC's Monthly Reports
Flora & fauna protection and vegetation clearing	Activities in Gulagarak Pine State Sanctuary minimised Vegetation clearing and tree felling minimised Topsoil collected, preserved and re-used	All construction sites / Contractor's camps	Review of register for tree felling Site inspections	Contractor has developed Flora & Fauna Protection and Vegetation Clearing Plan Register for tree felling is available Mitigation measures implemented for protecting flora and fauna	<u>Contractor:</u> Implements Flora & Fauna Protection and Vegetation Clearing Plan. Acts to resolve non-compliances with corrective actions. <u>CSC:</u> Reviews and supervises Contractor's plans. Identifies non-compliances in a register and reviews corrective actions implemented by the Contractor. <u>PIU:</u> Supervises the process.	Plan developed and approved prior to construction Reporting on activity in Contractor's Progress Reports as well as CSC's Monthly Reports
Utilities protection and relocation	All utilities identified and marked on site Cases of disruption of services impacting the end users	All construction sites / Contractor's camps	Review of Utilities Protection and Relocation Plan Site inspections	Contractor has developed Utilities Protection and Relocation Plan	<u>Contractor:</u> Implements Utilities Protection and Relocation Plan. <u>CSC:</u>	Plan developed and approved prior to construction Reporting on activity in Contractor's Progress Reports

ACTIVITY	PARAMETERS TO BE MONITORED	MONITORING LOCATION(S)	MONITORING METHOD	ENVIRONMENTAL PERFORMANCE INDICATOR	RESPONSIBLE ENTITIES	FREQUENCY (FORMAL MONITORING)
				Cases of disruption of services impacting the end users recorded and investigated	Reviews and supervises Contractor's plans. PIU: Supervises the process.	as well as CSC's Monthly Reports
Environmental protection	Parameters identified in the Environmental Monitoring Plan (air quality, noise, water quality, soil quality, vibration etc.) Soil erosion Use of topsoil stockpiles Activities in Gulagarak Pine State Sanctuary minimised	Locations for measurement as identified in the Environmental Monitoring Plan	Review of Environmental Protection Plan Review of complaints logged in grievance registers Review of data for measured parameters Site inspections	Contractor has developed Environmental Protection Plan Number and severity of complaints logged in grievance registers Cases of soil erosion Compliance with topsoil stockpile requirements Measured parameters	Contractor: Implements Environmental Protection Plan. Acts to resolve non-compliances with corrective actions. CSC: Reviews and supervises Contractor's plans. Identifies non-compliances in a register and reviews corrective actions implemented by the Contractor. PIU: Supervises the process.	Refer to Environmental Monitoring Plan Reporting on activity in Contractor's Progress Reports as well as CSC's Monthly Reports
Construction work camps	Location, layout, available facilities and management arrangements of work camps Compliance with National Labor Law for employment of workers, working hours, and paid leave	Contractor's camps	Review of the Contractor's Work Camps Plan and management arrangements to ensure that working practices and management arrangements are suitable Double check of availability of landowner's permissions Camp inspections	Contractor has developed Work Camps Plan Processes and procedures are sufficient for the number of people and activities undertaken whilst maintaining health and safety of persons working and visiting the site and the environment is protected from hazards. Employment and payment records Number and severity of complaints logged in grievance registers Training records with attendance lists on camp rules and cultural awareness.	Contractor: Implements Work Camps Plan. Keeps up-to-date employment and payment records on site which are available to the CSC for review. Acts to resolve non-compliances with corrective actions. CSC: Reviews and supervises Contractor's plans and records. Identifies non-compliances in a register and reviews corrective actions implemented by the Contractor. PIU: Supervises the process.	Plan developed and approved prior to construction Reporting on activity in Contractor's Progress Reports as well as CSC's Monthly Reports
Site management plan (quarry and borrow pits, dumping sites, concrete batching, and asphalt plants)	Location, layout and management of quarry and borrow pits, dumping sites, concrete batching, and asphalt plants	Locations of these sites	Review of the Contractor's Site Management Plan Particular review of Contractor's plan and risk assessment for handling explosives	Contractor has developed Site Management Plan Location and layout comply with the plan	Contractor: Implements Site Management Plan. Maintains material inventories. Acts to resolve non-compliances with corrective actions.	Plan developed and approved prior to construction Reporting on activity in Contractor's Progress Reports as well as CSC's Monthly Reports

ACTIVITY	PARAMETERS TO BE MONITORED	MONITORING LOCATION(S)	MONITORING METHOD	ENVIRONMENTAL PERFORMANCE INDICATOR	RESPONSIBLE ENTITIES	FREQUENCY (FORMAL MONITORING)
	Special attention to be applied to the control of substances hazardous to health and the storage and use of explosives in compliance with national regulations		Site inspections	Number and severity of complaints logged in grievance registers Inventory record of hazardous materials and report any missing / unaccounted materials	CSC: Reviews and supervises Contractor's plans and records. Identifies non-compliances in a register and reviews corrective actions implemented by the Contractor. PIU: Supervises the process.	
Traffic and access management	Public roads and access locations Material and waste transportation itineraries. Nuisances to locals and public safety issues. Damages to roads and drainage lines Signs for alternative routes	Roads used for transportation of equipment, materials, and waste Access roads to the site Locations with signs for alternative routes and diversions	Review of the Contractor's Traffic and Access Management Plan Site inspections	Approval of the Contractor's Traffic and Access Management Plan by the Road Police of Armenia Contractor's compliance with the plan Number and severity of complaints logged in grievance registers	Contractor: Develops Traffic and Access Management Plan and obtains approval by the Road Police. Installs signs for alternative routes / road diversions. Implements plan. Acts to resolve non-compliances with corrective actions. CSC: Reviews and supervises Contractor's plans and records. Identifies non-compliances in a register and reviews corrective actions implemented by the Contractor. PIU: Supervises the process.	Plan developed and approved prior to construction Reporting on activity in Contractor's Progress Reports as well as CSC's Monthly Reports
Emergency response	Dealing with emergency situations specific to the Project, in particular underground demolition and tunnel excavation and support Handling of hazardous substances, including explosives	All construction sites / Contractor's camps	Review of the Contractor's Emergency Response Plan Site inspections Review of accident reports	Approval of the Contractor's Emergency Response Plan Training records with attendance lists on emergency responses All accidents / incidents / near misses recorded and treated in compliance with the plan	Contractor: Develops and implements Emergency Response Plan. Holds training for employees. Acts to resolve non-compliances with corrective actions. CSC: Reviews and supervises Contractor's plans and records. Identifies non-compliances in a register and reviews corrective actions implemented by the Contractor.	Plan developed and approved prior to construction Reporting on activity in Contractor's Progress Reports as well as CSC's Monthly Reports Accident reports whenever accidents / incidents / near misses occur

ACTIVITY	PARAMETERS TO BE MONITORED	MONITORING LOCATION(S)	MONITORING METHOD	ENVIRONMENTAL PERFORMANCE INDICATOR	RESPONSIBLE ENTITIES	FREQUENCY (FORMAL MONITORING)
					PIU: Supervises the process.	
Waste and material management	Management of waste and construction material during construction	All construction sites / Contractor's camps Waste disposal locations	Review of the Contractor's Waste and Material Management Plan Site inspections Inspection of waste records	Approval of the Contractor's Waste and Material Management Plan Legal grounds for waste categorization and disposal are obtained and are available. All types of wastes and material are managed in compliance with the Plan. A waste register is maintained.	Contractor: Develops and implements Waste and Material Management Plan. Acts to resolve non-compliances with corrective actions. CSC: Reviews and supervises Contractor's plans and records. Identifies non-compliances in a register and reviews corrective actions implemented by the Contractor. PIU: Supervises the process.	Plan developed and approved prior to construction Reporting on activity in Contractor's Progress Reports (which includes the waste register) as well as CSC's Monthly Reports.
Site reinstatement, landscaping and revegetation	Construction site is cleaned from all the material, equipment and waste All the temporary used surfaces (including quarries and borrow pits) are restored and revegetated)	All construction sites / Contractor's camps Waste disposal locations	Site inspections	Approval of the Contractor's Site Reinstatement, Landscaping and Revegetation Plan All the used surfaces are restored to their original state Tree planting shall only be carried out in collaboration with the Armforest and (if within the sanctuary boundaries) the Gulagarak Pine State Sanctuary at a ratio of 1:10	Contractor: Develops and implements Site Reinstatement, Landscaping and Revegetation Plan. Acts to resolve non-compliances with corrective actions. CSC: Reviews and supervises Contractor's plans and records. Identifies non-compliances in a register and reviews corrective actions implemented by the Contractor. PIU: Supervises the process.	Plan developed and approved prior to construction Reporting on site reinstatement, landscaping and revegetation as part of taking-over process
Records and reporting	Site inspection checklists, Minutes of meetings, log-books for stakeholder engagement records, training records, Accident/ incident reports, Corrective Action Reports	Reports submitted by the Contractor to the CSC Registers and log-books available at site	Review or records and reports	Records are complete and up-to-date	Contractor: Maintains up-to-date records and reports CSC: Reviews Contractor's records and reports. Prepares its own reports.	Contractor's Progress Reports and weekly Corrective Action Plan CSC Monthly Reports and weekly monitoring report PIU submits semi-annual reports to ADB

ACTIVITY	PARAMETERS TO BE MONITORED	MONITORING LOCATION(S)	MONITORING METHOD	ENVIRONMENTAL PERFORMANCE INDICATOR	RESPONSIBLE ENTITIES	FREQUENCY (FORMAL MONITORING)
					PIU: Reviews CSC's reports and prepares semi-annual reports for ADB.	
POST-CONSTRUCTION PHASE						
Elimination of defects	Impact on the environment due to the fact that the EMP is not followed and is neglected	All former construction sites / Contractor's camps	Site inspections	Compliance with the SSEMP	Contractor: Implements SSEMP and resolves any remaining issues CSC: Identifies remaining issues and supervises Contractor activities to resolve them PIU: Implements audit site visit Supervises the process	As required based on the defects identified
Traffic movements	Parameters identified in the Environmental Monitoring Plan (air quality, noise, water quality, soil quality, vibration etc.)	Locations for measurement as identified in the Environmental Monitoring Plan	Review of complaints Review of data for measured parameters Site inspections	Number and severity of complaints Measured parameters	Contractor during the DLP CSC to supervise	Refer to Environmental Monitoring Plan
Surface water protection	Water quality	Water treatment plant(s) / control centre Locations for measurement as identified in the Environmental Monitoring Plan	Review of sensor data Site inspections	Measured parameters	Contractor during the DLP CSC to supervise Tunnel operator for operation and maintenance	As required by Environmental Monitoring Plan Continuous monitoring of sensor data
Air quality issues	Air quality in the tunnel	Control centre	Review of sensor data Site inspections	Measured parameters	Carried out by the tunnel operator	Continuous monitoring of sensor data
Site reinstatement, landscaping and revegetation	Normal growth of planted trees and shrubs	Locations where planting has been carried out	Site inspections	Health of trees and shrubs	Carried out by the tunnel operator	At 2 and 5 years after planting

Table 24: Environmental monitoring plan assessing implementation of environmental management plan activities

XI. CONCLUSIONS AND RECOMMENDATIONS

A. Conclusions

278. Based on the indication of the Rapid Environmental Assessment attached in Appendix A and the findings of the IEE, the classification of the subproject as Category “B” is confirmed, and no detailed EIA will be needed to comply with the ADB environmental policies.

279. The project will have positive impacts, including enhanced safety of the tunnel and road (improved structural integrity, modern safety features and reduced accident rates), economic benefits (job creation, increased efficiency of passing traffic, attracting investment to the region); energy efficiency and pollution control of upgraded tunnel systems, and community and social benefits.

280. Since there are no large communities in the immediate project area, the main negative impacts experienced by communities are inconvenience due to closure of the tunnel and reduced accessibility for local businesses. Other negative impacts are from dust, noise and on flora and fauna. Assuming that the mitigation measures and monitoring requirements in the Environmental Management Plan are effectively implemented, the project is not expected to have a significant adverse environmental impact. It is important that environmental supervision and monitoring is conducted as described and all actions are documented properly.

281. Particular care and attention shall be applied to Gulagarak Pine State Sanctuary, with work within its boundaries (which include the tunnel north portal) avoided or minimised to the greatest possible extent, and utilising only surfaces previously impacted.

282. Public consultations were held in the Gargar and Bazum communities by RDF and the Consultant on 05.12.2024. They were attended by community leaders, community residents, and the village administration head and employees. Key issues are the availability of water emerging from the tunnel for irrigation and drinking water, the start and duration of the works, and the possibility of employment for local persons during construction.

A Grievance Redress Mechanism tailored to the project has been developed to receive and facilitate the resolution of affected persons’ concerns, complaints and grievances.

B. Recommendations

283. To enable use of the bypass road as a diversion during non-winter conditions for local, light vehicles, RDF will need to carry out upgrades of the road in advance of tunnel construction to improve the road’s safety and driveability.

284. RDF shall ensure that the EMP is included in the contract documents, and the EMP provisions are implemented and monitored to their full extent.

285. Based on the EMP, the Contractor will prepare and submit for the CSC’s approval, the Site-Specific EMP, with detailed operating environmental management and monitoring measures during the pre-construction, construction and post-construction phases.

286. The compliance of construction activities to the ADB safeguards and to Armenian legislation shall be checked through regular monitoring carried out by the Contractor (self-monitoring), CSC and RDF.

287. The Contractor shall perform baseline data measurements for air quality, water quality, noise and vibration in the pre-construction phase, and shall implement regular measurements of the same parameters and at least the same locations during the construction phase and the defects liability period.

288. The CSC shall maintain a non-compliance register and issue non-compliance notices if SSEMP mitigation measures are not properly implemented in a timely manner. The Contractor shall implement corrective actions to resolve non-compliances before deadlines set by the CSC.

289. The Contractor and CSC shall report on implementation of the SSEMP and safeguard activities in compliance with the requirements of their contracts.

Appendix A: Rapid Environmental Assessment (REA) Checklist

Instructions:

(i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to the Environment and Safeguards Division (RSES) for endorsement by the Director, RSES and for approval by the Chief Compliance Officer.

(ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.

(iii) Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Armenia: Rehabilitation of Pushkin Tunnel

Conducted by Alisa Savadyan

SCREENING QUESTIONS	YES	NO	REMARKS
A. PROJECT SITING Is the Project area ...			
• Densely populated?		X	The Pushkin tunnel (length – 1830 m, width – 8 m, height – 4.5 m + 2.2 m) is located in Lori Marz, which passes under the Bazum mountain range and is part of the Stepanavan-Vanadzor main highway. It is connect the south (Darbas) and north (Gargar) of the Lori region of Armenia. The construction of the Pushkin tunnel was completed in 1971. The tunnel was damaged by the 1988 earthquake and rehabilitated in 2000. Bypass of Pushkin tunnel only via a mountain road which requires upgrade; however, this route is unsuitable for trucks which will need to be diverted regionally. Environmental measures which address significant increase in traffic through mountain road when the tunnel is closed also measures to ensure road safety shall be planned in the EMP.
• Heavy with development activities?		X	Not at present, and it is unlikely that any further planned projects / activities are going to be implemented simultaneously in the project area of influence.
• Adjacent to or within any of the following environmentally sensitive areas?			
○ Cultural heritage site		X	There are no state-listed cultural heritage sites on entrance to and exit from the tunnel. Lots of historical sites, like cemetery, old churches and cross stones are identified and registered by included in the N 49-Ա (Lori region), defined historical and cultural heritage list. The distance of the entries in the list of valued sites are several km, so no further impacts during the work are expected. Nevertheless the above sites will be identified as "valued sensitive receptor" and will be protected by the special measures in the EMP. Access by construction traffic shall be monitored.

SCREENING QUESTIONS	YES	NO	REMARKS
○ Protected area		X	Encroachment on nature and/ or cultural protected area by the reconstruction works of tunnel is not anticipated.
○ Wetland		X	No Ramsar registered sites
○ Mangrove		X	N/A for Armenia
○ Estuarine		X	No project activity leading to the impact
○ Buffer zone of protected area		X	See the next point
○ Special area for protecting biodiversity	X		Research carried out for the ESR indicates that the north portal of tunnel may lie just within the boundaries of the Gulagarak Pine State Sanctuary; however, obtaining accurate borders of protected areas is not simple, and this will be further clarified with Ministry of Environment and ArmForest during the IEE preparation.
○ Bay		X	N/A for the project
B. POTENTIAL ENVIRONMENTAL IMPACTS Will the Project cause…			
• impacts on the sustainability of associated sanitation and solid waste disposal systems and their interactions with other urban services.		X	A positive impact of the tunnel rehabilitation will be treatment of polluted water from the roadway. A separated drainage system will be installed, which means groundwater does not come into contact with polluted water. Construction waste will be generated during rehabilitation of the tunnel, which including storm water pipes and different cables (electricity, other), • Large volumes of waste will be generated as a result of removing (parts of) the concrete inner-lining of the tunnel; • cables will also be replaced, so existing cables are waste; • recycling measures for removed asphalt pavement should be implemented; • all the waste originated during rehabilitation shall be disposed at the landfills designated by the Stepanavan Municipality or reused if technically suitable (asphalt pavement); • waste minimisation program will be applied.
• deterioration of surrounding environmental conditions due to rapid urban population growth, commercial and industrial activity, and increased waste generation to the point that both manmade and natural systems are overloaded and the capacities to manage these systems are overwhelmed?		X	Modification of the surrounding environmental conditions is not expected, because no new facility or buildings are expected to be constructed as a result of the rehabilitation of the tunnel.
• degradation of land and ecosystems (e.g. loss of wetlands and wild lands,		X	The potential risk is manageable. The existing tunnel passes under the hills and no changes are expected due to rehabilitation. Impact on the gorge ecosystem wouldn't be expected. There

SCREENING QUESTIONS	YES	NO	REMARKS
coastal zones, watersheds and forests)?			are existing areas which can be used for site setup by the contractor. Tree cutting (if any) will be minimal and contractor site setup areas should utilise surfaces which have already been cleared. The impact on nearby water bodies is not expected as long as measures are taken as described below to prevent water run-off from construction areas without treatment. The operational buildings will be rehabilitated and the project will include landscaping in the portal areas.
• dislocation or involuntary resettlement of people?		X	Resettlement of people is not expected during rehabilitation of tunnel. Due to temporary closure of tunnel disturbance of traffic will be caused. Existing roads shall be utilised for bypass of the tunnel during rehabilitation works. Bypass of Pushkin tunnel only via a mountain road which requires upgrade; however, this route is unsuitable for trucks which will need to be diverted regionally. A traffic management plan will be developed.
• disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable group?		X	A risk of disproportionate impact on the vulnerable groups of population doesn't exist. Nevertheless the vulnerable groups shall be identified and contractor shall be charged with responsibility to meet their needs to the extent possible.
• degradation of cultural property, and loss of cultural heritage and tourism revenues?		X	The potential impact is manageable. The safety of visitors/tourists shall be ensured by bypass road. Cultural objects will not be disturbed by rehabilitation process. Nevertheless if they will be identified as valued sensitive receptors close to bypass road, they will be protected by the special measures in the EMP.
• occupation of low-lying lands, floodplains and steep hillsides by squatters and low-income groups, and their exposure to increased health hazards and risks due to pollutive industries?		X	N/A for the project area
• water resource problems (e.g. depletion/degradation of available water supply, deterioration for surface and ground water quality , and pollution of receiving waters?		X	The potential impact is manageable. A positive impact of the tunnel rehabilitation will be treatment of polluted water from the road. A separated drainage system will be installed, which means groundwater does not come into contact with polluted water. Engineering solutions for Gargar village water supply from drainage water will be considered with possible further implementation. Any permanent alteration of the surface water bodies is not anticipated. During construction polluted water from the site must be collected and treated before returning it to receiving waters. The wheels of construction vehicles exiting the tunnel should be washed to prevent contaminated water reaching receiving waters before washing.

SCREENING QUESTIONS	YES	NO	REMARKS
• Air pollution due to urban emissions?		X	The potential impact is manageable. There are no urban emissions Routine temporary impact typical for asphalt pavement, and chemicals from asphalt processing. It is likely that a concrete batching plant will be installed at the construction site. Regular mitigation measures envisaged in the EMP will manage the impact.
• risks and vulnerabilities related to occupational health and safety due to physical, chemical and biological hazards during project construction and operation?	X		Tunnelling involves increased risks compared to other construction works; therefore only experienced personnel should be deployed by contractors and a high-degree of mechanisation is desirable. The potential risks to occupational health and safety are manageable. A specific Health & Safety, Emergency Prevention and Preparedness Plan for the works will be prepared by the Consultant.
• road blocking and temporary flooding due to land excavation during rainy season?		X	The potential impact is manageable. No impacts are expected. Irreversible impact on the local road network is not anticipated. Temporary impacts will be managed by regular road safety mitigation measures set out in a Traffic Management Plan
• noise and dust from construction activities?	X		Routine temporary manageable impact typical for concrete batching plant at the portal and potentially an asphalt plant. Dealing with the removed concrete and excavated rock/soil may be noisy and dusty, but the impacts are limited to the tunnel portals. Special mitigation measures shall be designed to manage the impact and shall be included in the EMP.
• traffic disturbances due to construction material transport and wastes?		X	Potential impact is manageable and since traffic will be diverted to the bypass or regional roads (away from the tunnel), no significant impacts are anticipated. Temporary impacts will be managed by road safety mitigation measures set out in a Traffic Management Plan.
• temporary silt runoff due to construction?	X		Potential impact is manageable. Activities at the tunnel portals may increase silt runoff, and during removal of the tunnel lining there may be some extra runoff from the tunnel. Silt runoff from muck disposal areas (if any) must be prevented. Temporary impacts including some increased risk of sedimentation shall be managed by the special mitigation measures planned in the EMP.
• hazards to public health due to ambient, household and occupational pollution, thermal inversion, and smog formation?		X	Potential impact is manageable. No impact. The public will not be in the vicinity of any construction areas. The ventilation system of tunnel must be planned taken into account the altitude.
• water depletion and/or degradation?		X	Potential impact is manageable. Routine temporary impact typical for road construction works. Regular mitigation measures in EMP will manage the impact. The project will result in an improvement because a separated

SCREENING QUESTIONS	YES	NO	REMARKS
			drainage system will be introduced. At the moment the tunnel drainage system is not separated so water is polluted.
• overpaying of ground water, leading to land subsidence, lowered ground water table, and salinization?		X	Since the tunnel already exists these impacts (if any) have occurred in the past and rehabilitation works are very unlikely to have further effects.
• contamination of surface and ground waters due to improper waste disposal?		X	The potential impact is manageable. The project will result in an improvement because a separated drainage system will be introduced. At the moment the tunnel drainage system is not separated so water is polluted. Regular mitigation measures in the EMP will manage the impact. A Waste and Material Management Plan will be developed.
• pollution of receiving waters resulting in amenity losses, fisheries and marine resource depletion, and health problems?	X		The potential impact is manageable. Pollution of water due to site setup areas in the portals and in work in the tunnels means that water needs to be treated before it is returned to receiving waters. Regular mitigation measures in the EMP will manage the impact.
• large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		X	N/A for the project area
• social conflicts if workers from other regions or countries are hired?		X	The probability that the risk will materialize is negligible. The works contractor will be encouraged (via the tender documents) to give preference to the local work force, as well as to hire a social specialist to manage conflicts (if any).
• risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during operation and construction?		X	There are no communities nearby.
• community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project		X	There are no communities nearby.

SCREENING QUESTIONS	YES	NO	REMARKS
construction, operation and decommissioning?			

Checklist for Preliminary Climate Risk Screening

Country/Project Title: Armenia: Rehabilitation of Pushkin Tunnel

Sector : Urban Development

Division/Department: Environment and Safeguards Division (RSES)

SCREENING QUESTIONS		SCORE	REMARKS[1]
Location and Design of project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather related events such as floods, droughts, storms, landslides?	0	The storm water drainage system of the road will be designed to a specific return period as per standards. The tunnel already exists. The only extreme weather likely to affect it is snow, and this is predictable.
	Would the project design (e.g. the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed etc)?	1	The ventilation system installation will take into account climatic conditions and altitude that are based on historical records.
Materials and Maintenance	Would weather, current and likely future climate conditions (e.g. prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind and humidity hydro-meteorological parameters likely affect the selection of project inputs over the life of project outputs (e.g. construction material)?	0	All construction material will be required in accordance with the standards that integrate the weather related parameters.
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s)?	0	Regular maintenance measures that are taking into account the current and likely future weather and climate conditions will be proposed. Extreme events are not likely.
Performance of project outputs	Would weather/climate conditions, and related extreme events likely affect the performance (e.g. annual power production) of project output(s) (e.g. hydro-power generation facilities) throughout their design life time?	0	N/A, weather/climate conditions and extreme events are not likely to affect the project.

[1] If possible, provide details on the sensitivity of project components to climate conditions, such as how climate parameters are considered in design standards for infrastructure components, how changes in key climate parameters and sea level might affect the siting/routing of project, the selection of construction material and/or scheduling, performances and/or the maintenance cost/scheduling of project outputs.

Options for answers and corresponding score are provided below:

RESPONSE	SCORE
Not Likely	0
Likely	1
Very Likely	2

Responses when added that provide a score of 0 will be considered low risk project. If adding all responses will result to a score of 1-4 and that no score of 2 was given to any single response, the project will be assigned a medium risk category. A total score of 5 or more (which include providing a score of 1 in all responses) or a 2 in any single response, will be categorized as high risk project.

Result of Initial Screening (Low, Medium, High): **Medium**

Other Comments: **None**

Prepared by: **Alisa Savadyan**

Appendix B: Biodiversity study – flora

Tunnel under Pushkin pass: Biodiversity Study - Flora

Description of the Environment
ii Ecological resources

a. Flora and vegetation

The tunnel and its surrounding area are located in the Lori marz, which belongs to the Lori floristic region (Fig. 1, 2).

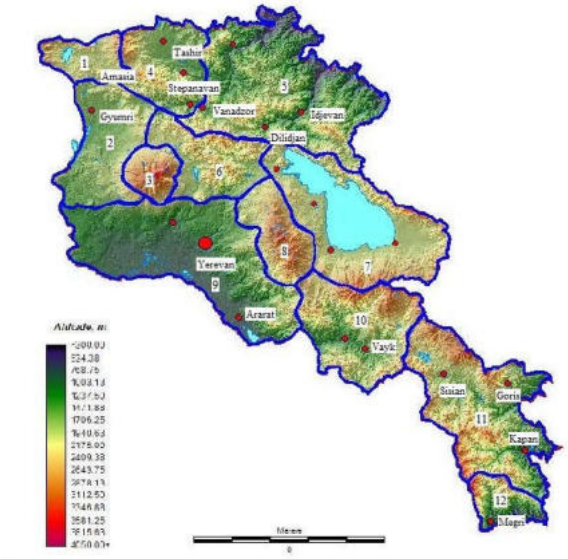


Fig. 1. Floristic regions of Armenia (Takhtajan, 1954)
1 – Upper Akhuryan, 2 – Shirak, 3 – Aragats, 4 – Lori, 5 – Ijevan, 6 – Aparan, 7 – Sevan, 8 – Gegham, 9 – Yerevan, 10 – Darelegis, 11 – Zangezur, 12 – Meghri

Fig. 2. Location of the tunnel under Pushkin pass

The Lori floristic region (1280 species) covers the entire Lori plateau, in the east by the foothills of the Lalvar and Lejan mountain ranges it is delimited from the Ijevan floristic region. In the west the border with the Upper Akhuryan floristic region runs along the Javakheti ridge. The northern border coincides with the state border of Armenia with Georgia. In the south the region covers the upper reaches of the Pambak River on the Pambak ridge, and in the southwest it borders the Shirak floristic region. Administratively, the region almost completely coincides with the Lori region of Armenia, with the exception of its south and east. The vegetation is represented mainly by meadows and forests (oak and beech), as well as wetland vegetation of the relict lakes of the Lori Plateau. The altitudes of the area are from 1300 to 2550 m above sea level. m. Endemic species – 6 (Fayvush, 2007). Species included in the Red Book of Plants of Armenia (2010) – 30.

The vegetation in the vicinity of the tunnel consists of meadow-steppes, subalpine meadows, and oak and beech forests. The Lori Plateau presents a whole series of rare ecosystems associated with relict lakes and wetlands. In addition, on the Pambak ridge in the subalpine belt there is a rare ecosystem of *Rhododendron caucasicum* heaths in Armenia (F2.2261 according to the EUNIS classification), and in the vicinity of Gyulagarak the ecosystem of Ponto-Caucasian Scots pine forests (G3.4E) is well defined.

Meadow-steppes are represented in the vicinity of southern entrance to the tunnel. There are Grass meadow-steppes (E2.161) with *Festuca valesiaca, Stipa tirsa, Elytrigia intermedia ssp. trichophora, Poa densa, Phleum phleoides, Koeleria macrantha, Dactylis glomerata* dominance (Fig. 3), and Forbs meadow-steppes (E2.162) with *Scabiosa bipinnata, Trifolium ambiguum, Anthriscus nemorosa, Achillea setacea, Artemisia absinthium, Serratula radiata* (Fig. 4).

Fig. 3. Grass meadow-steppe

Fig. 4. Forbs meadow-steppe

Subalpine meadows are represented by forb subalpine meadows (E2.322), where the dominants are most often *Scabiosa caucasica, Betonica macrantha, Rhinanthus pectinatus, Pimpinella saxifraga, Centaurea cheiranthifolia, Astrantia maxima, Tanacetum coccineum,* (Fig. 5).

Fig. 5. Subalpine meadow

Meadow ecosystems are used primarily as pastures; in relatively flat areas they are plowed and used for growing grain crops.

In the vicinity of southern entrance of the tunnel meadow-steppes are infested by expanding plant species: *Astragalus galegiformis* and *Heracleum sosnovskyi.*

Forests

Forest vegetation is represented mainly by beech and oak forests.

Caucasian beech forests (G1.6H) are very good represented in the vicinity of the northern entrance to the tunnel by beech and beech-hornbeam varieties (Fig. 6). In Armenia, beech forests (*Fagus orientalis*) can be divided into three categories - beech forests in dry, fresh and wet habitats, in the territory we describe all three categories are found (Yaroshenko, 1962). Here beech forests are almost pure, less often there are joined to beech (usually in the form of individual trees) *Quercus macranthera, Fraxinus excelsior, Carpinus betulus, Ulmus elliptica, Prunus divaricata,* in understory *Viburnum lantana, Euonymus latifolius, Daphne mezereum.*

Oak forests are represented by ecosystems G1.A1D2 – Oak forests of Armenia dominated by *Quercus macranthera* (Fig. 7). *Quercus macranthera* completely dominates here, and the composition of the tree stand is usually represented by single *Fraxinus excelsior, Acer hyrcanicum, Pinus kochiana, Viburnum lantana, Prunus divaricata, Lonicera caucasica*, and the composition of the herbage is dominated by cereals and representatives of forbs – *Poa nemoralis, P. pratense, Brachypodium sylvaticum, Dactylis glomerata, Primula macrocalyx, Origanum vulgare, Teucrium pollium, Galium verum, Filipendula vulgare, Achillea micrantha, Trifolium alpestre, T. pratense, Coronilla varia, Medicago sativa, M. lupulina.*

Fig. 6. Beech forest in the vicinity of the tunnel

Fig. 7. Oak forest in vicnity of the tunnel

Among the rare ecosystems, Ponto-Caucasian Scots pine forests (G3.4E) are found here (Fig. 8), the majority of this ecosystem is included in the "Gjulkagarak" State Sanctuary. Here *Pinus kochiana* usually completely dominates, which can be joined in small quantities by *Quercus macranthera, Sorbus aucuparia, Populus tremula, Fagus orientalis*. The undergrowth is usually almost undeveloped; species of *Rosa, Crataegus*, and *Rubus* are occasionally found in it. The habitats are included in Resolution 4 of the Berne Convention.

Fig. 8. Pine forest

Protected areas

Further research carried out for the ESR indicates that the north portal of tunnel may lie just within the boundaries of the Gyulagarak Pine State Sanctuary as can be seen on the figures below; however, obtaining accurate borders of protected area is not simple, and this will be clarified with Ministry of Environment and ArmForest during the IEE preparation.

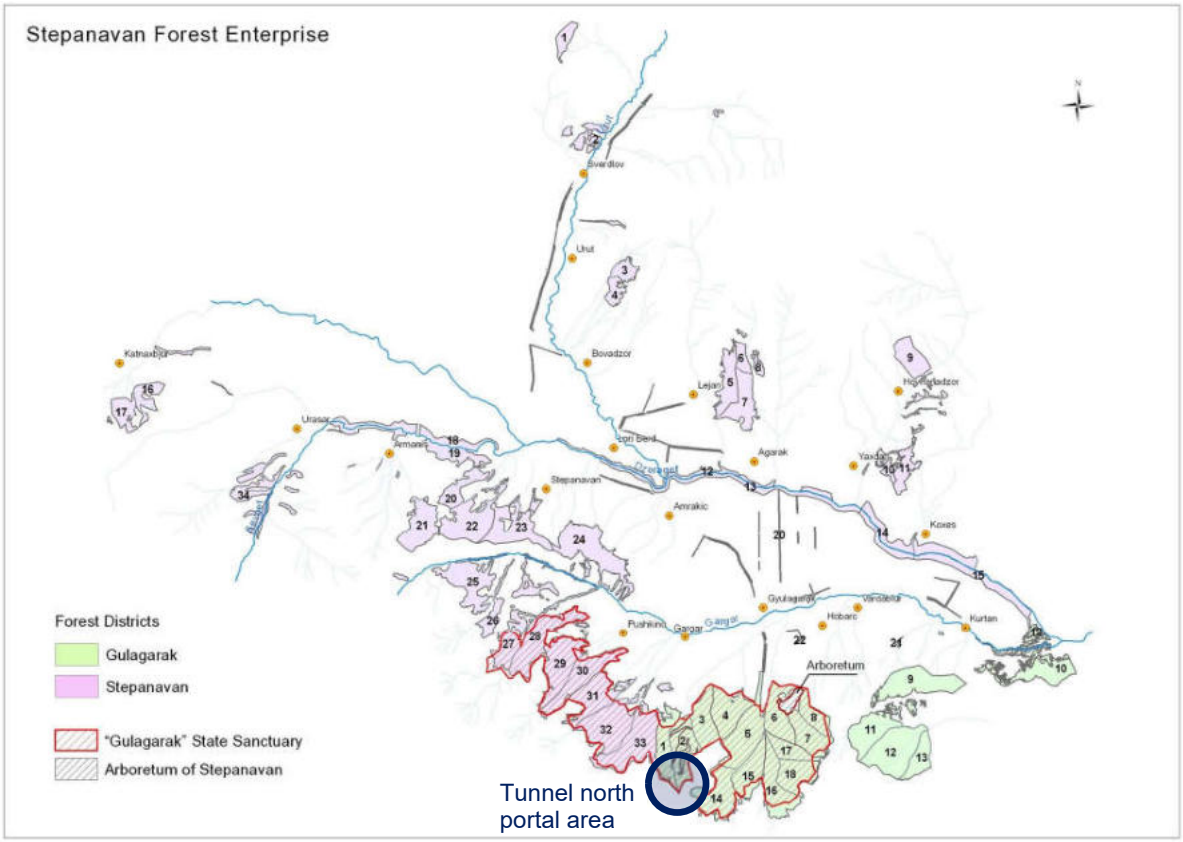


Fig. 9. Boundaries of "Gyulagarak Pine State Sanctuary" on the Forest Enterprise Map [source[1]: Draft structural model of "Gyulagarak Pine" State Sanctuary management plan prepared by WWF Armenia]

[1] https://fleg1.enpi-fleg.org/fileadmin/ufs/04.%20Program%20Information/4.02%20Program%20Components/4.02.01%20General/4.02.01.Armenia/Gyulagarak_MP_eng-1.pdf retrieved 06.02.2024

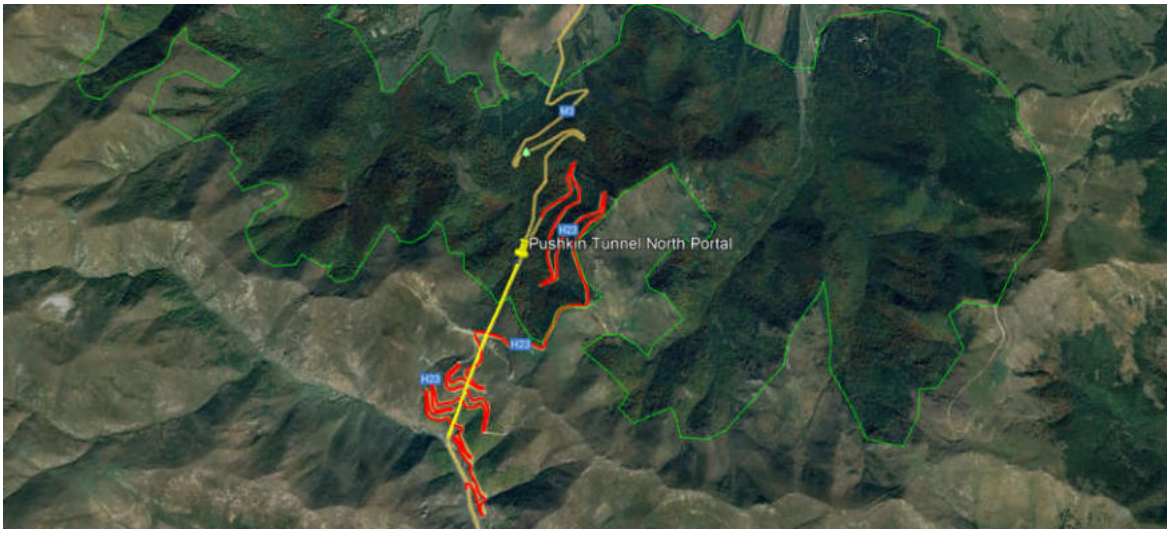


Fig. 10. Boundaries of "Gyulagarak Pine State Sanctuary" in relation to the tunnel north portal as shown in Google Earth

Rare plant species

Of the species included in the Red Book of Plants of Armenia, the following are found in the vicinity of tunnel:

Jurinea praetermissa (EN)
Rhododendron caucasicum (EN)
Gladiolus dzhavakheticus (EN)
Iris sibirica (VU)
Fritillaria collina (EN)
Primula cordifolia (CR)
Atropa belladonna (VU)

Appendix

In addition to those listed above, the following species of vascular plants are found in the area adjacent to the tunnel:

Acer trautvetteri
Ajuga genevensis
Alliaria petiolata
Alyssum alyssoides
Anthoxanthum odoratum
Anthriscus nemorosa
Arenaria serpullifolia
Asperula arvensis
Asplenium septentrionale
Astragalus hyalolepis
Barbarea vulgaris
Briza media
Bromus benekenii
Bromus erectus
Bromus hordaceus
Bromus tomentellus

Bromus variegatus
Bunias orientalis
Bunium microcarpum
Caltha polypetala
Campanula glomerata
Campanula hohenackeri
Campanula latifolia
Campanula stevenii
Capsella bursa-pastoris
Cardamine impatiens
Cardamine uliginosa
Carex sylvatica
Carlina biebersteinni
Carpinus betulus
Centaurea cheiranthifolia
Cerastium purpurascens
Cerinthe minor
Chaerophyllum aureum
Cirsium echinus
Cota melanoloma
Cruciata laevipes
Cruciata taurica
Cystopteris fragilis
Dactylis glomerata
Daphne mezereum
Doronicum oblongifolium
Dryopteris caucasica
Echium maculatum
Echium vulgare
Eleutherospermum cicutarium
Epilobium nervosum
Erysimum aureum
Euphorbia condylocarpa
Euphorbia macroceras
Euphorbia squamosa
Euphrasia hirtella
Euphrasia pectinata
Euphrasia sevanensis
Falcaria vulgaris
Festuca karsiana
Fragaria vesca
Galium aparine
Galium odoratum
Gentiana septemfida
Geranium robertianum
Geranium sylvaticum
Geum urbanum
Gypsophila elegans
Helictotrichon pubescens
Hesperis matronalis

Hordeum brevisubulatum
Hypericum perforatum
Isatis brachycarpa
Juncua atratus
Juncus inflexus
Lamium album
Lamium purpureum
Leucanthemum vulgare
Lilium szovitsianum
Lonicera caucasica
Lotus caucasicus
Malus orientalis
Minuartia oreina
Myosotis alpestre
Myosotis arvensis
Myosotis heteropoda
Myosotis ramosissima
Neottia nidus-avis
Nonaea rosea
Onosma tenuiflora
Pedicularis condensata
Pedicularis sibthorpii
Pedicularis wilhelmsii
Persicaria alpina
Petasites albus
Phleum hirsutum
Picris hieracioides
Pimpinella anthriscoides
Pimpinella rhodantha
Plantago atrata
Platanthera chlorantha
Poa angustifolia
Poa annua
Poa bulbosa
Poa compressa
Poa nemoralis
Poa pratensis
Polygonum alpestre
Polygonatum orientale
Primula macrocalyx
Prunus divaricata
Pulsatilla albana
Pyrus caucasica
Ranunculus arvensis
Reseda lutea
Ribes biebersteinii
Rosa spinosissima
Rubus idaeus
Rumex acetoselloides
Rumex obtusifolia

Rumex scutatus
Rumex tuberosus
Sanguisorba officinalis
Scabiosa caucasica
Scirpus sylvaticus
Scleranthus annuus
Scrophularia orientalis
Scutellaria orientalis
Sedum pilosum
Senecio vernalis
Silene alba
Silene dianthoides
Silene lasiantha
Silene latifolia
Silene ruprechtii
Silene spergulifolia
Sisymbrium loeselii
Sorbus aucuparia
Stachys macrantha
Stellaria media
Symphytum asperum
Tanacetum coccineum
Tanacetum parthenium
Thlaspi arvense
Thlaspi perfoliatum
Thymus kotschyanus
Trifolium arvense
Tussilago farfara
Ulmus scabra
Urtica dioica
Valeriana alliariifolia
Veronica gentianoides
Veronica multifida
Veronica peduncularis
Viburnum lantana
Vicia balansae
Viola arvensis
Viola occulta
Ziziphora clinopodioides

Appendix C: Biodiversity study – fauna

Tunnel under Pushkin pass: Biodiversity Study - Fauna

Brief description of the biodiversity of the study area

The Pushkin Tunnel located in the Lori region and built though the Bazum Range connects the valleys of the Pambak and Dzoraget rivers. The watersheds of these valleys are floristically different from each other. Areas in the northern side of the Bazum Mountain Range mainly comprise gentle slopes rolling down into the Lori Plateau and include a variety of ecosystems. Oak and beech trees growing just around the northern side of the tunnel form a dense forest cover. Further down are areas of Pontic-Caucasian pine woodland. Further north they are replaced with open spaces of meadow-steppes with scanty shrubbery, wet meadows with bogs and relic lakes. Cultivated lands in the form of orchards and fields are found nearly throughout the plateau. The southern side of the tunnel is located on the southern slope of the mountain range. Its surroundings comprise hillside of mountain-steppe with various shrubs. Residual woodland patches are occasionally found in shallow ravines. Further down to Pambak River the areas of mountain-steppe are less frequent and give way to river valleys, prevailing cultivated croplands which are replaced mainly by beech-oak forests, hayfields and pastures towards the Pambak Range.

The upper sections of Bazum mountain range just above the northern and southern entrances are represented by mountain steppes and steppic shrub ecosystems and to a lesser extent meadow steppe with subalpine areas used as pastures and hayfields. The type of landscape habitats and vegetation described above largely determine the species composition of vertebrate animals (birds and mammals) inhabiting the territory of Lori Marz.

A wide variety of ecosystems within this Marz support a high diversity of bird species in the area. Passerine birds such as redstarts, flycatchers, tits and alike predominate in wooded areas with well-developed undergrowth. Different species of pigeons, thrushes, woodpeckers occur both in dense mature forests and in small residual open woodlands growing along shallow ravines. Woodland areas also harbor a variety of both diurnal and nocturnal birds of prey. Goshawk, Sparrowhawk, Honey and Common Buzzard, Long-eared Owls are common in the forests of Lori. The mountain-steppe landscapes in the region, supporting both ground- and shrub-nesting species are also teeming with life here. Larks, wheatears, wagtails, various shrikes thrive abundantly here building nests in shrubs and on the ground just under the herbaceous growth. Almost all members of the grouse family inhabit the mountains of the Marz. The Caspian snowcock up in the highlands, the Caucasian grouse at the upper tree line in subalpine areas, Gray partridge and Common Quail are abundant in meadows and mountain steppes. Species such as Long-legged Buzzard, Common Kestrel, the endangered Vultures, Golden Eagle and Peregrine Falcon nest in rocky outcrops of mountains and in river gorges. Small lakes and swampy areas support the many species of waterbird fauna both breeding and migratory, including herons, geese, ducks, and waders passing through the Marz. During the autumn and spring migration, large birds of prey and both species of endangered cranes are seen soaring high in the sky throughout the Marz.

Mammals living within the boundaries of Lori Marz include most of the bird families found throughout the territory of Armenia. Among the large predators, bears are found across wooded areas and high-mountain regions. Wild boars and roe deer are also common. Lynx, Stone marten and Badger are found in both forested and mountain-steppe regions. Wolves, foxes, and hares are common across almost all landscape zones, ranging from high mountains to the lowest plateaus. Jackals, which have become widespread in recent times throughout the country, are mainly found in river valleys and wetland areas, frequently venturing into inhabited areas. And of course, small members of the animal world, insectivores and rodents are also widely distributed. The Four-toed Hedgehog and Forest dormouse are found both in small tree plantations and in fruit orchards. The Persian Squirrel is an abundant in the forests of the Marz. Ural field mouse, Major’s pine vole and Common vole are widespread in across many habitats

in the Marz. The Gray dwarf hamster is a permanent resident in populated areas. At dusk and during night hours in the mid-altitude areas of the marz and in some settlements, one can encounter several species of bats hunting nocturnal insects. One such species is the Brown Long-eared Bat listed in the Red Data Book of Armenia.

Material

The material used in this report was collected from existing research and scientific literature related to this region (literature sources, various reports, scientific collections of the Institute of Zoology). Literature sources included A.F. Leister, G.V. Sosnin 1942, Dal S.K. 1954, Geptner V.G. et al. 1967, Martirosyan B.A., Papanyan S.B. 1983, Bibikov D.I. 1985, Aghajanyan F.S. 1986 and 1993., Ghasabyan M.G. 1986; 2001; 2014; Popov G.Yu. 2003, Avagyan A.B. 2010, Adamian M.S. and Klem D. Jr. 1999, the Red Data Books of Armenia 1987, 2010, ASPB reports on IBA territories (http://bird-links.org/important-bird-areas/), and other preliminary data derived from the 2016 “Emerald network in Armenia”.

Based on the above, the Consultant has prepared lists of vertebrate species which are likely to occur in this area (southern and northern ends of the tunnel) (Tables 1, 2). Species listed in the national and global red lists (IUCN Red List and the Red Data Book of Armenia) are also included in the tables.

Results

The vegetation around the southern entrance of the tunnel includes gentle mountain-steppe slopes with various shrubby vegetation giving way to meadow steppes at somewhat higher elevations. Among these natural formations, one can find small rocky outcrops, tracts of residual forest and conifer plantations. The local population rarely uses these areas as pastures. Areas around the northern entrance of the tunnel are characterized by moderately steep hillsides mostly covered with beech and oak woods, and fairly dense undergrowth and small clearings. Patches of pine trees of varying size can be found intercropped in this broad-leaved forest with fairly dense canopy. The type of landscape habitat and vegetation described for this area predominantly determine the species composition of vertebrate animals inhabiting the vicinities around the southern and northern entrances of the tunnel.

Figure 1: Vegetation / area on south side

Figure 2: Vegetation / area on north side

Birds

Table 1 shows the checklist of bird species likely to occur in the areas around the southern and northern entrances of the Pushkin Tunnel.

Table 1

	Armenian name	English name	Scientific name	South	North	IUCN, RB
	Ciconiidae					
1	Սև արագիլ	Black Stork	Ciconia nigra	M	M	**RB**
2	Սպիտակ արագիլ	White Stork	Ciconia ciconia	M	M	
	Accipitridae					
3	Կրետակեր	European Honey-buzzard	Pernis apivorus	Br?	Br	
4	Սև ցին	Black Kite	Milvus migrans	S	M	
5	Մորուքավոր անգղ	Lammergeier	Gypaetus barbatus	S	S	**NT, RB**
6	Գիշանգղ	Egyptian Vulture	Neophron percnopterus	Br	S	**EN, RB**
7	Սպիտակագլուխ անգղ	Griffon Vulture	Gyps fulvus	S	?	**RB**
8	Օձակեր արծիվ	Short-toed Snake-eagle	Circaetus gallicus	S	Br?	**RB**
9	Դաշտային մկնաճուռակ	Hen Harrier	Circus cyaneus	M	M	
10	Տափաստանային մկնաճուռակ	Pallid Harrier	Circus macrourus	M	M	**NT, RB**
11	Մարգագետնային մկնաճուռակ	Montagu's Harrier	Circus pygargus	S	S	**RB**
12	Ցախաքլորարոս	Northern Goshawk	Accipiter gentilis	S	Br?	**RB**
13	Լորաճուռակ	Eurasian Sparrowhawk	Accipiter nisus	Br	Br	
14	Սովորական ճուռակ	Eurasian Buzzard	Buteo buteo	S	Br	
15	Տափաստանային ճուռակ	Long-legged Buzzard	Buteo rufinus	S	S	
16	Թավշաոտ ճուռակ	Rough-legged Buzzard	Buteo lagopus	W	W	
17	Փոքր ենթարծիվ	Lesser Spotted Eagle	Clanga pomarina	S	Br	**RB**
18	Մեծ ենթարծիվ	Greater Spotted Eagle	Clanga clanga	M	M	**VU, RB**
19	Տափաստանային արծիվ	Steppe Eagle	Aquila nipalensis	M	M	**EN, RB**
20	Գերեզմանաարծիվ	Eastern Imperial Eagle	Aquila heliaca	M	M	**VU, RB**
21	Քարարծիվ	Golden Eagle	Aquila chrysaetos	S	M	**RB**
	Falconidae					
22	Տափաստանային հողմավար բազե	Lesser Kestrel	Falco naumanni	M	M	**RB**
23	Սովորական հողմավար բազե	Common Kestrel	Falco tinnunculus	Br	Br?	
24	Աղավնաբազե	Merlin	Falco columbarius	W	W	**RB**
25	Սապսան	Peregrine Falcon	Falco peregrinus	S	S	**RB**
	Phasianidae					

	Armenian name	English name	Scientific name	South	North	IUCN, RB
26	Կովկասյան մայրեհավ	Caucasian Grouse	Lyrurus mlokosiewiczi	S	Br?	**NT, RB**
27	Մոխրագույն կաքավ	Grey Partridge	Perdix perdix	Br	Br?	
28	Լոր	Common Quail	Coturnix coturnix	Br	Br	
	Rallidae					
29	Մարգահավ	Corncrake	Crex crex	M	M	**RB**
	Gruidae					
30	Մոխրագույն կռունկ	Common Crane	Grus grus	M	M	**RB**
31	Գեղանի կռունկ	Demoiselle Crane	Anthropoides virgo	M	M	**RB**
	Laridae					
32	Սովորական որոր	Black-headed Gull	Larus ridibundus	M	M	
33	Սևագլուխ քրքջան	Pallas's Gull	Larus ichthyaetus	M	M	
34	Հայկական որոր	Armenian Gull	Larus armenicus	M	M	**RB**
35	Գետային ջրածիծառ	Common Tern	Sterna hirundo	M	M	
36	Սպիտակաայտ ջրածիծառ	Whiskered Tern	Chlidonias hybrida	M	M	**RB**
37	Սպիտակաթև ջրածիծառ	White-winged Tern	Chlidonias leucopterus	M	M	
	Columbidae					
38	Թխակապույտ աղավնի	Rock Pigeon	Columba livia	Br	Br?	
39	Անտառային աղավնի	Common Woodpigeon	Columba palumbus	S	Br	
40	Սովորական տատրակ	European Turtle-dove	Streptopelia turtur	S	Br	**VU**
	Cuculidae					
41	Սովորական կկու	Common Cuckoo	Cuculus canorus	Br	?	
	Strigidae					
42	Բվեճ	Eurasian Eagle-owl	Bubo bubo	Br	S	**RB**
43	Տնային բվիկ	Little Owl	Athene noctua	Br	Br?	
	Apodidae					
44	Սև մանգաղաթև	Common Swift	Apus apus	S	S	
	Meropidae					
45	Ոսկեգույն մեղվակեր	European Bee-eater	Merops apiaster	Br	S	
	Coraciidae					
46	Ներկարար	European Roller	Coracias garrulus	Br	S	**NT, RB**
	Upupidae					
47	Հոպոպ	Eurasian Hoopoe	Upupa epops	Br	S	
	Picidae					
48	Խայտաբղետ փայտփոր	Great Spotted Woodpecker	Dendrocopos major	S	Br	
	Alaudidae					

	Armenian name	English name	Scientific name	South	North	IUCN, RB
49	Անտառային արտույտ	Wood Lark	Lullula arborea	Br	Br	
50	Դաշտային արտույտ	Eurasian Skylark	Alauda arvensis	Br	Br?	
51	Եղջրավոր արտույտ	Horned Lark	Eremophila alpestris	S	S	
	Hirundinidae					
52	Գյուղական ծիծեռնակ	Barn Swallow	Hirundo rustica	Br	S	
53	Քաղաքային ծիծեռնակ	Northern House-martin	Delichon urbicum	M	M	
	Motacillidae					
54	Դաշտային ձիուկ	Tawny Pipit	Anthus campestris	S	?	
55	Անտառային ձիուկ	Tree Pipit	Anthus trivialis	S	S	
56	Մարգագետնային ձիուկ	Meadow Pipit	Anthus pratensis	Br	S	
57	Լեռնային ձիուկ	Water Pipit	Anthus spinoletta	S	S	
58	Դեղին խաղտտնիկ	Yellow Wagtail	Motacilla flava	Br	S	
59	Լեռնային խաղտտնիկ	Grey Wagtail	Motacilla cinerea	Br?	S	
60	Սպիտակ խաղտտնիկ	White Wagtail	Motacilla alba	Br	Br	
	Troglodytidae					
61	Եղնջաթռչնակ	Winter Wren	Troglodytes troglodytes	Br	Br	
	Muscicapidae					
62	Արշալուսիկ	European Robin	Erithacus rubecula	S	Br	
63	Սևուկ կարմրատուտ	Black Redstart	Phoenicurus ochruros	Br	Br	
64	Սովորական կարմրատուտ	Common Redstart	Phoenicurus phoenicurus	S	Br	
65	Մարգագետնային չքչքան	Whinchat	Saxicola rubetra	Br	?	
66	Սևագլուխ չքչքան	Common Stonechat	Saxicola torquatus	Br	Br	
67	Սովորական քարաթռչնակ	Northern Wheatear	Oenanthe oenanthe	Br	?	
	Turdidae					
68	Սև կեռնեխ	Eurasian Blackbird	Turdus merula	Br	Br	
69	Սոսնձակեռնեխ	Mistle Thrush	Turdus viscivorus	S	Br	
	Sylviidae					
70	Մոխրագույն շահրիկ	Common Whitethroat	Sylvia communis	Br	S	
71	Կովկասյան գեղգեղիկ	Mountain Chiffchaff	Phylloscopus sindianus	Br	M	
72	Ծնկլտան գեղգեղիկ	Common Chiffchaff	Phylloscopus collybita	M	M	

	Armenian name	English name	Scientific name	South	North	IUCN, RB
73	Գարնանային գեղգեղիկ	Willow Warbler	Phylloscopus trochilus	M	M	
	Reguliidae					
74	Դեղնագլուխ արքայիկ	Goldcrest	Regulus regulus	W	W	
	Muscicapidae					
75	Մոխրագույն ճանճորս	Spotted Flycatcher	Muscicapa striata	Br	Br	
76	Կիսասպիտակավի զ ճանճորս	Semi-collared Flycatcher	Ficedula semitorquata	S	Br	**NT, RB**
	Paridae					
77	Երկնագույն երաշտահավ	Blue Tit	Cyanistes caeruleus	Br	?	
78	Մեծ երաշտահավ	Great Tit	Parus major	S	Br	
	Laniidae					
79	Ժուլան	Red-backed Shrike	Lanius collurio	Br	Br	
80	Սևաճակատ շամփրուկ	Lesser Grey Shrike	Lanius minor	Br	Br?	
	Corvidae					
81	Անտառային կաչաղակ	Eurasian Jay	Garrulus glandarius	Br?	Br	
82	Սովորական կաչաղակ	Black-billed Magpie	Pica pica	Br	S	
83	Սովորական ճայ	Eurasian Jackdaw	Corvus monedula	M	M	
84	Սերմնաքաղ	Rook	Corvus frugilegus	M	M	
85	Մոխրագույն ագռավ	Hooded Crow	Corvus corone	S	S	
86	Սև ագռավ	Common Raven	Corvus corax	S	S	
	Sturnidae					
87	Սովորական սարյակ	Common Starling	Sturnus vulgaris	Br	?	
	Passeridae					
88	Տնային ճնճղուկ	House Sparrow	Passer domesticus	Br	Br	
89	Ամուրիկ	Eurasian Chaffinch	Fringilla coelebs	S	Br	
90	Սովորական սերինոս	Brambling	Fringilla montifringilla	W	W	
91	Կանաչ սերինոս	European Greenfinch	Carduelis chloris	S	Br	
92	Կարմրակատար	European Goldfinch	Carduelis carduelis	Br	S	
93	Կանեփնուկ	Eurasian Linnet	Carduelis cannabina	Br	Br	
94	Լեռնային վշասարեկ	Twite	Carduelis flavirostris	Br	M	
95	Եղևնու խաչկտուց	Red Crossbill	Loxia curvirostra	?	Br	**RB**
96	Սովորական ոսպնուկ	Common Rosefinch	Carpodacus erythrinus	Br	S	

	Armenian name	English name	Scientific name	South	North	IUCN, RB
	Emberizidae					
97	Սովորական դրախտապան	Yellowhammer	Emberiza citrinella	W	M	
98	Լեռնային դրախտապան	Rock Bunting	Emberiza cia	Br	S	
99	Կորեկնուկ	Corn Bunting	Miliaria calandra	Br	Br	

South = southern entrance of the tunnel
North = northern entrance of the tunnel
Br = Breeding
Br? = Probable breeding
? = Likely to occur
S = species that are regularly seen in the area, or visit occasionally in search of food or are rare visitors
M = migrant
W = winter visitor
IUCN = IUCN Red List
RB = Red Data Book of Armenia

According to Table 1, a total of 99 bird species from 29 families can be observed in the vicinity of the southern and northern tunnel entrances and their immediate surroundings. Passerines are the dominant group at both southern and northern entrances, with the highest number of nesting birds found near the tunnel entrances. Raptors are the second most abundant group, however despite their high species diversity the nesting population of raptors in these areas is relatively low. The group of breeding and potentially breeding (probable breeders) species on both sides of the tunnel is nearly equal, but their species composition is somewhat different. Ground- and shrub-nesting birds predominate in the outskirts of the southern entrance, while tree-nesting species and those using the tree understory prevail near the northern side of the tunnel. Also, the diversity of bird species which do not nest in the area but are regularly or periodically seen at both sides of the tunnel differ both in the number and the species composition. Their numbers prevail at the southern side of the tunnel over those at the northern side. There are 29 species of birds recorded at the southern entrance of the tunnel and only 24 species observed on the northern side. The difference in numbers and species composition is explained by variations in habitat landscapes on the northern and southern sides of the tunnel. Birds of prey and species which require more open spaces for search for food are found mainly on the southern side, while the forested northern slopes make it difficult for them to forage. The group of migratory birds are identical in numbers and species composition, which is explained by their passage over the ridge during the spring and autumn migrations. Raptors are the dominating group among migrant birds, with six species of Laridae crossing the ridge during their stopover or passage across the territory of the country. Wintering birds are lowest in number in this area which is due to harsh winter conditions on the southern side of the tunnel and the overall low number of birds wintering in the forest zone both in this region and elsewhere in the country.

9 bird species are listed in the IUCN Red List and 26 species are included in the Red Data Book of Armenia. As shown in Table 1, these species primarily include birds which migrate across the ridge, mainly large size eagles or species visiting the area occasionally in search of food such as Griffon Vulture, Bearded Vulture and Golden Eagle. Rare species nesting directly in the vicinity of both sides of the tunnel include Eurasian Eagle-owl. Semi-collared Flycatcher nests on the northern side and the European Roller on the southern side of the tunnel.

Mammals

Table 2 shows the checklist of mammals likely to occur in the vicinities of the southern and northern entrances of the Pushkin Tunnel.

Table 2

No	Scientific name	Armenian Name	English name	South	North	IUCN RB
	Erinacedae					
1.	Erinaceus concolor	Սպիտակափոր ոզնի	Southern white-breasted hedgehog	+	+	
	Talpidae					
2.	Talpa levantis	Փոքր խլուրդ	Levant mole	-	+	
	Soricidae					
3.	Crocidura gueldenstaedtii	Կովկասյան երկարագի սպիտակատամ սրընչակ	Gueldenstaedt's shrew	+	-	
4.	Crocidura leucodon	Սպիտակափոր սպիտակատամ սրընչակ	Bicolored shrew or bicoloured	+	-	
5.	Sorex minutus	Փոքր գորշատամ	Eurasian pygmy shrew	+	+	
	Vespertilionidae					
6.	Myotis blythi	Սրականջ գիշերաչղջիկ	Lesser mouse-eared bat	+	+	
7.	Myotis mystacinus	Բեղավոր գիշերաչղջիկ	Whiskered bat	+	-	
8.	Plecotus auritus	Գորշ ականջեղ չղջիկ	Brown long-eared bat	+	+	RB
	Leporidae					
9.	Lepus europaeus	Նապաստակ	European hare	+	+	
	Cervidae					
10.	Capreolus capreolus	Այծյամ եվրոպական	Roe deer	-	+	
	Suidae					
11.	Sus scrofa	Վայրի խոզ	Wild boar	-	+	
	Mustelidae					
12.	Martes foina	Քարակզաքիս	Beech marten	+	+	

No	Scientific name	Armenian Name	English name	South	North	IUCN RB
13.	Mustela nivalis	Աքիս	Least weasel	+	+	
14.	Meles meles	Գորշուկ	European badger	+	-	
	Ursidae					
15.	Ursus arctos	Գորշ արջ	Brown Bear	-	+	RB
	Canidae					
16.	Canis lupus	Գայլ	Gray wolf	+	+	
17.	Canis aureus	Չախկալ, սովորական շնագայլ	Jackal, Golden jackal	+	-	
18.	Vulpes vulpes	Սովորական աղվես	Fox	+	+	
	Felidae					
19.	Felis silvestris	Անտառային կատու	Wild cat	+	+	RB
20.	Lynx lynx	Կովկասյան լուսան	Caucasian lynx	-	+	
	Sciuridae					
21.	Sciurus anomalus	Կովկասյան կամ պարսկական սկյուռ	Caucasian or Persian squirrel	-	+	
	Gliridae					
22.	Myoxus glis	Մեծ քնամոլ (պոլչոկ)	Edible dormouse	-	+	
23.	Dryomys nitedula	Անտառային քնամոլ (քնամուկ)	Forest dormouse	-	+	
	Cricetidae					
24.	Cricetulus migratorius	Գորշ համստերիկ	Gray dwarf hamster	+	+	
25.	Microtus daghestanicus	Դաղստանական դաշտամուկ	Dagestan pine vole	+	+	
26.	Microtus majori	Թփուտային դաշտամուկ	Major’s pine vole	+	-	
27.	Microtus arvalis	Սովորական դաշտամուկ	Common vole	+	+	
	Muridae					
28.	Sylvaemus uralensis	Փոքր անտառային մուկ	Ural field mouse	+	+	
29.	Rattus norvegicus	Մոխրագույն առնետ	Brown rat	+	-	

South = southern entrance of the tunnel
North = northern entrance of the tunnel
IUCN = IUCN Red List
RB = Red Data Book of Armenia

As can be seen from Table 2, a total of 29 species of mammals from 15 families can be encountered on the southern and northern sides of the tunnel and their immediate proximities. The number of species observed at the southern and northern entrances is nearly identical, being 21 on the southern side and 22 on the northern side of the tunnel. However analyzing the research data it can be determined that the species diversity of animals inhabiting either sides of the tunnel is somewhat different. Species favoring more gentle hillsides with arid mountain steppe and meadows and low shrubbery growths and forested areas such as Bicolored shrew, Badger and Major's pine vole resort to the southern side of the tunnel. Northern sides of the tunnel are more abundant with species like Bear, Roe-deer, Wild Boar, Lynx, Persian squirrel, dormice, i.e., species which are mainly typical of forest habitats. Other species featured in the Table such as Wolf, Fox, Hare, Dagestan pine vole can be seen both on the northern and the southern sides of the tunnel. A total of 3 species of bats are known to occur on both sides of the tunnel, however their sightings inside the tunnel are less likely because of the persistent emission of exhaust gases.

Red-listed mammals are not documented here, however some species listed in the Red Data Book of Armenia may occur in the vicinities of both southern and northern entrances. These include Brown long-eared Bat and Wild Cat, as well as Brown Bear in areas adjoining the northern side of the Tunnel.

Protected Areas

Further research carried out for the ESR indicates that the north portal of tunnel may lie just within the boundaries of the Gyulagarak Pine State Sanctuary; however, obtaining accurate borders of the protected area is not simple, and this will be clarified with Ministry of Environment and ArmForest during the IEE preparation. (Figure 3, N3).

Further north is "Tashir" Important Bird Area (Figure 3, N1). In the south of the Marz is the Important Bird Area" Pambak" (Figure 3, N2). Since these two areas are located at substantially far distances from the tunnel entrances, it can be assumed that the tunnel rehabilitation activities will not disrupt the viability of any of the ecosystems present or cause damage to the wildlife populations present in these areas.

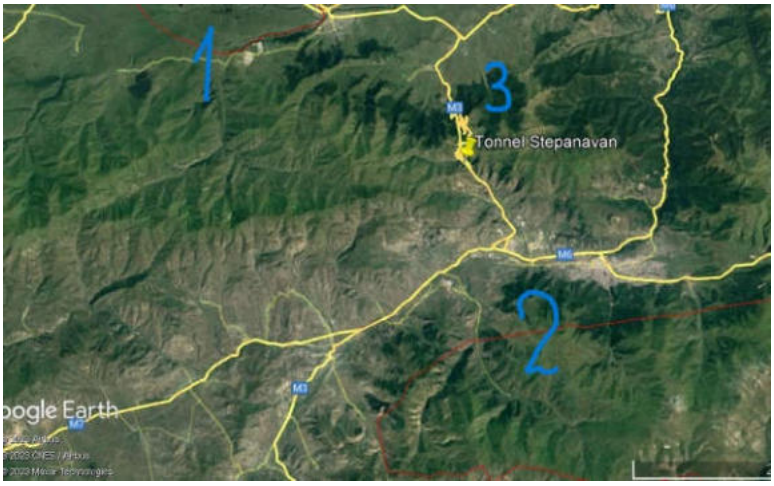
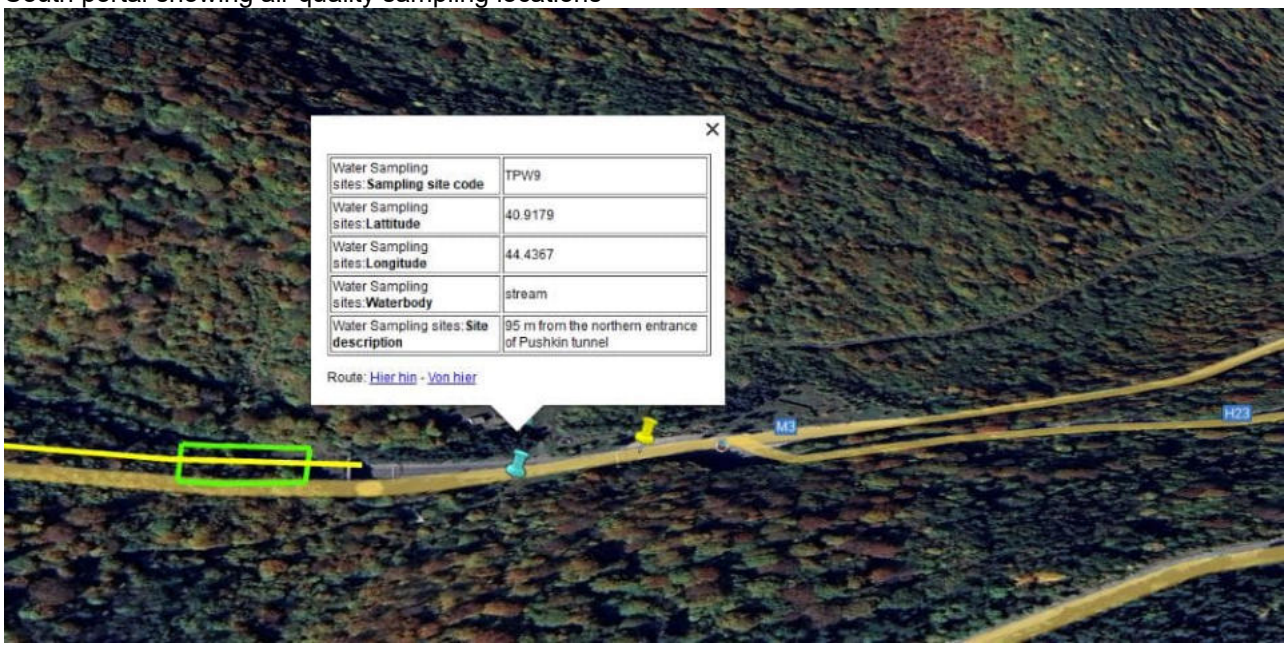


Figure 3: N1 "Tashir" Important Bird Area, N2 "Pambak" Important Bird Area, N3 "Gyulagarak" state sanctuary

Appendix D: Baseline survey – air quality test reports

South portal showing air quality sampling locations



North portal showing air quality sampling locations

Air sampling sites for NO_2 and SO_4				
№	Site description	Sampling site code	Coordinates	
			Lattitude	Longitude
1	65 m away from the southern entrance of Dilijan tunnel	PS1	40,65308	44,89265
2	30 m away from the northern entrance of Dilijan tunnel	PS2	40,67385	44,88242
3	85 m from the southern entrance of the Pushkin tunnel	PS3	40,90134	44,4289
4	140 m from the northern entrance of the Pushkin tunnel	PS4	40,91833	44,43719

Air sampling sites for inorganic dust, SiO_2, soot, As, Cr				
№	Site description	Sampling site code	Coordinates	
			Lattitude	Longitude
1	75-80 m away from the northern entrance of Dilijan tunnel	Dilijan tunnel Point I		
2	75-85 m away from the southern entrance of Dilijan tunnel	Dilijan tunnel Point II		
3	50-60 m from the southern entrance of the Pushkin tunnel	Pushkin tunnel Point I		
4	50-60 m from the northern entrance of the Pushkin tunnel	Pushkin tunnel Point II		

Details of air quality sampling locations

Customer: **«TRANSPROJECT» CJSC**
Contract for services: **L-20/24**
Sampling start: **June 05, 2024**
End of sampling: **June 20, 2024**
Date of receipt of the samples: **June 20, 2024**
Date of release of results: **June 26, 2024**
Sample matrix: **Air**
Sampling: **«Armhydromet» SNCO**

Approved by

«Hydrometeorology and
Monitoring Center» SNCO
Director

L. Azizyan

TEST REPORT_163_2024

Sample Name	Average daily concentration, mg/m³	
	Sulfur dioxide ($MPC_{aver.day}$ = 0.05 mg/m³)	**Nitrogen dioxide (MPCaver.day = 0.04mg/m³)**
PS1 Dilijan (south portal)	0.0183	0.00913
PS2 Dilijan (north portal)	0.00953	0.0110
PS3 Pushkin (south portal)	0.0221	0.00844
PS4 Pushkin (north portal)	0.0141	0.0102

MPC-maximum permissible concentration.

Statement: The results refer only to the tested samples.

Authorised by:

Deputy Director: G. Shahnazaryan

Head of Air Quality Monitoring Service: G. Hakobyan

Պատվիրատու՝ **«ՏՐԱՆՍՆԱԽԱԳԻԾ» ՓԲԸ**
Պայմանագրի համար՝ **L-20/24**
Նմուշառման սկիզբ՝ **հունիսի 05, 2024թ.**
Նմուշառման ավարտ՝ **հունիսի 20, 2024թ.**
Նմուշների ստացման ամսաթիվ՝ **հունիսի 20, 2024թ.**
Արդյունքների տրման ամսաթիվ՝ **հունիսի 26, 2024թ.**
Նմուշի մատրիցա՝ **օդ**
Նմուշառող՝ **«Հայհիդրոմետ» ՊՈԱԿ**

Հաստատում եմ

«Հիդրոօդերևութաբանության և մոնիթորինգի կենտրոն» ՊՈԱԿ-ի տնօրեն՝

Լ. Ազիզյան

ՓՈՐՁԱՐԿՄԱՆ ՀԱՇՎԵՏՎՈՒԹՅՈՒՆ_163_2024

Նմուշի անվանումը	Միջին օրական կոնցենտրացիա, մգ/մ^3	
	Ծծմբի երկօքսիդ (ՍԹԿ$_{միջ.օր}$ = 0.05 մգ/մ^3)	Ազոտի երկօքսիդ (ՍԹԿ$_{միջ.օր}$ = 0.04 մգ/մ^3)
PS1 Dilijan (south portal)	0.0183	0.00913
PS2 Dilijan (north portal)	0.00953	0.0110
PS3 Pushkin (south portal)	0.0221	0.00844
PS4 Pushkin (north	0.0141	0.0102

ՍԹԿ-սահմանային թույլատրելի կոնցենտրացիա:

Արդյունքները վերաբերում են միայն փորձարկված նմուշներին:

Հավաստում եմ

Տնօրենի տեղակալ՝ Գ. Շահնազարյան

Մթնոլորտային օդի որակի մոնիթորինգի ծառայության պետ՝ Գ. Հակոբյան

ԱՆ «ՀՎԿ ԱԶԳԱՅԻՆ ԿԵՆՏՐՈՆ» ՊՈԱԿ
«ՌԵՖԵՐԵՆՍ ԼԱԲՈՐԱՏՈՐ ԿԵՆՏՐՈՆ» ՄԱՍՆԱՃՅՈՒՂ
ՓՈՐՁԱՐԿՄԱՆ ԼԱԲՈՐԱՏՈՐԻԱ

(հավատարմագրման գրանցահամար, ում կողմից է տրված, հավատարմագրման ավարտը)

ՀՀ, ք. Երևան, Դավիթ Մալյան փ., N 37
Հեռ.՝ +37411610424. +37411311553
Էլ. փոստ՝ reference-lab@ncdc.am

ՀԱՍՏԱՏՈՒՄ ԵՄ
ԱՆ «ՀՎԿ ԱԶԳԱՅԻՆ ԿԵՆՏՐՈՆ» ՊՈԱԿ
«ՌԵՖԵՐԵՆՍ ԼԱԲՈՐԱՏՈՐ ԿԵՆՏՐՈՆ»
ՄԱՍՆԱՃՅՈՒՂԻ ՏՆՕՐԵՆ
ՍԵՐԳԵՅ ԿԱՐԱՊԵՏՅԱՆ

ՓՈՐՁԱՐԿՄԱՆ ԱՐՁԱՆԱԳՐՈՒԹՅՈՒՆ N 198/20; 199/25

Մթնոլորտային օդի քիմիական հետազոտության

առ 4 հուլիսի 2024թ.

Հայտատուի անունը/ անվանումը «Տրանսնախագիծ » ՓԲԸ

Հայտատուի իրավաբանական հասցեն

Օդի նմուշի վերցման վայրը և կետերը Պուշկինի թունել- I կետ- Վանաձորի կողմից թունելի կողմից 50-60մ հեռավորության վրա; II կետ- Ստեփանավանի կողմից թունելի կողմից 50-60 մ հեռավորության վրա

(Հասցեն, կետերի նկարագրությունը)

Նմուշառման նպատակը Օդում փոշու/սիլիցիումի երկօքսիդի պարունակությամբ/, արսենի,քրոմի, մրի հետազոտություն

Որակի կառավարման արձանագրություններ

Ձևաթուղթ՝ ՄԹՆՈԼՈՐՏԱՅԻՆ ՕԴԻ ՆՄՈՒՇԱՌՄԱՆ ԱՐՁԱՆԱԳՐՈՒԹՅՈՒՆ

Նշագիր՝ Ձ-Կ-ՍՔ-0002-01

Հղում՝ ՀԿԿԱԿ-ՌԼԿ-ՔԻՄ-Ը-0005-01 ԳՍԸ

Նմուշառման արձանագրության համար, ամսաթիվ,	N 20, առ 25.06.2024թ.
Նմուշի տեսակը(միանվագ, միջին օրեկան և այլն)	միանվագ
ՆՓ-ի անվանումը /ըստ որի սահմանվում է ցուցանիշի արժեքը/	ՀՀ կառավարության 2006 թվականի փետրվարի 2-ի «Բնակավայրերում մթնոլորտային օդն աղտոտող նյութերի սահմանային թույլատրելի խտությունների (կոնցենտրացիաների-ՍԹԿ) և Հայաստանի Հանրապետության տարածքում շահագործվող ավտոտրանսպորտային միջոցների բանած գազերում վնասակար նյութերի պարունակության սահմանային թույլատրելի նորմատիվները հաստատելու մասին» N 160-Ն որոշման
Նմուշառման ամսաթիվ/ ժամանակ	25.06.2024թ., 12^{55}
Տեղ հասցման ամսաթիվ/ժամանակ	25.06.2024թ., 18^{30}
Նմուշառման ընթացքում շրջակա միջավայրի պայմանների մասին	Արևոտ օր (քամիների վարդ, մառախուղ և այլն)
Հիմնական աղտոտող աղբյուրները	Մայրուղու տրանսպորտի շարժ

Ձևաթուղթ՝ ՄԹՆՈԼՈՐՏԱՅԻՆ ՕԴԻ ՆՄՈՒՇԱՌՄԱՆ ԱՐՁԱՆԱԳՐՈՒԹՅՈՒՆ

Նշագիր՝ Ձ-Կ-ՍՔ-0002-01

Հղում՝ ՀՎԿԱԿ-ՌԼԿ-ՔԻՄ-Ը-0005-01 ԳՍԸ

Տեղեկատվություն բուն նմուշառման վերաբերյալ.

Համարները		Նմուշառման կետը(համարը)	Օդերևութաբանական տվյալները						Նմուշառման ժամանակը		
						քամի					
Կլանիշներ, ֆիլտրեր	Նմուշառման կետերը ըստ էջքիզի		Մթնոլորտային ճնշում մմ սվ. սյուն	Օդի ջերմաստիճան, °C,	Հարաբերական խոնավությունը %	Արագությամբ մ/վրկ	Ուղղությունով	Եղանակը	Սկիզբ ժամը	Ավարտ	Ընդհատումների միջև ընկած ժամանակը
1	2	3	4	5	6	7	8	9	10	11	12
4	1		622	21.5	65				12^{55}	13^{55}	40լ/ր
5	1								13^{57}	14^{57}	40լ/ր
6	1								15^{00}	16^{00}	40լ/ր
30	1		622	21.5	65				12^{55}	13^{55}	40լ/ր
31	1								13^{57}	14^{57}	40լ/ր
32	1								15^{00}	16^{00}	40լ/ր
1	1		622	21.5	65				13^{00}	13^{30}	20լ/ր
2	1								14^{00}	15^{00}	20լ/ր
3	1								15^{00}	15^{30}	20լ/ր
10	2		662	24.4	56				13^{10}	14^{10}	40լ/ր
11	2								14^{15}	15^{15}	40լ/ր
12	2								15^{26}	16^{26}	40լ/ր
33	2		662	24.4	56				13^{10}	14^{10}	40լ/ր
34	2								14^{15}	15^{15}	40լ/ր
35	2								15^{26}	16^{26}	40լ/ր
7	2		662	24.4	56				13^{00}	13^{30}	20լ/ր
8	2								14^{00}	15^{00}	20լ/ր
9	2								15^{00}	15^{30}	20լ/ր

Էջ 3՝ 7-ից

Ձևաթուղթ՝ ՄԹՆՈԼՈՐՏԱՅԻՆ ՕԴԻ ՆՄՈՒՇԱՌՄԱՆ ԱՐՁԱՆԱԳՐՈՒԹՅՈՒՆ

Նշագիր՝ Ձ-Կ-ՍՔ-0002-01

Հղում՝ ՀՎԿԱԿ-ՌԼԿ-ՔԻՄ-Ը-0005-01 ԳՍԸ

Հետազոտությունների արդյունքները.

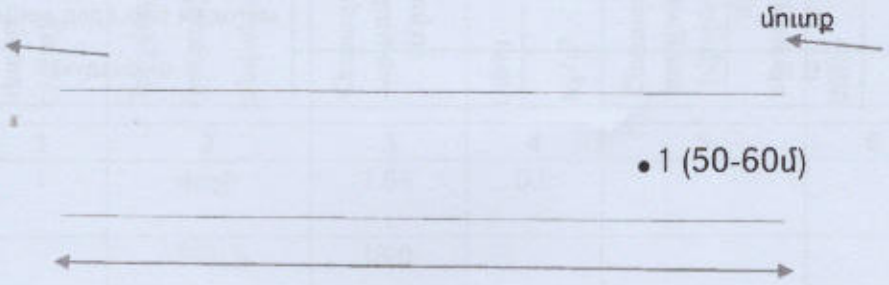
Կետերը ըստ էսքիզի	Որոշվող նյութի (ցուցանիշների անվանումը	Հետազոտության արդյունքը մգ/մ³ (Միավոր)	ՍԹԽ մգ/մ³	Հետազոտության արդյունքը մգ/մ³ (միջին օրական, միջին հերթափոխային ը	ՍԹԽ մգ/մ³	Գնահատում	Հետազոտության ՆՏՓ
1	2	3	4	5	6	7	8
1	փոշի	1.64	0.5				ՄՑ 4.1.2468-09 Соловьева «Руководство по методам опр.вред.веществ в от.воздухе»
	SiO_2 %	18.0					
1	փոշի	1.84	0.5				
	SiO_2 %	5.7					
1	փոշի	2.2	0.5				
	SiO_2 %	16.0					
1	Արսեն	0.00043			0.003		ՌԴ 52.44.593-97
1	Արսեն	0.00032			0.003		
1	Արսեն	0.00068			0.003		
1	Քրոմ	0.00185	0.0015				
1	Քրոմ	0.00157	0.0015				
1	Քրոմ	0.00172	0.0015				
1	Մուր	0.2	0.15				Соловьева Руководство по методам опр.вред.веществ в от.воздухе
1	Մուր	0.3	0.15				
1	Մուր	0.3	0.15				
2	Փոշի	0.97	0.5				ՄՑ 4.1.2468-09 Соловьева «Руководство по методам опр.вред.веществ в от.воздухе»
	SiO_2 %	13.8					
2	Փոշի	1.45	0.3				
	SiO_2 %	20.3					
2	Փոշի	1.36	0.5				
	SiO_2 %	15.7					
2	Արսեն	0.00079			0.003		ՌԴ 52.44.593-97
2	Արսեն	0.00041			0.003		

2	Արսեն	0.00062			0.003		
2	Քրոմ	0.00135	0.0015				
2	Քրոմ	0.0016	0.0015				
2	Քրոմ	0.00138	0.0015				
2	Մուր	0.10	0.15				Соловьева «Руководство по методам опр.вред.веществ в от.воздухе»
2	Մուր	0.10	0.15				
2	Մուր	0.10	0.15				

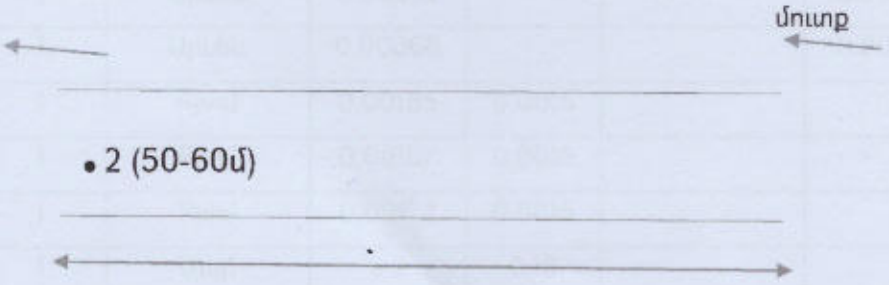
Տարածքը էսքիզը՝ (սենք, աշխատանքայի տեղ և այլն) աղտոտող աղբյուրի և նմուշառման կետերով.

Պուշկինի թունել

1. Վանաձորի կողմից Պուշկինի թունելի սկզբնամասից 50-60մ հեռավորության վրա



2.Ստեփանավանի կողմից թունելի ելքից 50-60 մ հեռավորության վրա



Ձևաթուղթ՝ ՄԹՆՈԼՈՐՏԱՅԻՆ ՕԴԻ ՆՄՈՒՇԱՌՄԱՆ ԱՐՁԱՆԱԳՐՈՒԹՅՈՒՆ

Նշագիր՝ Ձ-Կ-ՍՔ-0002-01

Հղում՝ ՀՎԿԱԿ-ՌԼԿ-ՔԻՄ-Ը-0005-01 ԳՍԸ

Եզրակացություն. _____ - ը նմուշը(ները)
(նմուշի/արտադրանքի անվանում)

համապատասխանում է/չիհամապատասխանում

_____
(ՆՓ-ի անվանումը, նշագիրը, կետերը)

Ըստ_____
ցուցանիշների/առկայության

Նկատառումներ -

(շեղումներ փորձարկման մեթոդից, լրացումներ/բացառումներ, տեղեկություն փորձարկման հատուկ պայմանների մասին)

Չափման անորոշություն -

(նշվում է, եթե դա առնչվում է արդյունքների հավաստիության հետ և պահանջում է հայտատուն)

Կատարող(ներ)՝ Գրիգորյան Ջ. _____
ստորագրություն

Գրիգորյան Լ. _____
ստորագրություն

Վավերացնող _____ _____
ստորագրություն

Quality management protocols

Form ` atmospheric air sampling protocol

Note` DZ-K-SQ-0002-01

Link ` HVKAK-RLK-QIM-Y-0005-01 GSY

Branch of the <<National Center for Disease Control and Prevention of the Ministry of Health>> Testing Laboratory

(Accreditation registration number, who gave, ending)

The city of Armenia, Yerevan, Davit Malyan st., N 37

Number` +37411610424 +37411311553

E mail` **reference-lab@ncdc.am**

I CONFIRM

Branch of the <<National Center for Disease Control and Prevention of the Ministry of Health>> Testing Laboratory

BRANCH DIRECTOR

_____ SERGEY KARAPETYAN

Test protocol N 198/20; 199/25

Chemical research of atmospheric air

04 july 2024

Name and address of the applicant organization << Transproject>> CJSC

Sampling location, address _____

Location and points of air sampling Pushkin tunnel-1 point-from the Vanadzor side at a distance of 50-60 m from the tunnel; 2 point-from the Stepanavan side at a distance of 50-60 m from the tunnel, with dust content/silicon dioxide in the air/arsenic, chromium, soot

Purpose of sampling

Quality management protocols

Form ` atmospheric air sampling protocol

Note` DZ-K-SQ-0002-01

Link ` HVKAK-RLK-QIM-Y-0005-01 GSY

for the sampling protocol, N 20-25.06.2024

date, type of sample

(one-time, average daily, etc.) one-time payment

Name of NP /according to which

the value of the indicator is determined/
On February 2, 2006 of the Government of the Republic of Armenia, "On the approval of the permissible limits of permissible concentrations of atmospheric air pollutants (concentration limits) in residential areas and of the content of harmful substances in exhaust gases of motor vehicles operated in the territory of the Republic of Armenia" number 160-N

date/time of sampling 25.06.2024; 12.55

date/time of delivery 25.06.2024; 18.30

about the environmental conditions during sampling a sunny day
winds, fog, etc.

the main sources of pollution the movement of motor transport

Quality management protocols

Form ` atmospheric air sampling protocol

Note` DZ-K-SQ-0002-01

Link ` HVKAK-RLK-QIM-Y-0005-01-GSY

numbers		sampling point	meteorological data						sampling time		
labels, filters	sampling points according to the sketch		Atmospheric pressure mm CH-column	air temperature	relative humidity	wind		weather	Beg Inning	end	As Pi Ration rate l/min
						direction	speed in m/s				
1	2	3	4	5	6	7	8	9	10	11	12
4	1		622	21,5	65				12,55	13,55	40/l/n
5									13,67	14,52	40/l/n
6	1								15,00	16,00	40l/n
30	1		622	21,5	65				12,55	13,55	40l/n
31	1								13,57	14,57	40l/n
32	1								15,00	16,00	40l/n
1	1		622	21,5	65				13,00	13,30	20l/n
2	1								14,00	15,00	20l/n
3	1								15,00	15,30	20l/n
10	2		622	24,5	56				13,10	14,10	40l/n
11	2								14,15	15,15	40l/n
12	2								15,26	16,16	40l/n
33	2		662	24,4	56				13,10	14,10	40l/n
34	2								14,15	15,15	40l/n
35	2								15,26	16,26	40l/n
7	2		662	24,4	56				13,00	13,30	20l/n

8	2								14,00	15,00	20l/p
9	2								15,00	15,30	20l/p

Results of the study

points according to the sketch	the name of the indicators of the substance being determined	the result of the study is mg / m3 at a time	STX mg / m3	the result of the study is mg/ m3 on average per day, average shift	STX mg / m3	Esti mation	research NTP
1	2	3	4	5	6	7	8
1	powder	1,64	0,5				MS 4,1,2468-09 Solovyova / methods for detecting harmful substances in the air
	SiO_2	18.0					
1	powder	1.84	0.5				
	SiO_2	5.7					
1	powder	2.2	0.5				
	SiO_2	16.0					
1.	Arsenic	0.00043			0.003		Rd 52.44.593-97
1	Arsenic	0.00032			0.003		
1	Arsenic	0.00068			0.003		
1	Chromium	0.00185	0.0015				
1	Chromium	0.00157	0.0015				

1	Chromium	0.00172	0.0015				
1	soot	0,2	0,15				Solovyova / methods for detecting harmful substances in the air
1	soot	0,3	0,15				
2	powder	0,97	0,5				MS 4,1,2468-09 Solovyova / methods for detecting harmful substances in the air
	SiO2	13.8					
2	powder	1.45	0.3				
	SiO_2	20.3					
2	powder	1.36	0.5				
	SiO_2	15.7					
2	Arsenic	0.00079			0.003		Rd-52-44.593-97
2	Arsenic	0.00041			0.003		
2	Arsenic	0.00062			0.003		
2	Chromium	0.00135	0.0015				
2	Chromium	0.0016	0.0015				
2	Chromium	0.00138	0.0015				
2	soot	0.10	0.15				Solovyova / methods for detecting harmful substances in the air
2	soot	0.10	0.15				
2	soot	0.10	0.15				

Quality management protocols

Form ` atmospheric air sampling protocol

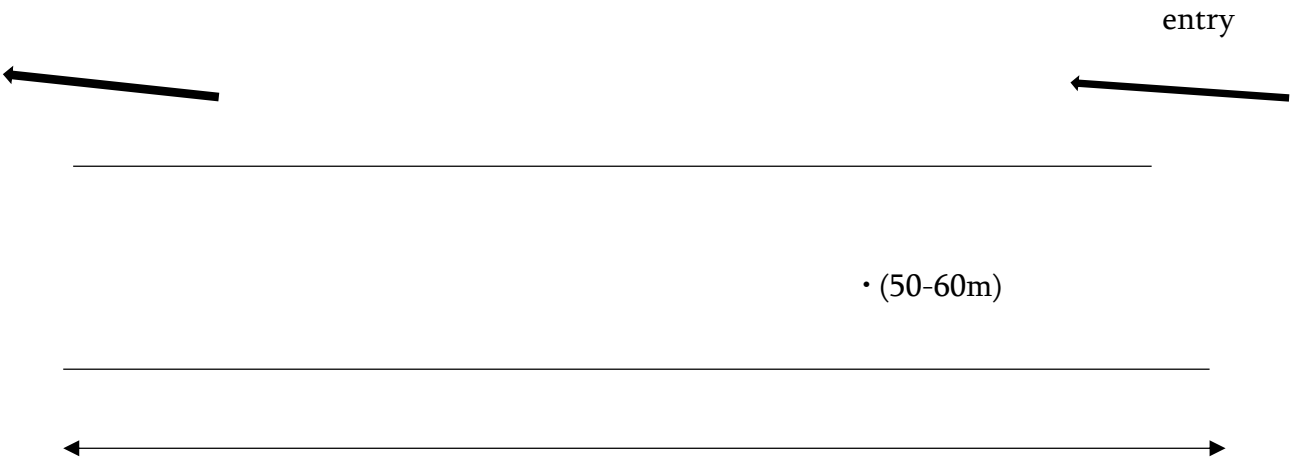
Note` DZ-K-SQ-0002-01

Link ` HVKAK-RLK-QIM-Y-0005-01-GSY

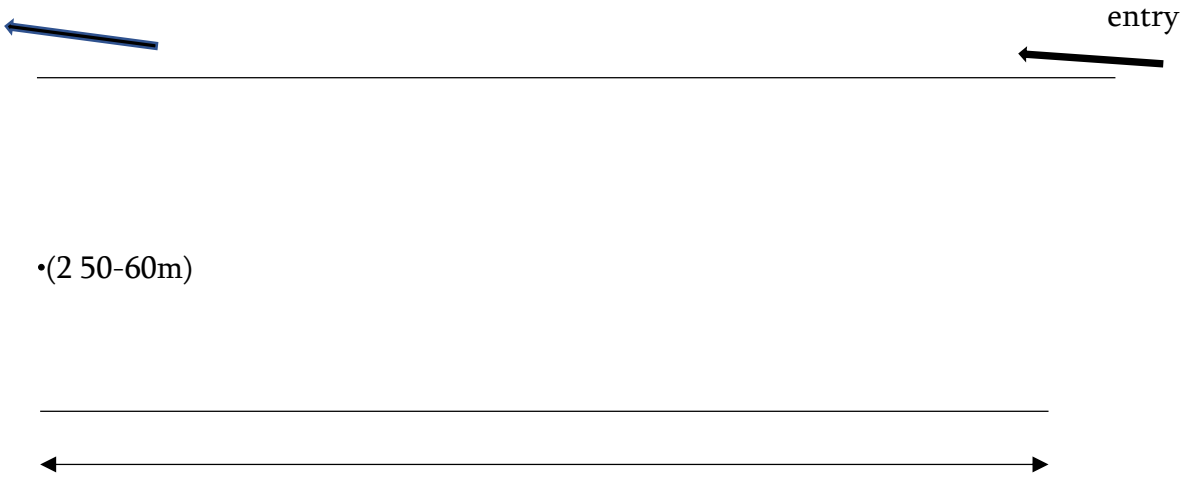
area sketch (building, workplace, etc.) with pollutant source and sampling points.

Pushkin tunnel

1. 50-60m from the beginning of the Pushkin tunnel on the Vanadzor side



2. 50-60m from the tunnel exit on the Stepanavan side



Quality management protocols

Form ` atmospheric air sampling protocol

Note` DZ-K-SQ-0002-01

Link ` HVKAK-RLK-QIM-Y-0005-01-GSY

Conclusion _____

_____ place of measurement

samples match, do not match _____

_____ name, marking, nph I points

by _____ the presence of indicators

Considerations

_____

deviations from the testing method, additions, exceptions, information about specific testing conditions

submitted at the request of the applicant

_____

submitted at the request of the applicant

_____

Performers` Z. Jhangiryan _____

signature

L. Grigoryan _____

signature

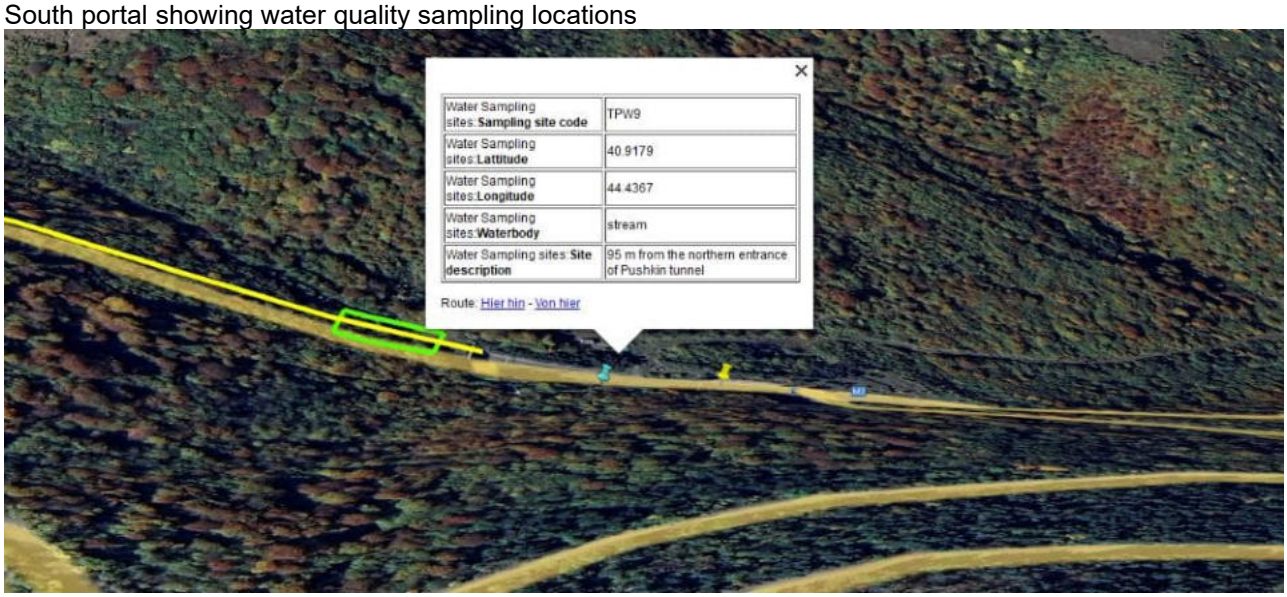
Validator

N. Hakhverdyan _____

signature

Appendix E: Baseline survey – water quality test reports

South portal showing water quality sampling locations



North portal showing water quality sampling locations

Water sampling sites					
№	Waterbody	Site description	Sampling site code	Coordinates	
				Lattitude	Longitude
1	river Dzknaget	50 m from the southern entrance of Dilijan tunnel	TPW1	40,65293	44,89209
2	drinking water	140 m from the northern entrance of Dilijan tunnel (source of drinking water "Barrel")	TPW2	40,67442	44,88193
3	stream	100 m from the northern entrance of the Dilijan tunnel	TPW3	40,67403	44,88199
4	drinking water	200 m east from the northern entrance of the Dilijan tunnel, on the road to the village of Semyonovka (memorial spring).	TPW4	40,67328	44,88537
5	stream	200 m east from the northern entrance of the Dilijan tunnel, on the road to the village of Semyonovka.	TPW5	40,67343	44,88549
6	river Bazum	170 m from the southern entrance of the Pushkin tunnel	TPW6	40,90044	44,42957
7	drinking water	160 m from the southern entrance of the Pushkin tunnel (memorial spring)	TPW7	40,90046	44,42972
8	stream	81 m from the northern entrance of the Pushkin tunnel	TPW8	40,91767	44,43714
9	stream	95 m from the northern entrance of Pushkin tunnel	TPW9	40,91788	44,43666

Details of water quality sampling locations

Customer: **«TRANSPROJECT» CJSC**
Contract for services: **L-20/24**
Date of receipt of the samples: **June 05, 2024**
Date of release of results: **June 26, 2024**
Date of laboratory examination: **June 05-25, 2024**
Sample matrix: **Water**
Sampling: **«Armhydromet» SNCO**
Sampling method: **ISO 5667-3**

Approved by

«Hydrometeorology and
Monitoring Center» SNCO
Director

L. Azizyan

TEST REPORT_161_2024

N.	Measured parameter	Unit of measurement	Measured value								Standard method used
			TPW1	TPW2	TPW3	TPW4	TPW5	TPW6	TPW7	TPW8	TPW9	
1	Suspended solids	mg/l	10.9	3.9	8.9	4.9	24.3	7.8	3.8	8.7	4.4	ISO 11923
2	Mineralization	mg/l	44	142	117	120	98	69	271	61	38	ISO 7888
3	Electrical conductivity	µS/cm	67	219	180	184	150	107	417	95	59	
4	Salinity	ppt	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	by calculation
5	pH	-	7.490	8.030	8.050	7.780	8.070	7.700	8.040	7.540	7.230	ISO 10523
6	Sulphate ion	mg/l	2.863	7.911	6.552	4.685	4.9944	12.2379	88.4013	10.1257	9.8594	ISO 10304-1
7	Chloride ion	mg/l	1.0212	1.380	2.680	1.194	1.0285	1.4764	2.9506	2.3271	1.4005	
8	Nitrate ion	mg/l	0.185	6.874	1.518	2.491	0.6909	1.0333	1.3308	3.3197	2.7532	
9	Bromide ion	mg/l	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	
10	Lithium	mg/l	0.000530	<0.0001	0.000625	<0.0001	<0.0001	0.000130	0.000375	0.000107	0.000213	ISO 17294-2
11	Beryllium	mg/l	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
12	Boron	mg/l	0.0105	0.0113	0.0112	0.00933	0.0109	0.0093	0.0140	0.0102	0.00753	
13	Sodium	mg/l	2.715	8.368	7.904	6.376	3.445	3.206	10.012	3.202	2.935	
14	Magnesium	mg/l	1.757	6.108	4.391	4.583	3.741	1.970	9.426	1.901	1.465	
15	Aluminium	mg/l	0.116	0.00102	0.104	0.0269	0.0920	0.100	0.0129	0.117	0.120	
16	Total phosphorus	mg/l	0.0294	0.0307	0.0251	0.0122	0.0140	<0.01	<0.01	<0.01	<0.01	
17	Potassium	mg/l	0.457	0.0136	0.398	0.0820	0.193	0.544	0.575	1.405	0.251	
18	Calcium	mg/l	7.978	26.84	21.97	24.42	20.66	13.44	37.98	9.347	4.960	
19	Titanium	mg/l	0.00691	0.00218	0.00526	0.00287	0.00573	0.00514	0.00175	0.00449	0.00459	
20	Vanadium	mg/l	0.00147	0.0135	0.00617	0.00708	0.00431	0.00137	0.00119	0.000740	0.000482	
21	Chromium	mg/l	0.000348	0.000302	0.000534	0.000352	0.000127	0.000225	0.000379	0.000207	0.000137	
22	Iron	mg/l	0.203	0.0369	0.124	0.0241	0.0976	0.132	0.0121	0.112	0.147	
23	Manganese	mg/l	0.0192	<0.0001	0.00638	0.000404	0.00363	0.00670	0.000560	0.00338	0.00440	
24	Cobalt	mg/l	0.000143	<0.0001	0.000124	<0.0001	0.000136	0.000135	0.000123	0.000147	0.000162	
25	Nickel	mg/l	0.00114	0.000628	0.000792	0.000542	0.000707	0.000493	0.00155	0.000527	0.000675	
26	Copper	mg/l	0.00149	0.000388	0.00195	0.000657	0.00165	0.00143	0.00102	0.00199	0.00250	
27	Zinc	mg/l	0.000887	0.000269	0.000866	0.000299	0.000365	0.000505	0.000510	0.000539	0.00106	
28	Arsenic	mg/l	0.000428	0.000370	0.000476	0.000387	0.000252	0.000323	0.000648	0.000256	0.000191	

TPW1 - TPW5: Dilijan Tunnel survey

TPW6 - TPW9: Pushkin Tunnel survey

TPW6-7 south portal, TP8-9 north portal

29	Selenium	mg/l	0.000180	0.00115	0.000237	0.000384	0.000179	0.000269	0.00106	0.000276	0.000342	ISO 17294-2
30	Strontium	mg/l	0.0409	0.0243	0.0339	0.0397	0.0362	0.0360	0.165	0.0394	0.0324	
31	Molybdenum	mg/l	0.000406	0.000127	0.000841	0.000201	0.000186	0.000739	0.0155	0.000260	0.000124	
32	Cadmium	mg/l	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
33	Tin	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
34	Antimony	mg/l	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
35	Barium	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.0192	0.0192	0.0143	
36	Lead	mg/l	0.000114	<0.0001	0.000284	<0.0001	<0.0001	<0.0001	<0.0001	0.000101	0.000157	

The samples were obtained in two 1-liter plastic containers.

The temperature of the samples at the time of receipt: 20-22 oC.

Statement: The results refer only to the tested samples.

Authorised by:

Deputy Director — G. Shahnazaryan

Head of Surface water quality monitoring service and water laboratory — L. Vardumyan

Պատվիրատու՝ **«ՏՐԱՆՍՆԱԽԱԳԻԾ» ՓԲԸ**
Պայմանագրի համար՝ **L-20/24**
Նմուշների ստացման ամսաթիվ՝ **հունիսի 05, 2024թ.**
Արդյունքների տրման ամսաթիվ՝ **հունիսի 26, 2024 թ.**
Լաբորատոր փորձարկման ամսաթիվ՝ **հունիսի 05-25, 2024թ.**
Նմուշի մատրիցա՝ **ջուր**
Նմուշառող՝ **«Հայհիդրոմետ» ՊՈԱԿ**
Նմուշառման մեթոդ՝ **ՀՍՏ ԻՍՕ 5667-3**

Հաստատում եմ

«Հիդրոօդերևութաբանության և մոնիթորինգի կենտրոն» ՊՈԱԿ-ի տնօրեն՝

Լ. Ազիզյան

ՓՈՐՁԱՐԿՄԱՆ ՀԱՇՎԵՏՎՈՒԹՅՈՒՆ_161_2024

h/h	Չափված ցուցանիշ	Չափման միավոր	Չափված արժեք									Կիրառված ստանդարտ մեթոդ
			TPW1	TPW2	TPW3	TPW4	TPW5	TPW6	TPW7	TPW8	TPW9	
1	Կախութային չոր նյութեր	մգ/լ	10.9	3.9	8.9	4.9	24.3	7.8	3.8	8.7	4.4	ՀՍՏ ԻՍՕ 11923
2	Հանքայնացում	մգ/լ	44	142	117	120	98	69	271	61	38	ՀՍՏ ԻՍՕ 7888
3	Էլեկտրահաղորդականություն	մկՍմ/սմ	67	219	180	184	150	107	417	95	59	
4	Աղայնություն	մգ/լ	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	Հաշվարկային
5	Ջրածնային ցուցիչ	-	7.490	8.030	8.050	7.780	8.070	7.700	8.040	7.540	7.230	ՀՍՏ ԻՍՕ 10523
6	Սուլֆատ իոն	մգ/լ	2.863	7.911	6.552	4.685	4.994	12.238	88.40	10.13	9.859	ՀՍՏ ԻՍՕ 10304-1
7	Քլորիդ իոն	մգ/լ	1.0212	1.380	2.680	1.194	1.0285	1.476	2.951	2.327	1.401	
8	Նիտրատ իոն	մգ/լ	0.185	6.874	1.518	2.491	0.691	1.0333	1.331	3.320	2.753	
9	Բրոմիդ իոն	մգ/լ	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	
10	Լիթիում	մգ/լ	0.000530	<0.0001	0.000625	<0.0001	<0.0001	0.000130	0.000375	0.000107	0.000213	ՀՍՏ ԻՍՕ 17294-2
11	Բերիլիում	մգ/լ	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
12	Բոր	մգ/լ	0.0105	0.0113	0.0112	0.00933	0.0109	0.00929	0.0140	0.0102	0.00753	
13	Նատրիում	մգ/լ	2.715	8.368	7.904	6.376	3.445	3.206	10.012	3.202	2.935	
14	Մագնեզիում	մգ/լ	1.757	6.108	4.391	4.583	3.741	1.970	9.426	1.901	1.465	
15	Ալյումին	մգ/լ	0.116	0.00102	0.104	0.0269	0.0920	0.100	0.0129	0.117	0.120	
16	Ընդհանուր ֆոսֆոր	մգ/լ	0.0294	0.0307	0.0251	0.0122	0.0140	<0.01	<0.01	<0.01	<0.01	
17	Կալիում	մգ/լ	0.457	0.0136	0.398	0.0820	0.193	0.544	0.575	1.405	0.251	
18	Կալցիում	մգ/լ	7.978	26.84	21.97	24.42	20.66	13.44	37.98	9.347	4.960	
19	Տիտան	մգ/լ	0.00691	0.00218	0.00526	0.00287	0.00573	0.00514	0.00175	0.00449	0.00459	
20	Վանադիում	մգ/լ	0.00147	0.0135	0.00617	0.00708	0.00431	0.00137	0.00119	0.000740	0.000482	
21	Քրոմ	մգ/լ	0.000348	0.000302	0.000534	0.000352	0.000127	0.000225	0.000379	0.000207	0.000137	
22	Երկաթ	մգ/լ	0.203	0.0369	0.124	0.0241	0.0976	0.132	0.0121	0.112	0.147	
23	Մանգան	մգ/լ	0.0192	<0.0001	0.00638	0.000404	0.00363	0.00670	0.000560	0.00338	0.00440	
24	Կոբալտ	մգ/լ	0.000143	<0.0001	0.000124	<0.0001	0.000136	0.000135	0.000123	0.000147	0.000162	
25	Նիկել	մգ/լ	0.00114	0.000628	0.000792	0.000542	0.000707	0.000493	0.001551	0.000527	0.00068	
26	Պղինձ	մգ/լ	0.00149	0.000388	0.00195	0.000657	0.00165	0.00143	0.00102	0.00199	0.00250	
27	Ցինկ	մգ/լ	0.000887	0.000269	0.000866	0.000299	0.000365	0.000505	0.000510	0.000539	0.00106	
28	Արսեն	մգ/լ	0.000428	0.000370	0.000476	0.000387	0.000252	0.000323	0.000648	0.000256	0.000191	

TPW1 - TPW5: Dilijan Tunnel survey

TPW6 - TPW9: Pushkin Tunnel survey

TPW6-7 south portal, TP8-9 north portal

29	Սելեն	մգ/լ	0.000180	0.00115	0.000237	0.000384	0.000179	0.000269	0.00106	0.000276	0.000342	ՀՍՏ ԻՍՕ 17294-2
30	Ստրոնցիում	մգ/լ	0.0409	0.0243	0.0339	0.0397	0.0362	0.0360	0.165	0.0394	0.0324	
31	Մոլիբդեն	մգ/լ	0.000406	0.000127	0.000841	0.000201	0.000186	0.000739	0.0155	0.000260	0.000124	
32	Կադմիում	մգ/լ	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
33	Անագ	մգ/լ	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
34	Ծարիր	մգ/լ	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
35	Բարիում	մգ/լ	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.0192	0.0192	0.0143	
36	Կապար	մգ/լ	0.000114	<0.0001	0.000284	<0.0001	<0.0001	<0.0001	<0.0001	0.000101	0.000157	

Նմուշները ստացվել է երկու հատ 1 լ ծավալով պլաստիկ տարաներով:
Նմուշների ջերմաստիճանը ստացման պահին՝ 20-22 °C:

Արդյունքը վերաբերում է միայն փորձարկված նմուշներին:

Հավաստում եմ

Տնօրենի տեղակալ՝ Գ. Շահնազարյան

Մակերևութային ջրերի որակի
մոնիթորինգի ծառայության պետ՝ Լ. Վարդումյան

Որակի կառավարման արձանագրություններ

Ձևաթուղթ՝ ՓՈՐՁԱՐԿՄԱՆ ԱՐՁԱՆԱԳՐՈՒԹՅՈՒՆ

Նշագիր՝ Ձ-Ը-ԸՆԴ-0009-01
Հղում՝ ՀՎԿԱԿ-ՌԼԿ-ԿԱՌ-0034-02 ԳՍԸ

ԱՆ «ՀՎԿ ԱԶԳԱՅԻՆ ԿԵՆՏՐՈՆ» ՊՈԱԿ
«ՌԵՖԵՐԵՆՍ ԼԱԲՈՐԱՏՈՐ ԿԵՆՏՐՈՆ» ՄԱՍՆԱՃՅՈՒՂ
ՓՈՐՁԱՐԿՄԱՆ ԼԱԲՈՐԱՏՈՐԻԱ

(հավատարմագրման գրանցահամար, ում կողմից է տրված, հավատարմագրման ավարտը)

ՀՀ, ք. Երևան, Դավիթ Մալյան փ., N 37
Հեռ.՝ +37411610424. +37411311553
Էլ. փոստ՝ reference-lab@ncdc.am

ՀԱՍՏԱՏՈՒՄ ԵՄ
ԱՆ «ՀՎԿ ԱԶԳԱՅԻՆ ԿԵՆՏՐՈՆ» ՊՈԱԿ
«ՌԵՖԵՐԵՆՍ ԼԱԲՈՐԱՏՈՐ ԿԵՆՏՐՈՆ»
Մ/Ճ-Ի ՏՆՕՐԵՆ
_____ Ս. ԿԱՐԱՊԵՏՅԱՆ

ՋՐԻ ՓՈՐՁԱՐԿՄԱՆ ԱՐՁԱՆԱԳՐՈՒԹՅՈՒՆ N 197/16

(Համաձայն ԳՕՍՏ ԻՍՕ/ԻԷԿ 17025-2019-ի)

առ « 04» « հուլիսի» 2024թ.

Հայտատու կազմակերպության անվանումը և հասցեն «Տրանսնախագիծ» ՓԲԸ
(Կարող է լինել և անհատ հայտատու)

Նմուշառման վայրը, հասցեն Պուշկինի թունել՝ Վանաձորի կողմից, թունելի մուտքի ձախ կողմից /գետի ջուր/
(կազմակերպություն, հասցե, կետ և այլն)

Սկզբնաղբյուրի անվանումը -

Նմուշի նկարագրությունը 1,0 լ **փաթեթավորումը** պոլիմերային տարա
(նմուշի քանակը, հատուկ նշումներ/համարակալում)

Նմուշառման ամսաթիվ 25.06.24թ. **ժամ** ժ.12[45] **Նմուշի ընդունման և փորձարկման ամսաթիվ** 25.06.- ից 03.07.

Փորձարկման ՆՓ -
(ցուցանիշի արժեք սահմանող ՆՓ-ի(ների) նշագիրը/համարը անհրաժեշտության դեպքում)

Նմուշառման արձանագրության և/կամ ուղեգրի համարը և ամսաթիվը 25.06.24թ.

Որակի կառավարման արձանագրություններ

Ձևաթուղթ՝ ՓՈՐՁԱՐԿՄԱՆ ԱՐՁԱՆԱԳՐՈՒԹՅՈՒՆ

Նշագիր՝ Ձ-Ը-ԸՆԴ-0009-01

Հղում՝ ՀՎԿԱԿ-ՌԼԿ-ԿԱՌ-0034-02 ԳՍԸ

(եթե անհրաժեշտ է)

Լրացուցիչ տեղեկատվություն Հետազոտությունները իրականացվել են թիվ 12-32 առ 20.04.2024թ.

պայմանագրի շրջանակներում _____

(պայմանագրի համարը, հատուկ ցուցումներ և պայմաններ (եթե անհրաժեշտ է) և այլն

ՀԵՏԱԶՈՏՈՒԹՅԱՆ ԱՐԴՅՈՒՆՔՆԵՐ*								
N	**Ցուցանիշի անվանում**	**Ցուցանիշի արժեք սահմանող ՆՓ-ի նշագիրը**	**Փորձարկման մեթոդը սահմանող փաստաթղթի նշագիրը**	**Ցուցանիշի արժեք**			**Չափման անորոշություն (պահանջի դեպքում)**	**Եզրակացություն**
				Չ/Մ	**Ըստ ՆՓ-ի**	**Ստացված**		
	Նավթամթերքներ		ՄՈՒԿ 4.1.1262-03	մգ/դմ^3	-	0,05	-	

Եզրակացություն _____ - ը

նմուշը(ները)

(նմուշի/արտադրանքի անվանում)

_____

համապատասխանում է/չի համապատասխանում

_____

(ՆՓ-ի անվանումը, նշագիրը, կետերը)

ըստ _____

ցուցանիշների/առկայության

Նկատառումներ -

_____

(շեղումներ փորձարկման մեթոդից, լրացումներ/բացառումներ, տեղեկություն փորձարկման հատուկ պայմանների մասին)

Չափման անորոշություն -

_____

(նշվում է, եթե դա առնչվում է արդյունքների հավաստիության հետ և պահանջում է հայտատուն)

Որակի կառավարման արձանագրություններ

Ձևաթուղթ՝ ՓՈՐՁԱՐԿՄԱՆ ԱՐՁԱՆԱԳՐՈՒԹՅՈՒՆ

Նշագիր՝ Ձ-Ը-ԸՆԴ-0009-01
Հղում՝ ՀՎԿԱԿ-ՌԼԿ-ԿԱՌ-0034-02 ԳՍԸ

Կատարող(ներ)՝ Ա. Մալխասյան _____
ստորագրություն

Մ. Նազարեթյան _____
ստորագրություն

Վավերացնող

Ն. Հախվերդյան _____
ստորագրություն

**Տվյալ արդյունքները վերաբերում են միայն փորձարկված նմուշներին:*

Սույն փորձարկման արձանագրությունը կազմված է 3 էջից՝ 1 օրինակով:

Փորձարկման արձանագրությունը չի կարելի մասնակիորեն արտատպել կամ վերարտադրել առանց փորձարկման լաբորատորիայի գրավոր թույլտվության:

Որակի կառավարման արձանագրություններ

Ձևաթուղթ՝ ՓՈՐՁԱՐԿՄԱՆ ԱՐՁԱՆԱԳՐՈՒԹՅՈՒՆ

Նշագիր՝ Ձ-Ը-ԸՆԴ-0009-01

Հղում՝ ՀՎԿԱԿ-ՌԼԿ-ԿԱՌ-0034-02 ԳՍԸ

ԱՆ «ՀՎԿ ԱԶԳԱՅԻՆ ԿԵՆՏՐՈՆ» ՊՈԱԿ
«ՌԵՖԵՐԵՆՍ ԼԱԲՈՐԱՏՈՐ ԿԵՆՏՐՈՆ» ՄԱՍՆԱՃՅՈՒՂ
ՓՈՐՁԱՐԿՄԱՆ ԼԱԲՈՐԱՏՈՐԻԱ

(հավատարմագրման գրանցահամար, ում կողմից է տրված, հավատարմագրման ավարտը)

ՀՀ, ք. Երևան, Դավիթ Մալյան փ., N 37
Հեռ.՝ +37411610424. +37411311553
Էլ. փոստ՝ reference-lab@ncdc.am

ՀԱՍՏԱՏՈՒՄ ԵՄ
ԱՆ «ՀՎԿ ԱԶԳԱՅԻՆ ԿԵՆՏՐՈՆ» ՊՈԱԿ
«ՌԵՖԵՐԵՆՍ ԼԱԲՈՐԱՏՈՐ ԿԵՆՏՐՈՆ»
Մ/Ճ-Ի ՏՆՕՐԵՆ
_____ Ս. ԿԱՐԱՊԵՏՅԱՆ

ԽՄԵԼՈՒ ՋՐԻ ՓՈՐՁԱՐԿՄԱՆ ԱՐՁԱՆԱԳՐՈՒԹՅՈՒՆ N 196/105

(Համաձայն ԳՕՍՏ ԻՍՕ/ԻԷԿ 17025-2019-ի)

առ __« 04» « հուլիսի» 2024թ.

Հայտատու կազմակերպության անվանումը և հասցեն «Տրանսնախագիծ» ՓԲԸ
(Կարող է լինել և անհատ հայտատու)

Նմուշառման վայրը, հասցեն Պուշկինի թունել, ք. Վանաձորի կողմից, աջ կողմի աղբյուրից
(կազմակերպություն, հասցե, կետ և այլն)

Սկզբնաղբյուրի անվանումը -

Նմուշի նկարագրությունը 1,0 լ **փաթեթավորումը** պոլիմերային տարա
(*Նմուշի քանակը, հատուկ նշումներ/համարակալում*)

Նմուշառման ամսաթիվ 25.06.24թ. **ժամ** ժ.12[55] **Նմուշի ընդունման և փորձարկման ամսաթիվ** 25.06.- ից 03.07.

Փորձարկման ՆՓ «Խմելու ջուր: Ջրամատակարարման կենտրոնացված համակարգերի ջրի որակին ներկայացվող հիգիենիկ պահանջներ: Որակի հսկողություն» ՍանԿևՆ N 2-III-Ա-2-1

(ցուցանիշի արժեք սահմանող ՆՓ-ի(ների) նշագիրը/համարը անհրաժեշտության դեպքում)

Որակի կառավարման արձանագրություններ

Ձևաթուղթ՝ ՓՈՐՁԱՐԿՄԱՆ ԱՐՁԱՆԱԳՐՈՒԹՅՈՒՆ

Նշագիր՝ Ձ-Ը-ԸՆԴ-0009-01

Հղում՝ ՀՎԿԱԿ-ՌԼԿ-ԿԱՌ-0034-02 ԳՍԸ

Նմուշառման արձանագրության և/կամ ուղեգրի համարը և ամսաթիվը 20.06.24թ.
(եթե անհրաժեշտ է)

Լրացուցիչ տեղեկատվություն Հետազոտությունները իրականացվել են թիվ 12-32 առ 20.04.2024թ.

պայմանագրի շրջանակներում

(պայմանագրի համարը, հատուկ ցուցումներ և պայմաններ (եթե անհրաժեշտ է) և այլն

ՀԵՏԱԶՈՏՈՒԹՅԱՆ ԱՐԴՅՈՒՆՔՆԵՐ*								
N	Ցուցանիշի անվանում	Ցուցանիշի արժեք սահմանող ՆՓ-ի նշագիրը	Փորձարկման մեթոդը սահմանող փաստաթղթի նշագիրը	Ցուցանիշի արժեք			Չափման անորոշություն (պահանջի դեպքում)	Եզրակացություն
				Չ/Մ	Ըստ ՆՓ-ի	Ստացված		
	Նավթամթերքներ	ՍանԿանՆ N 2-III-Ա-2-1	ՄՈՒԿ 4.1.1262-03	մգ/դմ^3	0.1	չի հայտնաբ.	-	Համապատասխ. է

Եզրակացություն - Ը
Նմուշը(ները)
(նմուշի/արտադրանքի անվանում)

համապատասխանում է/չիհամապատասխանում

(ՆՓ-ի անվանումը, նշագիրը, կետերը)

ըստ

ցուցանիշների/առկայության

Նկատառումներ -

(շեղումներ փորձարկման մեթոդից, լրացումներ/բացառումներ, տեղեկություն փորձարկման հատուկ պայմանների մասին)

Որակի կառավարման արձանագրություններ

Ձևաթուղթ՝ ՓՈՐՁԱՐԿՄԱՆ ԱՐՁԱՆԱԳՐՈՒԹՅՈՒՆ

Նշագիր՝ Ձ-Ը-ԸՆԴ-0009-01

Հղում՝ ՀՎԿԱԿ-ՌԼԿ-ԿԱՌ-0034-02 ԳՍԸ

Չափման անորոշություն -

(սաղքավորումների, մեթոդաբանության վալիդացիայի անորոշություն, նշվում է, եթե դա առնչվում է արդյունքների հավաստիության հետ և պահանջում է հայտատուն)

Կատարող(ներ)՝ Ա. Մալխասյան _____
ստորագրություն

Մ. Նազարեթյան _____
ստորագրություն

Վավերացնող

Ն. Հախվերդյան _____
ստորագրություն

**Տվյալ արդյունքները վերաբերում են միայն փորձարկված նմուշներին:*

Սույն փորձարկման արձանագրությունը կազմված է 3 էջից՝ 1 օրինակով:

Փորձարկման արձանագրությունը չի կարելի մասնակիորեն արտատպել կամ վերարտադրել առանց փորձարկման լաբորատորիայի գրավոր թույլտվության:

Որակի կառավարման արձանագրություններ

Ձևաթուղթ՝ ՓՈՐՁԱՐԿՄԱՆ ԱՐՁԱՆԱԳՐՈՒԹՅՈՒՆ

Նշագիր՝ Ձ-Ը-ԸՆԴ-0009-01

Հղում՝ ՀՎԿԱԿ-ՌԼԿ-ԿԱՌ-0034-02 ԳՍԸ

ԱՆ «ՀՎԿ ԱԶԳԱՅԻՆ ԿԵՆՏՐՈՆ» ՊՈԱԿ
«ՌԵՖԵՐԵՆՍ ԼԱԲՈՐԱՏՈՐ ԿԵՆՏՐՈՆ» ՄԱՍՆԱՃՅՈՒՂ
ՓՈՐՁԱՐԿՄԱՆ ԼԱԲՈՐԱՏՈՐԻԱ

(հավատարմագրման գրանցահամար, ում կողմից է տրված, հավատարմագրման ավարտը)

ՀՀ, ք. Երևան, Դավիթ Մալյան փ., N 37
Հեռ.՝ +37411610424. +37411311553
Էլ. փոստ՝ reference-lab@ncdc.am

ՀԱՍՏԱՏՈՒՄ ԵՄ
ԱՆ «ՀՎԿ ԱԶԳԱՅԻՆ ԿԵՆՏՐՈՆ» ՊՈԱԿ
«ՌԵՖԵՐԵՆՍ ԼԱԲՈՐԱՏՈՐ ԿԵՆՏՐՈՆ»
Մ/Ճ-Ի ՏՆՕՐԵՆ
Ս. ԿԱՐԱՊԵՏՅԱՆ

ՋՐԻ ՓՈՐՁԱՐԿՄԱՆ ԱՐՁԱՆԱԳՐՈՒԹՅՈՒՆ N 197/18

(Համաձայն ԳՕՍՏ ԻՍՕ/ԻԷԿ 17025-2019-ի)

առ « 04» « հուլիսի» 2024թ.

Հայտատու կազմակերպության անվանումը և հասցեն «Տրանսնախագիծ» ՓԲԸ
(Կարող է լինել և անհատ հայտատու)

Նմուշառման վայրը, հասցեն Պուշկինի թունել՝ Ստեփանավանի կողմից, թունելի մուտքի ձախ կողմից /առվակի ջուր/
(կազմակերպություն, հասցե, կետ և այլն)

Սկզբնաղբյուրի անվանումը -

Նմուշի նկարագրությունը 1.0 լ **փաթեթավորումը** պոլիմերային տարա
(նմուշի քանակը, հատուկ նշումներ/համարակալում)

Նմուշառման ամսաթիվ 25.06.24թ. **ժամ** ժ.13[25] **Նմուշի ընդունման և փորձարկման ամսաթիվ** 25.06.- ից 03.07.

Փորձարկման ՆՓ -

(ցուցանիշի արժեք սահմանող ՆՓ-ի(ների) նշագիրը/համարը անհրաժեշտության դեպքում)

Նմուշառման արձանագրության և/կամ ուղեգրի համարը և ամսաթիվը 25.06.24թ.

Որակի կառավարման արձանագրություններ

Ձևաթուղթ՝ ՓՈՐՁԱՐԿՄԱՆ ԱՐՁԱՆԱԳՐՈՒԹՅՈՒՆ

Նշագիր՝ Ձ-Ը-ԸՆԴ-0009-01

Հղում՝ ՀՎԿԱԿ-ՌԼԿ-ԿԱՌ-0034-02 ԳՍԸ

(եթե անհրաժեշտ է)

Լրացուցիչ տեղեկատվություն Հետազոտությունները իրականացվել են թիվ 12-32 առ 20.04.2024թ.

պայմանագրի շրջանակներում

(պայմանագրի համարը, հատուկ ցուցումներ և պայմաններ (եթե անհրաժեշտ է) և այլն

ՀԵՏԱԶՈՏՈՒԹՅԱՆ ԱՐԴՅՈՒՆՔՆԵՐ*								
N	**Ցուցանիշի անվանում**	**Ցուցանիշի արժեք սահմանող ՆՓ-ի նշագիրը**	**Փորձարկման մեթոդը սահմանող փաստաթղթի նշագիրը**	**Ցուցանիշի արժեք**			**Չափման անորոշություն (պահանջի դեպքում)**	**Եզրակացություն**
				Չ/Մ	**Ըստ ՆՓ-ի**	**Ստացված**		
	Նավթամթերքներ		ՄՈՒԿ 4.1.1262-03	մգ/դմ^3	-	0,03	-	

Եզրակացություն - Ը

նմուշը(ները) (նմուշի/արտադրանքի անվանում)

համապատասխանում է/չի համապատասխանում

(ՆՓ-ի անվանումը, նշագիրը, կետերը)

ըստ

ցուցանիշների/առկայության

Նկատառումներ -

(շեղումներ փորձարկման մեթոդից, լրացումներ/բացառումներ, տեղեկություն փորձարկման հատուկ պայմանների մասին)

Չափման անորոշություն -

(նշվում է, եթե դա առնչվում է արդյունքների հավաստիության հետ և պահանջում է հայտատուն)

Որակի կառավարման արձանագրություններ

Ձևաթուղթ՝ ՓՈՐՁԱՐԿՄԱՆ ԱՐՁԱՆԱԳՐՈՒԹՅՈՒՆ

Նշագիր՝ Ձ-Ը-ԸՆԴ-0009-01

Հղում՝ ՀՎԿԱԿ-ՈԼԿ-ԿԱՌ-0034-02 ԳՍԸ

Կատարող(ներ)՝ Ա. Մալխասյան _____

ստորագրություն

Մ. Նազարեթյան _____

ստորագրություն

Վավերացնող

Ն. Հախվերդյան _____

ստորագրություն

**Տվյալ արդյունքները վերաբերում են միայն փորձարկված նմուշներին:*

Սույն փորձարկման արձանագրությունը կազմված է 3 էջից՝ 1 օրինակով:

Փորձարկման արձանագրությունը չի կարելի մասնակիորեն արտատպել կամ վերարտադրել առանց փորձարկման լաբորատորիայի գրավոր թույլտվության:

Որակի կառավարման արձանագրություններ

Ձևաթուղթ՝ ՓՈՐՁԱՐԿՄԱՆ ԱՐՁԱՆԱԳՐՈՒԹՅՈՒՆ

Նշագիր՝ Ձ-Ը-ԸՆԴ-0009-01

Հղում՝ ՀՎԿԱԿ-ՌԼԿ-ԿԱՌ-0034-02 ԳՍԸ

ԱՆ «ՀՎԿ ԱԶԳԱՅԻՆ ԿԵՆՏՐՈՆ» ՊՈԱԿ
«ՌԵՖԵՐԵՆՍ ԼԱԲՈՐԱՏՈՐ ԿԵՆՏՐՈՆ» ՄԱՍՆԱՃՅՈՒՂ
ՓՈՐՁԱՐԿՄԱՆ ԼԱԲՈՐԱՏՈՐԻԱ

(հավատարմագրման գրանցահամար, ում կողմից է տրված, հավատարմագրման ավարտը)

ՀՀ, ք. Երևան, Դավիթ Մալյան փ., N 37
Հեռ.՝ +37411610424, +37411311553
Էլ. փոստ՝ **reference-lab@ncdc.am**

ՀԱՍՏԱՏՈՒՄ ԵՄ
ԱՆ «ՀՎԿ ԱԶԳԱՅԻՆ ԿԵՆՏՐՈՆ» ՊՈԱԿ
«ՌԵՖԵՐԵՆՍ ԼԱԲՈՐԱՏՈՐ ԿԵՆՏՐՈՆ»
Մ/Ճ-Ի ՏՆՕՐԵՆ
_____ Ս. ԿԱՐԱՊԵՏՅԱՆ

ՋՐԻ ՓՈՐՁԱՐԿՄԱՆ ԱՐՁԱՆԱԳՐՈՒԹՅՈՒՆ N 197/17

(Համաձայն ԳՕՍՏ ԻՍՕ/ԻԷԿ 17025-2019-ի)

առ « 04» « հուլիսի» 2024թ.

Հայտատու կազմակերպության անվանումը և հասցեն «Տրանսնախագիծ» ՓԲԸ
(Կարող է լինել և անհատ հայտատու)

Նմուշառման վայրը, հասցեն Պուշկինի թունել՝ Ստեփանավանի կողմից, թունելի մուտք աջ կողմից /առվակի ջուր/
(կազմակերպություն, հասցե, կետ և այլն)

Սկզբնաղբյուրի անվանումը -

Նմուշի նկարագրությունը 1,0 լ **փաթեթավորումը** պոլիմերային տարա
(նմուշի քանակը, հատուկ նշումներ/համարակալում)

Նմուշառման ամսաթիվ 25.06.24թ. **ժամ** ժ.13[10] **Նմուշի ընդունման և փորձարկման ամսաթիվ** 25.06.- ից 03.07.

Փորձարկման ՆՓ -

(ցուցանիշի արժեք սահմանող ՆՓ-ի(ների) նշագիրը/համարը անհրաժեշտության դեպքում)

Նմուշառման արձանագրության և/կամ ուղեգրի համարը և ամսաթիվը 25.06.24թ.

Էջ 1՝ 3-ից

Որակի կառավարման արձանագրություններ

Ձևաթուղթ՝ ՓՈՐՁԱՐԿՄԱՆ ԱՐՁԱՆԱԳՐՈՒԹՅՈՒՆ

Նշագիր՝ Ձ-Ը-ԸՆԴ-0009-01

Հղում՝ ՀՎԿԱԿ-ՌԼԿ-ԿԱՌ-0034-02 ԳՍԸ

(եթե անհրաժեշտ է)

Լրացուցիչ տեղեկատվություն Հետազոտությունները իրականացվել են թիվ 12-32 առ 20.04.2024թ.

պայմանագրի շրջանակներում

(պայմանագրի համարը, հատուկ ցուցումներ և պայմաններ (եթե անհրաժեշտ է) և այլն

ՀԵՏԱԶՈՏՈՒԹՅԱՆ ԱՐԴՅՈՒՆՔՆԵՐ*								
N	**Ցուցանիշի անվանում**	**Ցուցանիշի արժեք սահմանող ՆՓ-ի նշագիրը**	**Փորձարկման մեթոդը սահմանող փաստաթղթի նշագիրը**	**Ցուցանիշի արժեք**			**Չափման անորոշություն (պահանջի դեպքում)**	**Եզրակացություն**
				Չ/Մ	**Ըստ ՆՓ-ի**	**Ստացված**		
	Նավթամթերքներ		ՄՈՒԿ 4.1.1262-03	մգ/դմ³	-	0,04	-	

Եզրակացություն - Ը

նմուշը(ները) (նմուշի/արտադրանքի անվանում)

համապատասխանում է/չի համապատասխանում

(ՆՓ-ի անվանումը, նշագիրը, կետերը)

ըստ

ցուցանիշների/առկայության

Նկատառումներ -

(շեղումներ փորձարկման մեթոդից, լրացումներ/բացառումներ, տեղեկություն փորձարկման հատուկ պայմանների մասին)

Չափման անորոշություն -

(նշվում է, եթե դա առնչվում է արդյունքների հավաստիության հետ և պահանջում է հայտատուն)

Որակի կառավարման արձանագրություններ

Ձևաթուղթ՝ ՓՈՐՁԱՐԿՄԱՆ ԱՐՁԱՆԱԳՐՈՒԹՅՈՒՆ

Նշագիր՝ Ձ-Ը-ԸՆԴ-0009-01

Հղում՝ ՀՎԿԱԿ-ՌԼԿ-ԿԱՌ-0034-02 ԳՍԸ

Կատարող(ներ)՝ Ա. Մալխասյան _____
ստորագրություն

Մ. Նազարեթյան _____
ստորագրություն

Վավերացնող

Ն. Հախվերդյան _____
ստորագրություն

**Տվյալ արդյունքները վերաբերում են միայն փորձարկված նմուշներին:*

Սույն փորձարկման արձանագրությունը կազմված է 3 էջից՝ 1 օրինակով:

Փորձարկման արձանագրությունը չի կարելի մասնակիորեն արտատպել կամ վերարտադրել առանց փորձարկման լաբորատորիայի գրավոր թույլտվության:

Appendix F: Baseline survey – vibration test reports

Vibration and noise sampling sites				
№	Site description	Sampling site code	Coordinates	
			Lattitude	Longitude
1	50-70 m away from the northern entrance of Dilijan tunnel	Dilijan tunnel Point I		
2	50-70 m away from the southern entrance of Dilijan tunnel	Dilijan tunnel Point II		
3	50-70 m from the southern entrance of the Pushkin tunnel	Pushkin tunnel Point I		
4	50-70 m from the northern entrance of the Pushkin tunnel	Pushkin tunnel Point II		

Details of vibration sampling locations

ԱՆ «ՀՎԿ ԱԶԳԱՅԻՆ ԿԵՆՏՐՈՆ» ՊՈԱԿ
«ՌԵՖԵՐԵՆՍ ԼԱԲՈՐԱՏՈՐ ԿԵՆՏՐՈՆ» ՄԱՍՆԱՃՅՈՒՂ
ՓՈՐՁԱՐԿՄԱՆ ԼԱԲՈՐԱՏՈՐԻԱ

ՀՀ, ք. Երևան, Դավիթ Մալյան փ., N 37
Հեռ.՝ +37411610424. +37411311553
Էլ. փոստ՝ reference-lab@ncdc.am

ԳՕՍՏ ԻՍՕ/ԻԷԿ 17025
№ 074/ T-125

ՀԱՍՏԱՏՈՒՄ ԵՄ
ԱՆ «ՀՎԿ ԱԶԳԱՅԻՆ ԿԵՆՏՐՈՆ» ՊՈԱԿ
«ՌԵՖԵՐԵՆՍ ԼԱԲՈՐԱՏՈՐ ԿԵՆՏՐՈՆ»
Մ/Ճ-Ի ՏՆՕՐԵՆ
_____Ս. ԿԱՐԱՊԵՏՅԱՆ

Փորձարկման արձանագրություն №2

Թրթռման (վիբրացիայի) չափման

(Համաձայն ԳՕՍՏ ԻՍՕ/ԻԷԿ 17025-2019-ի)

25.06.2024թ.

Հայտատու կազմակերպության անվանումը «Տրանսնախագիծ» ՓԲԸ

Չափման վայրը Պուշկինի թունել

կազմակերպություն, հասցե, կոնտակտային տվյալներ

Չափման վայրի նկարագիրը արտադրամաս

արտադրամաս, տեղամաս, խմբասենյակ, դասասենյակ և այլն

Չափումն իրականացնելու ամսաթիվ, ժամ 25.06.2024թ. 12:55-14:00

Չափման արդյունքների արձանագրման ամսաթիվ, ժամ 29.06.2024թ. 09:20

Չափմանը ներկա կազմակերպության ներկայացուցիչ «Տրանսնախագիծ» ՓԲ ընկերության տեղամասի պետ Վ. Վարդանյան

պաշտոն,անուն,ազգանուն,ստորագրություն

Չափման տեխնիկական միջոցը OKTABA -110A

անվանումը, տիպը, մակնիշը

Տեղեկատվություն ստուգաչափման/
տրամաչափարկման մասին ՎԿ №107049
առ 12.02.2024թ., ուժի մեջ է մինչև 12.02.2025թ.

վկայականի N, տրման ամսաթիվը, գործողության ժամկետը

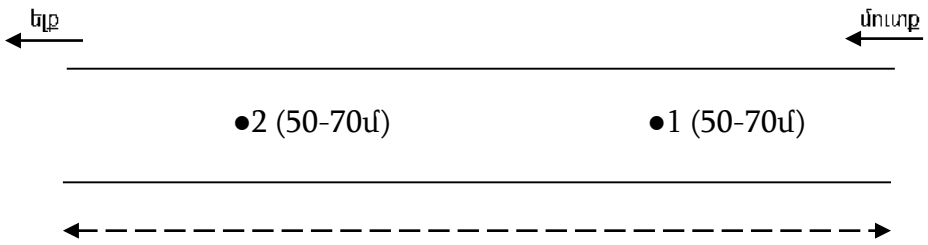
Չափման կատարման ՆՓ, իրավական հիմքերը կամ մեթոդը «Աշխատատեղերում, բնակելի և հասարակական շենքերում թրթռման (վիբրացիայի) հիգիենիկ նորմերը» ՀՆ N2.2.4-009-06

ՆՏՓ, Սան. Կ. և Ն. և այլն

Թրթռման հիմնական աղբյուրները

Տարածքի (սենքի, աշխատատեղի և այլն) գծանկարը՝ թրթռման աղբյուրի նշմամբ.

1. Պուշկինի թունել



ՓՈՐՁԱՐԿՄԱՆ ԱՐՁԱՆԱԳՐՈՒԹՅՈՒՆ ***N 3 ատ 25.06.2024 թ.***

ԹՐԹՌՄԱՆ (ՎԻԲՐԱՑԻԱՅԻ) ՉԱՓՄԱՆ

հհ	Կետերի համարները ըստ գծանկարի	Չափման տեղ (նշել սարքավորումների ձեռքի գործիքների և այլն տիպը,, մակնիշը անձնագրային այլ տվյալներ)	Թրթռման ազդեցության տևողությունը կիսամյակի ընթացքում	Միավորման համարակը,	Թրթռման տիպը				Միջին երկրաչափական հաճախականություններով (Հց) օկտավային շերտերում թրթռման ճշտգրված մակարդակները, դԲ,									Թրթռման արագացման ճշտգրված մակարդակ, դԲ		Թրթռման արագության ճշտգրված մակարդակ, դԲ	
					Ընդհանուր			Տեղային													
					ըստ առանցքների	ըստ ուղղությունների	ըստ ժամանակի		1	2	4	8	16	31,5	63	125	250				
																		Ձեռքային մշակում	Ոտքերի վրա կանգնելիս	Ձեռքային մշակում	Ոտքերի վրա կանգնելիս
1	*2*	*3*	*4*		*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*	*21*
1	1	Թունելի մուտքից 50-70մ ներս	12^{55} 14^{00}			+		-	-	112	109	85	74	64	81	-	-	74	-	-	-
2	2	Թունելի ելքից 50-70մ ներս				+		-	-	66	64	62	61	63	65	-	-	71	-	-	-

Եզրակացություն. _____ -ի _____
(Չափման վայրի (նշել՝ «բոլորը» կամ չհամապատասխանող կետերի համարները)
Նմուշը (ները) համապատասխանում է(են)/չի(չեն) համապատասխանում _____
(ՆՓ-ի անվանումը, նշագիրը, կետերը)

ըստ _____ցուցանիշների/առկայության:

Նկատառումներ

_____
(շեղումներ փորձարկման մեթոդից, լրացումներ/բացառումներ, տեղեկություն փորձարկման հատուկ պայմանների մասին)
(ներկայացվում է հայտատուի պահանջով)

Լրացուցիչ տեղեկություն

_____
_____

Չափումներ կատարող(ներ)–ի պաշտոնը _____ _____

ստորագրություն ԱԱՀ

_____ _____

ստորագրություն ԱԱՀ

Վավերացնող _____ _____

ստորագրություն ԱԱՀ

**Տվյալ արդյունքները վերաբերում են միայն փորձարկումն իրականացված վայրին:*

Սույն փորձարկման արձանագրությունը կազմված է ___ էջից՝ ___ օրինակով:

Փորձարկման արձանագրությունը չի կարելի մասնակիորեն արտատպել կամ վերարտադրել առանց փորձարկման լաբորատորիայի գրավոր թույլտվության:

Արձանագրությունը կազմված է 2 օրինակից:

TESTING PROTOCOL **N 3 dated** – 25.06.2024

measurement of vibration

Branch of the <<National Center for Disease Control and Prevention of the Ministry of Health>> Testing Laboratory

GOST ISO/IEK 17025
N 074/T125

RA, Erevan, Davit Malyan str., N 37
Phone: +37411610424. +37411311553
E mail: reference-lab@ncdc.am

_____ I confirm
State non-profit organization of the
<<National Center for Disease Control>>
and Prevention of the Ministry of Health
<<Reference Laboratory Center >> branch Director
_____ S. Karapetyan

TESTING PROTOCOL
Measurement Of Vibration
(In Accordance with GOST ISO/IEC 17025-2019)

25.06.2024

The applicant organization << Transproject>> FBE
place of measurement Pushkin Tunnel
organization's address, contact information

Description of the measurement location - workshop
Date and time of the measurement 25.06.2024 12.55-14.00
Date and time of recording the measurement results 29.06.2024 09.20
The representative present at the measurement- << Transproject>> FBE head of the site V. Vardanyan
The measure of the measurement technique OKTABA -110A
name, type, brand
Calibration/Calibration Information Certificate 107049 dated 02/12/2024, valid until 02/12/2025
NPH of measurement performance, legal basis or method

SN N 2 ||| -11.3

the main source of noise

TESTING PROTOCOL **N 3 dated** – 25.06.2024

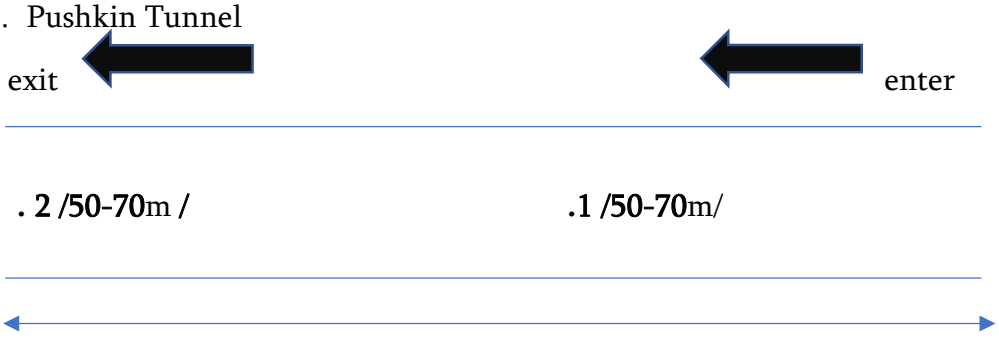
measurement of vibration

basics or method- Vibration/vibration/hygiene standards in workplaces, residential and public buildings HN **N** 2.2.4-009-06

The main source of vibration

Drawing of the area indicating the source of vibration

1. Pushkin Tunnel



point numbers according to the drawing	place of measurement / indication of the type of hand tools, etc. equipment, passport data	Vibration effect and duration during gear shifting	execution time	type of vibration				adjusted vibration levels in octavial bands with average geometric frequencies in dB									adjustable vibration acceleration level, dB		adjustable vibration acceleration level, dB	
				common			local	1	2	4	8	16	31,5	63	125	250	measurement result	acceptable rate	measurement result	acceptable rate
				transport	transport and technological	technological														
1	at a distance of 50-70 m from the entrance to the tunnel				+		-	-	112	109	85	74	64	81	-	-	74	-	-	-
2	at a distance of 50-70 m from the exit of the tunnel				+		-	-	66	64	62	61	63	65	-	-	71	-	-	-

TESTING PROTOCOL **N 3 dated** – 25.06.2024

vibration measurement of vibration

Conclusion _____

_____ place of measurement

samples match, do not match _____

_____ name, marking, nph I points

by _____ the presence of indicators

Considerations

Performers` _____

signature

Validator _____

signature

Appendix G: Baseline survey – noise test reports

ՓՈՐՁԱՐԿՄԱՆ ԱՐՁԱՆԱԳՐՈՒԹՅՈՒՆ ***N 14 առ 25.06.2024թ.***
ԱՂՄՈՒԿԻ ՉԱՓՄԱՆ

ԱՆ «ՀՎԿ ԱԶԳԱՅԻՆ ԿԵՆՏՐՈՆ» ՊՈԱԿ
«ՌԵՖԵՐԵՆՍ ԼԱԲՈՐԱՏՈՐ ԿԵՆՏՐՈՆ» ՄԱՍՆԱՃՅՈՒՂ
ՓՈՐՁԱՐԿՄԱՆ ԼԱԲՈՐԱՏՈՐԻԱ

ՀՀ, ք. Երևան, Դավիթ Մալյան փ., N 37
Հեռ.՝ +37411610424. +37411311553
Էլ. փոստ՝ reference-lab@ncdc.am

ԳՕՍՏ ԻՍՕ/ԻԷԿ 17025
№ 074/ T-125

ՀԱՍՏԱՏՈՒՄ ԵՄ
ԱՆ «ՀՎԿ ԱԶԳԱՅԻՆ ԿԵՆՏՐՈՆ» ՊՈԱԿ
«ՌԵՖԵՐԵՆՍ ԼԱԲՈՐԱՏՈՐ ԿԵՆՏՐՈՆ»
Մ/Ճ-Ի ՏՆՕՐԵՆ
_____Ս. ԿԱՐԱՊԵՏՅԱՆ

Փորձարկման արձանագրություն № 14

Աղմուկի չափման

(Համաձայն ԳՕՍՏ ԻՍՕ/ԻԷԿ 17025-2019-ի)

25.06.2024թ.

Հայտատուի/կազմակերպության անվանումը «Տրանսնախագիծ» ՓԲԸ

Չափման վայրը Պուշկինի թունել

կազմակերպություն, հասցե, կոնտակտային տվյալներ

Չափման վայրի նկարագիրը

արտադրամաս, տեղամաս, խմբասենյակ, դասասենյակ և այլն

Չափումն իրականացնելու ամսաթիվ, ժամ 25.06.2024թ. 12:55-14:00

Չափման արդյունքների արձանագրման ամսաթիվ, ժամ 29.06.2024թ. 09:20

Չափմանը ներկա ներկայացուցիչ «Տրանսնախագիծ» ՓԲ ընկերության տեղամասի պետ Վ. Վարդանյան

պաշտոն,անուն,ազգանուն,ստորագրություն

Չափման տեխնիկական միջոցը OKTABA- 110A

անվանումը, տիպը, մակնիշը

Տեղեկատվություն ստուգաչափման/տրամաչափարկման մասին ՎԿ N 107048 առ 12.02.2024թ., ուժի մեջ է մինչև 12.02.2025թ.

վկայականի N, տրման ամսաթիվը, գործողության ժամկետը

Չափման կատարման ՆՓ, իրավական հիմքերը կամ մեթոդը ՍՆ N 2 III -11.3

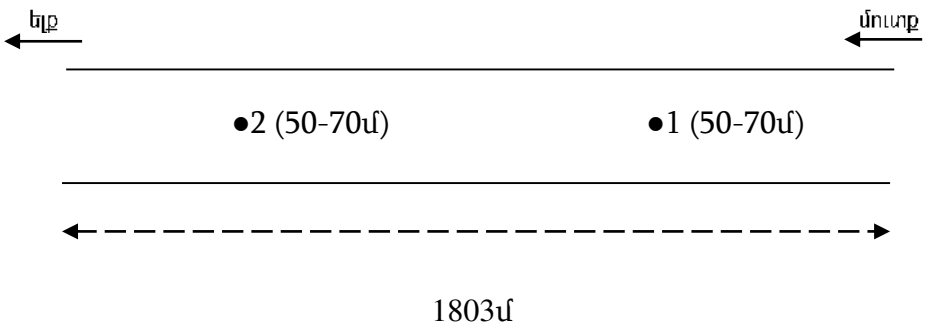
ՆՏՓ, Սան. Կ. և Ն. և այլն

Աղմուկի հիմնական աղբյուրները

ՓՈՐՁԱՐԿՄԱՆ ԱՐՁԱՆԱԳՐՈՒԹՅՈՒՆ ***N 14 առ 25.06.2024թ.***
ԱՂՄՈՒԿԻ ՉԱՓՄԱՆ

Տարածքի (սենքի, աշխատատեղի և այլն) գծանկարը՝ աղմուկի աղբյուրի նշմամբ

1. Պուշկինի թունել



հ/հ	Կետերի համարները ըստ գծանկարի	Չափման տեղ (նշել աղբյուրների ձեռքի գործիքների և այլն տիպը, մակնիշը և այլն)	Լրացուցիչ տեղեկություններ (կատարման ժամանակը, աղմուկի ընդհատման ժամանակահատվածները և այլն)	Աղմուկի բնույթը						Միջին երկրաչափական հաճախականություններով (Հց) օկտավային շերտերում ձայնի ճնշման մակարդակները, դԲ,									Ձայնի համարժեք մակարդակ $L_{Aհամ.}$ դԲԱ	Ձայնի առավելագույն մակարդակ $L_{Amաքս}$ դԲԱ	Ձայնի համարժեք մակարդակի ուղղումներ $L_{Aհամ.}$ դԲԱ	Ձայնի մակարդակի ուղղումներ $L_{Amաքս}$ դԲԱ
				ըստ սպեկտրի		ըստ ժամանակային բնութագրի																
				Լայնաշերտ	Երանգային	Մշտական	Ոչ մշտական			31,5	63	125	250	500	1000	2000	4000	8000				
							Տատանվող	Ընդհատվող	Ազդակային													
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	11	12	13	14	15	16	17	18	19	20	*21*	*22*	*23*
1	1	Թունելի մուտքից 50-70մ ներս	12^{55} 14^{00}	+		+				79	84	81	79	77	76	68	59	50	79	-	-	-
2	2	Թունելի ելքից 50-70մ ներս		+		+				86	90	82	80	78	78	70	61	50	82	-	-	-

Եզրակացություն. _____ -ի _____
(Չափման վայրի (նշել՝ «բոլորը» կամ չհամապատասխանող կետերի համարները)

Նմուշը (ները) համապատասխանում է(են)/չի(չեն) համապատասխանում _____Համապատասխանում է_____
(ՆՓ-ի անվանումը, նշագիրը, կետերը)
_____ ըստ ցուցանիշների/առկայության:

Նմուշը (ները) համապատասխանում է(են)/չի(չեն) համապատասխանում _____
(ՆՓ-ի անվանումը, նշագիրը, կետերը)
_____ ըստ ցուցանիշների/առկայության:

Նկատառումներ

_____
(շեղումներ փորձարկման մեթոդից, լրացումներ/բացառումներ, տեղեկություն փորձարկման հատուկ պայմանների մասին)
(ներկայացվում է հայտատուի պահանջով)

Լրացուցիչ տեղեկություն

_____
_____

**Տվյալ արդյունքները վերաբերում են միայն փորձարկումն իրականացված վայրին:*
Սույն փորձարկման արձանագրությունը կազմված է _5_ էջից՝ _2_ օրինակով:
Փորձարկման արձանագրությունը չի կարելի մասնակիորեն արտատպել կամ վերարտադրել առանց փորձարկման լաբորատորիայի գրավոր թույլտվության:

Չափումներ կատարող(ներ)-ի պաշտոնը
Ակուստիկ, ֆիզիկական գործոնների հետազոտության, ճարտարագիտատեխնիկական և տեղեկատվական տեխնոլոգիաների բաժնի պետ — Մովսես Երիցյան

ստորագրություն ԱԱՀ

ստորագրություն ԱԱՀ

Վավերացնող ստորագրություն ԱԱՀ

Արձանագրությունը կազմված է 2 օրինակից:

TESTING PROTOCOL **N14 dated** – 20.06.2024
NOISE MEASUREMENT

Branch of the <<National Center for Disease Control and Prevention of the Ministry of Health>> Testing Laboratory

GOST ISO/IEK 17025
N 074/T125

RA, Erevan, Davit Malyan str., N 37
Phone: +37411610424. +37411311553
E mail: reference-lab@ncdc.am

I confirm
State non-profit organization of the
<<National Center for Disease Control>>
and Prevention of the Ministry of Health
<<Reference Laboratory Center >> branch Director
S. Karapetyan

Testing protocol N 14

NOISE MEASUREMENT

(In Accordance with GOST ISO/IEC 17025-2019)

25.06.2024

The applicant organization << Transproject>> CJSC

(organization's address, contact information)

place of measurement Pushkin Tunnel

Description of the measurement location

Date and time of the measurement 25.06.2024 12.55-14.00

Date and time of recording the measurement results 29.06.2024 -09.20

The representative present at the measurement- << Transproject>> CJSC

head of the site V. Vardanyan

The measure of the measurement technique OKTABA -110A
name, type, brand

TESTING PROTOCOL **N14 dated** – 25.06.2024

NOISE MEASUREMENT

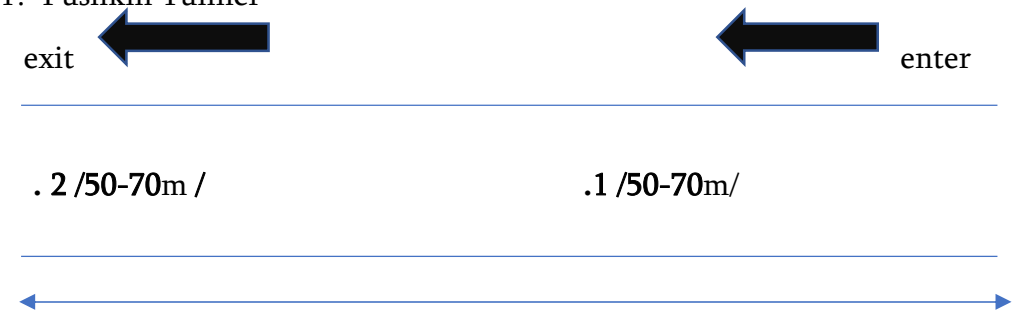
Calibration/Calibration Information Certificate 107048 dated 02/12/2024, valid until 02/12/2025

NPH of measurement performance, legal basis or method

SN N 2 ||| -11.3

the main source of noise

1. Pushkin Tunnel



Number	Point numbers according To the drawing	Place of measurement	Additional information	Personality of the noise						sound pressure levels per octave with average geometric frequencies (Hz), dB								
				According to the spectrum		According to the time characteristic				31.5	63	125	250	500				
				Broad-band	Foun-dation cream	constant	Not permanent											
							Hesi tant	intermittent	alarm									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	1	50-70 m from the tunnel entrance	12:55-14:00							79	84	81	79	77				
2	2	50-70 m from the tunnel exit								86	90	82	80	78				

sound pressure levels per octave with average geometric frequencies (Hz), dB							
1000	2000	4000	8000	adequate volume level, L -dBA	maximum volume level , L -dBA	equivalent permissible volume level ,L -dBA	maximum allowable volume level ,L -dBA
16	17	18	19	20	21	22	23
76	68	59	50	79	–	–	–
78	70	61	50	82	–	–	–

TESTING PROTOCOL **N14 dated** – 20.06.2024

NOISE MEASUREMENT

Conclusion _____

_____ place of measurement

samples match, do not match _____

_____ name, marking, nph I points

by _____ the presence of indicators

Considerations

_____

deviations from the testing method, additions, exceptions, information about specific testing conditions

submitted at the request of the applicant

_____

submitted at the request of the applicant

_____

TESTING PROTOCOL **N14 dated** – 25.06.2024

NOISE MEASUREMENT

*These results apply only to the place where the test was performed.

This test report consists of 6 pages in two copies.

The test report may not be partially copied or reproduced without the written permission of the testing laboratory

Position of measurers Head of the Research Department of

Acoustic, Physical factors, engineering and Information Technologies

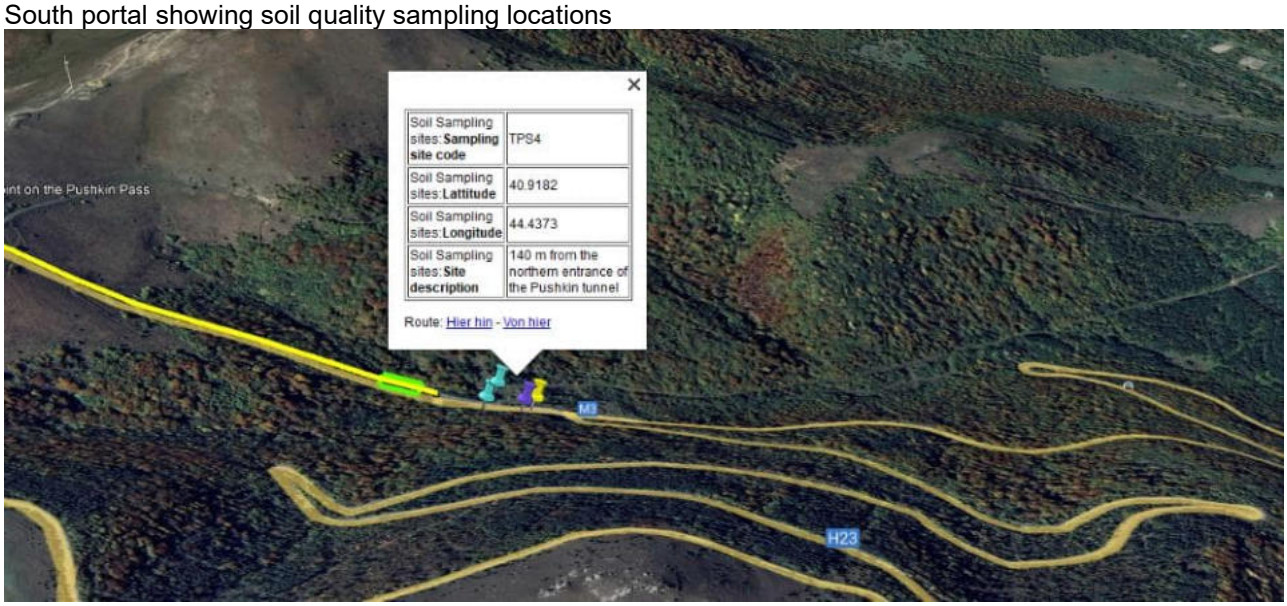
Movses Ericyan signature

the inspector signature

The protocol consists of 2 copies

Appendix H: Baseline survey – soil test reports

South portal showing soil quality sampling locations



North portal showing soil quality sampling locations

Soil sampling sites				
№	Site description	Sampling site code	Coordinates	
			Lattitude	Longitude
1	85 m away from the southern entrance of Dilijan tunnel	TPS1	40,65319	44,89312
2	100 m away from the northern entrance of Dilijan tunnel	TPS2	40,67793	44,87943
3	75 m from the southern entrance of the Pushkin tunnel	TPS3	40,90147	44,42902
4	140 m from the northern entrance of the Pushkin tunnel	TPS4	40,91817	44,4373

Details of soil sampling locations

Customer: **«TRANSPROJECT» CJSC**
Contract for services: **L-20/24**
Date of receipt of the samples: **June 19, 2024**
Date of release of results: **July 03, 2024**
Date of laboratory examination: **June 19-July 02, 2024**
Sampling: **«Armhydromet» SNCO**
Sample matrix: **Soil**

Approved by

«Hydrometeorology and Monitoring Center» SNCO
Director

L. Azizyan

TEST REPORT_162_2024

N	Measured parameter	Unit of measurement	Measured value				Used Standard method
			Coordinates				
			N 40.65319 EO44.89312	N 40.67793 EO44.87943	N 40.90147 EO44.42902	N 40.91817 EO44.43730	
1	Aluminium	mg/kg	39116	31750	35096	35250	ISO 13196
2	Silicon	mg/kg	87232	73383	71831	103877	
3	Phosphorus	mg/kg	837	668	<50	451	
4	Sulfur	mg/kg	1123	1131	1100	996	
5	Chlorine	mg/kg	1200	984	1170	1162	
6	Potassium	mg/kg	14165	8198	8136	7889	
7	Calcium	mg/kg	15535	13662	35864	9402	
8	Titanium	mg/kg	3760	2898	2864	4065	
9	Vanadium	mg/kg	<25	<25	<25	<25	
10	Chromium	mg/kg	<10	76	58	22	
11	Manganese	mg/kg	1189	682	843	879	
12	Iron	mg/kg	44097	30791	35770	39211	
13	Nickel	mg/kg	17	40	28	25	
14	Copper	mg/kg	66	37	49	55	
15	Zinc	mg/kg	87	114	88	70	
16	Arsenic	mg/kg	10	11	13	21	
17	Selenium	mg/kg	<5	<5	<5	<5	
18	Rubidium	mg/kg	89	53	49	44	
19	Strontium	mg/kg	487	164	247	181	
20	Yttrium	mg/kg	30	17	25	23	
21	Zirconium	mg/kg	165	111	122	147	
22	Niobium	mg/kg	6	<5	7	8	
23	Molybdenum	mg/kg	<5	<5	<5	<5	
24	Silver	mg/kg	<5	<5	<5	<5	
25	Cadmium	mg/kg	<5	<5	<5	<5	
26	Tin	mg/kg	<5	<5	<5	<5	
27	Antimony	mg/kg	<5	<5	<5	<5	
28	Tantalum	mg/kg	<5	<5	<5	<5	
29	Mercury	mg/kg	<5	<5	<5	<5	
30	Lead	mg/kg	16	17	12	21	
31	Bismuth	mg/kg	<5	15	<5	<5	
32	Thorium	mg/kg	9	<5	<5	7	
33	pH	-	7.34	6.92	7.86	6.53	ISO 10390
34	Electrical Conductivity	µS/cm	110.6	206	183.4	59.0	ISO 11265
35	Salinity	mg/kg	50	100	70	20	ISO 11265
36	Fluoride ion	mg/L	0.188	0.101	0.266	0.104	ISO 10304-1
37	Chloride ion	mg/L	2.161	2.640	2.430	2.0768	
38	Bromide ion	mg/L	<0.03	<0.03	<0.03	<0.03	
39	Nitrate ion	mg/L	0.925	6.582	0.940	1.0985	
40	Sulfate ion	mg/L	3.576	7.426	4.764	3.273	
41	Phosphate ion	mg/L	0.412	1.905	0.421	0.152	

Samples (1.5 kg) were received in polyethylene bags.

Statement: The results refer only to the tested samples.

Authorised by:

Deputy Director: G. Shahnazaryan

Head of soils, sedimentand hydrobiological monitoring services: V. Karyan

Պատվիրատու՝ **«ՏՐԱՆՍՆԱԽԱԳԻԾ» ՓԲԸ**
Պայմանագրի համար՝ **L-20/24**
Նմուշների ստացման ամսաթիվ՝ **հունիս 19, 2024թ.**
Արդյունքների տրման ամսաթիվ՝ **հուլիսի 03, 2024թ.**
Լաբորատոր փորձարկման ամսաթիվ՝ **հունիսի 19-հուլիսի 02, 2024թ.**
Նմուշառող՝ **«Հայհիդրոմետ» ՊՈԱԿ**
Նմուշի մատրիցա՝ **հող**

Հաստատում

«Հիդրոօդերևութաբանության և մոնիթորինգի կենտրոն» ՊՈԱԿ-ի տնօրեն՝

Լ. Ազիզյան

ՓՈՐՁԱՐԿՄԱՆ ՀԱՇՎԵՏՎՈՒԹՅՈՒՆ_162_2024

h.h.	Չափված ցուցանիշ	Չափման միավոր	Չափված արժեք				Կիրառված ստանդարտ մեթոդ
			Կոորդինատներ				
			N 40.65319 EO44.89312	N 40.67793 EO44.87943	N 40.90147 EO44.42902	N 40.91817 EO44.43730	
1	Ալյումին	մգ/կգ	39116	31750	35096	35250	ԻՍՕ 13196
2	Սիլիցիում	մգ/կգ	87232	73383	71831	103877	
3	Ֆոսֆոր	մգ/կգ	837	668	<50	451	
4	Ծծումբ	մգ/կգ	1123	1131	1100	996	
5	Քլոր	մգ/կգ	1200	984	1170	1162	
6	Կալիում	մգ/կգ	14165	8198	8136	7889	
7	Կալցիում	մգ/կգ	15535	13662	35864	9402	
8	Տիտան	մգ/կգ	3760	2898	2864	4065	
9	Վանադիում	մգ/կգ	<25	<25	<25	<25	
10	Քրոմ	մգ/կգ	<10	76	58	22	
11	Մանգան	մգ/կգ	1189	682	843	879	
12	Երկաթ	մգ/կգ	44097	30791	35770	39211	
13	Նիկել	մգ/կգ	17	40	28	25	
14	Պղինձ	մգ/կգ	66	37	49	55	
15	Ցինկ	մգ/կգ	87	114	88	70	
16	Արսեն	մգ/կգ	10	11	13	21	
17	Սելեն	մգ/կգ	<5	<5	<5	<5	
18	Ռուբիդիում	մգ/կգ	89	53	49	44	
19	Ստրոնցիում	մգ/կգ	487	164	247	181	
20	Իտրիում	մգ/կգ	30	17	25	23	
21	Ցիրկոնիում	մգ/կգ	165	111	122	147	
22	Նիոբիում	մգ/կգ	6	<5	7	8	
23	Մոլիբդեն	մգ/կգ	<5	<5	<5	<5	
24	Արծաթ	մգ/կգ	<5	<5	<5	<5	
25	Կադմիում	մգ/կգ	<5	<5	<5	<5	
26	Անագ	մգ/կգ	<5	<5	<5	<5	
27	Ծարիր	մգ/կգ	<5	<5	<5	<5	
28	Վոլֆրամ	մգ/կգ	<5	<5	<5	<5	
29	Սնդիկ	մգ/կգ	<5	<5	<5	<5	
30	Կապար	մգ/կգ	16	17	12	21	
31	Բիսմութ	մգ/կգ	<5	15	<5	<5	
32	Թորիում	մգ/կգ	9	<5	<5	7	
33	pH	–	7.34	6.92	7.86	6.53	ՀՍՏ ԻՍՕ 10390
34	Էլեկտրահաղորդականություն	µS/cm	110.6	206	183.4	59.0	ԻՍՕ 11265
35	Աղայնացում	մգ/կգ	50	100	70	20	ԻՍՕ 11265
36	Ֆտորիդ իոն	մգ/լ	0.188	0.101	0.266	0.104	ՀՍՏ ԻՍՕ 10304-1
37	Քլորիդ-իոն	մգ/լ	2.161	2.640	2.430	2.0768	
38	Բրոմիդ իոն	մգ/լ	<0.03	<0.03	<0.03	<0.03	
39	Նիտրատ իոն	մգ/լ	0.925	6.582	0.940	1.0985	
40	Սուլֆատ իոն	մգ/լ	3.576	7.426	4.764	3.273	
41	Ֆոսֆատ իոն	մգ/լ	0.412	1.905	0.421	0.152	

Նմուշները (1.5 կգ) ստացվել են պոլիէթիլենային

Արդյունքները վերաբերում են միայն փորձարկված նմուշներին:

Հավաստում եմ

Տնօրենի տեղակալ՝ Գ.Շահնազարյան

Հողերի, հատակային նստվածքների
և հիդրոկենսաբանական մոնիթորինգի ծառայության պետ՝ Վ. Քաոյան

Appendix I: Baseline survey – light test reports

Lighting sampling sites				
№	Site description	Sampling site code	Coordinates	
			Lattitude	Longitude
1	0 m from the southern entrance of Dilijan tunnel	Dilijan tunnel Point I		
2	25 m from the southern entrance of Dilijan tunnel	Dilijan tunnel Point II		
3	25 m from the northern entrance of Dilijan tunnel	Dilijan tunnel Point III		
4	0 m from the northern entrance of Dilijan tunnel	Dilijan tunnel Point IV		
5	00 m from the southern entrance of the Pushkin tunnel	Pushkin tunnel Point I		
6	25 m from the southern entrance of the Pushkin tunnel	Pushkin tunnel Point II		
7	25 m from the northern entrance of the Pushkin tunnel	Pushkin tunnel Point III		
8	0 m from the northern entrance of the Pushkin tunnel	Pushkin tunnel Point IV		

Details of light sampling locations

ԱՆ «ՀՎԿ ԱԶԳԱՅԻՆ ԿԵՆՏՐՈՆ» ՊՈԱԿ
«ՌԵՖԵՐԵՆՍ ԼԱԲՈՐԱՏՈՐ ԿԵՆՏՐՈՆ» ՄԱՍՆԱՃՅՈՒՂ
ՓՈՐՁԱՐԿՄԱՆ ԼԱԲՈՐԱՏՈՐԻԱ

ՀՀ, ք. Երևան, Դավիթ Մալյան փ., N 37
Հեռ.՝ +37411610424. +37411311553
Էլ. փոստ՝ reference-lab@ncdc.am

ԳՕՍՏ ԻՍՕ/ԻԷԿ 17025
№ 074/ T-125

ՀԱՍՏԱՏՈՒՄ ԵՄ
ԱՆ «ՀՎԿ ԱԶԳԱՅԻՆ ԿԵՆՏՐՈՆ»
ՊՈԱԿ
«ՌԵՖԵՐԵՆՍ ԼԱԲՈՐԱՏՈՐ
ԿԵՆՏՐՈՆ»
Մ/Ճ-Ի ՏՆՕՐԵՆ
_____Ս. ԿԱՐԱՊԵՏՅԱՆ

Փորձարկման արձանագրություն № 14

Լուսավորվածության չափման

(Համաձայն ԳՕՍՏ ԻՍՕ/ԻԷԿ 17025-2019-ի)

25.06.2024թ.

Հայտատուի/կազմակերպության անվանումը «Տրանսնախագիծ» ՓԲԸ

Չափման վայրը Պուշկինի թունել

կազմակերպություն, հասցե, կոնտակտային տվյալներ

Չափման վայրի նկարագիրը

արտադրամաս, տեղամաս, խմբասենյակ, դասասենյակ և այլն

«Տրանսնախագիծ» ՓԲ ընկերության տեղամասի պետ Վ. Վարդանյան «Տրանսնախագիծ» ՓԲ ընկերության ներկայացուցիչ

Չափումն իրականացնելու ամսաթիվ, ժամ 25.06.2024թ. 12:55-14:00

Չափման արդյունքների արձանագրման ամսաթիվ, ժամ 29.06.2024թ. 09:20

Չափման տեխնիկական միջոցը Testo 540

անվանումը, տիպը, մակնիշը

Տեղեկատվություն պետական ստուգաչափման/ տրամաչափարկման մասին Վկ № 116489

ՓՈՐՁԱՐԿՄԱՆ ԱՐՁԱՆԱԳՐՈՒԹՅՈՒՆ ***14 առ 25.06.2024թ.***

ԼՈՒՍԱՎՈՐՎԱԾՈՒԹՅԱՆ ՉԱՓՄԱՆ

առ 12.02.2024թ. ուժի մեջ է մինչև 12.02.2025թ.

վկայականի N, տրման ամսաթիվը, գործողության ժամկետը

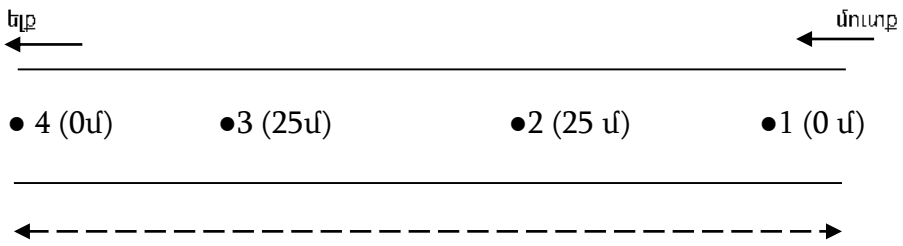
Չափման կատարման ՆՓ,
իրավական հիմքերը կամ մեթոդը ՀՀ առողջապահության նախարարի հրամանը

«Աշխատանքի հիգիենիկ դասակարգումը ըստ արտադրական միջավայրի վնասակար և վտանգավոր գործոնների, աշխատանքային գործընթացի ծանրության և լարվածության ցուցանիշների» N 2.2-002-05 ՍԿՆ

ՆՏՓ, Սան. Կ. և Ն. և այլն

Սենքի գծանկարը՝ սարքավորումների տեղաբաշխման, լուսատուների տեղադրման, լուսաբացվածքների (պատուհաններ, լույսային լապտերներ և այլն) տեղակայման և չափման կետերի նշմամբ

1. Պուշկինի թունել



ՓՈՐՁԱՐԿՄԱՆ ԱՐՁԱՆԱԳՐՈՒԹՅՈՒՆ ***14 առ 25.06.2024թ.***

ԼՈՒՍԱՎՈՐՎԱԾՈՒԹՅԱՆ ՉԱՓՄԱՆ

7. Արհեստական լուսավորվածության չափման արդյունքները

	N տող	Չափման տեղը	Աշխատանքի կարգը	Թեմայի համարը	Լուսավորվածության նորմայի կամ նախագծային արժեքի համարը	Տեսակը /լրումներով/	Լուսավորվածությունը լրութսերով(ԼՔ)		Նվազագույն թույլատրելի արժեքը
							Լուսավորման համակցված համակարգի դեպում		
							Ընդհանուր (էֆեկտիվ) + տեղային	Ընդհանուր լուսավորման	
1	2	3	4	5	6	7	8	9	10	11
1	1	Թունելի մուտքի 0մ մոտ				L				
2	2	Թունելի մուտքից 25մ ներս				L			80	
3	3	Թունելի ելքից 25մ ներս				L			70	
4	4	Թունելի ելքի 0մ մոտ				L				

8. Բնական լուսավորվածության չափման արդյունքները

Չափերն ըստ նկարի Նկարագրեք ըստ նշման	Բնական լուսավորում,								Համատեղված լուսավորում,							
	Վերին կամ համակցված լուսավորման դեպքում				Կողմնային լուսավորման դեպում				Վերին կամ համակցված լուսավորման դեպքում				Կողմնային լուսավորման դեպում			
	(ԲԼԳ, %)								(ԲԼԳ, %)							
	Լուսավորման նվազագույն արժեքը	Միջին դիմադրությունը	Ֆոտոհիշողության դիմադրությունը	Թույլատրելի (ԲԼԳ) նվազագույն արժեքը	Լուսավորման նվազագույն արժեքը	Միջին դիմադրությունը	Ֆոտոհիշողության դիմադրությունը	Թույլատրելի նվազագույն արժեքը	Լուսավորման նվազագույն արժեքը	Միջին դիմադրությունը	Ֆոտոհիշողության դիմադրությունը	Թույլատրելի (ԲԼԳ) նվազագույն արժեքը	Լուսավորման նվազագույն արժեքը	Միջին դիմադրությունը	Ֆոտոհիշողության դիմադրությունը	Թույլատրելի նվազագույն արժեքը
12	13	14	15	16	17	8	19	20	21	22	23	24	25	26	27	28
12^{55} 14^{00}													1780	20000	8.9	
													1690	20000	8.5	

Եզրակացություն. _____ -ի _____
(Չափման վայրի (նշել՝ «բոլորը» կամ չհամապատասխանող կետերի համարները)
Նմուշը (ները) համապատասխանում է(են)/չի(չեն) համապատասխանում _____
(ՆՓ-ի անվանումը, նշագիրը, կետերը)

ըստ _____ցուցանիշների/առկայության:

Նկատառումներ

_____
(շեղումներ փորձարկման մեթոդից, լրացումներ/բացառումներ, տեղեկություն փորձարկման հատուկ պայմանների մասին)

(ներկայացվում է հայտատուի պահանջով)

Լրացուցիչ տեղեկություն

_____
_____

ՓՈՐՁԱՐԿՄԱՆ ԱՐՁԱՆԱԳՐՈՒԹՅՈՒՆ ***14 ատ 25.06.2024թ.***

ԼՈՒՍԱՎՈՐՎԱԾՈՒԹՅԱՆ ՉԱՓՄԱՆ

**Տվյալ արդյունքները վերաբերում են միայն փորձարկումն իրականացված վայրին:*

Սույն փորձարկման արձանագրությունը կազմված է _6_ էջից՝ _2_ օրինակով:

Փորձարկման արձանագրությունը չի կարելի մասնակիորեն արտատպել կամ վերարտադրել առանց փորձարկման լաբորատորիայի գրավոր թույլտվության:

Չափումներ կատարող(ներ)–ի պաշտոնը
Ակուստիկ, ֆիզիկական գործոնների հետազոտության, ճարտարագիտատեխնիկական և տեղեկատվական տեխնոլոգիաների բաժնի պետ — Մովսես Երիցյան

ստորագրություն — ԱԱՀ

ստորագրություն — ԱԱՀ

Վավերացնող

ստորագրություն — ԱԱՀ

Արձանագրությունը կազմված է 2 օրինակից:

measurement results

TESTING PROTOCOL **N14 dated** – 25.06.2024

LIGHT MEASUREMENT

Branch of the <<National Center for Disease Control and Prevention of the Ministry of Health>> Testing Laboratory

GOST ISO/IEK 17025

N 074/T125

RA, Erevan, Davit Malyan str., N 37

Phone: +37411610424. +37411311553

E mail: reference-lab@ncdc.am

_____ I confirm

State non-profit organization of the

<<National Center for Disease Control>>

and Prevention of the Ministry of Health

<<Reference Laboratory Center >> branch Director

_____ S. Karapetyan

testing protocol N 14

LIGHT MEASUREMENT

(In Accordance with GOST ISO/IEC 17025-2019)

25.06.2024

measurement results

The applicant organization << Transproject>> FBE

place of measurement Pushkin Tunnel

organization's address, contact information

Description of the measurement location

Date and time of the measurement 25.06.2024 12.55-14.00

Date and time of recording the measurement results 29.06.2024 09.20

The representative present at the measurement- << Transproject>> FBE

head of the site V. Vardanyan

The measure of the measurement technique Testo 540

name, type, brand

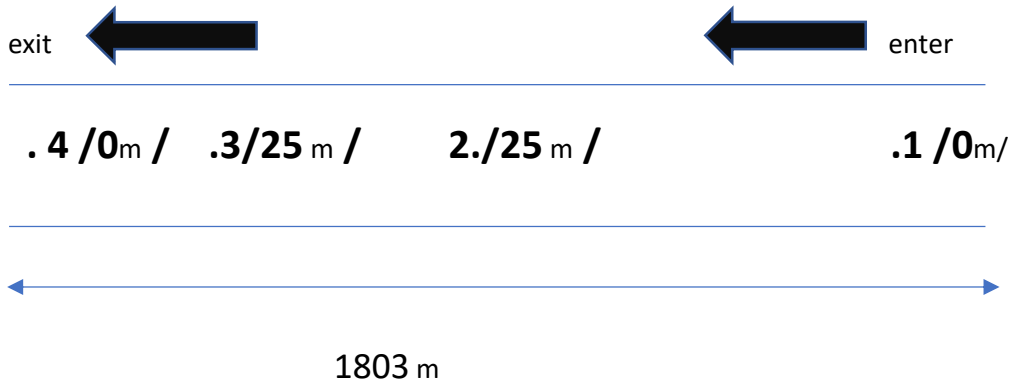
Calibration/Calibration Information Certificate 116489 dated 02/12/2024, valid until 02/12/2025

NPH of measurement performance, legal basis or method Order of the Minister of Health of the Republic of Armenia

Hygienic classification of work according to harmful and dangerous factors of the production environment, indicators of severity and intensity of the work process N 2.2 002.05 SKN

a drawing indicating the placement of equipment, installation of fixtures, location of fixtures and measurement points

1. Pushkin Tunnel



measurement results

1	according to the drawing	place of measurement	the order of work	subcategory	lighting system combined, combined, local, general	type/ fluorescent, luminous	Lux. lighting			
							in the case of a combined type of lighting		common	
							simple /local+ general/	just a lighting system		
1	1. about 0 m from the tunnel entrance	3	4	5	6	7	8	9	10	11
2	2. 25 m from the tunnel entrance					L			80	
3	3. 25 m within the tunnel exit					L			70	
4	4. about 0 m at the exit of the tunnel					L				

measurement results

Measurement time	NATURAL LIGHTING								COMBINED LIGHTING							
	In the case of overhead or combined lighting				in the case of side lighting				In the case of overhead or combined lighting				in the case of side lighting			
	BLG															
	Room lighting	Outdoor lighting	Natural lighting	Acceptable rate	room lighting	Outdoor lighting	Natural lighting	Acceptable rate	room lighting	Outdoor lighting	Natural lighting	Acceptable rate	Room lighting	Outdoor lighting	Natural lighting	
12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
12,55-14,00													1780	20000	8,9	
													1690	20000	8,5	

measurement results

TESTING PROTOCOL **N14 dated** – 25.06.2024

LIGHT MEASUREMENT

Conclusion _____

_____ place of measurement

samples match, do not match _____

_____name, marking, nph I points

by _____ the presence of indicators

Considerations

_____

deviations from the testing method, additions, exceptions, information about specific testing conditions

submitted at the request of the applicant

_____

submitted at the request of the applicant

_____

measurement results

TESTING PROTOCOL **N14 dated** – 25.06.2024

LIGHT MEASUREMENT

*These results apply only to the place where the test was performed.

This test report consists of 6 pages in two copies.

The test report may not be partially copied or reproduced without the written permission of the testing laboratory

Position of measurers Head of the Research Department of

Acoustic, Physical factors, engineering and Information Technologies

Movses Ericyan signature

the inspector signature

The protocol consists of 2 copies

Appendix J: Correspondence from MOE on Gulagarak Pine State Sanctuary boundaries

ՀՀ ԾՐԱԳԱԿԱ ՄԻՋԱՎԱՅՐԻ ՆԱԽԱՐԱՐՈՒԹՅՈՒՆ
ՀՀ, ք. Երևան, 0010,
Հանրապետության հրապարակ,
Կառավարական տուն 3

ՆԱԽԱՐԱՐ
ՊԱՐՈՆ ՀԱԿՈԲ ՍԻՄՈՅԱՆԻՆ

TRANSPROJECT
ՏՐԱՆՍՆԱԽԱԳԾ ՓԲԸ
ՀԱՍՑԵ՝ ԳԱՎԻՈՏԱՆՀԱՄԱՐԻ 23
0014 ԵՐԵՎԱՆ, ՀՀ
ՀԵՌ. + 374 10 24 16 42
+ 374 10 24 16 76
ՖԱՔՍ՝ + 374 10 24 11 91
WWW. TRANSPROJECT.INFO

ԱՄՍԱԹԻՎ՝ 01.03.2024թ
ՀՊՀ՝ Ե-ՏՆ-20/24
ՎԵՐԱԲԵՐՅԱԼ՝ ՀՀ ԾՐԱԳԱԿԱ ՄԻՋԱՎԱՅՐԻ ՆԱԽԱՐԱՐՈՒԹՅՈՒՆ

Հարգելի պ-ն Սիմոյան

Ցանկանում ենք տեղեկացնել, որ Ասիական Զարգացման Բանկի աջակցությամբ 2023թ-ի հունիսի 20-ից մեկնարկել է Հայաստան-Վրաստան սահմանային ճանապարհի (M-6, Վանաձոր-Բագրատաշեն) բարելավման ծրագիրը: Ծրագրի նպատակն է իրականացնել Դիլիջան և Պուշկին թունելների տեխնիկական վիճակի ուսումնասիրման, նախագծման և հիմնանորոգման աշխատանքները:

Այդ նպատակով հայտարարված մրցույթային արդյունքում նախագծային աշխատանքները իրականացվում են «ԲԵՌՆԱՐԴ Գրուպ Ջեդթի Ջիէմբիէյչ (Ավստրիա) և «Ակտես ԲԵՌՆԱՐԴ» Ջիէմբիէյչ (Ավստրիա) համատեղ ձեռնարկության կողմից (ենթախորհրդատու՝ «Տրանսնախագիծ» ՓԲԸ):

Հաշվի առնելով որ երկու թունելների հիմնանորոգման աշխատանքները իրականացվելու են բնության հատուկ պահպանվող տարածքների սահմանամերձ գոտիներում ակնկալում ենք Ձեր աջակցությունը վերջիններիս սահմանների ճշգրտման և քարտեզների ստացման ուղղությամբ:

Սույն գրությամբ ակնկալում ենք Ձեր աջակցությունը Դիլիջան և Սևան ազգային պարկերի՝ իրենց կազմում գտնվող պետական արգելավայրերի, ինչպես նաև Գյուլագարակի պետական արգելավայրի սահմանների հստակեցման վերաբերյալ:

Ակնկալում ենք կադաստրային կամ այլ պաշտոնական քարտեզների, ինչպես նաև տվյալ ԲՀՊՏ-ի Դիլիջանի և Պուշկինի թունելներին գտնվելու վերաբերյալ ցանկացած տեղեկատվության ստացումը, որը կաջակցի խորհրդատուի թիմին հնարավորինս մեղմելու շինարարական հրապարակի կառավարման, ինչպես նաև թունելների հիմնանորոգման աշխատանքների իրականացման ընթացքը:

Հարգանքով՝ <<Տրանսնախագիծ>>

ՓԲԸ-ի տնօրեն՝ Էդուարդ Մարտիրոսյան

ՀԱՅԱՍՏԱՆԻ ՀԱՆՐԱՊԵՏՈՒԹՅԱՆ
ՇՐՋԱԿԱ ՄԻՋԱՎԱՅՐԻ ՆԱԽԱՐԱՐՈՒԹՅԱՆ
ԳԼԽԱՎՈՐ ՔԱՐՏՈՒՂԱՐ
REPUBLIC OF ARMENIA
SECRETARY GENERAL OF MINISTRY OF ENVIRONMENT
РЕСПУБЛИКА АРМЕНИЯ
ГЕНЕРАЛЬНЫЙ СЕКРЕТАРЬ МИНИСТЕРСТВА ОКРУЖАЮЩЕЙ СРЕДЫ

№ 5/16.11/5694
«_____» «_____» 2024թ.

«Տրանսնախազիծ» ՓԲԸ-ի ներկայացուցիչ, փաստաբան
պարոն Տիգրան Բեգունյանին

Հարգելի պարոն Բեգունյան

Ի պատասխան Ձեր 2024 թվականի մայիսի 10-ի N 1135080 հարցման՝ «Դիլիջան» և «Սևան» ազգային պարկերի, Գյուլագարակի պետական արգելավայրի սահմանների հստակեցման համար անհրաժեշտ տեղեկատվություն տրամադրելու առնչությամբ հայտնում եմ, որ գրությամբ ներկայացված կոորդինատներից «44.88414747,40.67826915» և «44.87168641,40.67526266» գտնվում են շրջակա միջավայրի նախարարության «Դիլիջան» ազգային պարկ» ՊՈԱԿ-ի «Դիլիջան տեղամաս» մասնաճյուղի 45 և 46 քառակուսիներում և հանդիսանում են ազգային պարկի արգելոցային գոտիներ, իսկ մնացած չորսը դուրս են «Դիլիջան» ազգային պարկի տարածքից:

Համաձայն շրջակա միջավայրի նախարարի 2023 թվականի օգոստոսի 10-ի N 278-Լ հրամանի «Պուշկինի» թունելի հարակից հողերում ներկայացված կոորդինատներով տարածքից (347,65 հեկտար) 171,7 հեկտարը գտնվում է շրջակա միջավայրի նախարարության «Հայանտառ» ՊՈԱԿ-ի կառավարման լիազորության ներքո, որից՝ 50,75 հեկտարը գտնվում է «Վանաձորի անտառտնտեսության» մասնաճյուղի սահմաններում, իսկ 120,95 հեկտարը՝ Գյուլագարակի պետական արգելավայրի սահմաններում:

Ձեր գրությամբ ներկայացրած կոորդինատային տվյալները չեն համապատասխանում շրջակա միջավայրի նախարարության գլխավոր քարտուղարի 2024 թվականի մարտի 24-ի № 5/16.11/3214 գրությամբ պահանջված WGS-84 (ARMREF 02) ազգային գեոդեզիական կոորդինատային համակարգի կոորդինատային տվյալներին: Նախատեսված տարածքին կամ մերձակա, հարակից տարածքներին վերաբերող տեղեկություններ կարող եք գտնել հետևյալ իրավական ակտերում.

- ՀՀ կառավարության 2014 թվականի սեպտեմբերի 25-ի «Հայաստանի Հանրապետության բնության հատուկ պահպանվող տարածքների ռազմավարությունը, պահպանության և օգտագործման բնագավառում պետական ծրագիրը և միջոցառումները հաստատելու մասին» N 1059-Ա որոշում,
- Կառավարության 2017 թվականի փետրվարի 23-ի «Դիլիջան» ազգային պարկի 2017-2026 թվականների կառավարման պլանը և կառավարմանն ուղղված առաջնահերթ միջոցառումները հաստատելու մասին» N 190-Ն որոշում,

ՀԱՅԱՍՏԱՆԻ ՀԱՆՐԱՊԵՏՈՒԹՅՈՒՆ
ՇՐՋԱԿԱ ՄԻՋԱՎԱՅՐԻ ՆԱԽԱՐԱՐՈՒԹՅՈՒՆ
0010, ք.Երևան, Հանրապետության հր., Կառավարական տուն 3
3 Government Bld., Republic Sq., Yerevan, Armenia, 0010
0010, Армения, г.Ереван, Пл. Республики, Дом Правительства 3
☎ +374 11 818 520 | 🖷 +374 11 818 506

- Կառավարության 2007 թվականի հունվարի 18 -ի «Սևան» ազգային պարկի 2007-2011 թվականների կառավարման պլանի (հողերի օգտագործման սխեմայի) հաստատման մասին» N 205-Ն որոշում,
- ՀՀ կառավարության 2008 թվականի օգոստոսի 14-ի «Հայաստանի Հանրապետության բնության հուշարձանների ցանկը հաստատելու մասին» N 967-Ն որոշում:

Կից ներկայացնում եմ «Ստեփանավանի» անտառտնտեսության և «Դիլիջան» ազգային պարկի քարտեզները:

Առդիր՝ 1 խտանիշք:

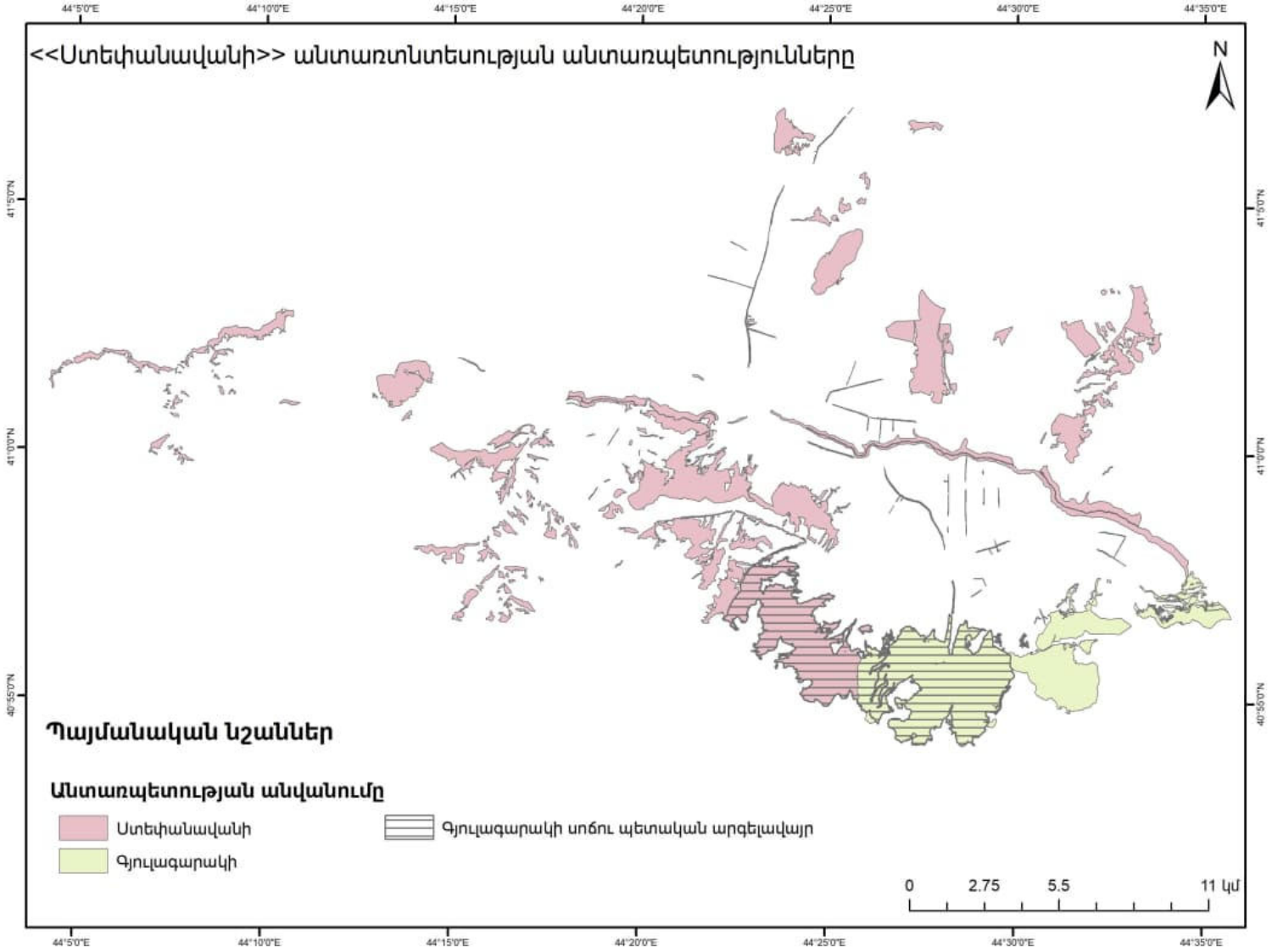
6/5/2024

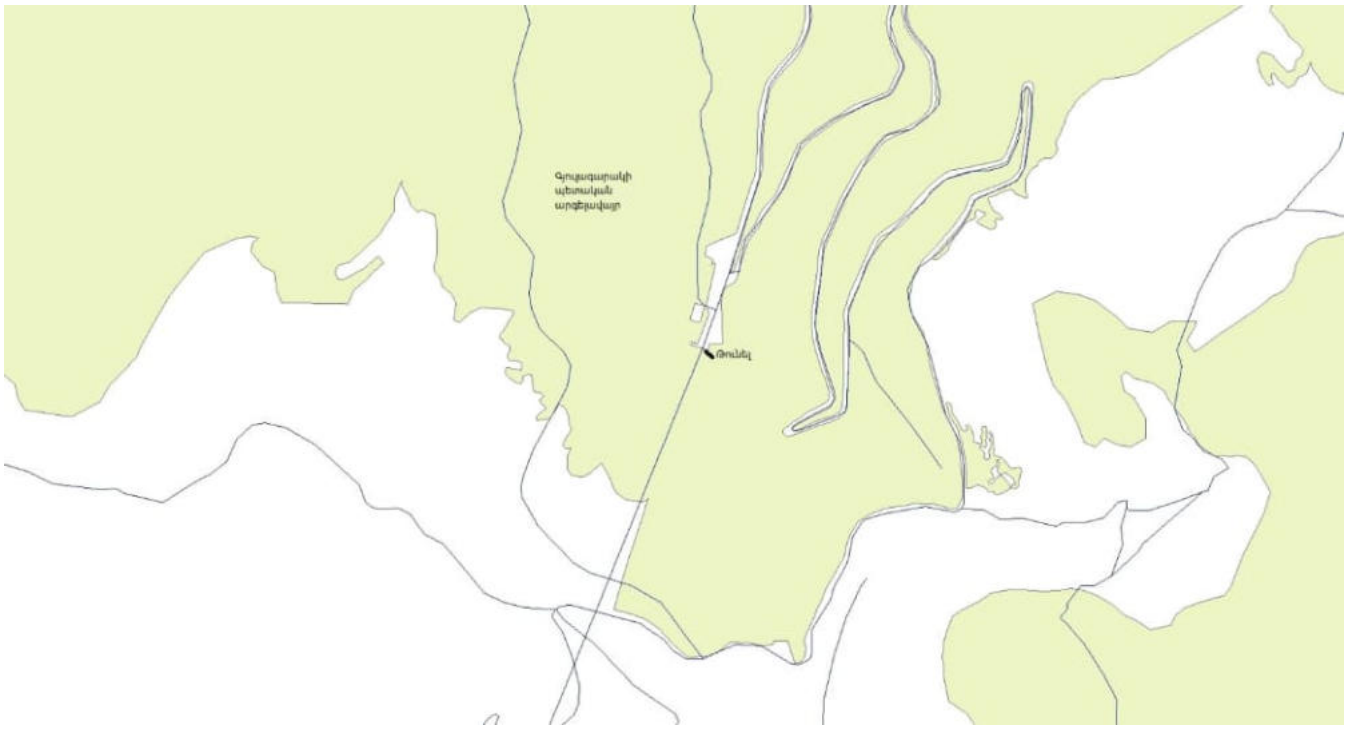
X

ՍԵՐԳՈ ԱԹԱՆԵՍՅԱՆ

Հարգանքով՝ Signed by: ATANESYAN SERGO 4007880425 Սերգո Աթանեսյան

ԲՀՊՏ և կենսաբազմազանության քաղաքականության
վարչություն Արմեն Գրիգորյան 011 818 516


<<Ստեփանավանի>> անտառտնտեսության անտառպետությունները
N
44°5'0"E
44°10'0"E
44°15'0"E
44°20'0"E
44°25'0"E
44°30'0"E
44°35'0"E
41°5'0"N
41°0'0"N
40°55'0"N
Պայմանական նշաններ
Անտառպետության անվանումը
Ստեփանավանի
Գյուլագարակի
Գյուլագարակի սոճու պետական արգելավայր
0
2.75
5.5
11 կմ


Գուգարաթաղի
պետական
արգելավայր
Թունել

Appendix K: Minutes of Public Consultations

Minutes of the Public Discussions held in Gargar Community on the December 5th 2024

Project presentation team

Refer to list and details contained within the body of the report

List of participants

Khachik Vardanyan, plus participants noted on the list below

This year at 12.30pm on the 5th of December 2024, public discussions were held in the Lori region of Republic of Armenia (RA), specifically the Gulagarak community and Gargar settlement within the framework associated with the “Reconstruction of the Pushkin Tunnel” program.
The discussions were attended by Khachik Vardanyan, the community leader for the Gyulagarak, Gor Aghajanyan, the administrative head of Gargarr, as well as community residents and employees of the Gargarr village administration. There were a total of 25, participants and the record of attendees is attached below.

The Armenian Department of Roads representatives (below), presented information to the public and supported discussions..

- Aram Vardanyan – Project Manager
- Samvel Mkrtchyan – Project Engineer
- Inessa Zargaryan – Environmental protection specialist

Bernard Gruppe ZT (Austria)" and "Transproject (Yerevan, Armenia)" consortium were also present by the following representatives :

- Markus Türtscher – Project Designer
- Alisa Savadyan – Environmental and Social Issues Specialist
- Tigran Begumyan – Legal Expert and Project Lawyer

Khachik Vardanyan, the head of the Gyulagarak community, opened the meeting with a, brief introduction and confirmed the purpose of the discussions to the attendees, and then opened the meeting to Alisa Savadyan.

Alisa Savadyan presented the composition of the team, reiterated the purpose of the meeting and the details of the program implementation, noting the importance of the tunnel repair works for Lori marz. She emphasized that local residents would be involved in the construction works, which, in turn, will also have a temporary social positive impact in providing employment opportunities to the local residents. Alisa

Savadyan noted that the technical design team was present and ready to answer any questions regarding the tunnel rehabilitation, technical aspects, temporary detour roads, implementation deadlines, and other details. She then passed the meeting to Markus Türtscher from Bernard Gruppe ZT (Austria) to explain the tunnel design works.

Markus explained (through a translator), the types of work to be carried out, He emphasized that a year ago a study was conducted which resulted in a detailed report identifying key issues with the existing condition of the tunnel and the works required to refurbish the tunnel and tunnel portal areas. There works include, partial demolition of the tunnel walls, replacement of the concrete surfaces, installation of a new road surface, repair of the drainage system, as well as repair and expansion of the parallel escape tunnel by an additional 450 meters and construction of intermediate connections between the tunnels to ensure safe and long-lasting operation of the tunnel.

Aram Vardanyan, highlighted other issues and details of the tunnel rehabilitation, and noted that the current tunnel does not have a fire-fighting system, and this will also be installed to ensure safety within the tunnel. A parallel tunnel will constructed and commissioned for safe evacuation and intermediate connecting passages will be constructed every 300-400 meters. All these works must be carried at a high level of quality within 36 months. During this period, the tunnel will be closed, and a detour will be in operation to manage traffic.

Alisa Savadyan offered the attendees to ask questions to the technical and environmental teams.

A resident asked:

- The community expects to have benefit from the tunnel rehabilitation, particularly considering that the issue of groundwater supply should be resolved. The community eventually expects to have an opportunity use the water for irrigation and partly for drinking (if suitable) in future. This issue was raised during the tunnel study phase, and the residents asked their representative to submit a letter to the relevant department and authorities. It is the resident's belief that a letter was submitted by the Member of Parliament of the RA Government, although the Traffic Department/Authority is yet to be contacted. The resident raised the issue of how the water could be collected and utilized rather than dumped into the river.

Markus Türtscher explained:

- Currently clean ground water and surface polluted water are mixed, and they cannot be used for irrigation. However, following tunnel refurbishment the water will be collected and separated. A water collection reservoir will be built where

the water will gather, and the polluted part will settle as sludge, which will then be mechanically removed from the reservoir and sent for disposal.

Aram Vardanyan added:

> This water will be used for the fire protection system and the excess water can be used by the residents at their convenience, but this will require the installation of a pumping station, which is an additional cost and cannot be realized within the project.

A resident then asked when will the tunnel rehabilitation work start.

Aram Vardanyan:

• Full improvement of the bypass road, namely asphalting, repair of damaged sections, installation of fencing and other works should be carried out fully, and only after their completion will the tunnel renovation will begin. According to approximate estimates, the improvement of the detour road will take about two years.

Resident:

• Is it possible to involve residents in the construction process, and it will be desirable if the local people can be involved in the construction, local people should be able to use the tunnel instead of the bypass road during construction considering that the program of work and project duration will complicate their lives and movement.

Samvel Mkrtchyan:

• During the construction process, all these issues will be managed by the contractor. Of course, the workers involved in the construction will have their passes, which will allow them to enter the construction site without additional complications. Besides that, the contractor may provide transportation for the workers, which will transport them to the construction site and to the community during the day.

Aram Vardanyan:

• During the tunnel repair, the bypass road will only work in the summer months because it is built in a mountainous area and will be dangerous in winter. In the winter, limited work will be undertaken in the tunnel that allows partial use of the tunnel by vehicles.

Resident:

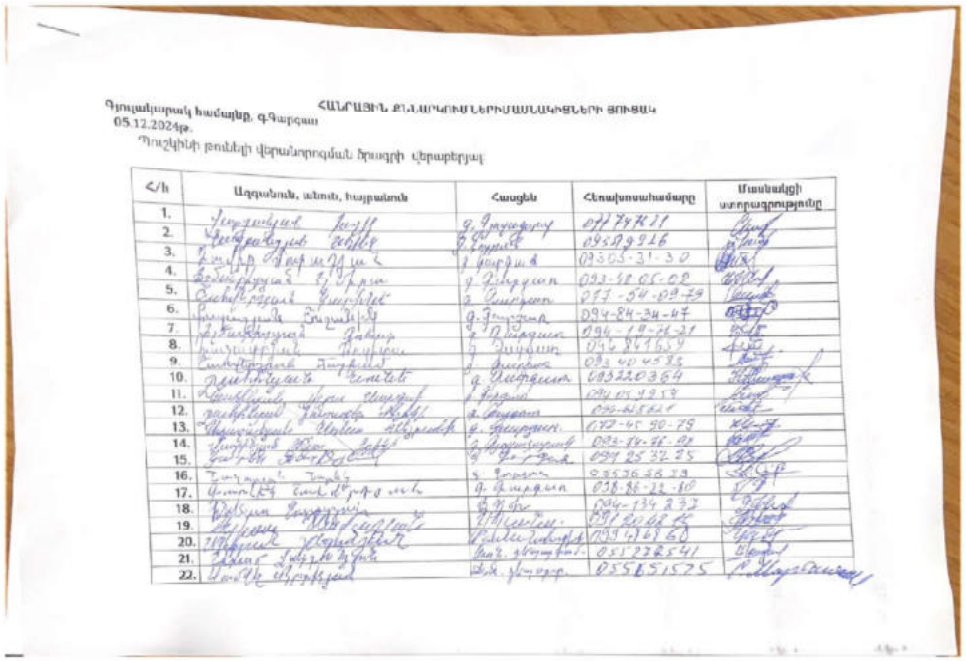
• The issue of water usage for irrigation purposes was raised again.

Alisa Savadyan:

With this project and programme of works, it is impossible to make changes in the project or create an additional projects. On this issue you should contact the Ministry of Territorial Administration and Infrastructure of Armenia, specifically the Water Committee, which can consider this opportunity within the framework of a state or any other program. A. Savadyan emphasized that it is necessary to understand where the letter was sent and whether it was sent to the correct recipient or not.

The discussions were summed up, and the team gave comprehensive answers to all questions.

List of participants



Գյուղախորհրդի նիստերի դահլիճ, գ.Գարգառ
05.12.2024թ.

ՀԱՆՐԱՅԻՆ ՔՆՆԱՐԿՈՒՄ ԸՆԹԱՑԱԿԱՐԳԵՐԻ ՑՈՒՑԱԿ

Պուշկինի թռուցիկի վերանորոգման ծրագրի վերաբերյալ

Հ/հ	Ազգանուն, անուն, հայրանուն	Հասցեն	Հեռախոսահամարը	Մասնակցի մտերազրությունը
1.		գ. Գարգառ	077 77 77 11	
2.		գ. Գարգառ	093 09 99 26	
3.		գ. Գարգառ	0905 31 30	
4.		գ. Գարգառ	093-42-65-02	
5.		գ. Գարգառ	077-54-09-79	
6.		գ. Գարգառ	094-84-34-47	
7.		գ. Գարգառ	094 48-46-21	
8.		գ. Գարգառ	096 84 16 39	
9.		գ. Գարգառ	093 40 45 83	
10.		գ. Գարգառ	093220364	
11.		գ. Գարգառ	094 67 42 53	
12.		գ. Գարգառ	094-48 82 6	
13.		գ. Գարգառ	077-45 90-79	
14.		գ. Գարգառ	093-84-46-49	
15.		գ. Գարգառ	094 25 32 25	
16.		գ. Գարգառ	093 26 28 79	
17.		գ. Գարգառ	098-86-22-80	
18.		գ. Գարգառ	094-134 272	
19.		գ. Գարգառ	091 20 08 45	
20.		գ. Գարգառ	099 41 61 60	
21.		գ. Գարգառ	0 81 27 25 41	
22.		գ. Գարգառ	055 65 15 75	

23.		գ. Գարգառ	093 40 35 21	
24.				
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26.		գ. Գարգառ	077-14-15-96	
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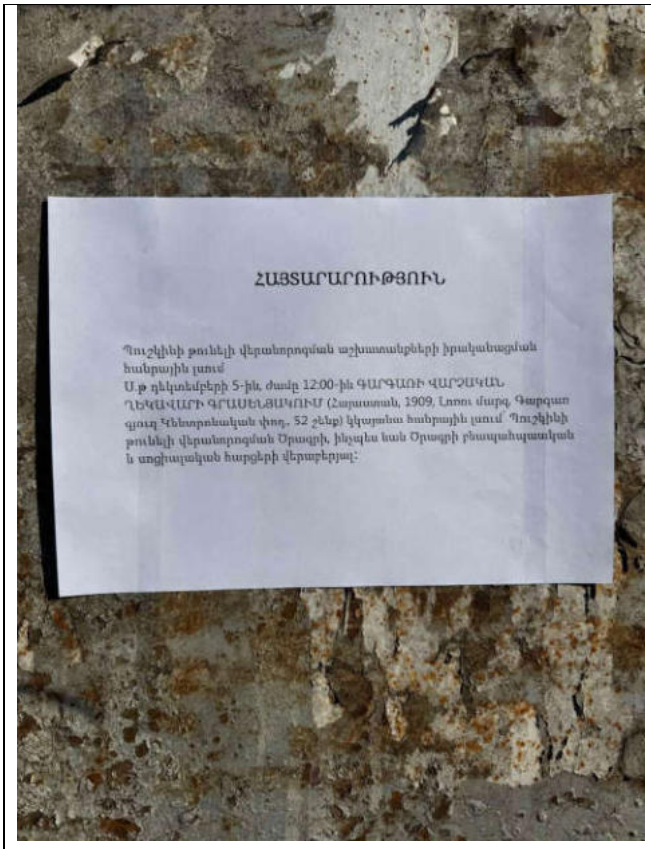
համայնքի ղեկավար

ԼՍԱՐՏՆՅԱՆ

Pictures


ՀԱՅՏԱՐԱՐՈՒԹՅՈՒՆ
Պուշկինի թունելի վերանորոգման աշխատանքների իրականացման
հանրային լսում
Մ.թ դեկտեմբերի 5-ին, ժամը 12:00-ին ԳԱՐԳԱՌՈՒ ՎԱՐՉԱԿԱՆ
ՂԵԿԱՎԱՐԻ ԳՐԱՍԵՆՅԱԿՈՒՄ (Հայաստան, 1909, Լոռու մարզ, Գաթգատ
գյուղ Չինտրեական փող., 52 շենք) կկայանա հանրային լսում՝ Պուշկինի
թունելի վերանորոգման Օրապրի, ինչպես նաև Օրապրի բնապահպանական
և սոցիալական հարցերի վերաբերյալ:

Minutes of the Public Discussions Held in Bazum Community on December 5

This year on December 5, at 14:30, public discussions were held in the village of Bazum, Gyulagarak community, Lori province, within the framework of the "Rehabilitation of Pushkin Tunnel" project.
The discussions were attended by Arthur Tsaturyan, the administrative head of Bazum, as well as community residents and employees of the Bazum village administration. The total number of participants was 15, and the list of participants is attached.

From the Department of Roads, at the public discussions were present.

- Aram Vardanyan – Project Manager
- Samvel Mkrtchyan – Project Engineer
- Inessa Zargaryan – Environmental protection specialist

Representatives from the consortium responsible for the design works, "Bernard Engineering" and "Transnakhagits," were also present:

- Markus Türtscher – Project Designer
- Alisa Savadyan – Environmental and Social Issues Specialist
- Tigran Begumyan – Lawyer

Arthur Tsaturyan, the administrative head of Bazum, introduced the purpose of the discussions to the attendees and then passed the word to Alisa Savadyan.
Alisa Savadyan presented the composition of the team, the purpose of the meeting and the details of the program implementation, noting the importance of the tunnel repair works for Lori marz. She emphasized that local residents would be involved in the construction works, which, in turn, will also have a temporary social positive impact in providing employment to the local residents. Savadyan mentioned that the technical team was present and ready to answer any questions regarding the tunnel rehabilitation, technological works, temporary detour roads, implementation deadlines, and other details. She then passed the word to Markus Türtscher for an explanation of the design works.

Markus Türtscher, with the help of a translator, explained the types of works to be carried out. He emphasized that a year ago, a study was conducted, resulting in a detailed report on the current condition of the tunnel and the additional necessary constructions. Demolition of the tunnel walls, replacement of the concrete surface, installation of a new road surface, repair of the drainage system, as well as repair and expansion of the parallel tunnel by an additional 450 meters and construction of intermediate connections between the tunnels will ensure safe and long-lasting operation of the tunnel.

Alisa Savadyan offered the attendees to ask their questions to the engineering team.

One resident asked if the water could be treated and used for drinking during the construction of the tunnel, as the problem of drinking water supply in many places is very serious. The village was supposed to be connected to the Novoseltsevo water pipeline, but this work has not yet been done and the village is facing a serious problem. We understood from the words of the administrative head that each resident gets drinking water from their deep well.

Markus Türtscher explained now, clean groundwater and polluted underground water are mixed, and their use is impossible without cleaning. After the tunnel rehabilitation, the waters will be separated, and clean water can be collected in a small reservoir or water basin. The plan does not foresee the realization of the project for the water supply system, but with additional investment, the water can be purified, chlorinated, and pumped to the village.

Resident:

-Now, the water flowing from the tunnel into the lower section of the river is very dirty, it is polluted and, in turn pollutes the river.

Aram Vardanyan mentioned that the situation described by the resident is possible because, as mentioned earlier, the waters are mixed, and the water contaminated with oils and fuels from the tunnel operation flows into the river without purification. As a result of the rehabilitation, the water will be purified, and river pollution will also be prevented.

Aram Vardanyan added that the parallel tunnel will be repaired and will be used for evacuation and emergency purposes.

The residents were interested when the tunnel rehabilitation works will begin.

Aram Vardanyan mentioned that the full improvement and rehabilitation of the detour road is a prerequisite, and the tunnel rehabilitation will not begin until this works are completed. With approximate calculations, the restoration of the detour road will take two years. During the winter, the tunnel road will be used, and the works will be carried out, which will allow to ensure the movement of vehicles through the tunnel. In the summer, the detour mountain road will be available.

A. Tsaturyan mentioned that during the recent floods and heavy rains, several sections of the detour road were damaged, the asphalt layer shifted, and that during the renovation, attention should also be given to the road reinforcement works.

A. Vardanyan mentioned that a study will be carried out, and all necessary measures will be taken to make the detour road safe. This road passes through a mountainous area, but not through residential areas. In any case, mitigation measures related to road congestion should be included in the program documents.

The discussions were concluded, and the team provided comprehensive answers to all the questions.

List of participants

PUBLIC HEARING

IMPLEMENTATION OF REHABILITATION WORKS OF PUSHKIN TUNNEL

ՊՈՒՇԿԻՆԻ ԹՈՒՆԵԼԻ ՎԵՐԱՆՈՐՈԳՄԱՆ ԱՇԽԱՏԱՆՔՆԵՐԻ ԻՐԱԿԱՆԱՑՄԱՆ

ՀԱՆՐԱՅԻՆ ԼՍՈՒՄ

BAZUMA ADMINISTRATIVE COMMUNITY

ԲԱԶՈՒՄԻ ՎԱՐՉԱԿԱՆ ՀԱՄԱՅՆՔ

LIST OF PARTICIPANTS OF PUBLIC CONSULTATION MEETING

ՀԱՆՐԱՅԻՆ ԼՍՈՒՐԴԱՑՎՈՒԹՅԱՆ ՄԱՍՆԱԿԻՑՆԵՐԻ ՑԱՆԿ

5 դեկտեմբերի, 2024

5 December 2024

#	Name/ Անուն Ազգանուն	Position /Պաշտոն	Contacts/ Կոնտակտային տվյալներ	Signature/ Ստորագրություն
1.	[illegible]	[illegible]	093 97 31 43	[illegible]
2.	[illegible]	[illegible]	077 45 00 56	[illegible]
3.	[illegible]	[illegible]	093 96 48 58	[illegible]
4.				
5.				
6.				
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10.				

3.	[illegible]	[illegible]	093 48 68 58	[illegible]
4.	[illegible]	[illegible]	0340800 12	[illegible]
5.	[illegible]	[illegible]	09885668 1	[illegible]
6.	[illegible]	[illegible]	077 83 21 84	[illegible]
7.	[illegible]	[illegible]	093 47 48 65	[illegible]
8.	[illegible]	[illegible]	055 27 25 41	[illegible]
9.	[illegible]	[illegible]	055 65 15 25	[illegible]
10.	[illegible]	[illegible]	094 54 11 59	[illegible]

PUBLIC HEARING

IMPLEMENTATION OF REHABILITATION WORKS OF PUSHKIN TUNNEL

ՊՈՒՇԿԻՆԻ ԹՈՒՄԲԱՅԻ ՎԵՐԱՆՈՐՈԳՄԱՆ ԱՇԽԱՏԱՆՔՆԵՐԻ ԻՐԱԿԱՆԱՑՄԱՆ

ՀԱՆՐԱՅԻՆ ԼՍՈՒՄ

BAZUMA ADMINISTRATIVE COMMUNITY

ԲԱԶՄԱՄԻ ՎԱՐՉԱԿԱՆ ՀԱՄԱՅՆՔ

LIST OF PARTICIPANTS OF PUBLIC CONSULTATION MEETING

ՀԱՆՐԱՅԻՆ ԽՈՐՀՐԴԱԿՑԱԿԱՆ ՄԱՍՆԱԿՑՈՒԹՅԱՆ ՄԱՍՆԱԿՑՈՒՄՆԵՐԻ ՑԱՆԿ

5 դեկտեմբերի, 2024

5 December 2024

#	Name/ Անուն Ազգանուն	Position/ Պաշտոն	Contacts/ Կոնտակտային տվյալներ	Signature/ Ստորագրություն
1.	[illegible]	[illegible]	094 13 42 33	[illegible]
2.	[illegible]	[illegible]	091 20 42 15	[illegible]

Pictures

Appendix L: Correspondence from Gulagarak Community on waste disposal areas

ՀԱՅԱՍՏԱՆԻ ՀԱՆՐԱՊԵՏՈՒԹՅԱՆ ԼՈՌՈՒ ՄԱՐԶ
ԳՅՈՒԼԱԳԱՐԱԿԻ ՀԱՄԱՅՆՔԱՊԵՏԱՐԱՆ

«27» մայիսի 2024թ.

N 743

<<ՏՐԱՆՍՆԱԽԱԳԻԾ>> ՓԲԸ-ի ՏՆՕՐԵՆ
Պ-Ն ԷԴՈՒԱՐԴ ՄԱՐՏԻՐՈՍՅԱՆԻՆ

Հարգելի պարոն Մարտիրոսյան

Ի պատասխան Ձեր 27.05.2024թ.թիվ 634 գրության տեղեկացնում ենք, որ Պուշկինի թունելի հիմնանորոգման ընթացքում առաջացած շինարարական աղբը կտեղափոխվի Գյուլագարակ բնակավայրի արևելքից դուրս եկող Գարգառ գետի ձախ ափ՝ 11 կմ հեռավորության վրա:

ՀԱՄԱՅՆՔԻ ՂԵԿԱՎԱՐ՝ ԽԱՉԻԿ ՎԱՐԴԱՆՅԱՆ

Կատ.՝Ա.Սարուխանյան
Հեռ.093747638

Հայաստանի Հանրապետության Լոռու մարզի Գյուլագարակ համայնք

In 2024 of May 27

N.71043

Referred to the Director of "Transproject" CJSC Eduard Martirosyan

Dear Mr. Martirosyan

In response to your letter No. 634 dated 27.05.24, we are informing you that the construction waste generated during the overhaul of the Pushkin tunnel will be moved to the left side of the Gargar River, which exits from the east of the Gulagarak settlement, at a distance of 11 km.

Head of the community: Khachik Vardanyan

Appendix M: Correspondence from Pambak Community on waste disposal areas

ՀԱՅԱՍՏԱՆԻ ՀԱՆՐԱՊԵՏՈՒԹՅԱՆ ԼՈՌՈՒ ՄԱՐԶԻ ՓԱՄԲԱԿ ՀԱՄԱՅՆՔԻ ՂԵԿԱՎԱՐ

Հայաստանի Հանրապետության Լոռու մարզի Փամբակ համայնք
22 Լոռու մարզ, գ.Փամբակ, Հեռ. +374 98393131, info@pambak.am

N Ե-0074/25
13 հունվար 2025թ.

ՏԻԳՐԱՆ ԲԵԳՈՒՆՑԱՆԻՆ

Ի պատասխան Ձեր 13.12.2024 թվականի դիմումի,

Տեղեկացնում եմ, որ շինարարական թափոնները կարող է տեղափոխվել թունելից մոտ 8 կմ հեռավորության վրա գտնվող տարածք:

Կից ներկայացնում եմ տարածքի տեղադիրքի լուսանկար:

Առդիր՝ էլ. նյութ:

Wiederherstellbare Signatur

X

Signiert von: KOSTANDYAN SUREN 1711880647

ՀԱՄԱՅՆՔԻ ՂԵԿԱՎԱՐ **Ս. ԿՈՍՏԱՆԴՅԱՆ**

Կատ. Բաղումի վարչական ղեկավար՝ Ա. Մատոյան
+37494060012

HEAD OF THE PAMBAK COMMUNITY OF THE LORI REGION OF THE REPUBLIC OF ARMENIA

The Pambak community of the Lori region of the Republic of Armenia Lori region of the Republic of Armenia,

Pambak village, Tel. +374 98393131, info@pambak.am

N Ъ-0074/25
January 13, 2025

TO TIGRAN BEGUNYAN

In response to your application dated 12/13/2024,
I would like to inform you that construction waste can be moved to a site located about 8 kilometers from the tunnel.

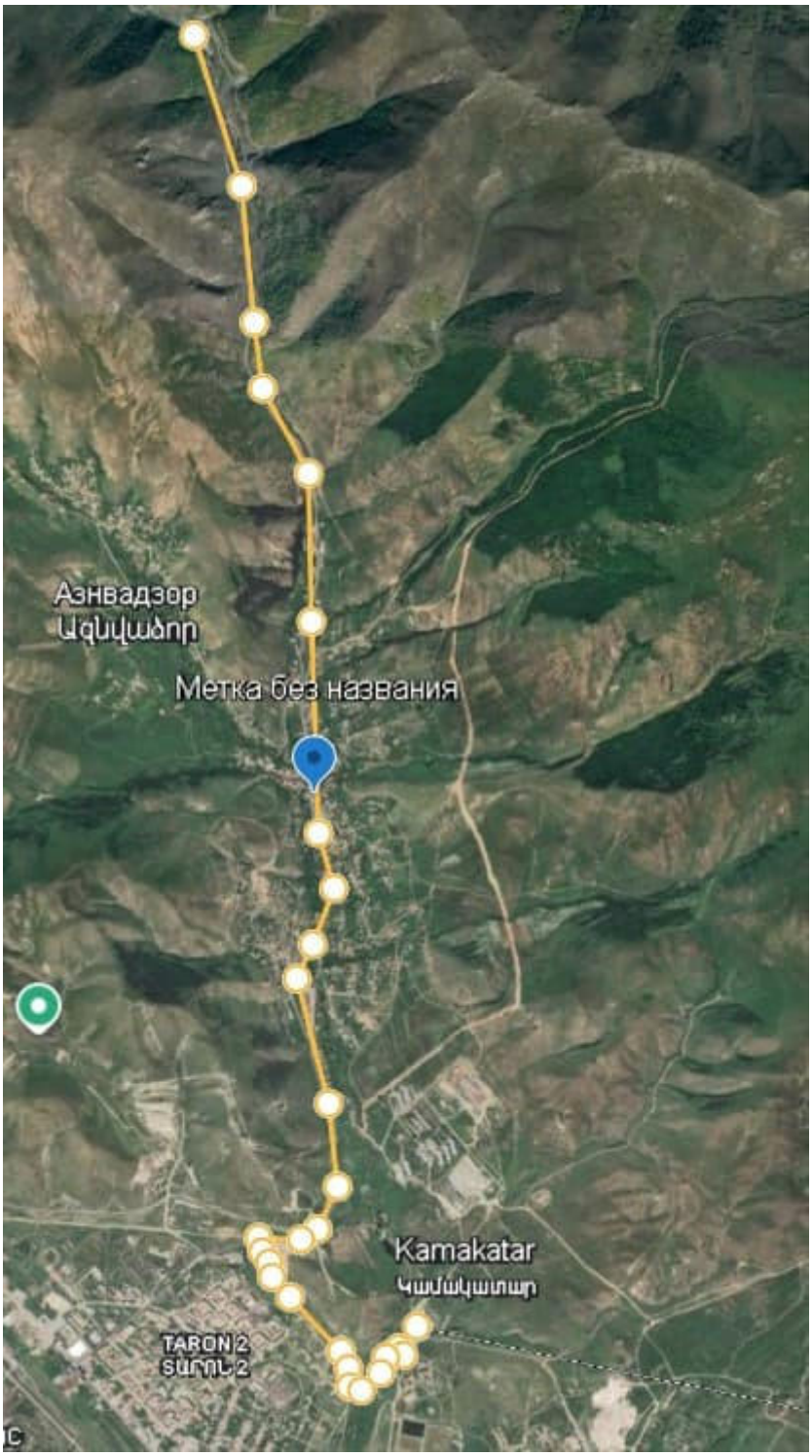
See attached photo of the location.
Also attached: electronic material

X _____

COMUNNITY HEAD. **S.KOSTANDYAN**

Administrator of the Bazum settlement A. Tsaturyan

+37494060012


Азнвадзор
Ազնվաձոր
Метка без названия
Kamakatar
Կամակատար
TARON 2
ՏԱՐՈՆ 2

Appendix N: Incident / Accident Forms

INCIDENT NOTIFICATION FORM

Project:		**Incident Date:**	
Location:		**Incident Time:**	
Equipment Involved:		**Operation in Progress:**	

Weather: ☐ Clear ☐ Dark ☐ Rain ☐ Snow ☐ High Winds ☐ Other (describe):
Visibility: ☐ Artificial Light ☐ Dark ☐ Dawn ☐ Daylight ☐ Dusk

Reporting Level of Incident:

☐ Fatality ☐ Lost Time ☐ Restricted Work ☐ Medical Aid ☐ First Aid	☐ Near Miss ☐ Equipment Damage ☐ Property Damage ☐ Fire/Explosion	☐ Business Interruption ☐ Security/Trespass/Theft ☐ Mobile Equipment ☐ Vehicle ☐ Spill/Release	☐ Government Reportable ☐ Non-reportable ☐ Contravention ☐ Public Complaint

Contractor Incident: ☐ Yes ☐ No **Contractor name:**

Report Prepared by: Signature: Date:	**Supervisor's Name:** Tel. No. Date:

AFFECTED PERSONS (Worker Positions)

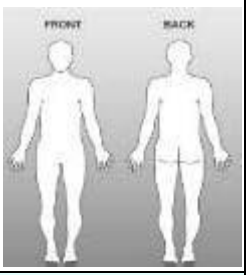
DESCRIPTION OF INCIDENT (Describe what, when, why, who and how. Use separate pages if required. Attach photos if applicable.)

(i) WITNESSES- Provide separate witness reports

(ii) Name		**(iii)**	**(iv)** Contact Information
(v)		**(vi)**	**(vii)**
(viii)		**(ix)**	**(x)**

(xi) NOTIFICATIONS

What internal notifications have been made?	What external notifications have been made?

INJURY INFORMATION (if applicable)	
Position:	Current condition:
Was injured person(s) taken to hospital? Yes ☐ No ☐ *(If yes, provide name and location of the hospital)*	
Indicate the area of injury, if applicable, on the diagram to the right, and describe the injury in the space below:	
VEHICLE INFORMATION (if applicable)	
Driver's Name:	Driver's License No.:
Year, Make & Model:	Driver's Phone Number:
License Plate or Serial Number:	Insurer and Policy No.:
Was seat belt done up? ☐ Yes ☐ No	Was a cell phone being used? ☐ Yes ☐ No
Were police notified? Yes ☐ No ☐	Name of police officer:
Road conditions: ☐ Dry ☐ Gravel ☐ Wet ☐ Icy	Other Info/Attachments:
Spill/Release Information (if applicable)	
Product: **Volume:** **Quantity Recovered:**	
Initial Causal Analysis of Incident:	
Direct Cause: (what / how)	
Root Cause: (why)	
Corrective Actions to Prevent Recurrence:	

Note: Refer to the "Root Cause Investigation & Corrective Action Form" for further detail.

INCIDENT ROOT CAUSE INVESTIGATION AND CORRECTIVE ACTION FORM

Project:		**Incident Date:**	
Location:		**Incident Time:**	
Incident Title:			

Has the Incident Notification Form been completed? ☐ Yes ☐ No
If not, complete the incident notification form before completing this form.

☐ Fatality ☐ Lost Time ☐ Restricted Work ☐ Medical Aid ☐ First Aid	☐ Near Miss ☐ Equipment Damage ☐ Property Damage ☐ Fire/Explosion	☐ Business Interruption ☐ Security/Trespass/Theft ☐ Mobile Equipment ☐ Vehicle ☐ Spill/Release	☐ Government Reportable ☐ Non-reportable ☐ Contravention ☐ Public Complaint

Report Prepared by: Signature: Date:	**Supervisor's Name:** Signature: Date:

This form is used to help analyze incident **root causes** and **contributing factors**. Incidents rarely arise due to one single cause, and there are often multiple contributing factors that are involved in an incident.
A **cause** is a condition that produces an effect. If a cause is eliminated, the effect is eliminated.
A **contributing factor** is a condition that influences the effect but does not cause the effect. If the contributing factor is eliminated, the effect is not necessarily eliminated but may be influenced in other ways, such as being less severe, less likely, proceeding more slowly, or other similar effects.

DESCRIPTION OF INCIDENT (Use separate pages if required. Attach photos if applicable.)

Root Cause and Contributing Factor Analysis (add more pages if necessary for any section)

LEADING EVENTS ANALYSIS (Describe the events leading up to the incident that were different to a normal sequence of events for this activity. Consider whether changes from normal sequences of events were causes or contributing factors to the incident.) (Refer to Chapter 6 of the ADB OCHS Guide for detail)

Were the proper safe work practices and procedures being used by the workers in the events leading up to the incident? If not, why not?

Were relevant legislation and standards being followed by the workers in the events leading up to the incident? If not, why not?

Were there any mechanical failures or defects that led to the incident? If yes, describe below:

Were the proper safety devices in place and being used? Were workers using proper personal protective equipment (PPE)? If not, why not?

Did the actions or lack of actions of anyone at the worksite contribute to the incident? If yes, describe below:

Were there any unusual conditions that contributed to the incident, such as (but not limited to) weather, other activities in the area, or anything else that was not typical for the task?

Did the workers present at the incident respond in a safe and appropriate way? Describe below:

Were the workers adequately trained to respond to the incident? If not, what training would have helped to lead to a better outcome?

Are there adequate procedures in place to respond to similar incidents? If not, what procedures need to be developed?

Check any causes and contributing factors from the following list. If necessary, add additional causes and contributing factors.

☐ Operating equipment without training
☐ Operating equipment without proper care
☐ Operating equipment without safety devices in place or with inoperable safety devices
☐ Inadequate warning to workers of a safety issue
☐ Inadequate barriers or barricades
☐ Using defective tools or equipment
☐ Proper equipment unavailable
☐ Improper loading
☐ Poor housekeeping practices
☐ Repetitive action injury
☐ Poor maintenance of tools/equipment
☐ Hazardous conditions (gas, dust, fumes)
☐ Inadequate site security
☐ Inadequate worker protection from toxic substances
☐ Inadequate PPE
☐ Improper use of PPE
☐ Inadequate lighting
☐ Inadequate ventilation
☐ Inadequate supervision
☐ Inadequate training
☐ Fatigue
☐ Worker(s) under the influence of substances such as alcohol c medications
☐
☐
☐

List the contributing factors and their involvement as a cause of the incident.

Contributing Factors	Involvement

Describe the root cause (s) below:

Corrective Action Analysis

List the corrective actions already taken or planned to prevent a similar incident from occurring. Indicate whether the corrective action is already complete and who is responsible for implementing it.

Corrective Action	Person Responsible	Status?

Summarize any further information learned from this root cause and contributing factor analysis, including any information that needs to be shared with the workers or worksite management.

APPENDIX O: Outline for Contractor's Site-Specific Environmental Management Plan

A. Introduction: description of what the present SSEMP is developed for, geographic location, PKs; attach map
B. Purpose of the SSEMP;
C. Responsible entities and persons
D. Legislative framework
E. Permissions and approvals
F. Site description:
   I. the present situation, availability of wild nature, topsoil, contaminated soil, dumped waste, trees and shrubs, dust, noise, availability of water bodies, other factors that may impact construction; attach pics
   II. presence of infrastructure: access roads, field roads, pipes, electricity, irrigation, drainage, etc;
   III. presence of sensitive receptors: residential houses, offices, businesses, etc. attach pics;
G. Site operation:
   I. list the works to be implemented here;
   II. Machinery
   III. Staff employed on-site;
H. Impacts and risk Assessment

Complete the Table:

N	Construction Activity	Hazards to consider	Likelihood (1 to 5)	Consequence (1 to 5)	Risk Score	Environmental Mitigation Measures

I. Environmental Management Plans:
   I. Mitigation
      1. Environmental and Safety Orientation Plan
      2. Occupational Health, and Safety Plan
      3. Public Consultation and Communications Plan
      4. Cultural Heritage Management Plan
      5. Surface and Underground Water Protection plan
      6. Flora & Fauna Protection and Vegetation Clearing Plan including the Tree Management Plan
      7. Utilities Protection and Relocation Plan
      8. Environmental Protection Plan
      9. Construction Work Camps Plan (describe the camps, attach the SMP for camp)
      10. Site Management Plan (Quarry and borrow pit, dumping sites, concrete batching and asphalt plants)
      11. Traffic and Access Management Plan
      12. Emergency Response Plan

13. Waste and Material Management Plan (Describe the types and the sources of material: existing or opened, attach permissions types and quantities of waste to be generated in this section, describe the handling of asphalt waste, describe the dump sites existing or newly opened, attach permissions;);
14. Site Reinstatement, Landscaping, and Revegetation Plan : describe how the site will look like upon the closure.

II. Monitoring:

III. Environmental parameters: water quality, air pollution, noise& vibration, describe the measurement points and attach the map;

IV. Regular monitoring of site according to EMP

J. Reporting.