

Semi-Annual Environmental Monitoring Report

Project Number: 53178-001

Semestral Report (January – June 2023)

June 2023

Georgia: East-West Highway (Shorapani – Argveta Section) Improvement Project

Prepared by the Roads Department of the Ministry of Regional Development and Infrastructure of Georgia for the Asian Development Bank.

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Version	Date	Description
1.0	10/07/2023	First version of Semi-annual Environmental Monitoring Report

ABBREVIATIONS

ADB	Asian Development Bank
AP	Affected Person
BOD	Bio-Chemical Oxygen Demand
BP	Batching Plant
CAR	Corrective Action Requirement
CAREC	Central Asia Regional Economic Corridor
CC	Construction Contractor
COD	Chemical Oxygen Demand
CLO	Community Liaison Officer
CSCS	Consultancy Services for Construction Supervision
CSC	Construction Supervision Consultant
CSEMP	Contractor's Contract Specific Environmental Management Plan
dB (A)	Decibel
DO	Dissolved Oxygen
EIA	Environmental Impact Assessment
EIB	European Investment Bank
EMP	Environmental Management Plan
EMR	Environmental Monitoring Report
ESR	Environmental Sensitive Receiver
GRM	Grievance Redress Mechanism
HIV	Human Immunodeficiency Virus
HS	Health & Safety
HSE	Health Safety and Environment
IEE	Initial Environmental Examination
IFC	International Finance Corporation
MAC	Maximum Admissible Concentration
MoEPA	Ministry of Environmental Protection and Agriculture
MoESD	Ministry of Economy and Sustainable Development
MoM	Minutes of Meeting
MRDI	Ministry of Regional Development and Infrastructure of Georgia
NCN	Non-Conformance Notice
NCR	Non-Conformance Report
NFA	National Forest Agency
NOC	No Objection Certificate
OSHA	Occupational Safety and Health Administration
PPE	Personnel Protective Equipment'

PAPs	Project Affected Persons
PIU	Project Implementation Unit
QC	Quality Control
RD	Road Department
RoW	Right of Way
SC	Supervision Consultant
SEMP	Site Specific Environmental Management Plan
SFF	State Forest Fund
SPS	Safeguard Policy Statement
STD	Sexually Transmitted Diseases
TSS	Total Suspended Solids
VG	Village Governor

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1. INTRODUCTION

1. The Project involves construction of a new road section of the E-60 highway located in Imereti Region of central Georgia. Section F4 forms the Shorapani-Argveta portion of the Khevi-Ubisa-Shorapani-Argveta section of the E-60 Highway Route. The Construction Contractor (The Contractor, CC) of the Project is Guizhou Highway Engineering Group Co Ltd and China National Technical Import & Export Corporation Joint Venture. The Consultant for Construction Supervision (The Engineer, CSC/SC) of the Project is UBM Uluslararası Birleşmiş Müşavirler Müşavirlik Hizmetleri A.Ş. (Turkey) and SMEC International PTY LTD (Australia). The signature date of the Contract is 16.01.2020. All environmental safeguard documents are prepared by the Contractor, approved by the Engineer, and sent to the Roads Department of the Ministry of Regional Development and Infrastructure of Georgia (the Employer, RD).

1.1 Preamble

2. This report presents the Semi-Annual Environmental Monitoring review of the Shorapani–Argveta Section (E60 Highway Route), Lot F4 Construction Project, and covers the period of January to June 2023.
3. This report is the seventh Semi-Annual Environmental Monitoring Report (SAEMR) prepared for the Project.

1.2 Headline Information

4. The Project is a newly built two-lane highway project with a total length of 14.7 km and involves the construction of a new road section of the E-60 highway, namely Lot F4, located in the Imereti region that is one of the main historical, economic, cultural and educational regions of central Georgia. Lot F4 forms the Shorapani–Argveta portion of the Khevi-Ubisa-Shorapani-Argveta section of the E-60.
5. The project involves the construction of 2x6 tunnels, 2x7 bridges, 4 interchanges, 2x1 overpasses, 5 underpasses, and 50 culverts. The length of the Project road is given below:
 - 1) Right lane (TA – meaning Tbilisi – Argveta direction) - 14.778 km,
 - 2) Left lane (AT – meaning Argveta – Tbilisi direction) - 14.726 km
6. The Project alignment is located within Zestaphoni Municipality, which covers a total area of 423 square kilometers and includes the towns of Zestaphoni and Shorapani as well as numerous small villages such as Kveda Tseva, Shorapani, Zestaphoni, Kveda Sakara, and Argveta. Besides, the alignment runs through forest areas, agricultural land plots, hilly forest slopes, residential areas, and riparian ecosystems.
7. The Project outlines (km 0+000 – 14.7+000):
 - Classification of road: Highway
 - Design speed: 100 km/h
 - Speed Limit: 80 km/h
 - Road length: 14.7 km
 - Road width: 27.60 m
 - Numbers of lanes: 2x2
 - Lane width: 3.75 m
8. The official work commencement date for the construction is 20 October 2020. The period of implementation of the contract, including the Defects Notification Period and until the issuing of the Final Acceptance and Performance Certificate is 60 (sixty) months after the Commencement Date. The construction completion date has been extended by more than 8 months, and the new completion date for the Project is 30 June 2023.

2. PROJECT DESCRIPTION AND CURRENT ACTIVITIES

2.1 Project Description

9. E-60 highway connecting the Black Sea coast to the capital of Georgia passes through a mountainous area 600-850 meters above the sea level. The Project road comprises Lot F4 (Shorapani – Argveta) of the Khevi-Ubisa-Shorapani-Argveta Road (E-60). The proposed highway is located in the complex hilly-mountainous geographical area and crosses numerous mountains, rivers, and ravines. Mixed forests, typical of this climate zone, cover the slopes of the mountains.
10. The alignment is located on the left side of the existing 2-lane road both as an exposed road and through two tunnels. The existing road passes through difficult mountainous terrain paralleling first the River Rikotula and then, the River Dzirula and consists of multiple bridges and several tunnels.
11. The government of Georgia has requested Asian Development Bank (ADB) to finance the construction of the proposed highway. The project is classified as Category A Project – Environmental Safeguards under ADB SPS 2009 since it is considered to have significant diverse impacts over a wide area, such as noise impacts, significant quantities of spoil disposal, road safety impacts, and vibration. Environmental Impact Assessment (EIA) was prepared in May 2019 and disclosed on the ADB website in October 2019.
12. The National EIA document was prepared and submitted by the Roads Department (RD) to the Ministry of Environmental Protection and Agriculture (MoEPA) in December 2017. State Ecological Expertise approval was obtained from MoEPA on 26-03-2018. This covers all scopes under the Project.
13. The Project involves the construction of a new road section of the E-60 highway located in the Imereti Region of Central Georgia (Figure 1). Proposed Lot F4 forms the Shorapani-Argveta portion of the Khevi-Ubisa-Shorapani-Argveta section of the E-60. The length of the Project road is given below:
 - 1) Right lane (TA – meaning Tbilisi – Argveta direction) - 14.778 km,
 - 2) Left lane (AT – meaning Argveta – Tbilisi direction) - 14.726 km

Figure 1: Location of Project Area



Figure 1: Location of Project Area

14. The project includes the construction of 12 tunnels with a total length of 8506.36 meters, 14 bridges with a total length of 5020.54 meters, 2 overpasses with a total length of 84.64 meters, 5 underpasses with a total length of 198 meters, 50 culverts with a total length of 1552.07 meters and 4 interchanges.
15. Bridges' length will vary from 32 meters to 846 meters. Tunnels will be constructed with double tubes with lengths from 399 meters to 1193 meters.
16. Technical parameters of the alignment considered during detail design include:
 - Design speed: 100 km/h,
 - Speed Limit: 80 km/h,
 - Number of traffic lanes: 4,
 - Width of traffic lane: 3.75 m,
 - Width of each carriageway: 7.5 m,
 - Width of paved shoulder (emergency lane): 2.5 m,
 - Width of verge: 1.0 m,
 - Width of central reserve: 5.0 m,
 - Width of the paved shoulder at the central reserve: 1.0 m,
 - Total width of each paved platform: 11.0 m,
 - Width of roadbed: 27.60 m,
 - Carriageway cross-fall on straight sections: 2.5%,
 - The minimum radius of the horizontal curve: 400 m,
 - Maximum longitudinal gradient: 4%,
 - Minimum convex curve: 15 000 m, and
 - Minimum concaved curve: 15 000 m.

2.2 Project Contracts and Management

17. Information related to the project execution is given in Table 1 below:

Table 1: Project Information

Employer	Roads Department of Georgia, Ministry of Regional Development and Infrastructure of Georgia
Funding Source	Asian Development Bank
The Engineer	UBM Uluslararası Birleşmiş Müşavirler Müşavirlik Hizmetleri A.Ş. (Turkey) and SMEC International PTY LTD (Australia)
Contractor	Guizhou Highway Engineering Group Co Ltd and China National Technical Import & Export Corporation Joint Venture
Contract Number	SARP/CW/OCB-01
Contract Date of the Contractor	16.01.2020
Starting Date of Construction	20.10.2020
Contract Period	36 months (36+24 month engineer)
Original Completion Date	20.10.2023

Expired time	15
Remaining time	21 months
Defects Notification Period	24.3 months 730 days
Contract Price (GEL)	GEL 582 777 310.00

18. The Terms of References (ToR) for the Consultancy Services for Construction Supervision (CSCS) Contract contains the following tasks for the environmental specialists:

- Scrutinize the Contractor’s construction method statement for its compliance with environmental aspects,
- Review and approve Contractor Site Specific Environmental Management Plans (EMP),
- Supervise the Contractor in all matters concerning environmental aspects,
- Monitor compliance with the EMP by the Contractor and issue Non-conformances Reports (NCR) as needed,
- Review Contractor’s Corrective Action Plans (CAR),
- Review and approve temporary construction areas use and associated Site-Specific EMPs for such sites,
- Assist the Employer in undertaking and monitoring environmental safeguards,
- Identify and report any environmental issues that may arise during construction to the Team Leader and the Employer,
- Perform regular coordination with the Employer for any matters related to the implementation, monitoring, and reporting of ADB’s safeguards policy.

19. The obligation of the Contractor, to safeguard, mitigate adverse impacts, and rehabilitate the environment is addressed through environmental provisions in the Fédération Internationale Des Ingénieurs-Conseils (FIDIC) conditions of the contract for construction, Multilateral Development Banks (MDB) harmonized addition- June 2010, and special clauses included in the contract related to the environment, especially, section 116 (pollution) and Appendix X of technical specifications. FIDIC clauses 4.18 (protection of the environment), 4.8 (safety procedures), 6.4 (labor laws), 16.3 (cessation of work/ remedial work), 2.3b (employer’s personnel), 4.21 (progress report) are important in this regard.

20. The Contract for CSCS was awarded to UBM for three phases of the project:

- 1) Phase 1: Design review, to be completed in a period of three months and submitted to RD
- 2) Phase 2: Construction supervision and contract administration. The construction period is for 36 months
- 3) Phase 3: Defects Notification Period, 24 months

21. Contact details of ADB, SC, CC, and RD representatives are given in Table 2 below:

Table 2: Main Environmental Staff of ADB, CC, SC, and RD

Organization	Position	Name
ADB	Head Office, Senior Environment Specialist, Portfolio, Results, Safeguards and Gender Unit (PSG), CWRD	Name: Ninette Pajarillaga e-mail: npajarillaga@adb.org

	ADB National Environmental Safeguards Consultant	Name: Giorgi Kobaladze Cell: +995599689834 e-mail: gkobaladze.consultant@adb.org
	Associate Safeguards Officer Georgia Resident Mission	Name: Nino Nadashvili Cell: +995 595 070442 e-mail: nnadashvili@adb.org
RD	Environmental Specialist	Name: Tamar Nasuashvili Cell:+995595598281 e-mail: tamara2903@gmail.com
	Deputy Head of Environmental Unit	Name: Gia Sopadze Cell: +10599939209 e-mail: sogia@gmail.com
SC	International Environmental Specialist	Emre Duran (started work on June 2022) Cell:+905325258556 e-mail: eduran@ubm.com.tr/duran.emre.tr@gmail.com
	Environmental Expert	Mari Kechkhuashvili (started work on May 2022) Cell:+995599398777 e-mail: kechxushvili.mari94@gmail.com
CC	Project Manager	Name: Chen Yuqiang Cell: +995599200396 e-mail: gggg3bc@gmail.com
	Environmental Specialist	Name: David Kurdadze Cell: +995595116017 e-mail: kurdadzedavid999@gmail.com
	Environmental Specialist	Name: Levan Ozbetelashvili Cell: +995595116017 e-mail: levani.ozbetelashvili.1@iliauni.edu.ge

22. The ongoing civil works and works' progress is given in section 2.3. All awarded contracts included EMPs cleared by ADB and any conditions of applicable national EIA clearance.
23. Under the contract, the Contractor shall comply with all applicable national and local environmental laws and regulations as well as applicable respective standards under the Contract. The Contractor is responsible to:
- Establish an operational system for managing environmental impacts,
 - Develop the SEMP as well as topic-specific EMPs by identifying environmental risks arising from the works, the mitigation measures to be applied, and monitoring to be carried out,
 - Implement the required mitigation measures and monitoring,
 - Take any corrective or preventative actions set out in safeguards monitoring reports that the Employer will prepare from time to time to monitor the implementation of the EMP,
 - Submit monthly compliance reports to the engineer.
24. The Contractor, Guizhou Highway Engineering Group Co Ltd, is responsible for the implementation of SEMP throughout the project during the construction phase. The Supervision Consultant, UBM (Engineer), is responsible to:
- Monitor the implementation of SEMP by the Contractor at all its active construction sites and project-related facilities,
 - Prepare monthly and semi-annual Environmental Monitoring reports for the Employer based on the SEMP monitoring and implementation activities.

25. Responsibility for daily management for environmental monitoring and implementation of the SEMP is given to the Health Safety and Environment (HSE) Manager, Mr. Du Jun. He has direct authority from the Project Manager to give instruction to all site staff regarding environmental issues. The project organization chart for key management staff of Guizhou Highway Engineering Group Co Ltd is provided in Figure 2 and the organization chart for Health, Safety, Environmental and Social management is shown in Figure 3.

Figure 2: Contractor Project Management Staff

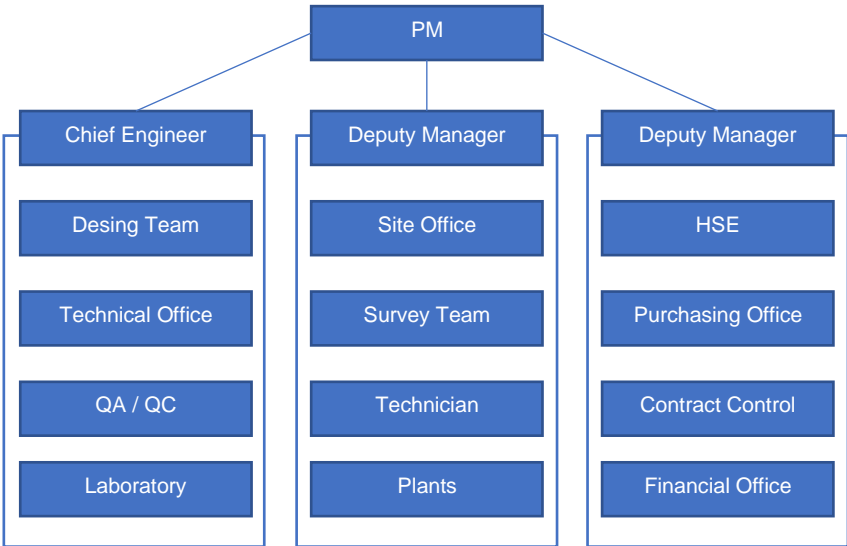


Figure 3: Contractor’s H&S, Environmental and Social Organization Chart



2.3 Project Activities during Current Reporting Period

26. Table 3 summarizes the construction activities that are being undertaken during this monitoring and reporting period at various sections of the Project.

Table 3: Project Activities Carried Out during the Reporting Period

Tunnel №1, Tbilisi side	Cutting of slope and construction of the access road Continued slope protection works by steel mesh and shotcrete	On-going
Tunnel №1 AT, Argveta side	Continued excavation of the tunnel, installation of steel ribs and 20-cm shotcrete spraying	On-going
Tunnel №1 TA, Argveta side	Continued excavation of the tunnel, installation of steel ribs and 20-cm shotcrete spraying	On-going
Tunnel №2 AT, Tbilisi side	Continued mechanical excavation of the bench, installation of steel ribs and 20-cm shotcrete spraying, construction of invert and installation of waterproofing membrane and final lining construction is ongoing	On-going
Tunnel №2 TA, Tbilisi side	Continued excavation of the bench, installation of steel ribs and 20-cm shotcrete spraying and construction of invert and installation of waterproofing membrane and final lining construction is ongoing	On-going
Tunnel №2, Argveta side	Continued mechanical excavation of the tunnel, installation of steel ribs and 20-cm shotcrete spraying.	On-going
Tunnel №3 AT Tbilisi side	Continued excavation of the tunnel, installation of steel ribs and 20-cm shotcrete spraying, construction of invert and application of waterproofing membrane, and construction of final lining Tunnel №3 TA Tbilisi side - continued excavation of the tunnel, installation of steel ribs and 20-cm shotcrete spraying, construction of invert and installation of waterproofing membrane and construction of final lining	On-going
Tunnel №3 AT, Argveta side	Continued excavation of the tunnel, installation of steel ribs and 20-cm shotcrete spraying	On-going
Tunnel №3 TA, Argveta side	Continued excavation of the tunnel by mechanisms, installation of steel ribs and 20-cm shotcrete spraying	On-going
Tunnel №4, TA Argveta side, continued excavation of the tunnel, installation of steel ribs and 20	Cm shotcrete spraying, installation of water proofing membrane and construction of invert	On-going
Tunnel №4, AT, Argveta side	Continued excavation of the tunnel, installation of steel ribs and 20-cm shotcrete spraying	On-going
Tunnel №4, Tbilisi side	Continued construction of temporary portal and earthworks	On-going
Tunnel №5 TA, Tbilisi side	Continued excavation of the lower section by the mean of mechanisms, installation of steel ribs and 20-cm shotcrete spraying. Continued construction of invert and installation of waterproofing membrane	On-going
Tunnel №5 AT, Tbilisi side	Continued excavation by the mean of mechanisms, installation of steel ribs and 20-cm shotcrete spraying and construction of invert.	On-going
Tunnel №5 TA, Argveta side	Continued mechanical excavation, installation of steel ribs and 20-cm shotcrete spraying. Continued construction of the tunnel's invert and waterproofing membrane application, continued final lining construction	On-going

Tunnel №5 AT, Argveta side	Continued mechanical excavation, installation of steel ribs and 20-cm shotcrete spraying.	On-going
Interchange №2	Continued construction of retaining wall	On-going
Interchange №3, Retaining wall	Continued construction of the retaining wall's body	On-going
Interchange №1	Earthworks are ongoing.	On-going
Interchange №2	Earthworks are ongoing	On-going
Interchange №3	Continued construction of embankment fill from excavation material, continued placement of asphalt and concrete for the road surface	On-going
Interchange №3	Completed construction of bridge deck slab	On-going
Interchange №4	Continued delivery and compaction of borrow pit material	On-going
Bridge №1 TA	Continued construction of columns and cross beams, continued assembling of steel reinforcement for Abutment at Tbilisi side	On-going
Bridge №1 AT	Continued construction of pile caps, columns and cross beams	On-going
Bridge №2	Construction of piers columns and cross beams is ongoing, continued construction of Abutments - Argveta and Tbilisi sides	On-going
Bridge №3 TA	Continued installation of steel reinforcement for deck slab and New Jersey barrier	On-going
Bridge №3 AT	Commenced installation of steel reinforcement for bridge deck	On-going
Bridges №4 AT and TA	Completed installation of steel beams for TA direction. The steel beams fabrication, delivery and assembling for AT direction bridge	On-going
Bridge №5	Continued construction of abutments - Tbilisi and Argveta sides	On-going
Bridge №6 AT and TA	Completed construction of approach slabs	On-going
Km 0	Continued cutting of slope and its protection by soil Nailing, steel mesh and shotcrete - Tbilisi side.	On-going
km 1+950 to km 2+500	Continued mechanical cutting of slope and installation of steel mesh for slope protection	On-going
Km 4+980 to km 5+100	Continued trimming of slope by excavators and slope protection, continue excavation of rock by jackhammer	On-going
Km5 retaining wall	Completed construction of piling foundation	On-going
PK 8+300 to PK 8+700 (Batching Plant №2 area)	Excavation of rock by jackhammer and transport to filling section	On-going
Km 9 to km 14	Continued construction of embankment fill	On-going
Km 9	Demolition of the existing house	On-going
Utilities	Relocation of Gas pipes, high voltage electrical lines (including pylons) and water pipes ongoing	On-going
Continued construction of box culvert №4208	Steel rebar and concrete works	On-going
Commenced construction of culvert №4218	Excavation completed, assembling of steel reinforcement is ongoing	On-going
	Continued prefabrication of steel elements for Bridge №2	On-going
	Continued prefabrication of Pre-stressed concrete beams and concrete deck slabs	On-going
	Delivery of raw steel for construction of steel elements of Bridge №2	On-going

27. Progress of works carried out during the reporting period is summarized in Table 4 below:

Table 4: Construction Progress during Reporting Period

Row	Description of Main Activities	% W.F.	Progress	Cumulative Progress Including May	Cumulative Progress including April	Progress in May
1	Bill No 1. General Items	0,00%	Actual			
			Planned			
2	Bill No 2. Setting Out and Site Clearance	0,23%	Actual	96,25%	93,52%	2,73%
			Planned	100,00%	100,00%	0,00%
3	Bill No 3. Earthworks	4,21%	Actual	81,31%	66,64%	14,67
			Planned	97,93%	96,91%	1,02%
4	Bill No 4. Culverts and Drainage	1,31%	Actual	51,91%	51,91%	0,00%
			Planned	100,00%	98,92%	1,08%
5	Bill No 5. Bridges and Overpasses	46,00%	Actual	27,43%	26,11%	1,32%
			Planned	94,53%	83,42%	11,10%
6	Bill No 6 & 7 Tunnels	36,49%	Actual	44,06%	40,42%	3,64%
			Planned	87,90%	83,73%	4,16%
7	Bill No 8. Road Pavement	4,07%	Actual	6,56%	5,44%	1,11%
			Planned	50,13%	37,85%	12,28%
8	Bill No 9. Road Furniture	3,42%	Actual	2,83%	2,83%	0,00%
			Planned	90,86%	36,14%	54,72%
9	Bill No 10. Interchanges	1,81%	Actual	29,69%	29,30%	0,39%
			Planned	94,53%	77,70%	16,82%
10	Bill No 11. Relocation Of Utilities	0,94%	Actual	95,78%	95,78%	0,00%
			Planned	100,00%	100,00%	0,00%
11	Bill No 12. Greenery	0,55%	Actual			0,00%
			Planned	90,18%	68,76%	21,42%
12	Bill No 13. Retaining Walls	0,47%	Actual	40,88%	40,88%	0,00%
			Planned	00,00%	100,00%	
13	Bill No 14. Lighting	0,43%	Actual			0,00%
			Planned	84,01%	46,23%	37,79%
14	Daywork	0,05%	Actual			
			Planned			
Overall Progress of the Project		100,00%	Actual	35,02%	32,41%	2,6%
			Planned	90,36%	80,72%	9,64%

2.4 Information on Personnel Working at Construction Site

28. The following summarizes the overall personnel hired by the Contractor as of May 2023. Table 5 provides detailed information about personnel working at the site. Additionally, Table 6 shows the monthly change of the local and foreign staff hired.

- Total number of employees: 1117
- Foreign Staff (including management, administration, and technical Staff): 549
- Local Staff (skilled and unskilled workers): 568

Table 5: Information of Personnel Working at Site as of May 2023

#	Human Resources	Total
1	Company leaders	4
2	Project Manager	1
3	Quality Control	6
4	Technical office	49
5	Administration	18
6	Site Manager	5
7	Site Engineers	31
8	HSE	7
9	Surveyors	8
10	Foremens	20
11	Operators	151
12	Drivers	36
13	Plant Operators Plant Operators and labors	20
14	Garage facilities and camp	19
15	Mess hall	27
16	Skilled workers	358
17	Unskilled workers	254
18	Security	25
19	Flagmen	23
20	Sub-Contractors	55
21	Total	1117

HSE Staff (breakdown of 8 personnel)		
1	Jun Du	HSE Manager
2	Giorgi Karelidze	HS officer
3	Mirza Bagashvili	HS officer
4	Giorgi Kimeridze	HS officer
5	Lasha Peradze	Traffic safety officer
6	David Kurdadze	Environmental officer
7	Levan Ozbetelashvili	Environmental officer

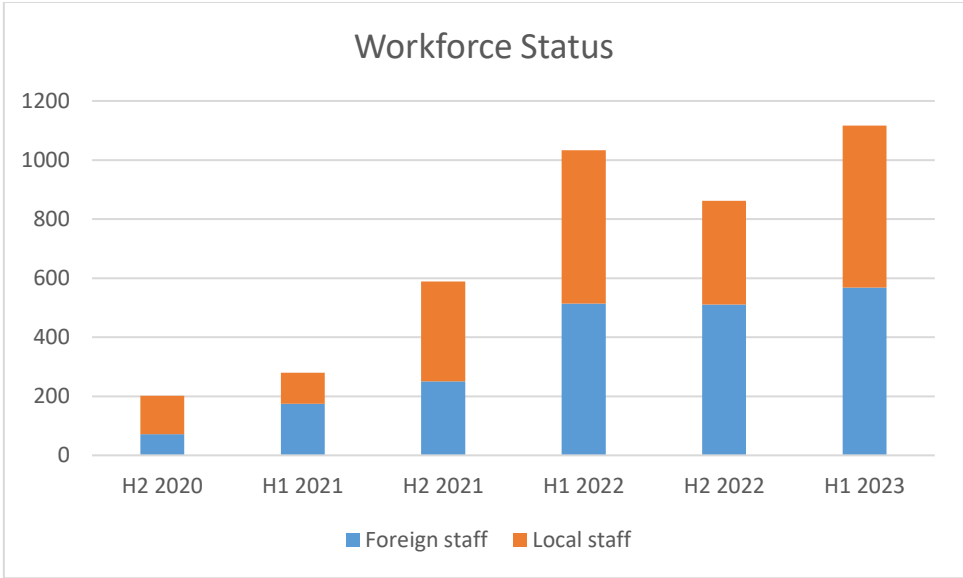
29. Levan Ozbetelashvili started to work at the beginning of December as the Contractor's environmental officer.

Table 6: The Mothnly Change of the local and foreign personel

Employees' origin	Jan 2023	Feb 2023	Mar 2023	Apr 2023	May 2023
Local	568	568	568	568	568
Foreign	489	549	549	549	549
Total	1057	1117	1117	1117	1117

30. Figure 4 shows a graphical representation of the number of foreign and local staff hired by the Contractor. The total number of the Contractor's staff has increased by 30% since the end of the second half of 2022 during this reporting period.

Figure 4: Project Workforce as of December 2022



2.5 Description of any Changes to Project Design

31. The Contractor has submitted a variation proposal for Tunnel 6 (April 22, 2021, Ref 20210422-017-GHEC-UBM). The contractor proposed changing the initial design to an open excavation roadbed. On April 1, 2021, the RD, Engineer, and Contractor jointly inspected the site, and a meeting was also held on April 7, 2021, between the RD, Engineer, and Contractor to evaluate and discuss the proposal. The RD demanded that the Contractor prepare the cost and time impact report. After submitting the related report, the variation has been approved by the Engineer and RD. The excavation started during this reporting period.

2.6 Description of Any Changes to Agreed Construction Methods

32. Instead of the usual drill and blast method, the excavation method will be used at Tunnel No. 6. The excavated material from this change will be used as fill material for the road, and a small amount of it is expected to be stored near the 3rd spoil disposal area. There will be no impact on any water source in the area during these excavation works. Additionally, since excavation is being used instead of tunnel construction, monitoring of air quality, noise, and vibration levels has commenced in the vicinity, and these measurements will continue throughout the project.

33. Additionally, a new batching plant has been established to meet the increasing cement demand. The Contractor provided an air quality study to the Engineer, which examines the potential effects of the new plant on air quality. This report has been approved by the Engineer. Furthermore, the monitoring of air quality and noise levels has commenced in the vicinity of the new batching plant, and these measurements will continue throughout the project..

3. ENVIRONMENT SAFEGUARD ACTIVITIES

3.1 General Description of Environment Safeguards Activities

34. Mari Kechkhuashvili was assigned as a local Environmental Specialist in May 2022, and Emre Duran was assigned as the International Environmental Specialist in June 2022 as part of the Engineer's environmental team. The team's responsibilities include checking the environmental impacts caused by the construction activities and ensuring compliance with the requirements of EIA, SEMP, and topic-specific EMPs.
35. The Engineer's environmental team prepares monthly and semi-annual reports to be submitted to the Resident Engineer (RE). These reports depict the ongoing construction activities, environmental issues, health and safety issues, grievance status, implementation of mitigation measures defined in the EIA, and compliance status. As of June 2023, five monthly reports have been submitted to the RE (as an environmental section in the Engineer's Monthly Progress Report). The general issues in the reports are given in Section 3.3, "Issues Tracking".
36. The environmental teams of the Contractor and the Engineer conduct regular site visits to monitor compliance with the SEMP. In addition, there are both Contractor and Engineer Health and Safety (H&S) teams. They also run regular site visits to monitor compliance with the H&S rules of the Project, traffic safety, and other safety-related issues. The details of the environmental site visits are given in Section 3.2, "Site Audits".
37. The Contractor's and Engineer's social teams maintain the Grievance Redress Mechanism (GRM). The details of the GRM logbook are given in Section 4.8, "Social Management and Grievance Redress Mechanism". The H&S Engineer's team also has a log with open and closed issues (in a report format). The details of these logs are given in Section 3.3, "Issue Tracking".
38. The Construction Contractor hired a consultant (Sustainable Development Solutions Caucasus (SDSC) LLC) to prepare environmental management plans and required environmental reports, and to conduct instrumental monitoring studies per EIA requirements.

3.2 Site Audits

39. Weekly or bi-weekly site visits were carried out by the local environmental specialist of the Engineer, Ms. Mari Kechkhuashvili, to the following sites/processes:
 - Office sites,
 - Camp areas,
 - Access roads,
 - Concrete batching plant 1,
 - Cutting of trees,
 - Topsoil Stripping,
 - Interchange 1 & 2,
 - Tunnel 1, 2, 3,4 & 3 Portals,
 - Tunnel 6 cut and cover area
 - Steel Bar Processing Plant.
40. Mr. Emre Duran, the international Environmental expert, also attends bi-weekly site visits when he is on-site. Additionally, the Contractor's Environmental team also participates in the scheduled site inspections.
41. The inspection method includes visual inspection, interviews with workers, review of permits obtained, and monthly reports.
42. The summary of site visits and the issues encountered during site visits are given in Table 7.

Table 7: Summary of Site Visits and of the Environmental Team During the Reporting Period (Jul-Dec 2023)

Date of Site Visit	Locations	Environmental Issue
12.01.2023	Worker's Camp No 2, 3, 4 & 5	<ul style="list-style-type: none"> Sanitary facilities have poor conditions, including missing soap, toilet paper, and paper towels. Greywater is directly discharged into the receiving environment. Poor housekeeping practices. Inadequate waste management for scrap metals.
19.01.2023	Worker's Camps Camp No 2 & 3, Batching plant, Interchange 2, Hazardous Waste Storage Area	<ul style="list-style-type: none"> Batching plant wastewater ponds are full of sediments, and water containing silt and concrete residues is discharged into the river. Sanitary facilities have poor conditions, including missing soap, toilet paper, and paper towels. Greywater is directly discharged, leading to environmental pollution. Poor housekeeping practices are observed. Poor storage of hazardous materials. Inadequate waste management, with full waste bins.
23.01.2023	Worker's Camp No 2 & 6	<ul style="list-style-type: none"> The septic tank in Worker's Camp N0 2 is full and leaking sewage water. Septic tanks in Workers Camp No 6 are leaking, resulting in wastewater discharge into the receiving environment.
02.02.2023	Worker's Camp No 1 & 3, Batching Plant 1	<ul style="list-style-type: none"> Greywater management problems; Household waste management Batching plant waste water management
11.02.2023	Tunnel 6 working area	<ul style="list-style-type: none"> An improperly constructed water channel has been observed. Poor topsoil management practices have been observed.
20.02.2023	Batching plant	<ul style="list-style-type: none"> Inadequate sediment management have been observed.
16.03.2023	Worker's Camp N0 2 & 3 ; Batching plant	<ul style="list-style-type: none"> Poor conditions at sanitary facilities at several camps have been observed, including missing soap, toilet paper, and paper towels. Incorrect hazardous waste management; Poor waste management and housekeeping practices have been observed
23 .03.2023	Worker's Camp No 1, 2, 3, 4, 5 & 6; Batching plant, Interchange 2, Hazardous Waste Storage Area, Tunnel 1, 3, 4 & 5, Main camp, Spoil Disposal Are 1 & 2	<ul style="list-style-type: none"> Poor conditions at sanitary facilities at several camps have been observed, including missing soap, toilet paper, and paper towels. Direct discharge of greywater into the receiving environment. Waste management problems, especially with hazardous and amateur waste. Spill in the material storage area close to the hazardous waste storage zone. Sewage tanks in Camp 1, 4, and 6 are full. Improper storage of hazardous materials. Spill from a broken heavy machinery near the tire washing pond close to the workshop in Interchange 2. Poor waste management, including domestic waste, metal waste, and hazardous waste.
29.03.2023	Interchange N2; camp N3	<ul style="list-style-type: none"> Poor conditions at sanitary facilities, with missing soap, toilet paper, and paper towels. Inadequate waste management.
10.04.2023	Worker's Camp No 2, Interchange 1, Batching Plan 1	<ul style="list-style-type: none"> The sedimentation ponds of the batching plant N1 are full and require regular cleaning. Poor waste management practices.
12.04.2023	Main camp, Worker's Camp No 2, 4, 6, Interchange	<ul style="list-style-type: none"> In the main camp, stormwater and domestic wastewater (from the kitchen, bathroom, and laundry) are collected in the

	1&2, Batching Plan 1,	<p>drainage system and flow into the ground without any treatment.</p> <ul style="list-style-type: none"> • In the main camp, oil barrels are placed close to the drainage system without any secondary containment. • In Worker's Camp No 4, a small amount of domestic and hazardous waste has been discarded outside waste collection containers. • In Worker's Camp No 6, waste materials were mixed with construction materials. • In Worker's Camp No 6, the restrooms are unclean, and hygiene norms are not followed.
15.04.2023	Main camp, Worker's Camp No 2 & 3, Interchange 1& 2,	<ul style="list-style-type: none"> • Poor hazardous waste management in the hazardous waste storage area. • Oil spill near the workshop area in Interchange No. 2. • Poor waste management at Worker's Camp No. 3.
19.04.2023	Worker's Camp No 2, Interchange 1, Batching Plan 1, Camp N6	<ul style="list-style-type: none"> • The sedimentation ponds of the batching plant No. 1 are full. • There is poor waste management at Tunnel Portal No. 3.
01.05.2023	Batching Plant 1, interchange 2	<ul style="list-style-type: none"> • The batching plant is full of sediments. • There is a large amount of hazardous waste that needs to be transported.
04.05.2023	Private Land around Batching Plant No 1, Tunnel 6 Excavation	<ul style="list-style-type: none"> • A site visit with the Road Department's representatives is scheduled to explore the private areas around Tunnel Excavation 6 and the batching plant.
11.05.2023	Worker's Camp No 1 and 2	<ul style="list-style-type: none"> • Poor gray water management: the plastic pipe is not connected to the sediments tank. • Unsanitary conditions exist at Camp No 1 and 2. • The septic tank is full in Worker's camp No 2.
18.05.2023	Interchange No 4, Worker's Camp No 3	<ul style="list-style-type: none"> • Dust during the process of arranging the embankment required watering. • The sanitary condition is extremely poor.
01.06.2023	Worker's Camp No 1 and 2	<ul style="list-style-type: none"> • Poor greywater management: wastewater from the kitchen and bathroom is flowing directly into the receiving environment because the plastic water pipe is damaged and not connected properly. The Engineer has instructed the Contractor on how to resolve this problem • The septic tank is damaged, causing waste water to leak. It requires repair and regular cleaning (Camp No 2). • The drainage channel at Camp No 2 needs to be cleaned
05.06.2023	Batching Plant No 2	<ul style="list-style-type: none"> • General site visit for newly constructed batching plant • Water management is a key issues for this new batching plant (water source and waste water management)
08.06.2023	Worker's Camp No 4 and 6 Tunnel 4 & 5 Portals	<ul style="list-style-type: none"> • Dust generation during heavy machinery working and transportation. • Poor waste management (overflowing waste bins and scattered wastes- Tunnel Portal 4&5 and Worker's Camp No 4 & 6) • Poor hazardous material storage • Poor hazardous waste management

43. There is no new NCR in this reporting period.

3.3. Issues Tracking

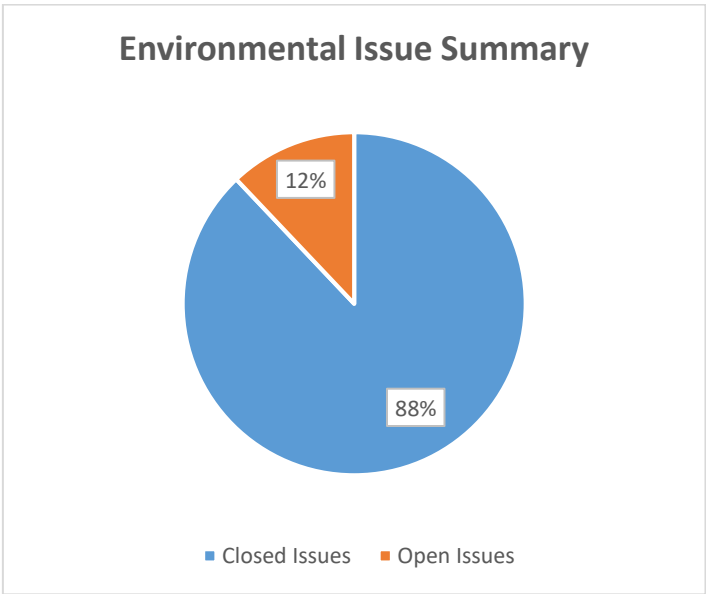
Environmental Issues

- 44. The Contractor has obtained all the required permits required at this stage and has also developed a Compensation Tree Planting Plan.
- 45. The Environmental team tracks the statistics of the environmental issues during the reporting period, which is given in Table 9. The status of the issues is given in Figure 5.
- 46. The Engineer has submitted the identified issues to the Contractor through mail notifications, official letters, and verbally, when appropriate, to take corrective actions. Of the 104 issues identified, 102 have been closed, including 12 remaining issues from the previous monitoring period. There are 12 remaining issues that will be followed up in the next semi-annual report.
- 47. The main environmental issues are discharging water from the batching plant, uncontrolled sewage and grey water discharges, waste management, dust during the dry season, hazardous waste management, and sanitation at the WCs and shower areas. The Engineer has warned several times about these issues in various locations. The Contractor solved some environmental issues immediately, but some remain unresolved.

Table 9: Summary of Environmental Issue Tracking for the Reporting Period

Issues opened during this reporting period	104
Pending Issues from the previous reporting period	12
Issues closed this reporting period	102
Number of open issues	14
Closed in percentage	88 %

Figure 5: Environmental Issue Summary during the Monitoring Period



Health and Safety Issues

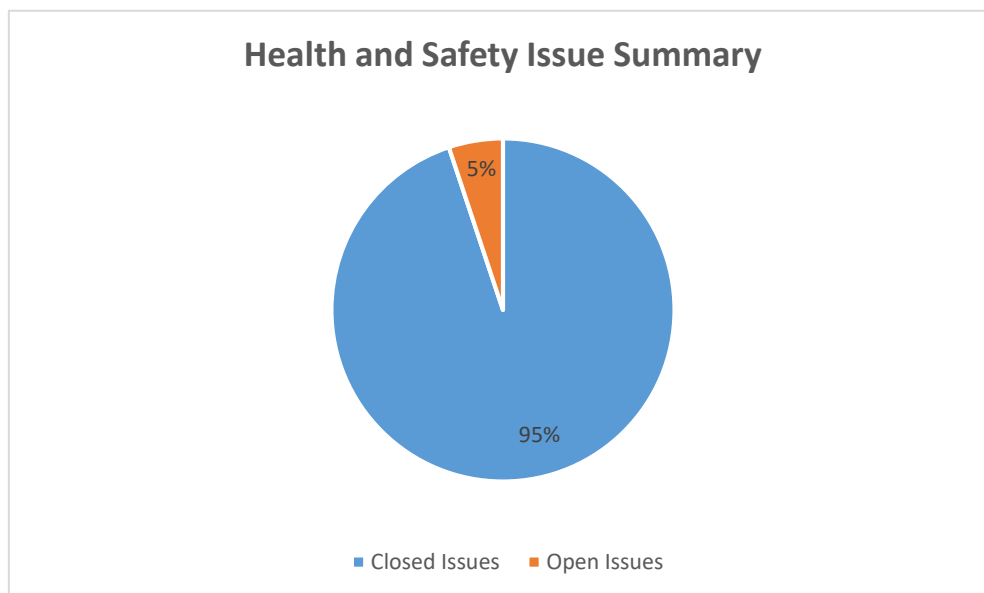
48. The H&S team is also tracking H&S issues (“good” and “bad” behavior and performances), and their statistics during the reporting period are given in Table 10.
49. The main H&S issues are poor housekeeping, improper material storage, electrical safety, damaged lifting equipment, damaged tools and equipment, poor ventilation, unsafe working at height, PPE usage, dangerous and hand-made equipment, poor road conditions, improper fire extinguishers, deep excavation without guard rails, and driving safety. Some locations show good observations, such as proper PPE usage and barriers, and quick responses to ventilation issues. The Contractor solved some issues related to Company H&S rules and requirements immediately, while some require correction in the following weeks after the observations are reported to the Contractor.
50. Data on the number of closed and open issues is presented in Table 10 and Figure 6. This data is based on the observed issues that have been closed or remained open during the Project. Out of three hundred and ninety (390) issues, three hundred and sixty-nine (369) issues were closed, and there are twenty-one (21) issues remaining for the next semi-annual report to follow up.

Table 10: Summary of Health and Safety Issue Tracking for the Reporting Period

Good behavior and performances during this reporting period	109
Issues opened during this reporting period	390
Pending Issues from the previous reporting period	21
Issues closed this reporting period	390
Number of open issues	21
Closed in percentage	95%

51.

Figure 6: H&S Issue Summary during the Monitoring Period



52. Identified non-conformities that occurred in work sites were issued to the Contractor through inspection reports (Annex 2) by the Engineer to take corrective actions.

3.4 Trends

Environmental

53. There are occasional leaks observed in septic tanks on the sites, and the frequency of septic tank pumping should be increased to prevent such leaks. Leaks can cause environmental pollution by affecting the soil and water sources. Therefore, regular inspection and maintenance of septic systems are crucial steps to reduce their environmental impact.
54. There are some repair issues in the greywater system that need to be addressed. Greywater is a system that treats and reuses wastewater. However, deficiencies and malfunctions can hinder the effective operation of the greywater system. Hence, regular inspection, identification, and repair of issues are important.
55. There are deficiencies in environmental organization and waste collection. Increasing waste collection and sorting efforts and assigning specific personnel to manage waste collection and segregation in the sites and camps are necessary. Since it is not feasible for the environmental team to manage all areas, it is important to designate specialized teams for waste collection and segregation. Additionally, the number and capacity of waste containers should be increased.
56. Attention should be paid to seasonal dust generation and its mitigation by increasing the frequency of watering in relevant areas. Dust generated at construction sites can impact the health of workers and contribute to environmental pollution. Therefore, regular watering in areas prone to dust formation is important to reduce its spread and improve air quality.
57. Adequate storage and proper placement of hazardous waste containers, such as fuel and other oils, should be ensured on the site, and regular collection of waste generated from these materials should be conducted. Hazardous wastes can have serious effects on ecosystems and human health. Therefore, proper management of hazardous wastes should be a priority to prevent leaks and pollution.

Health and Safety

58. The following items represent recurring health and safety issues at the construction site that need to be addressed
59. There are concerns regarding electrical safety at the site. Proper measures should be taken to ensure safe electrical installations, usage, and maintenance. This includes regular inspection of electrical systems, proper grounding, and the use of appropriate personal protective equipment (PPE) by workers.
60. Working at heights poses significant risks if not managed properly. Adequate fall protection systems, such as guardrails, safety nets, or personal fall arrest systems, should be implemented to prevent accidents and protect workers from falls.
61. There are issues related to inadequate lighting inside tunnels. Sufficient and appropriate lighting should be installed to ensure clear visibility and prevent accidents or injuries caused by poor illumination.
62. Proper ventilation is crucial in tunnels to maintain air quality and prevent the accumulation of hazardous gases, dust, or fumes. Adequate ventilation systems should be in place and regularly maintained to create a safe working environment for the workers.
63. There are concerns regarding the use of inappropriate equipment and tools, such as hand-held cutters, ladders, etc. It is important to ensure that workers are provided with suitable and well-maintained equipment and trained on their correct usage. Regular checks and inspections should be conducted to identify and address any equipment-related hazards.

64. There are some issues with poor housekeeping. Poor housekeeping often leads to clutter and obstructions in work areas. Accumulation of materials, tools, equipment, and other objects in walkways and workspaces can create tripping hazards. Untidy workspaces with scattered debris, liquids, or loose objects increase the risk of slip, trip, and fall accidents. Poorly managed storage of flammable materials, chemicals, and waste can create fire hazards. The Contractor should address poor housekeeping with a proactive approach that involves regular cleaning, proper storage and organization of tools and materials, clear labeling, designated waste disposal areas, and ongoing training and awareness programs for employees.
65. The Contractor has been actively addressing and resolving most of the identified environmental and health & safety issues on a regular basis. However, it should be noted that certain issues have been recurring due to workers' behavior and limitations in terms of personnel and resources. In light of this, the Engineer has recommended that the Contractor undertake regular training sessions and toolbox meetings to enhance workers' awareness and compliance with HSE regulations. Additionally, it is advised to allocate more personnel and resources to effectively tackle HSE issues.

3.5 Unanticipated Impacts or Risk

66. There are no unanticipated impacts or risks.

4. RESULTS OF ENVIRONMENTAL MONITORING

4.1 Overview of the Monitoring Conducted During Current Period

67. Six monthly sampling sessions were conducted for surface water quality analysis during the reporting period of January–June 2023. The samples were collected from River Dzirula (Bridge N1), River Dzirula (Bridge N2), River Borimela (Bridge N3), and River Kvirila (Bridge N4), as shown in Table 11. The samples were taken 50 meters upstream and 50 meters downstream (where possible) from the construction site to evaluate the water quality difference before and after the construction activities..
68. In addition to monthly instrumental environmental monitoring reports. Several regular vibration monitorings were conducted during blasting operations, and the Contractor conducted several more vibration and noise monitoring regarding the grievances received by the Road Department and the Engineer. Those monitoring summaries are given starting from paragraph 82.
69. The sampling locations for air, noise, vibration, and water quality were selected considering the ongoing construction activities, as shown in Figure 7 and Figure 8. The objective was to evaluate the potential impacts on the environmentally sensitive receptors resulting from the construction activities. The results of the instrumental monitoring are given below in tabular form.

Figure 7: Surface Water Quality Sampling Locations



Figure 8: Noise, Vibration, and Ambient Air Quality Sampling Locations



Surface Water Quality

70. Six monthly sampling sessions were conducted for surface water quality analysis during the reporting period of January–June 2023. The samples were collected from River Dzirula (Bridge N1), River Dzirula (Bridge N2), River Borimela (Bridge N3), and River Kvirila (Bridge N4), as shown in Table 11. The samples were taken 50 meters upstream and 50 meters downstream (where possible) from the construction site to evaluate the water quality difference before and after the construction activities.
71. The results are given between Table 12 – 15. Essential parameters exceeding the National MAC levels are shown between Figures 9 – 11.
72. In some locations, TSS levels are high during the summer due to increased flow rates and erosion from dry and hot weather conditions. To prevent this, the construction company should restrict machinery access to river protection zones during the dry season and ensure slope stability in areas close to rivers, particularly spoil disposal areas.
73. The Contractor must not discharge untreated sewage water or dispose of hazardous wastes into rivers. These actions are prohibited by the EIA requirements. Hazardous materials should be stored and managed appropriately and kept away from water sources.

Table 11: Surface Water Quality Monitoring Locations

Location	Coordinates	
	X	Y
River Dzirula (Bridge N1)	340316.57	4663074.32
River Dzirula (Bridge N2)	342153.91	4661762.47
River Borimela (Bridge N3)	343185.48	4662005.84
River Kvirila (Bridge N4)	344312.76	4661999.60

Table 12: Surface Water Analysis Results of Dzirula River (Bridge N1) Up and Down Stream

Parameters	Unit	EIA Standards (National MAC)	Baseline results (June 2021)	Upstream (Jan 2023)	Downstream (Jan 2023)	Upstream (Feb 2023)	Downstream (Feb 2023)	Upstream (Mar 2023)	Downstream (Mar 2023)	Upstream (Apr 2023)	Downstream (Apr 2023)	Upstream (May 2023)	Downstream (May 2023)	Upstream (June 2023)	Downstream (June 2023)
pH	-	6.5-8.5	8,12	7,95	7,96	8,05	7,99	7,90	7,88	8,12	8,00	8,27	8,11	8,14	8,12
BOD	mg/L	6,00	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
TSS	mg/L	Increase no more than 0.75 mg/L	<0,5	10	12	8	7	26	37	8	10	10	12	12	15
Total N	mg/L	NA	0,083	0,21	0,22	0,29	0,30	<0,5	<0,5	0,10	0,10	0,12	0,13	0,1	0,11
Total P	mg/L	2,00	2,00	0,40	0,50	0,63	0,70	<0,06	<0,06	0,08	0,10	<0,02	<0,02	<0,02	<0,02
Nitrates	mg/L	40,00	0,25	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1,0	<1,0
Phosphates	mg/L	3,50	<0,1	1,20	1,40	1,90	2,00	<0,02	<0,02	0,25	0,27	<0,06	<0,06	<0,06	<0,06
Oil and Grease	mg/L	0.3		<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3

Not 1. The parameters with red color are higher than the National MAC levels at that analysis period.

Not 2. The highlighted parameters are significantly higher than the upstream levels at that analysis period.

Table 13: Surface Water Results of Dzirula River (Bridge N2) Up and Down Stream

Parameters	Unit	EIA Standards (National MAC)	Baseline results (June 2021)	Upstream (Jan 2023)	Downstream (Jan 2023)	Upstream (Feb 2023)	Downstream (Feb 2023)	Upstream (Mar 2023)	Downstream (Mar 2023)	Upstream (Apr 2023)	Downstream (Apr 2023)	Upstream (May 2023)	Downstream (May 2023)	Upstream (June 2023)	Downstream (June 2023)
pH	-	6.5-8.5	8,12	7,97	7,96	7,96	7,97	8,05	8,05	8,07	8,13	8,17	8,06		
BOD	mg/L	6,00	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3,0	<3
TSS	mg/L	Increase no more than 0.75 mg/L	15	8	8	16	14	7	8	7	5	15	14	18	20
Total N	mg/L	NA	<0,5	0,29	0,30	0,25	0,27	<0,5	<0,5	0,12	0,14	0,10	0,11	0,12	0,12
Total P	mg/L	2,00	0,083	0,70	0,83	0,70	0,63	0,29	0,30	0,17	0,20	<0,02	<0,02	0,03	0,03
Nitrates	mg/L	40,00	2,00	<1	<1	<1	<1	<1	<1	<1,0	<1,0	<1,0	<1,0	<1,0	<1,0
Phosphates	mg/L	3,50	0,25	2,10	2,50	2,10	2,20	0,78	0,79	0,50	0,60	<0,06	<0,06	0,09	0,09
Oil and Grease	mg/L	0.3	<0,1	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3

Not 1. The parameters with red color are higher than the National MAC levels at that analysis period.

Not 2. The highlighted parameters are significantly higher than the upstream levels at that analysis period.

Table 14: Surface Water Results of Borimela River (Bridge N3) Up and Down Stream

Parameters	Unit	EIA Standards (National MAC)	<i>Baseline results (June 2021)</i>	Upstream (Jan 2023)	Downstream (Jan 2023)	Upstream (Feb 2023)	Downstream (Febr 2023)	Upstream (Mar 2023)	Downstream (Mar 2023)	Upstream (Apr 2023)	Downstream (Apr 2023)	Upstream (May 2023)	Downstream (May 2023)	Upstream (June 2023)	Downstream (June 2023)
pH	-	6.5-8.5	8,16	8,12	8,21	8,05	8,16	8,10	8,08	8,17	8,19	8,17	8,11	8,12	8,16
BOD	mg/L	6,00	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
TSS	mg/L	Increase no more than 0.75 mg/L	20,00	11	12	18	9	9	7	6	7	10	11	20	21
Total N	mg/L	NA	1,50	0,25	0,23	0,31	0,30	<0,5	<0,5	0,15	0,17	0,17	0,16	0,10	0,11
Total P	mg/L	2,00	0,150	0,43	0,43	0,80	0,77	0,13	0,13	0,03	0,02	<0,02	<0,02	<0,02	<0,02
Nitrates	mg/L	40,00	4,00	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Phosphates	mg/L	3,50	0,45	1,30	1,30	2,40	2,30	0,43	0,40	0,09	0,07	<0,06	<0,06	<0,06	<0,06
Oil and Grease	mg/L	0.3	<0,1	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3

Not 1. The parameters with red color are higher than the National MAC levels at that analysis period.

Not 2. The highlighted parameters are significantly higher than the upstream levels at that analysis period.

Table 15: Surface Water Results of Kvirila River (Bridge N4) Up and Down Stream

Parameters	Unit	EIA Standards (National MAC)	<i>Baseline results (June 2021)</i>	Upstream (Jan 2023)	Downstream (Jan 2023)	Upstream (Feb 2023)	Downstream (Feb 2023)	Upstream (Mar 2023)	Downstream (Mar 2023)	Upstream (Apr 2023)	Downstream (Apr 2023)	Upstream (May 2023)	Downstream (May 2023)	Upstream (June 2023)	Downstream (June 2023)
pH	-	6.5-8.5	8,12	8,19	8,16	8,12	8,11	8,00	8,02	8,27	8,29	8,25	8,26	8,11	8,14
BOD	mg/L	6,00	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
TSS	mg/L	Increase no more than 0.75 mg/L	2085	37	42	96	110	92	80	8	9	7	8	15	18
Total N	mg/L	NA	<0,5	0,31	0,32	0,27	0,28	<0,5	<0,5	0,11	0,14	0,20	0,22	0,12	0,12
Total P	mg/L	2,00	0,092	0,90	0,97	0,93	0,90	0,20	0,21	0,23	0,23	<0,02	<0,02	0,04	0,03
Nitrates	mg/L	40,00	2,00	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Phosphates	mg/L	44684,00	0,28	2,70	2,90	2,80	2,90	0,62	0,60	0,70	0,70	<0,06	<0,06	0,12	0,09
Oil and Grease	mg/L	0.3	<0,1	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3

Not 1. The parameters with red color are higher than the National MAC levels at that analysis period.

Not 2. The highlighted parameters are significantly higher than the upstream levels at that analysis period.

Figure 9: Dzirula River (Bridge N1) Upstream and Downstream TSS Chart (January-June 2023)

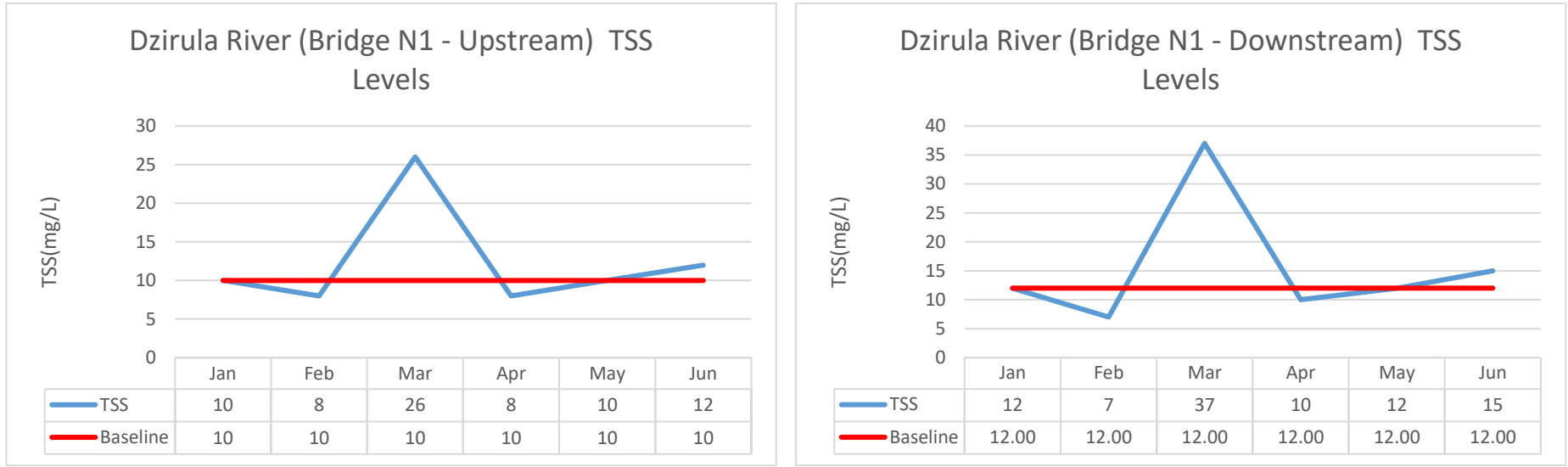


Figure 10: Dzirula River (Bridge N2) Upstream and Downstream TSS Chart (January-June 2023)

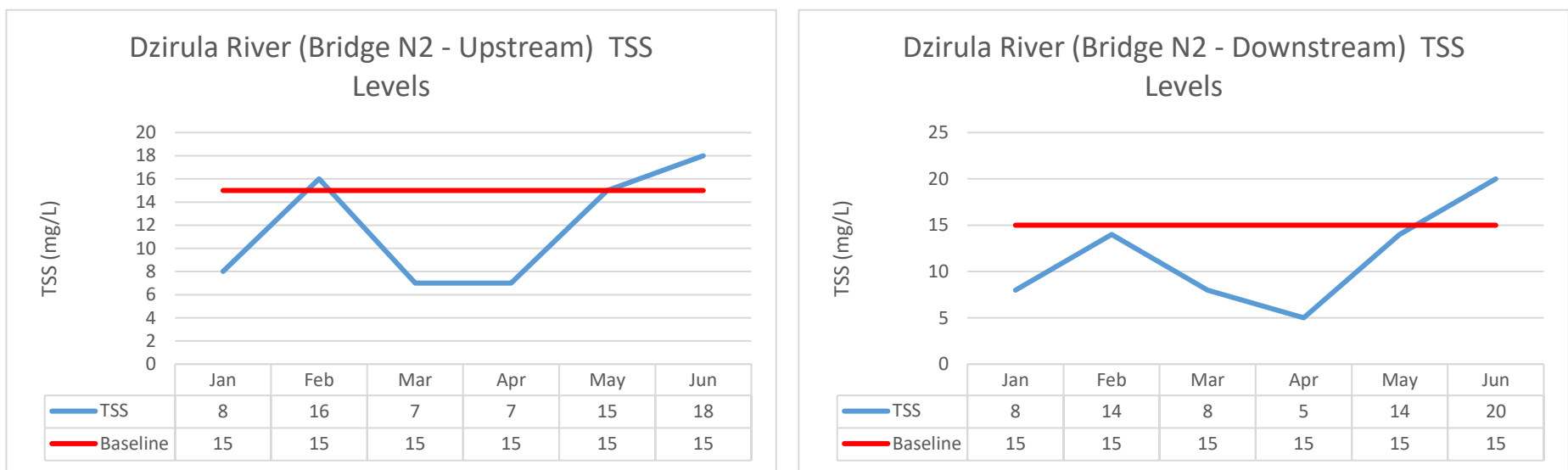


Figure 11: Borimela River (Bridge N3) Upstream and Downstream TSS Chart (January-June 2023)

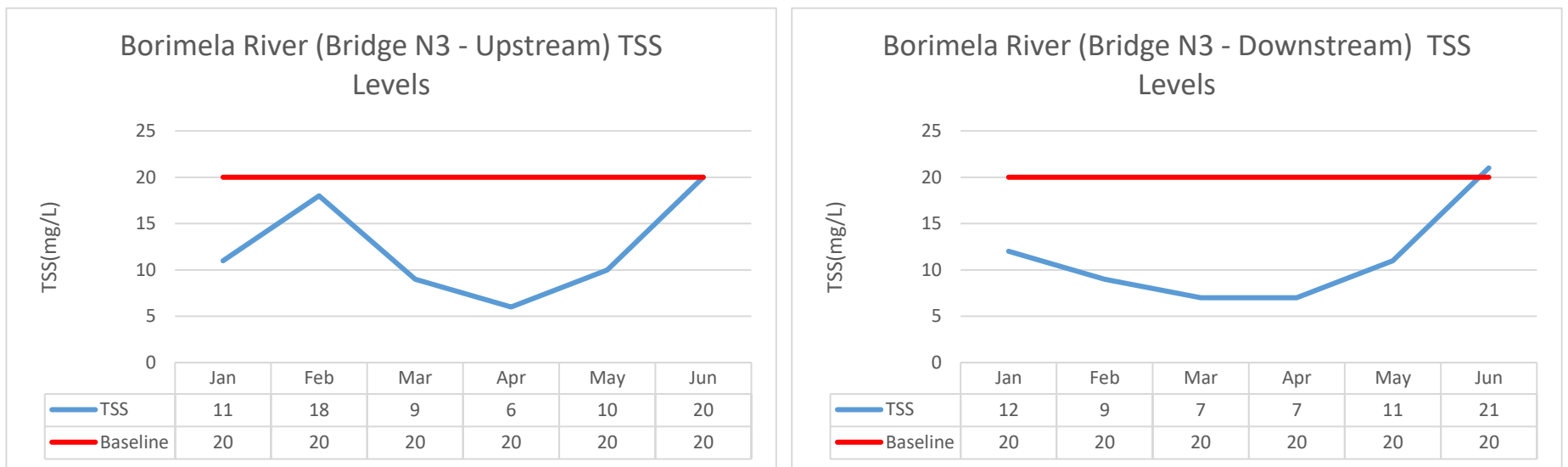
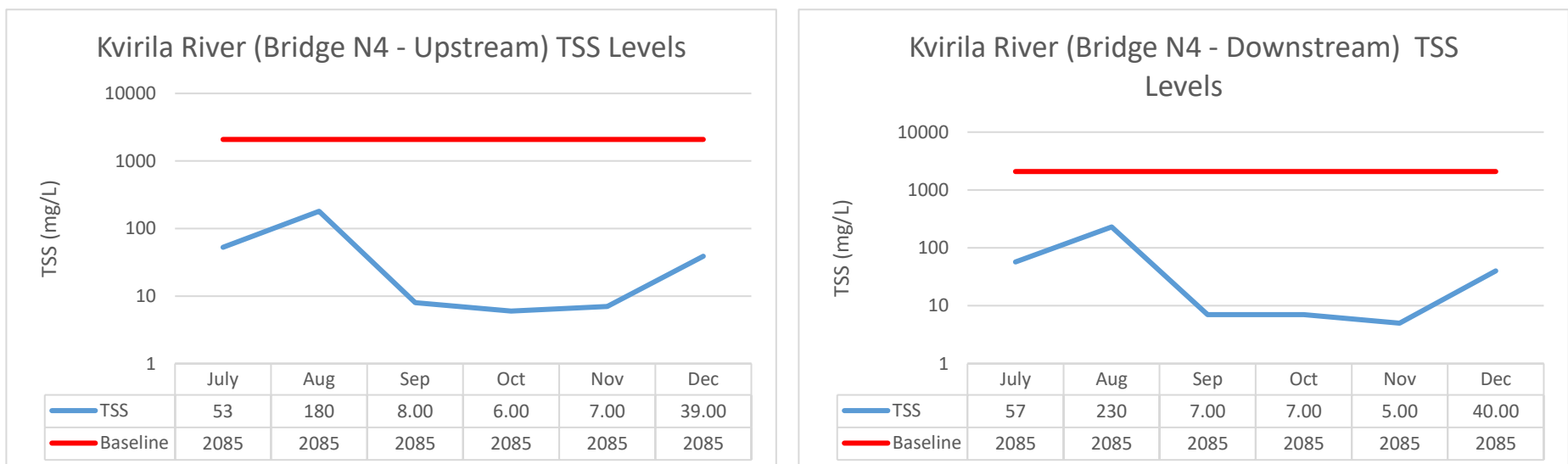


Figure 12: Kvirila River (Bridge N4) Upstream and Downstream TSS Chart (January-June 2023)



Noise and Vibration Monitoring

74. The Contractor and the Engineer selected noise monitoring locations to evaluate the impact on noise-sensitive receptors (NSR) due to various construction activities during the reporting period. The locations are given in Table 16.

Table 16: Noise Monitoring Locations

Location	Coordinates	
	X	Y
Near Nebieridze house (Nebieridze)	334912.03	4666175.68
Near Babukhadia house (Babukhadia)/Spoil Disposal Area N2	340212	4662807
Between tunnels 4 & 5 (T4-T5) /KM 6.4	339444	4663581
Batch Plant 1 (BP1) TA	342363	4661841
Top of Tunnel 5 (T5)	339472	4664180
Tunnel 5 AT portal (T5-AT)	338583	4664433
Bridge 5 (B5)	337746	4664626
KM 5.8	340323.98	4662868.69
Uznadze Street 93	339238	4664399
Anzor Kudziashvili's house	339418	4664226
Natela Peradze's house	333796	4666486
Nikoladze Street	337522	4664779
Gocha Kapanadze's house	337562	4664645
Davit/Shavgulidze Khijakadze's house	337670	4664573
Tunnel 3	340977	4661891
Ushangi Shavgulidze's house	337642	4664537
Tunnel 6	337520	4664765
Tunnel 6 (2)	337541	4664740
New Batch Plant (No 2)	336292	4665560
New Batch Plant (No 2)-2	336386	4665722
Adjacent to Gaioz Kakheli's house	339895	4663443
Maia Saralidze's house	337994	4664804
Gela Nebieridze's house	334936	4666200

75. The average equivalent noise levels (LAeq) recorded during different monitoring locations and periods are shown in Table 18 and compared with the daytime IFC limits of 55 dB(A) for residential areas and educational institutions.
76. It has been observed that noise levels exceed the established standards in some measurement points. This elevation in noise can be attributed to several factors. Firstly, the operation of heavy machinery, which is in close proximity to the noise measurement points, generates substantial noise. Additionally, the increased traffic, resulting from both the construction activities and the regular traffic around the monitoring points, contributes to the overall noise levels.

77.

78. Overall, the LAeq results vary between 34.1 dB(A) to 75.2 dB(A), which is relatively high for receiving environments. However, according to the outdoor-indoor noise reduction (OINR) by the Federal Highway Administration US Department of Transportation, 'Noise Measurement Handbook (FHWA-HEP-18-065)', if the windows are closed, the noise reduction in the interior of the building with masonry structure and a single glazed window would be up to 25 dB(A). On the other hand, the reduction is 10 dB(A) with open windows. Therefore, a slightly higher noise level outside the building would not be felt inside the building by the residents. Moreover, the Consultant measured noise levels close to the active construction sites, which will decrease with distance.

79. The Contractor and the Engineer selected vibration monitoring locations to evaluate the impact on the sensitive receptors due to various construction activities during the reporting period. The vibration monitoring locations are given in Table 17.

Table 17: Vibration Measurement Locations

Location	Coordinates	
	X	Y
Nebieridze	334912.03	4666175.68
Between tunnels 4 & 5 (T4-T5) - Km 6,4	339444	4663581
BP 2 (3) (BO2-3) - Gordeziani_Mtchedlidze's house	338752	4664365
Top of Tunnel 5 (T5)	339472	4664180
Tunnel 5 AT portal (T5-AT)	338583	4664433
Near Tunnel 5 AT portal (1) (NT5-AT-1) - Phati Khijakadze's house	338903	4664449
Near Tunnel 5 AT portal (1)_opposite (NT5-AT-1-O) - Uznadze Street 75	338913	4664419
Bridge 5 (B5)	337746	4664626
Spoil disposal area N2	340247	4662834
Uznadze Street 93	339238	4664399
Anzor Kudziashvili's house	339418	4664226
Shavlegi Maghlakelidze's house	338893	4664405
Natela Peradze's house	333796	4666486
Nikoladze Street	337522	4664779
Gocha Kapanadze's house	337562	4664645
Tunnel 3	340977	4661891
Davit/Shavgulidze Khijakadze's house	337664	4664565
Ushangi Shavgulidze's house	337642	4664537
Tunnel 6 (1)	337519	4664777
Tunnel 6 (2)	337541	4664740
New Batch Plant (No2) 1	336292	4665560
New Batch Plant (No2) 2	336386	4665722
Adjacent to Gaioz Kakheli's house	339895	4663443

80. According to the criteria set in the EIA, based on BS 6472 and German standard DIN 4150-3: 1999, there is no damage likely to structure building due to vibration at peak particle velocity (PPV) less than 5 mm/sec, risk of cosmetic damage from 5 to 15 mm/sec, and risk of structural damage at PPV greater than 15 mm/sec.
81. Table 19 presents vibration results that exceed the Georgian legislation limit (1.5 mm/s) in specific locations during certain monitoring sessions.
82. These elevated levels can be attributed to several factors. Firstly, the operation of heavy machinery, which is in close proximity to the noise measurement points, generates higher vibration levels. Additionally, in some locations the blasting may be the cause of the vibration level increment. Moreover some construction activities such as drilling and earth moving can cause the increased vibration levels. Finally certain geological conditions can influence the transmission and amplification of vibration, which can cause higher monitored vibration levels. In certain areas, the recorded vibration levels have exceeded established standards. This excess can be attributed to multiple contributing factors. Firstly, the operation of heavy machinery, situated in proximity to the vibration measurement points, results in elevated vibration levels. Additionally, in specific locations, blasting operations may be responsible for the observed increment in vibration levels. Moreover, various construction activities like drilling and earthmoving can contribute to the heightened vibration levels. Lastly, the geological conditions inherent to particular areas can significantly influence the transmission and amplification of vibrations, thereby leading to the elevated monitored vibration levels.
83. It's important to note that while the vibration levels surpass the Georgian legislation limit (1.5 mm/s), they remain well within the permissible range outlined in the Environmental Impact Assessment (EIA) and contract conditions.

Table 18: Average Equivalent Noise Levels Result during the Monitoring Period

Average Equivalent Noise level (LAeq) Measurement dB(A)																														
Location/Month	Top of T5 – M (Uzd nadze str.)	Top of T5 – E (Uzd nadze str.)	Top of T5 – E	BP1 TA – W	T5-AT – NW	T5-AT – W	B5 – NW	B5 – W	KM 6.4	Nika Kvizhin adze's house	Tunnel 3	Tunnel 3 - N	Natela Peradze's house	Anzor Kudzias hvili's house	Nikol adze Street - NW	Gocha Kapanadze's house (T6) NW	Gocha Kapanadze's house (T6) W	T5-AT – W - hydraulic hammer	Davit Khijakadze's house	Ushangi Shavgulidze's house	Tunnel 6	Tunnel 6 (construction site)	New Batch Plant - baseline	Adjacent to Gaioz Kakheli's house – E	Maia Saralidze's house	Shavgulidze_Khijakadze's houses	Gela Nebieridze's house	IFC Standard		
Jan-23			36,6	70,5	67,2	63,1	48,8	48,9	44,1	56,1			54,2	42,3																
Feb-23				68,9	50,9	50,8			58,2	67,1					60,0	43,1	54,1	54,7	51,1											
Mar-23			39,6	75,2	56,6	68,4			52,9	57,7			52,7																	
Apr-23	37,7	34,1	39,8	67,4	59,6	67,8			50,6	56,8	64,1		52,8						53,9	51,4	51,5		52,7							55,00
May-23			45,2	70,7	41,9	56,4			51,8	58,5	63,6	63,7									61,0	58,8		35,4	53,0	53,2	68,3			
June-23				71,4	50,2	53,6				60,7	70,1	62,8					63,7				60,9	62,4	59,8			50,4				

*S - Session
 **NW- non-working
 ***W – working
 ****E – Evening

Table 19: Vibration Monitoring Results

Location/Session	Month	Peak Particle Velocity (PPV) mm/sec			Peak Vector Max Values		Legislation limits	
		Transversal Y	Vertical Z	Longitudinal X	mm/sec	db	mm/sec	db
T4-T5 (KM 6.4)	Jan	0,284	0,205	0,678	0,716	83,10	1,100	67 (+10)
	Feb	0,189	0,142	0,386	0,398	78,00	1,100	67 (+10)
	Mar	0,118	0,118	0,189	0,202	72,10	1,100	67 (+10)
	Apr	0,583	0,607	0,244	0,619	81,80	1,100	67 (+10)
	May	0,126	0,110	0,110	0,182	71,20	1,100	67 (+10)
T5-AT NW	Jan	0,150	0,173	0,158	0,237	73,50	1,100	67 (+10)
	Feb	0,244	0,213	0,394	0,441	78,90	1,100	67 (+10)
	Mar	0,173	0,142	0,229	0,234	73,40	1,100	67 (+10)
	Apr	0,189	0,126	0,213	0,244	73,80	1,100	67 (+10)
	May	0,134	0,118	0,118	0,183	71,30	1,100	67 (+10)
	June	0,134	0,126	0,126	0,181	71,20	1,100	67 (+10)
T5-AT W	Jan	0,126	0,456	0,166	0,475	79,50	1,100	67 (+10)
	Feb	0,276	0,205	0,315	0,348	76,80	1,100	67 (+10)
	Mar	0,110	0,102	0,095	0,155	69,80	1,100	67 (+10)
	Apr	0,118	0,142	0,142	0,182	71,20	1,100	67 (+10)
	May	0,118	0,102	0,095	0,156	69,90	1,100	67 (+10)
	June	0,221	0,150	0,173	0,223	73,00	1,100	67 (+10)
B5 W	Jan	0,110	0,095	0,095	0,129	68,20	1,100	67 (+10)
Gordeziani Mtchedlidze's houses - NW	Jan	0,181	0,213	0,221	0,257	74,20	1,100	67 (+10)
	Feb	0,205	0,236	0,197	0,258	74,20	1,100	67 (+10)
	Mar	0,229	0,221	0,331	0,354	77,00	1,100	67 (+10)
	Jan	0,166	0,221	0,205	0,240	73,60	1,100	67 (+10)

Gordeziani Mtchedlidze's houses - W	Feb	0,229	0,221	0,276	0,291	75,30	1,100	67 (+10)
	Mar	0,418	0,394	0,221	0,486	79,70	1,100	67 (+10)
	Apr	0,662	0,828	0,307	0,834	84,40	1,100	67 (+10)
Pati Khijakadze's house - W	Sep	0,733	0,914	0,560	0,979	85,80	1,100	67 (+10)
	May	0,638	0,828	0,449	0,869	84,80	1,100	67 (+10)
Uznadze Street 75 - W	Sep	0,662	1,537	0,591	1,546	89,80	1,100	67 (+10)
	Oct	0,583	1,592	0,772	1,601	90,10	1,100	67 (+10)
	Apr	0,512	1,001	0,363	1,044	86,40	1,100	67 (+10)
	Jun	0,560	0,828	1,364	1,495	89,50	1,100	67 (+10)
Shavlegi Maghlakelidze's house – NW	Oct	0,213	0,236	0,166	0,274	85,20	1,100	67 (+10)
	Nov	0,363	0,268	0,236	0,420	78,500	1,100	67 (+10)
	Dec	0,173	0,276	0,252	0,310	75,800	1,100	67 (+10)
	Jan	0,158	0,213	0,323	0,333	76,50	1,100	67 (+10)
Shavlegi Maghlakelidze's house – W	Oct	3,334	5,139	5,257	8,072	104,20	1,100	67 (+10)
	Nov	0,300	0,229	0,363	0,456	79,200	1,100	67 (+10)
	Dec	0,150	0,142	0,221	0,244	73,80	1,100	67 (+10)
	Jan	0,229	0,394	0,497	0,540	80,70	1,100	67 (+10)
	Apr	0,307	0,244	0,339	0,393	77,90	1,100	67 (+10)
Nebieridze's house – next to the residential building	Oct	0,733	0,418	0,489	0,744	83,50	1,100	67 (+10)
	May	0,173	0,292	0,252	0,326	76,30	1,100	67 (+10)
Tunnel 3	Dec -baseline	0,197	0,134	0,166	0,218	72,80	1,100	67 (+10)
	Apr	0,166	0,095	0,166	0,195	71,80	1,100	67 (+10)
	May	0,095	0,087	0,087	0,129	68,20	1,100	67 (+10)
	Jun	0,102	0,079	0,095	0,132	68,40	1,100	67 (+10)
Tunnel 3 - N****	May	0,087	0,063	0,079	0,107	66,60	1,100	67 (+10)
	Jun	0,110	0,102	0,095	0,156	69,90	1,100	67 (+10)
Natela Peradze	Dec	0,150	0,236	0,173	0,294	75,40	1,100	67 (+10)
	Jan	0,284	0,236	0,142	0,346	76,80	1,100	67 (+10)
	Mar	0,229	0,307	0,260	0,316	76,00	1,100	67 (+10)
	Apr	0,118	0,181	0,102	0,198	71,90	1,100	67 (+10)
Spoil Disposal Area N2	Jan	0,087	0,079	0,110	0,132	68,40	1,100	67 (+10)
	Feb	1,482	3,547	2,979	3,925	97,90	1,100	67 (+10)
	Mar	0,276	0,347	0,213	0,362	77,20	1,100	67 (+10)
	Apr	0,386	0,284	0,300	0,458	79,20	1,100	67 (+10)
	May	0,142	0,102	0,110	0,159	70,00	1,100	67 (+10)
	June	0,158	0,244	0,315	0,322	76,20	1,100	67 (+10)
Uznadze Street 93 - E	Jan	0,071	0,071	0,071	0,101	66,10	1,100	67 (+10)
	Feb	0,087	0,079	0,079	0,118	67,50	1,100	67 (+10)
	Apr	0,087	0,079	0,087	0,117	67,40	1,100	67 (+10)
Uznadze Street 93 - Day	Feb	0,102	0,166	0,142	0,188	71,50	1,100	67 (+10)
	Feb	0,087	0,079	0,079	0,144	69,20	1,100	67 (+10)

Uznadze Street 93 - Morning	Mar	0,110	0,102	0,087	0,153	69,70	1,100	67 (+10)
	Apr	0,102	0,110	0,087	0,151	69,60	1,100	67 (+10)
Anzor Kudziashvili's house - Night	Jan	0,071	0,063	0,087	0,097	65,80	1,100	67 (+10)
Nikoladze Street - Baseline	Feb	0,150	0,126	0,181	0,195	71,80	1,100	67 (+10)
Gocha Kapanadze's house - Baseline	Feb	0,110	0,150	0,166	0,223	73,00	1,100	67 (+10)
Gocha Kapanadze's house - W	Feb	0,221	0,181	0,189	0,276	74,80	1,100	67 (+10)
	Jun	0,307	0,229	0,378	0,514	80,20		
Tunnel 5 AT - W (hydraulic hammer)	Feb	0,307	0,142	0,150	0,312	75,90	1,100	67 (+10)
Davit-Shavgulidze Khijakadze's house	Feb	0,812	1,025	1,427	1,935	91,70	1,100	67 (+10)
	Apr	0,150	0,126	0,181	0,198	71,90	1,100	67 (+10)
	May	0,142	0,118	0,126	0,206	72,30	1,100	67 (+10)
	June	0,236	0,221	0,244	0,302	75,60	1,100	67 (+10)
Tunnel 6	Apr	0,331	0,418	0,386	0,509	80,10	1,100	67 (+10)
	May	0,158	0,126	0,150	0,190	71,60	1,100	67 (+10)
	June	0,205	0,205	0,134	0,239	73,60	1,100	67 (+10)
Tunnel 6 (2)	May	0,197	0,134	0,166	0,226	73,10	1,100	67 (+10)
	June	0,229	0,252	0,300	0,374	77,50	1,100	67 (+10)
New Batch Plant	Apr (baseline)	0,118	0,110	0,118	0,134	68,60	1,100	67 (+10)
	June	0,102	0,087	0,102	0,133	68,50	1,100	67 (+10)
Ushangi Shavgulidze's house	Apr	0,079	0,079	0,095	0,110	66,80	1,100	67 (+10)
Adjacent to Gaioz Kakheli's house	May	0,087	0,063	0,079	0,111	66,90	1,100	67 (+10)

*NW- non-working
**W – working
***E – Evening

Air Quality Monitoring

84. Air quality monitoring locations were selected to evaluate the impact of the construction activities on the nearest sensitive receptors. Table 20 shows the measurement locations for passive NO_x and SO_x samplings and dust measurements.

Table 20: Air Quality Measurement Locations

Location	Measurement	Coordinates	
		X	Y
Batch Plant 1 (BP1) AT	NO _x , SO _x	342607	4661686
Batch Plant 1 (BP1) TA	NO _x , SO _x , dust	342363	4661841
KM 5.8	NO _x , SO _x	340323.98	4662868.69
Spoil disposal area N2	NO _x , SO _x , dust	340247	4662834
KM 6.4	NO _x , SO _x , dust	339493.72	4663649.74
Tunnel 5 AT portal (T5)	NO _x , SO _x , dust	338583	4664433
KM 12.6 AT	NO _x , SO _x	336852	4665151
KM 12.6 TA	NO _x , SO _x	336881.01	4665342.12
Bridge 5	dust	337746	4664626
Natela Peradze's house	dust	333796	4666486
Tunnel 3	dust	340977	4661891
Maia Saralidze's house	dust	337994	4664804
Davit/Shavgulidze Khijakadze's house	dust	337664	4664565
New Batch Plant	dust	336292	4665560
Gela Nebieridze's house	dust	334936	4666200
Gocha Kapanadze's house	dust	337560	4664641

85. The air quality test results are given in Table 21 and Table 22. According to the measurements, PM levels are within the national limits for air quality in Georgia (150 micrograms/m³) except for three measurements in BP1 location. Additionally there are several measurements conducted on BP1-TA location and in KM 6.4 location, where NO_x levels are slightly higher than the MPC limits (0.04 mg/m³). These data are shown in Figure 13.

Table 21: Air Quality (SO_x, NO_x) Measurement Results

Location	Month	Exposure time (h)	SO _x mg/m ³	NO _x mg/m ³	*MPC for SO _x mg/m ³
BP1 AT	Jan	696,08	<0,002	0,026	0,05
	Feb	789,92	<0,002	0,014	0,05
	Mar	551	<0,002	0,014	0,05
	Apr	476,92	<0,002	0,016	0,05
	May	549,67	<0,002	0,018	0,05
	June	841,17	<0,002	0,018	0,05
BP1 TA	Jan	696,4	<0,002	0,026	0,05
	Feb	789,75	<0,002	0,014	0,05
	Mar	551	<0,002	0,041	0,05
	Apr	477,17	<0,002	0,048	0,05
	May	549,4	<0,002	0,042	0,05
	June	841,08	<0,002	0,034	0,05
KM 4.4	Jan	692,22	<0,002	0,02	0,05
	Feb	1011,25	<0,002	0,038	0,05

	Mar	646,4	<0,002	0,02	0,05
	Apr	677	<0,002	0,02	0,05
	May	695,08	<0,002	0,046	0,05
	June	846,16	<0,002	<0,02	0,05
KM 5.8	Jan	696	<0,002	0,03	0,05
	Feb	788,75	<0,002	0,027	0,05
	Mar	581,6	<0,002	0,028	0,05
	Apr	476,25	<0,002	0,021	0,05
	May	551,1	<0,002	0,019	0,05
	June	865,83	<0,002	0,02	0,05
Babukhadia	Jan	696,25	<0,002	0,03	0,05
	Feb	768,25	<0,002	0,028	0,05
	Mar	552	<0,002	0,028	0,05
	Apr	475,92	<0,002	0,011	0,05
	May	551,3	<0,002	0,013	0,05
	June	846,17	<0,002	0,013	0,05
KM 6.4	Jan	696,22	<0,002	0,023	0,05
	Feb	768,13	<0,002	0,05	0,05
	Mar	549,2	<0,002	0,051	0,05
	Apr	476,83	<0,002	0,018	0,05
	May	552,5	<0,002	0,016	0,05
	June	863,92	<0,002	0,014	0,05
T5 AT	Jan	695,1	<0,002	0,02	0,05
	Feb	768,17	<0,002	0,029	0,05
	Mar	552	<0,002	0,021	0,05
	Apr	456,08	<0,002	0,021	0,05
	May	577,7	<0,002	0,024	0,05
	June	839,92	<0,002	0,02	0,05
KM 12.6 AT	Jan	738,4	<0,002	0,021	0,05
	Feb	769,92	<0,002	<0,02	0,05
	Mar	554,1	<0,002	<0,005	0,05
	Apr	459,83	<0,002	0,014	0,05
	May	596,1	<0,002	0,01	0,05
	June	840,58	<0,002	0,011	0,05
KM 12.6 TA	Jan	738,3	<0,002	0,015	0,05
	Feb	769,75	<0,002	0,014	0,05
	Mar	554,2	<0,002	0,014	0,05
	Apr	459,75	<0,002	0,009	0,05
	May	596,2	<0,002	0,01	0,05
	June	840,75	<0,002	0,011	0,05
KM 13.3	Jan	696,08	<0,002	0,02	0,05

*Maximum permissible concentrations (MPC) of atmospheric air pollutants in populated areas hygiene norms 2.1.6. 002 -01.

**NW – non-working

***W – working

***E – Evening

Figure 13: Air Quality Measurement Results of NOx

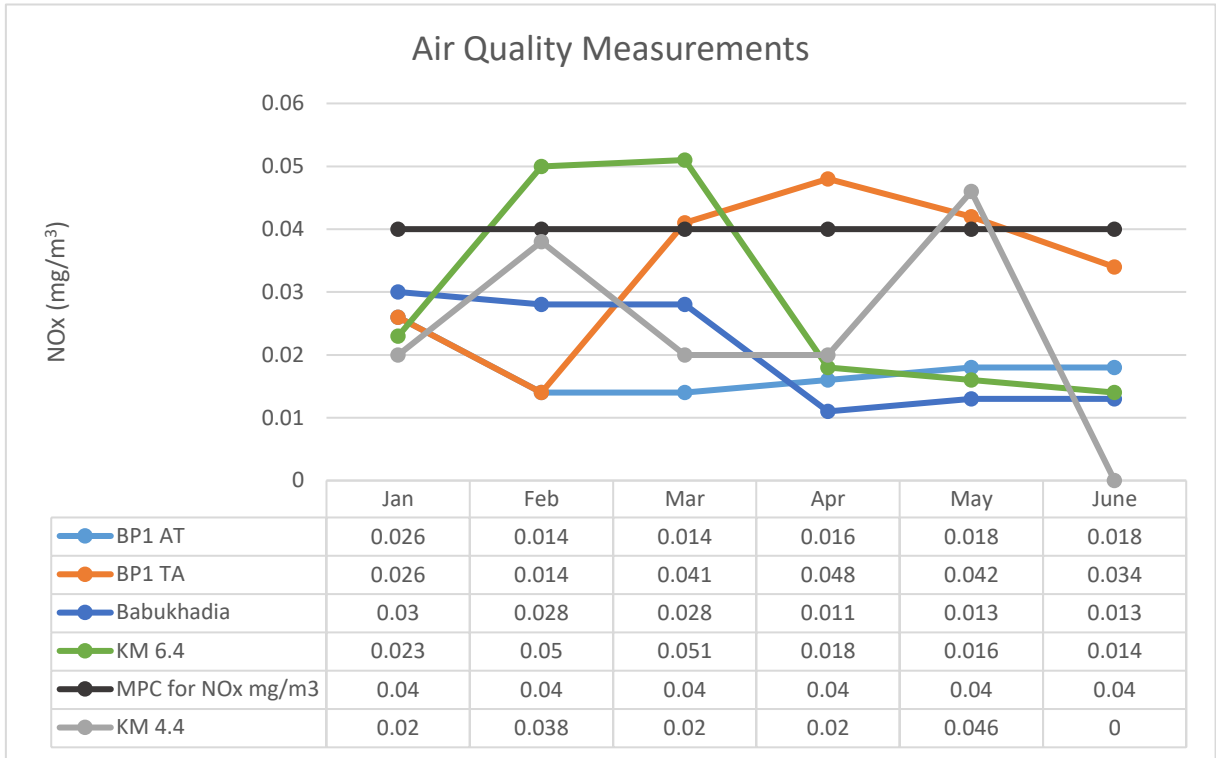


Figure 13: Air Quality Measurement Results of NOx (cont.)

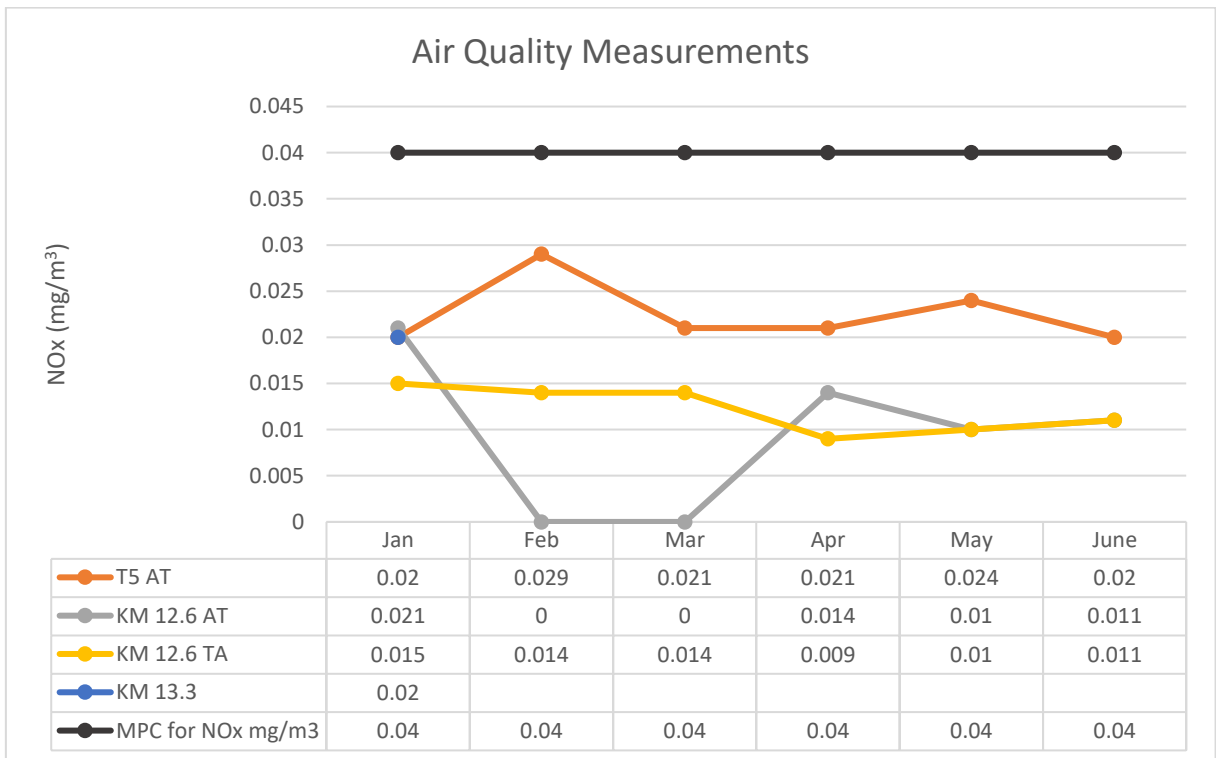


Table 22: Air Quality (PM) Measurement Results

Location/Session	PM ₁₀ (µg/m ³)			PM _{2.5} (µg/m ³)			PM _{Total} (µg/m ³)			
	30 Min Avg.	min	max	30 Min Avg.	min	max	30 Min Avg.	min	max	
T5 AT	January - W**	26,2	12	47	10,95	6	24	26,2	12	47
	January - NW***	24,3	9	45	9,45	6	14	24,3	9	45
	February - W**	24,3	11	38	8,2	5	11	24,3	11	38
	February - NW***	20	8	34	8	5	11	20	8	34
	March - W**	20,75	14	28	9	5	12	20,75	14	28
	March - NW***	7,55	1	16	3,25	2	5	7,55	1	16
	April - W**	16,5	7	31	5,4	3	9	16,5	7	31
	April - NW***	25,05	10	79	7,25	4	22	25,05	10	79
	May - W**	8,85	5	12	3,55	1	5	8,85	5	12
	May - NW***	23,95	6	117	5,15	1	18	23,95	6	117
	June - W**	28,35	12	61	7,3	5	14	28,35	12	61
June - NW***	15	6	25	4,75	3	7	15	6	25	
Bridge N5	August	19	17	21	19	16	21	19	17	21
	November	14,55	10	24	4,85	4	6	14,55	10	24
	December - W**	22,4	14	44	9,45	6	14	22,4	14	44
	December - NW***	44,1	26	70	32	11	32	44,1	26	70
	January - W**	28,15	12	101	10	7	19	28,15	12	101
	January - NW***	29,1	10	218	8,6	5	34	29,1	10	218
Nika Kvizhinadze's house / Spoil disposal area N2	October	37	22	55	11	6	18	37	22	5
	December	93,8	51	125	23,7	17	28	93,8	51	125
	January	46,35	21	78	13,9	10	18	46,35	21	78
	April	33,65	19	52	12	7	19	33,65	19	52
	May	7,55	4	14	3,4	2	5	7,55	4	14
	June	32,1	10	73	8,4	3	23	32,1	10	73
Tunnel 3	April	25,65	8	126	7,6	4	20	25,65	8	126
	May	34,75	18	80	10,1	5	23	34,75	18	80
	June	21,2	13	32	6,6	5	10	21,2	13	32
Natela Peradze's house	January	29	18	45	10,5	8	13	29	18	45
	February	9,5	2	72	2,4	1	6	9,5	2	72
	April	11,95	8	22	4,8	4	6	11,95	8	22
BP1	February	302,7	160	834	73,95	40	205	302,7	160	834
	March	416	48	1506	78	14	309	416	48	1506
	April	23,55	12	44	8,15	6	14	23,55	12	44
	May	159,1	23	602	28,4	5	111	159,1	23	602
	June	264,45	10	3621	27,05	4	249	264,45	10	3621
Shavgulidze/Davit Khijakadze's house	April	24,2	10	58	5,15	3	8	24,2	10	58
	May	22,65	5	117	5,5	2	19	22,65	5	117
	June	20,2	12	32	5,3	3	7	20,2	12	32
New Batch Plant	April	17,8	12	22	6	5	10	24,2	10	58

	June	8,7	4	12	3,8	3	5	8,7	4	12
Tunnel 6 (2)	May	24,06	4	57	4,5	1	13	24,06	4	57
	June	9,1	4	14	4,05	2	5	9,1	4	14
Gela Nebieridze's house	May	31,6	20	49	7,3	5	10	69	49	89
Gocha Kapanadze's house	June	15,8	10	23	4,7	3	6	15,8	10	23

*W – working

**NW – non-working

The additional vibration and noise monitorings

86. The Contractor conducted 1,785 vibration monitorings during blastings in each tunnel, and only 5 (0.3%) of these monitorings exceeded the MAC of Georgian legislation (1.5 mm/s). The details of these vibration monitorings are given in Table 23. In addition, the Contractor conducted five more vibration measurements and one noise monitoring in response to grievances.

Table 23: Additional Vibration Summary

	January	February	March	April	Mai
Tunnel 1 - Total	89	73	69	48	44
Tunnel 1 - Exceeding	0	0	0	0	0
Tunnel 2 - Total					
Tunnel 2 - Exceeding					
Tunnel 3 - Total	105	97	194	200	217
Tunnel 3 - Exceeding	0	0	0	0	5
Tunnel 4 - Total	112	66	109	136	183
Tunnel 4 - Exceeding	0	0	0	0	0
Tunnel 5 - Total	29			14	
Tunnel 5 - Exceeding	0			0	
Total	335	236	372	398	444
Exceeding	0	0	0	0	5

4.2 Summary of Monitoring Outcomes

87. The Contractor has hired Sustainable Development Solutions Caucasus (SDSC) LLC, a certified laboratory, to conduct regular monthly instrumental monitoring of the parameters for air and water quality and noise levels to control pollution levels. Testing has been carried out every month since August 2021.

88. Air quality was tested at various locations along the project area. The test results revealed that the dust and gaseous pollutant levels are mainly within the National and IFC acceptable range and around the baseline measurement values. The measurement data is also similar when compared with the previous reporting period. Therefore, there are no outliers in the data received since the monitoring work started.

89. In some locations, the Total Suspended Solids (TSS) levels are high during summer seasons, which could be related to the flow rate of the rivers. Therefore, the Contractor must restrict all kinds of machinery from entering the river protection zone, especially during the dry season, and operate the

settling ponds of the batching plant properly to avoid increasing TSS levels in the Borimela River, which is a tributary of Dzirula river.

90. Some locations, some residential and some non-residential, have higher vibration levels than the Georgian vibration standards established based on human comfort levels. However, the vibration levels stayed within German and British standards, which are used to avoid impacts on buildings.
91. Additionally, the Contractor conducted 1,785 vibration monitorings during blastings in each tunnel, and only 5 (0.3%) of these monitorings exceeded the MAC of Georgian legislation (1.5 mm/s).
92. The vibration data is higher than the baseline data when there are no construction activities. However, after construction work started, especially the blasting work for the tunnels, the vibration levels increased and were similar to the previous monitoring report.

4.3 Material Resource Mobilization

93. Up to May 2023, the following materials were mobilized on-site by the Contractor (Table 26):

Table 26: Material Mobilization

#	Major materials	Unit	Cumulative
1	Cement	Ton	139,552.5
2	Steel Reinforcement	Ton	24,650.0
3	Bitum and Bitumen emulsion	Ton	23.9
4	Granular materials for Sub Base	M ³	0.0
5	Granular materials for Base	M ³	6,655.0
6	Granular materials for Concrete	M ³	2,881.00
6.1	Sand	M ³	265,914.6
6.2	Crushed Aggregates	M ³	212,953.7
7	Angle Steel S355J2W	Ton	1,443.2
8	Thick angle steel	Ton	13,498.3

4.4 Waste Management

94. The Contractor developed a Waste Management plan to describe the requirements for establishing and conducting proper waste management and to address the handling, storage, and management of wastes to assure that works are conducted in a manner that minimizes environmental risk and is shared with the MoEPA in 2020. The Contractor received comments in January 2021 for the revision of the plan. After revision and resubmission of the plan dated April 23, 2021, it was approved dated May 7, 2021, by the MoEPA. The Contractor officially shared the plan with the Engineer on July 2, 2021.
95. The Contractor renewed the agreement with the “Zestafoni Cleaning and Improvement Service Center” of the Zestafoni Municipality regarding the provision of the collection and transportation of domestic wastes on February 2, 2023. The agreement is valid until February 1, 2024.
96. The Contractor has developed a waste log to record the movements of all non-hazardous and hazardous wastes. This register/log mainly includes;
 - Type of waste,
 - The volume or mass of the waste,
 - Date of disposal,
 - Sub-Contractor’s name.
97. Detailed information regarding the type of waste disposed of and responsible licensed companies are given in Table 27.

Table 27: Waste Management (January-June 2023)

#	Domestic/Hazardous Waste & Sewage	Volume /kg/m ³	Licensed Company	Transferred
1	Household waste	270 m ³	NNLEP "Zestafoni Cleaning and Improvement Service Center" of the Zestafoni Municipality	+
2	Sewage water	720 m ³	Municipality's sewage system through Sanitari LLC	+
3	Used tires	153 Piece	According to the company's waste management plan It should be transferred to „Lazu Group" LLC ,, through „Sanitari" LLC Note* It is planned to be delivered EPR organization and make a change in the waste management plan. EPR organization - "Wasteless" is an association of Extended Producer Responsibility of Georgia, the purpose of "Wasteless" is to help companies to transform their business in an efficient, clean, and sustainable direction and to promote awareness in the direction of waste management in Georgia. Obtained authorization from the Ministry for waste management of all four directions (waste oils, used tires, electrical and electronic equipment waste, batteries, and accumulator waste).	- Note * stored
4	Hydraulic and used oil	600 L.	According to the company's waste management plan It should be transferred to Sanitari LLC Note* It is planned to be delivered EPR organization and make a change in the waste management plan. EPR organization - "Wasteless" is an association of Extended Producer Responsibility of Georgia, the purpose of "Wasteless" is to help companies to transform their business in an efficient, clean, and sustainable direction and to promote awareness in the direction of waste management in Georgia. Obtained authorization from the Ministry for waste management of all four directions (waste oils, used tires, electrical and electronic equipment waste, batteries, and accumulator waste).	- Note * stored
5	Waste paints and varnishes	380 kg	Sanitari LLC	- Note * stored
6	Chemical additive tanks	0	Sanitari LLC	-
7	Oil drums	60 Piece	Sanitari LLC	- Note * stored
8	Used food oil	0	Note* According to the company's waste management plan Biodegradable kitchen waste handovers to NNLEP "Zestafoni Cleaning and Improvement Service Center" of the Zestafoni Municipality	-
9	Printer tonner	0 Note* charging / updating	Sanitari LLC	-
10	Absorbents (e.g., oil filters, polluted clothes and materials)	250 kg	Sanitari LLC	- Note * stored
11	Medical Waste	4 kg	Sanitari LLC	- Note * stored
12	Metal Scraps	1 500 kg	"Geosteel" LLC	- Note * stored
13	Wood Waste	30 m ³	Given to Local Citizens	+
14	Contaminated soil	360 kg	Sanitari LLC	- Note * stored

98. The Contractor keeps records of waste transfer notes filled and signed by the Contractor, waste carrier, and receiving facility. During the reporting period, **270 m³** of domestic waste was transferred to be disposed of.

99. The Contractor constructed septic tanks in worker's camp no 2 and worker camp no 3 with a total capacity of 90 m³ and 45 m³ respectively. During the reporting period, the Contractor discharged **720 m³** of domestic wastewater through licensed vacuum trucks owned by "Sanitari LLC".

4.5 Spoil Disposal

100. The main source that generates a large amount of the waste is earthworks, specifically: the excavation of the soil and rock soil material excavated from the tunnels. The estimated volume for spoil generation is given below:

- Estimated spoil generation: 2,450,000 m³
- Estimated spoil reuse for embankments: 2,050,000 m³
- Spoil needs to be disposed of: 400,000 m³ (estimated spoil disposal into Spoil Disposal Area No 1: 120.000 m³, estimated spoil disposal into Spoil Disposal Area No 2: 250.000 m³, estimated spoil disposal into Spoil Disposal Area No 3: 30.000 m³)

101. Two spoil disposal areas were approved by the Ministry of Regional Development and Infrastructure of Georgia (MRDI) and the Roads Department of Georgia (RD). The first approved area is located at the administrative borders of Zestafoni Municipality, N45 Sergo Zakariadze Street (c/c: N32.10.41.096; 32.10.41 .262), right side of the existing E60 main Road KM 185+00 to KM 200+00 with a total area of 42,438 m². The second approved spoil area is located in the village Kveda Sakara (C/C N32.03.44.018) with a 10,900 m² total area. The Contractor started using a third spoil disposal area approved by the MRDI after the excavation work commenced at Tunnel 6 location. This area was initially proposed and utilized at the beginning of the Project but was discontinued a few months later, as it is located far away from the main excavation working areas.

4.6 Health and Safety

102. HSE Team is responsible implementation, supervision, and monitoring of the construction activities on-site on a daily basis to ensure occupational and community health and safety are maintained. The Contractor's HS specialists include the followings:

Jan Du: Head HSE officer

Mirza Bagashvil: Local HSE staff

Giorgi Karelidze; Local HSE officer

Lasha Peradze: Traffic Safety

Giorgi Kimeridze: Local HSE staff

103. Engineer's local H&S specialists, Mr. Zaal Giorgadze and Nerses Makarov have been continuously monitoring the Contractor's H&S performance in working areas. They have provided advice to the Contractor on how it mitigate risks. H&S specialist, Mr. Giorgadze, prepared and reported approximately 24 weekly (6 monthly) safety observation reports during the reporting period. Moreover, Mr. Zura Rukhadze joined the Engineer's team as Road Safety Specialist to ensure traffic safety during construction.

4.6.1 Community Health and Safety

104. No incident reported involving community members or no traffic incident was recorded during the reporting period.

105. The Contractor has appointed flagmen to control the movement of heavy vehicles on construction sites and the traffic while cars/heavy vehicles enter and exit the construction sites. All flagmen were trained about the HSE requirements of the Project.

106. The Contractor has appointed security officers on all construction site entrances and installed a CCTV camera control system in all camp areas and batching plants. Camp areas and batching plants are fenced along to provide isolation. DETECTORI (The Security Company) has installed CCTV Cameras, which are being watched and operated by the DETECTOR

4.6.2 Occupational Health and Safety

- 107. Regular safety inspection of the construction site is being conducted by H&S representatives as a continuous process. H&S specialist reports all safety deviations to HSE Manager daily. In addition, the H&S department conducts mandatory HSE induction for new employees and started to provide special safety training for workers to raise safety culture including working at height, flagmen training, driving safety, requirements for earthwork activities, and lifting operations. Moreover, the HS specialist prepares documentation for training, risk assessments for special works, and work procedures.
- 108. The Contractor is providing the mandatory PPEs and special protective equipment for the on-site workers. Nevertheless, more than enforcement of usage is required. Therefore, the Contractor purchased welder’s aprons (30 no’s) for welders and safety shoes and distributed them to workers.
- 109. The accidents reported during the reporting period are given in Table 28. Based on data provided by the HSE team, there were no major or minor accidents during the reporting period.
- 110. There are daily walkthroughs by the HSE inspectors from the Contractor and Engineer and bi-weekly/monthly HSE meetings.

Table 28: Types of Accidents Reported

Accident Type	Reporting Period (Jan 2023 to Jun 2023)	Total (Dec 2020 to Jun 2023)
Near Miss	0	0
Accident Minor	0	1
Accident Major	0	1

- 111. The Contractor assigned permanent medical personnel (doctor – Irma Porchkhidze and nurse – Nino Okroshidze) to provide medical assistance in a medical emergency, including the safe evacuation of the injured person. The doctor started working at the beginning of 2022.

4.7 Training

- 112. The Contractor continues the training program to form a lasting culture on the behavior and activities of employees, affecting the environmental, social, and safety performances. The program covers both mandatory induction training and work-specific training.
- 113. During the reporting period, given training covered the following topics:
 - Induction training,
 - Tree cutting,
 - Tops soil stripping and storage,
 - Hazardous non-hazardous waste handling storage,
 - Refueling process,
 - Environmental and social training,
 - Earthwork activities,
 - Driving safety,
 - Lifting operations,
 - Working at height,
 - Flagmen training,
 - Toolbox talks,
 - Refresh the Concrete Mixer truck drivers training cisterns to wash out procedure and Usage of the separators,
 - Refueling Process, and
 - Blasting activities.
- 114. The Contractor conducted general Environmental and Social training on environmental issues for 167 persons of the Contractor’s staff. The training covered basic knowledge related to

environmental legislation, topsoil preservation, air quality, waste management, land contamination, spill prevention, biodiversity, noise, resources management, chemical management, community safety, cultural heritage, and code of conduct. Sample attendance lists/sheets are enclosed in Annex 4.

115. During reporting period 2015 toolbox talks were provided by the HS&Environment officers, foremen, or site supervisors.

4.8 Social Management and Grievance Redress Mechanism

116. Grievance Redress Mechanism (GRM) was developed by the Contractor and submitted to Engineer for reviewing and approval (February 19, 2021- Ref: 20210403-0148-GHEC-UBM, April 3, 2021- Ref: 20210316-0134-GHEC-UBM and April 16, 2021-Ref: 20210416-0166-GHEC-UBM). GRM was approved in April 2021.

117. Nineteen (19) grievances were received either directly from the local community or through the Employer during the reporting period. Of the total nineteen received grievances, twelve related to Damaged structure / Assets, and three complaints logged were pertinent to design issue/inclusion in LARP, and the remaining Four was for Restriction or Loss of Access as given in Table 29. Of 19 grievances, 2 have been resolved, and 3 are on a technical hold. The details of some complaints are given in Annex 5 - Complaints Log.

Table 29: Status of Grievances

S#	Nature of Grievances	No. of total Grievances	Results		
			Open	Close	Tech. Hold
1	Damage to Infrastructure/Assets	12	8	1	3
2	Inclusion in LARP	3	3	-	-
3	Restriction or loss of access	4	4	-	-
4	Compensation Rate	-	-	-	-
5	HSE Concerns	-	-	-	-
6	Disturbance: Noise / Vibration / Dust	-	-	-	-
Total		19	15	1	3

118. The Contractor implements community meetings and regular visits to the site. The details of these communication with stakeholders are given in the Social Safeguard Monitoring Report (January-June 2023).

5. FUNCTIONING OF SSEMP

5.1 SSEMP Review

119. To ensure that all potential mitigation measures are applied during the construction phase, the Contractor shall be responsible for preparing his Specific Environmental Management Plans (SEMP) during the pre-construction phase. The approved SEMP include the following plans:

(i) Topic Specific Plans:

- Waste Management Plan
- Spoil Disposal Plan for Arrangement of Spoil Disposal Area
- Re-cultivation Plan
- Traffic Management Plan
- Occupational Health and Safety Plan
- Community Health and Safety Plan
- Emergency Preparedness and Response Plan
- Air Quality Plan
- Spill Response Plan
- Vibration Monitoring Plan

- Clearance, Re-vegetation, and Restoration Management Plan
- Groundwater Management Plan
- Tunnel Blasting Plan
- Noise Management Plan
- Biodiversity Action Plan
- Topsoil Stripping and Storage Plan
- Chance Find Procedure
- Grievance Redress Mechanism
- H&S and E&S Training Plan
- Bridge Construction Plan
- Community Liaison Management Plan

(ii) Site Specific Plans:

- Construction Camp Management Plan
- Asphalt Plant Plan
- Rock Crushing Plant Plan
- Concrete Batching Plant Plan.
- Site-Specific Method Statement for Working in the Area above the
- Railway Line at KM 6.3 and at Bridge BR 4.0.1. AT/TA
- Detailed Method of Working in the Water and Workplan
- Contaminated Spoil Treatment Plan

120. In Annex 6, the Clearance, Re-vegetation, and Restoration Management Plan, as well as the Re-cultivation Plan were given. These plans outline the areas to be reinstated and provide detailed information about the reinstatement process.

121. SEMP was developed by the Contractor and submitted to the Engineer for reviewing and approval (January 27, 2021-Ref:20210127-0090-GHEC-UBM, February 19, 2021- Ref:20210219-00108-GHEC-UBM, March 2, 2021-Ref:20210302-0118-GHEC-UBM March 15, 2021-Ref: 20210315-0129-GHEC-UBM and May 28, 2021- Ref 20210528-0148). SEMP was approved on June 7, 2021, with Engineer's letter no 0333-CSAE60-F4-UBM-GE.

6. GOOD PRACTICES

6.1 Good Practices

122. Following best practices are being adopted by the Contractor due to site inspections, issuance of inspection reports, and discussions during construction progress meetings headed by the Engineer:

- The Contractor has implemented a series of measures to enhance the quality of discharge water from the batching plant, including changing filters and cleaning the ponds. These measures have been effective in reducing the amount of suspended solids and other pollutants in the discharge water. However, further improvements are being explored to meet the required water quality standards.
- The Contractor improved the hazardous waste storage area by installing new fencing and security measures. They also improved the area for non-hazardous waste collection by providing more containers and signage.

7. SUMMARY AND RECOMMENDATION

7.1 Summary

123. The Engineer observed a sum of 104 Environmental and 390 Health and Safety issues during site visits and inspections. Out of 104 Environmental issues (and additional 12 issues from the previous reporting period), 102 issues were closed, and there are 12 issues remaining for the next semi-annual report to follow up. Similarly, out of 390 H&S issues (and additional 21 issues from the previous reporting period), 390 issues were closed, and there are 21 corrective action requirements for the next semi-annual report to follow up.
124. The Contractor has hired a certified laboratory, Sustainable Development Solutions Caucasus (SDSC) LLC, and carried out instrumental monitoring, including noise, vibration, air quality, and surface water quality measurements, during the reporting period. The Contractor's Consultant also monitored vibration during tunnel blastings.
125. The environmental monitoring results show no significant variance from previous monitoring periods. TSS values are essential parameters for surface water quality. Noise and vibration levels are sometimes higher than local and international regulations allow. The Contractor could arrange working schedules at these locations to reduce the levels.

7.2 Recommendations & Follow-up Actions for the next Monitoring Period

126. The following recommendations describe any actions required to achieve full compliance with each requirement in the EIA, EMP, and conditions of the contract during the 2nd half of 2023 (H2 2023):
- The main environmental issues to be improved are listed below;
 - **Sewage Management Improvement:** The Contractor should implement better sewage management practices to prevent any direct discharge of sewage into the environment. This may include upgrading existing systems. This would help to reduce the amount of sewage that is discharged into the environment, which would improve water quality and reduce the risk of disease.
 - **Greywater Management Enhancement:** The Contractor should take measures to improve greywater management, particularly in locations where the plastic water pipe is damaged and leading to direct environmental pollution. Repairing the damaged pipes and ensuring proper connections can help reduce the discharge of greywater into the environment.
 - **Waste and Hazardous Waste Management Optimization:** The Contractor must focus on improving waste management practices, especially for hazardous waste. Proper storage, handling, and disposal of hazardous materials should be strictly adhered to, following the guidelines of the Environmental Impact Assessment (EIA).
 - **Watering During Dry Season:** The Contractor should increase the frequency of watering during the dry season when necessary to minimize dust generation, which can affect air quality and local communities.
 - **Sanitary Facilities Improvement:** The conditions of sanitary facilities at various camps need improvement. The Contractor should take necessary steps to ensure that these facilities are well-maintained, adequately equipped, and regularly stocked with essentials such as soap, toilet paper, and paper towels. This would help to improve the health and hygiene of workers and local residents.
 - **Proper Handling of Hazardous Material:** The Contractor must ensure that hazardous materials are stored under appropriate conditions and kept away from water courses to avoid any accidental spills or pollution incidents.

- **Better Water Management in the New Batching Plant:** To meet increasing cement demand while maintaining environmental standards, the Contractor should continuously monitor and improve water management practices at the new batching plant.
 - **River Protection Measures:** The Contractor should enhance river protection by ensuring slope stability in areas close to rivers and limiting spoil disposal areas near water bodies to prevent sediments from mixing into surface water. This would help to prevent erosion and pollution of rivers
 - **Working Schedules and Noise/Vibration Mitigation:** In locations with higher noise and vibration levels, the Contractor could arrange working schedules to minimize the effects on local communities. Implementing measures like quieter machinery or damping techniques during blasting operations can also help reduce noise and vibration impacts
 - **Increased Environmental Training:** To ensure all personnel are aware of and committed to environmental best practices, the Contractor should increase the number of environmental training sessions. Training should cover pollution prevention, waste management, and other essential environmental aspects.
- There are several H&S issues to improve, such as
 - Poor housekeeping,
 - Improper material storage,
 - Electrical safety,
 - Damaged lifting equipment,
 - Damaged tools and equipment,
 - Poor ventilation,
 - Unsafe working at height,
 - PPE usage,
 - Dangerous and hand-made equipment,
 - Poor Access road conditions,
 - Improper fire extinguishers,
 - Deep excavation without guard rails and
 - Driving safety.

ANNEXES

Annex 1: Project Photo log during Monitoring Period

	
<p>Improper Storage of Scrap Metal Waste (Workshop 2, January 2023)</p>	<p>Batching Plant Discharge Water Settling Ponds (Batching Plant No 1 (January 2023)</p>



Batching Plant Discharge Water Settling Ponds (Batching Plant No 1 (January 2023))



Full Waste Bin (Worker's Camp No 3, January 2023)



Improper Hazardous Material Storage (Steel Workshop at Interchange 2 ,
January 2023)



New Wood Waste Collection Area (Next to Hazardous Waste Storage Area, January 2023)



New Glass and Non-Hazardous Waste Collection Area (Next to Hazardous Waste Storage Area, January 2023)



Leaking Sewage Tank (Worker's Camp No 2, March 2023)



Full Sewage Tank (Worker's Camp No 6, March 2023)



Improper Storage of Hazardous Material Container (Tunnel 5 Argveta Site Workshop, March 2023)



Improper Storage of Scrap Metal Waste (Tunnel 5 Argveta Site Workshop, March 2023)



Poor Waste Management (Interchange 2, April 2023)



Broken Grey Water Pipes (Worker's Camp No 1, May 2023)



Panoramic View of Batchingplant No 2 (June 2023)



Poor Water Management in Batching Plant No 2 (June 2023)



Poor Hazardous Waste Management (Tunnel 4 Portal, June 2023)



Poor Hazardous Waste Management (Tunnel 4 Portal, June 2023)



Poor Waste Management (Worker's Camp No 4, June 2023)



Poor Dust Management (Access Road to Tunne 4&5, June 2023)



Poor Waste Management (Tunnel 4 Portal, June 2023)

Annex 2: Latest HS&E Inspection Report (June 2023)



Site Inspection Report

Project:	Construction of "Shorapani-Argveta" Section (E60 Highway Route) Lot F4
Subject:	On Site Inspection
Inspection Date:	From 03 rd to 09 th of July, 2023
Issue Date:	10 th of July, 2023
Occupational Health & Safety Specialists:	Nerses Makarov – Zaza Giorgadze

Detailed Description of Activities

On the week, from 03rd to 09th of July, 2023, work processes have been inspected on SHORAPANI-ARGVETA Section F4 by UBM Health and safety representatives. Inspections were done during day and night shift. Site inspections revealed safety violations and good observations. Weekly H&S management meeting has been held on 05th of July, 2023. Health and safety related issues were discussed with Contractor's H&S team. Agreement reached to continue work hard on improvement of H&S related issues during the work process to ensure that the site is a safe working environment for the workers, involved in the tasks at workplaces. Also, corrective actions were taken against violations which have been revealed in the previous inspection reports.

Below are the list of the violations and good observations revealed during on-site inspection. Some issues, related to Company H&S rules and requirement were solved immediately and some must be corrected in the following week.

Supporting Photos with Descriptions.
Possible damage of equipment and personnel injury

High voltage electric cables are still buried in mud and pressed between the rocks and nobody from the Contractor's Company is trying to take care of this issue. These cables must be released from the rocks as soon as possible to avoid the possible damage on the protection layer of these cables and possible injury of working personnel when touching.



Tunnel N2AT-T



Tunnel N3 (Near the main distribution board)

Site Inspection Report

Picture 1: Negative observations (Possible incident and injury of working personnel) (Tunnel N2AT-T and Tunnel N3) - The violation to H&S rules and requirements that had been observed by the Engineer in previous weeks, isn't solved yet. The power cables are still partially buried under or pressed between the rocks and mud. The loose rocks are still rolling down the hill and falling on those cables. It may cause a possible incident. Site responsible persons from the Contractor Company are informed about it. The Engineer has asked the Contractor to react on this non-compliance as soon as possible to avoid possible incident and injury of working personnel. The H&S responsible persons from the Contractor Company are also informed about it and asked to do regular inspection of working territory, to identify all non-compliances, reduce and eliminate all possible risks of incident. No positive changes have been made until now. **This non-compliance isn't solved yet.**



Picture 2: Driving safety (Road related incidents) (Access Road to Tunnels N4 and 5) - The non-compliance, related to road safety isn't solved yet. The Contractor has to react to this non-compliance as soon as possible, because the condition of the temporary access road surface is deteriorating day after day and it may cause the possible traffic related problem and possible delay in the working process. The existing cracks and holes are becoming more visible and wider than it was in the previous weeks. It is double danger, when driving in the night time (In some section of the access road, it becomes very narrow and there is a big risk to lose the concentration, drive out the road and turn over. In some section, road is partially damaged). The Engineers are highlighting this issue on the management weekly safety meetings with the Contractor's H&S team and asking the Contractor's site responsible persons many times to repair the road surface, arrange some jersey barriers or flashing safety poles and place it on most dangerous areas of mentioned access road to protect unsafe sections and safe people's life, but there are no positive changes in this regard. Plus, this road must be periodically be washed and cleaned from the mud. **Non-compliance is still open.**

Positive observation:



Tunnel N2AT-A – Steel cutting machine in working condition has been observed.

2

Negative observations:



Tunnels N: 4AT-A and 4TA-A – About 1 Month this welding machine is left unattended in mud.



Tunnels N: 4TA-A and 5AT-T – The wood cutting machines in unsafe condition have been observed.

-This type of wood cutting device doesn't meet the International H&S standards, because the working personnel isn't fully protected from getting possible injures (Devices aren't equipped with the factory-made "emergency shut down" buttons. The wood cutting electric circular saws are installed at the handmade supports and handmade switch gears are fixed on it. The rotating parts aren't well protected, head covers are made by wooden timbers or steel made plates. It may protect the workers from getting injury when it is in standby mode, but it will not protect the workers, when machine is running and rotating parts or cutting blades are swinging). The cables are not connected to each other properly and it may cause the possible incident and injury of working personnel.

*Picture 3: Positive and Negative observations (Safe work process) (All Tunnels and nearby workshops) – The Engineers are still facing the violation to H&S requirement from the worker's side. They are using partially damage tools and equipment at workplaces (bending, welding and cutting machines with damaged extension cables, with a handmade switch gears and missing emergency "shut down" buttons on it). H&S representatives from the Contractor Company were informed about it many times. The Engineer has asked them to take all necessary action for to solve this non-compliance as soon as possible and avoid possible injury of working personnel, but no any positive changes had been made in this regard until now. The Engineers are still waiting for feedback from the Contractor. **Non-compliance is still open.***

Electric distribution boards (Panels):

3

Site Inspection Report

Damaged, not properly locked and thrown on the ground (floor) electric boxes have been observed.

Good observation:



Tunnel N2AT-A – The well locked and signed up electric box has been observed.



Before



After

Bridge 4 (Interchange N2) – Fallen down electric box has been observed. After verbal warning, given to the Contractor's site responsible persons, it was fixed in correct position.

Negative observations:



Tunnel N1AT-A



Tunnel N2AT-A



Tunnel N4TA-A



Bridge 3 (Interchange N1)



Bridge N1, pier 11



Tunnel N2AT-T

Limited access to the electric distribution boards (Possible trip, slip and falling hazards).



Tunnel N2 AT-T



Bridge 4 (Interchange N2)

Extension cables:

Positive observations:



Tunnel N1AT-A



Tunnel N3AT-T



Before



After

Bridge 4 (Interchange N2)

Negative observations:



Tunnel N: 2AT-T



N4AT-A and TA-A



Tunnel N2AT-A



Tunnel N4TA-A

Site Inspection Report



Thrown in mud and the water, electric cables have been observed. After verbal warning, given to the Contractor, all electric cables were removed from the mud, but they weren't hung on to the wall.

Picture 4: Positive and Negative observations – (Electric safety - Possible injuries of working personnel) (Tunnels, bridges, Interchanges and nearby workshops): Continue violations to electrical safety rules and requirements. The Engineers are still face with electric safety related non-compliances at workplaces. Some electric panels and distribution boards are in good condition, properly locked and labeled, but most of them are in terrible condition. Not properly locked, partially damaged and thrown on the floor electric panels have been observed and continue observing by the Engineers during site inspections. The high voltage "life" electric cables have been observed passing through the reinforcing bars and are thrown in the water and mud. All these non-compliances may cause possible incidents and injury of working personnel. The Engineers are continuously informing the site responsible persons from the Contractor Company about these issues and asking to solve this problem as soon as possible. The Contractor is trying to close all these non-compliances, but it isn't enough for full completion of mentioned above problems. The Contractor has to replace or repair all damaged or not properly locked electric panels on the new one, keep an eye and continue monitoring of electrical safety related issues at workplace, do site inspections very often to reduce and finally eliminate all possibilities of having electric safety related incidents at workplaces. The Engineer is still waiting for feedback from the Contractor. Some electric related non-compliances aren't solved yet.

Negative observations:



Tunnel N2TA-T – Damaged lifting devices in use have been observed. They were removed and sent to the trash bin.

Site Inspection Report



Tunnels N3AT-A – The handmade lifting device in use has been observed. It isn't allowed to use the handmade lifting devices, because it may cause the possible drop and possible property damage. All damaged or handmade lifting tools and equipment must be replaced on the Factory made and certified ones.

Positive observations:



Before



After

Bridge N4 (Interchange N2) – The damaged lifting belt use has been observed. After verbal warning, given to the Contractor, it was replaced with a better one.

Picture 5: Negative and Positive observations (Lifting Safety-Possible drop and property damage) (Interchanges, tunnels and workshops) – Some working crews around the project are using correct type lifting tools and equipment, but the Engineers are still facing violation to lifting safety regulations (Bad quality, cut, damaged, thrown in mud and handmade lifting tools and equipment in use) when visiting the workplaces. The site responsible persons and H&S representatives from the Contractor Company are already warned to find and remove from the site all cut or damaged lifting equipment and protect working personnel from getting hurt, but the Engineers are still facing the same situation when inspecting the workplaces. The Contractor has to pay additional attention to this issue and do an inspection of all work processes systematically to reduce and eliminate all unsafe acts and conditions. The Engineers are still waiting for feedback from the Contractor. **Non-compliance isn't solved yet.**

Site Inspection Report



Tunnel N1 AT-A

Tunnel N5AT-T

Picture 6: Negative observations (Workplace Safety-Possible personal injury) (Tunnels) – Most of the temporary bridges, used for the movement of workers and vehicles aren't equipped with the handrails and no warning signs (informing the workers about possible hazards) are fixed around, only safety flashing cones are placed in some places. **Plus, there is a big possibility of trip, slip and fall hazards or possible slide of working machinery, because the surfaces (walkways) of that bridges are very dirty and muddy, as it shown at the picture.** The Engineers are systematically asking the Contractor to fix all mentioned above non-compliances to avoid possible falling from the bridges and injury of working personnel, but no positive changes have been made until now. The Engineers are still waiting for feedback from the Contractor. **Non-compliance isn't solved yet.**



Picture 7: Bad observations – Electric Safety (Tunnel N5AT-T) – It has been observed that there is a section inside the tunnel, which isn't illuminated (About 100m in the middle of AT direction). It has also been observed that the walkway in the highlighted above section is in bad condition too. It is very dangerous, when visibility is "zero" and any wrong step in the mud may cause possible trip, slip and fall hazards. The electric bulbs must be fixed as soon as possible to avoid the trip, slip and fall hazards. Site responsible and H&S representatives from the Contractor Company were informed about this non-compliance. The Engineer has asked them to fix this non-compliance as soon as possible to avoid the possible incident from happening. **Non-compliance isn't solved.**

Site Inspection Report



Before



After

Tunnel №4 ATA - Ventilation system was turned off because of some technical reason and was partially dismantled, but later it was refixed and turned on.



Tunnel N3AT-T – During site visit it has been observed that the ventilation system was turned off. After visual inspection, it has been observed that the workers were busy with some work activities inside the tunnel. The quality of oxygen was acceptable for that moment, but the Contractor has to pay additional attention to this issue and turn on the ventilation system, when somebody is performing the task inside the tunnel in order to avoid the possible personal injury.

Positive observations:



Tunnel N1AT-A



Tunnel N3AT-A

Site Inspection Report

Picture 8: Negative and Positive observations (Poor Ventilation-Possible personal injury)(Tunnels) - The violation of workplace safety rules, that had been observed by the Engineer in the previous weeks, isn't solved yet. Not some many tunnel portals have been left on this project, where the ventilation system is still functioning, but the Engineers are still facing the partially cut, damaged and turned off ventilation fans when inspecting the work process. Lack of oxygen inside the tunnel could cause health related problems and possible injury of working personnel. Site responsible persons and H&S representatives and H&S representatives from the Contractor Company were informed about it. The Engineer has asked them to take an action and solve this non-compliance soon in order to avoid the possible health related problems. **Non-compliance isn't solved.**



Interchange N2 (Bridge N4) – The trip, slip and falling related non-compliances that have been observed by the Engineer in the previous weeks, isn't solved (No hard barriers are placed nearby and no warning signs are fixed or hung to warn the workers about the possible hazards).

Picture 9: Non-compliance (Workplace safety - Possible fall or injury) (Interchange N2 (Bridge N4)) – The workplace safety related non-compliance that has been observed by the Engineer during site inspection, isn't solved yet. The access roads aren't well secured (Protected). There is a big possibility of trip, slip and fall hazards and injury of working personnel. The site responsible persons from the Contractor Company were informed about it. H&S representatives from the Contractor Company were also informed about it and asked to do inspections of working territories very often to find the H&S related non-compliances, reduce and finally eliminate the possible hazards. **Non-compliance isn't solved yet.**

Site Inspection Report



Picture 10: Non-compliances (Work at height Safety-Possible injury of working personnel) (Bridge 4 – Interchange 2) Violation of work at height safety standards has been observed by the Engineer, when inspecting the work process. The workers weren't equipped with personal safety harnesses, while platforming the task at height. The H&S and site responsible persons from the Contractor Company were informed about it. The Engineer has asked the Contractor to pay additional attention to this issue to avoid the possible incident and injury of working personnel. **Non-compliance isn't solved.**



Picture 11: Non-compliances (Work at height Safety-Possible fall and injury of working personnel) (Bridge 1, Pier 2) - Violation of work at height safety standards has been observed by the Engineer, when inspecting the work process. The workers weren't equipped with personal safety harnesses, while platforming the task at height. The H&S and site responsible persons from the Contractor Company were informed about it. The Engineer has asked the Contractor to pay additional attention to this issue in order to avoid the possible incident and injury of working personnel. **Non-compliance isn't solved.**

Site Inspection Report



Picture 12: Negative observations (Safe work process) (Possible falls and injury of working personnel) – The temporary stair case in unsafe condition has been observed. It must be redesigned immediately, because the workers aren't fully protected from possible falls. The access onto the platform is not safe, because the stair case is bended and supports aren't fixed properly. The site responsible persons from the Contractor Company were informed about it and asked to solve all non-compliance before somebody from the working crew might get hurt there. **Non-compliance is still open.**

Negative observation:



(Tunnel N4 (Tbilisi Portal)) – Not properly stored oxygen cylinders that had been observed by the Engineer in the previous week, weren't restored until now (They weren't well secured and the area wasn't well protected from the possible unacceptable and unauthorized contacts. The careless touch could cause the possible property damage and injury of working personnel. It has also been observed that no warning signs were hung at the shelter, to warn the people about the possible hazards). The responsible persons from the Contractor Company must react to this non-compliance as soon as possible to avoid the possible incident.

Site Inspection Report



Tunnel N4TA-A



Bridge N2



Bridge N1, pier 11

Picture 13: Negative observation – (Improper storage - Property damage) – The violation to workplace safety related H&S requirement that had been observed by the Engineer in the previous weeks is still actual. The Engineers are still facing the oxygen cylinders and propane bottles that are left inattentively at workplaces. Incorrect or accidental contact with the cylinders may cause the possible property damage and injury of working personnel. The site responsible persons from the Contractor Company were informed about it by the Engineer several time. The Engineer has asked to remove all oxygen cylinders/propane bottles that aren't in use, away from the workplaces and send it to the storage area. Also, the Engineer has asked Contractor to place all using cylinders in the trolley and replace all damaged gauges on the new one. The Engineer is waiting for feedback from the Contractor. **Non-compliance is still open.**



One of the examples of eye wash station.

Picture 14: Non-compliances – Health care (Tunnels) – Tunneling crews aren't still supplied with eye wash stations, for effective fight against possible drops of concrete in the eyes. Information about it was forwarded to the site responsible persons and H&S representatives from the Contractor Company. The Engineer has asked them to arrange and distribute the eye wash stations to site as soon as possible to avoid possible incidents at workplace. The Engineer is still waiting for feedback from the Contractor. **Non-compliance isn't solved yet.**

Positive observation:



Interchange N2 (Bridge 4) and Tunnels: N3AT-A; N4AT-A: - *Workers wears the proper PPE when working.*

Negative observation:



Tunnels: N4AT-A; N5AT-T; N1AT-A – *Improper use of PPE by the workers when performing the task.*

Picture 15: Positive and Negative observations – Personal Protective Equipment (All Tunnels) – Correct and improper use of PPE has been observed by the Engineer when inspecting the work process inside the tunnels. The workers who didn't wear the correct PPE, were warned verbally by the Engineer and the workers who wore the correct PPE, were thanked by the Engineer for caring about their own health and safety. The H&S representatives from the Contractor Company were informed about these non-compliances and asked them to pay more attention to such sensitive issue to avoid possible incidents and injury of working personnel. **Non-compliance still isn't solved.**

Site Inspection Report



Tunnel N3AT-T

Tunnel N2AT-T

Picture 16: Negative observations (Possible contamination of soil) (Tunnels and not only) – Not properly stored oil barrels and other chemicals have been observed during site inspection. The site responsible persons from the Contractor Company were informed about these non-compliances and asked to remove all chemicals from the site and move it to the chemical storage area. All hazardous materials should be kept in especially arranged for such materials storage area to avoid the possible contamination of soil. **Non-compliance isn't solved.**



Tunnel N1AT-A – *Rolled down the hill loose rocks have been observed by the Engineer when inspecting the working territory. Wrong type warning signs were installed nearby. The Contractor has to pay additional attention to this issue and necessary safety precautions must be taken in order to avoid the possible incident and injury of working personnel. The access road to the tunnel portals must be well protected and correct type warning signs must be placed nearby to warn the working personnel about the hazards of getting possible injury.*



Tunnel N1AT-A – *Slope is partially washed and may collapse down.*

Site Inspection Report



Abutment for Bridge N1 - Pieces of rocks that are accumulated on top of the hill, may roll down in any second and hit the workers, that will perform the task close to the bottom of that hill.

Picture 17: Non-compliance – Possible collapse of the slope (Tunnels: N1AT-A and N2AT-A) – No positive changes have been made seems last weeks. The Contractor has started the excavation of a slope on top of the right side of the tunnel portal and the hole has started becoming bigger and bigger (Tunnel N1AT-A). Plus, the rocks are rolling down on the access road and there is a big possibility that somebody may get injured there. Another slope (Right side from the Tunnel N1AT-A portal) is also washed by heavy rain and it may collapse in one day if the necessary safety measures will not be taken by the Contractor. Additional attention should be paid to the slope near the Tunnel N2AT-A portal (Abutment for Bridge N1), because the loose rocks are accumulated at the edge of slope. They may roll down the hill in any second and hit the workers, performing the task close to the bottom of that slope. The Contractor H&S team is aware of this case, but no positive changes have been made until today. **Non-compliance isn't solved.**



Picture 18: Non-compliance – Welfare facilities (Health and care) (Tunnels №2, 3 and 5) – No positive changes have been made seems last weeks. The dining room, rest room, room for to change the clothes and storage area for construction materials (Including hazardous materials). All these still are gathered in one space. Site responsible persons from the Contractor Company were informed about these non-compliances. The Engineer asked the Contractor to care about the worker's health and safety and split all these spaces. The Engineer is waiting for feedback from the Contractor. **Non-compliance isn't solved.**

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Site Inspection Report



Picture 19: Driving safety (Possible accident (Company mixer and dump trucks)) – The driving safety related non-compliance has been observed by the Engineer when inspecting the working process at site. The mixer was equipped with worn (Partially damaged) tire. The Engineer has asked the Contractor's site responsible persons to take care of this issue and solve it as soon as possible in order to avoid the possible accidents and possible injury of working personnel. H&S representatives from the Contractor Company were also informed about it and the Engineer asked them to take this issue on their own control. The management of the Contractor Company gave promises to change all damaged and cut tires and close this issue as soon as possible. The Engineer is waiting for feedback from the Contractor. **Non-compliance is still open.**



Picture 20: Non-compliance – Workplace safety (All tunnels) – Damaged and destroyed registration board has been observed by the Engineer during site visits. The registration boards are empty or not sufficient number of copies of ID cards are hung onto, because the workers are not using this boards as per requirements. They do not hang on their badges, before entering into the tunnels. Site responsible persons from the Contractor Company were informed about it. The Engineer asked H&S representatives from the Contractor Company to conduct additional safety training course for the Company employees and explain them why and what for they have to use these boards. **Non-compliance is still open.**

Site Inspection Report



Picture 21: Non-compliance – Working at height safety Violations (Bridge N1, Pier 11 and Bridge N2 Abutment) – Unsafe accesses to the workplaces have been observed by the Engineer when inspecting the work process. The site responsible persons from the Contractor Company were informed about it. The Engineer has asked them to pay additional attention to this non-compliance in order to avoid the possible falls. **Non-compliance isn't solved.**

Positive observations:



Tunnel N3AT-A



Tunnel N3AT-T

Site Inspection Report



Bridge N2 Abutment – *It has been observed that the crew members were installing the safety flash cones around the pump truck before starting the concrete pouring in order to ensure the workplace safety.*

Negative observations:



Access to Tunnel N3

Tunnel N3AT-A

Tunnel N3TA-A

Access to Pier 7, Bridge 1

- Access roads, edges of slopes and open holes aren't well protected from possible falls and rolls.

Picture 22: Positive and negative observations (Workplace safety) (All Tunnels and bridges) – During site inspection it has been observed by the Engineer, that some edges of temporary access roads (Pandusses) and open holes inside the tunnels are protected by safety reflective cones, but some aren't. Site responsible persons and H&S representatives from the Contractor Company were informed about these non-compliances. The Engineer has asked the Contractor to pay additional attention to this issue in order to avoid the possible incidents and possible injury of working personnel. ***Non-compliance is still open.***



Picture 23: Non-compliance – Electrical Safety (Tunnel №5 TAA) –Violation of workplace safety, path leading to the electrical distribution box is very unsafe, there are armatures sticking out. Safe pathway must be ensured to get to the electrical distribution box.



Picture 24: Non-compliance – Working at height safety Violations (Tunnel №4005 AT-TA Argveta Portal) – Violation of working at height safety requirements. Workers are not wearing safety harnesses, and personal protective equipment.



Picture 25: Non-compliance – Working at height safety Violations (Tunnel №4005 AT-TA Argveta Portal) – Violation of working at height safety requirements. Using homemade ladder, it is not allowed to use not industrially made tools and equipment.



Picture 26: Non-compliance – Working at height safety Violations (Retaining wall 4501) –Homemade ladder is being used, it is not allowed to use not industrially made tools/equipment. Homemade ladder must be replaced.



Picture 27: Non-compliance – Electrical Safety (Retaining wall 4501) –Electrical cables are scattered all around. Some of them are damaged. Damaged cables must be replaced and rest of the cables must be safely organized.



Picture 28: Non-compliance – Working at height safety Violations (Tunnel №4001 AT Tbilisi Portal) – Violation of working at height safety requirements. There are no guardrails, protective guardrails must be installed to avoid falling of people and equipment.



Picture 29: Non-compliance – Electrical Safety (Tunnel №4001 AT Tbilisi Portal) – Electrical wiring is not safe, cables must be checked and wiring must be safely organized.



Picture 30: Non-compliance – Workplace safety Violations (Tunnel №4003 ATT) – Ventilation is turned off and there are people working inside. It is not allowed to work in the tunnel when there is not a safe environment.



Picture 31: Non-compliance – Working at height safety Violations (Tunnel №4003 AT-T) –Homemade ladder is being used, it is not allowed to use not industrially made tools/equipment. Homemade ladder must be replaced.



Picture 32: Non-compliance – Workplace safety Violations (Tunnel №4003 AT-T) – Generator is placed next to the fuel products, and there is no spill tray placed. Safe distance must be kept.



Picture 33: Non-compliance – Workplace safety Violations (Tunnel №3 AT-T) –Unsafe handling of cylinders. There is no safe distance kept between cylinders. Safe distance must be kept and special carts must be used to insert cylinders for safe handling.



Picture 34: Non-compliance – Workplace safety Violations (Tunnel №3 ATT) – Ventilation system is turned off and there are people working inside. It is not allowed to work in the tunnel when there is not a safe environment.



Picture 35: Non-compliance – Electrical Safety (Tunnel №4005 TA Tbilisi Portal) – Violation of electrical safety. Electrical distribution box is fallen on the ground.



Picture 36: Non-compliance – Electrical Safety (Tunnel №4005 TA Tbilisi Portal) –Fire extinguishers are scattered around the electrical distribution box. Fire extinguishers must be placed at the proper places.



Picture 37: Non-compliance – Working at height safety Violations (Bridge №5 Pier №3 AT) –Violation of working at height safety requirements. Protective equipment is not being used when working at height, workers must wear safety harnesses.



Picture 38: Non-compliance – Working at height safety Violations (Bridge №5 Pier №2 AT) –Workers are not wearing safety harnesses! Warnings regarding these violations have been given for two days and works still continued with several safety violations. These issues must be payed attention.

REMARK: No NCRs were issued and written in this week.



ENVIRONMENTAL MONITORING REPORT
WATER, AMBIENT AIR QUALITY, NOISE AND VIBRATION
MONITORING

F4, SECTION OF E60 HIGHWAY

PREPARED BY
SDSC LLC

DIRECTOR: GIORGI GULIASHVILI

A handwritten signature in blue ink, appearing to read "Giorgi Guliashvili".



June, 2023

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Attachments

Attachment 1 – Air, noise and vibration monitoring report

Attachment 2 - Water tests laboratory reports

1. Introduction

1.1. Project description

The Government of Georgia is endeavoring to make Georgia a regional and logistics hub and more attractive for businesses. The East West Highway (EWH), stretching 410 km from Sarpi on the Black Sea, at the border with Turkey, through the center of the country to the capital Tbilisi and on to the border with Azerbaijan, is the main inter-regional and international route between western and eastern Georgia, as well as its neighboring.

In light of the traffic growth on EWH, the high percentage of truck traffic, and the difficult terrain and resulting geometric profiles, capacity expansion of the current 2-lane mountainous section between Chumateleti and Argveta is crucial to realizing full potential of the EWH with improvements to the highway either completed or underway on each side of this section.

Therefore, the Government has requested the Asian Development Bank (ADB) and several other development partners to finance the remaining bottleneck sections (Chumateleti - Argveta) on the EWH.

The Project involves construction of a new road section of the E-60 highway located in Imereti Region of central Georgia (see Figure 1-1). Section F4 forms the Shorapani – Argveta portion of the Khevi-Ubisa-Shorapani-Argveta section of the E-60. The length of the Project road is as follows:

- Right lane (TA – meaning Tbilisi – Argveta direction) - 14.778 km;
- Left lane (AT – meaning Argveta – Tbilisi direction) - 14.726 km.

Figure 1-1 Road Location Map



1.2. Purpose of the monitoring

As per contract LTD SDSC was requested to conduct regular surface water, Noise, Vibration, air quality and dust monitoring along the F4 section of highway construction.

The purpose of the monitoring was to collect monitoring data of surface water, Air quality, Dust, Noise and Vibration and compare with baseline monitoring results as well as with project specified standards based on EIA.

2. Monitoring locations

2.1. Water Monitoring Locations

Water monitoring locations proposed by the client are reflected in Table 2-1, and in Figures 2-1. The monitoring was undertaken 50m up and downstream from each location. Bridge N3 up and downstream monitoring location also covers the Batching plant 1 monitoring locations.

Table 2-1 Surface water monitoring locations

Monitoring Locations	Coordinates	Monitoring Date
River Kvirila (Bridge N4)	340316.57 4663074.32	10/06/23
River Borimela (bridge N3)	342153.91 4661762.47	10/06/23
River Dzirula (bridge N2)	343185.48 4662005.84	10/06/23
River Dzirula (bridge N1)	344312.76 4661999.60	10/06/23

Figure 2-1 Surface water monitoring locations



2.2. Noise, Vibration and Ambient air quality monitoring locations

Dust, noise, vibration, and air quality measurements were performed on 15 monitoring points along F4 section of the E-60 highway in the month of June. GPS Coordinates of monitoring points are shown in the Table 2-2 and general overview on satellite map (Figure 2-2).

Table 2-2 Noise, Vibration and Ambient air quality monitoring locations

#	Point	X	Y	Conducted work/measurement
1	Batch Plant 1 AT	342607	4661686	NO _x , SO _x
2	Batch Plant 1 TA	342363	4661841	NO _x , SO _x , noise, dust
3	Tunnel 3	340977	4661891	Noise, dust, vibration
4	KM 5.8	340324	4662868	NO _x , SO _x
5	Spoil disposal area N2	340247	4662834	NO _x , SO _x , noise, dust, vibration
6	KM 6.4	339444	4663581	NO _x , SO _x
7	Uznadze Street 75	338914	4664422	Vibration
8	Tunnel 5 AT portal	338583	4664433	NO _x , SO _x , noise, dust, vibration

9	Shavgulidze_Khijakadze's houses	337666	4664592	Noise, dust, vibration
10	Gocha Kaganadze's house	337560	4664641	Noise, dust, vibration
11	Tunnel 6 (1)	337519	4664777	Vibration, noise
12	Tunnel 6 (2)	337541	4664740	Vibration, noise, dust
13	KM 12.6 AT	336852	4665151	NO _x , SO _x
14	KM 12.6 YA	336881	4665342	NO _x , SO _x
15	New Batch Plant	336386	Noise, dust, vibration	

Figure 2-2 Noise, Vibration and Ambient air quality monitoring locations





3. Monitoring parameters and methodologies

3.1. Surface Water monitoring

Monitoring parameters for surface water monitoring were provided by Client based on EIA requirements. List of parameters to be monitored and test methods are reflected in Table 3-1. National Maximum Allowable Concentrations (MAC) in surface waters have been used as a reference.

Table 3-1 Surface water monitoring parameters

Chemical Parameters	Measuring Unit	Test Method	National MAC
pH	-	SST ISO 10523:2010	6.5-8.5
BOD ₅	mg/l O ₂	SST ISO 5815-2:2003/2020	6
COD	mg/l O ₂	SST ISO 6060:2010	30
TSS	mg/l	SST ISO 11923: 2007	Increase by no more than 0.75
Total N	mg/l	GD 52.24.364-95	N/A
Total P	mg/l	SST ISO 6878:2004/2020	2
Nitrates (NO ₃)	mg/l	SST ISO 7890-3 : 2008	40
phosphates (PO ₄)	mg/l	SST ISO 6878:2004/2020	3.5
Oil & Grease	mg/l	EPA 413.1	0.3
Microbiological Parameters			

Total coliforms	MPN in 100 ml	SST ISO 9308 -1:2014/2014	400
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The water samples are taken by the certified monitoring technicians, which are specially trained for the water sampling activities. The analysis of the water samples was conducted in the accredited DG Consulting Laboratory with ISO 17025 standard and if necessary, samples are sent to SYN LAB (Germany).

3.2. Ambient air quality

Air Quality monitoring methodology

Air monitoring - NOx and SOx sampling was conducted via passive sampler/concentrating tubes using English Company Gradko International standard certified tubes. The detailed information regarding method and model is provided in table below

Table 3-2 monitoring tubes model and methodology

Parameter	NOx	SOx
Manufacturer/Model	Gradko International Ditrax 100 RAM	Gradko International Ditrax 600 RAM
Integration period	No less 7-day Exposure	No less 7-day Exposure
Sampling Frequency	Continuous	Continuous
MDL/Target	1.4 µg/m ³	0.2 µg/m ³
Sampling and Analytical Method	Sorbent impregnated diffusion/ion chromatography	Sorbent impregnated diffusion/UV Spectrophotometry

PM10 and PM2.5 monitoring methodology

Dust monitoring was conducted according to the EU standards. The equipment, which was used during the measurement are Dust Trak DRX Desktop aerosol monitor, which is installed in the Environmental Enclosure 8535, which allows the aerosol to measure dust concentration in ambient air in the field conditions.

Before starting the measurements, Zero Calibration was done to the aerosol, which calibrates the device to zero level in order, not to get correct results

The photos below show the used equipment for Dust monitoring and Zero Calibrator.

Figure 3-1 Dust Monitoring equipment



Figure 3-2 Zero calibrator



3.3. Noise Monitoring Methodology and Equipment

The noise level measurements were implemented in accordance with the British Standard BS 7445-2:2003 'Description and measurement of environmental noise'. The dust concentration measurements in the ambient air were conducted in accordance to the EU standards.

The monitoring points were selected, so as to represent the impact of the construction on local population as realistically as possible.

According to the above-mentioned standard, the following equipment was used during the noise level measurement activities:

- Rion NL-52, First class noise measurement device;
- Windscreen, WS-16;
- Tripod;
- SD Card;

Figure 3-3 Noise monitoring equipment



Noise measurement range: 0-133 dB

Noise measurements were done for one 30-minute session for each monitoring points.

3.4. *Vibration monitoring methodology and equipment*

The vibration level measurements are conducted using the InstanTel Minimate Plus Device. It records the waveform data to the integrated memory. After the monitoring activities, the recorded data is processed in the PC Program Blastware, which is also created by the company InstanTel.

The vibration measurement is conducted using Transducer (Geophone), which is connected to the InstanTel Minimate Plus device. Three ground spikes are attached to the bottom of the transducer, pushed to the ground covering the attached spike fully. The geophone shall be directed towards the vibration source using the directional arrow, which is engraved on the Geophone itself. After this, the sandbag is put on top of the transducer for solid compaction.

After the correct installation of the Geophone, sensorcheck program is launched on the Minimate Plus device for further correct vibration measurements. In order to start vibration monitoring, the tests for sensor check program shall be Passed, which is displayed on the Minimate Plus device. After the mentioned activities, recording of the vibration waveform is starting.

As it was already described above, after recording the Vibration Waveform session, the device saves the session to the integrated hard drive. After what, the session is transferred to the Personal Computer and processed using special program called Blastware, which is also created by the Company InstanTEL. The program created event report, which includes vibration waveform graphs, timing and other detailed information about the recorded session.

Figure 3-4 Vibration monitoring equipment



4. Laboratories

Water and air quality samples taken during field activities were sent to DG consulting laboratory (Georgia) and SYN LAB (Germany) for analyses. Samples were analyzed in accordance analytical suites and test methods proposed in chapter

5. Sampling activities

5.1. *Surface Water Monitoring field activities*

Sampling activities were undertaken on 10.06.23. The field team included Lasha Bibichadze and Giorgi Guliashvili. As per initial request from the Client, monitoring plan was included 4 bridge construction sites up and down stream monitoring.

All of the proposed sampling points were sampled successfully during the field visit.

Figure 5-1 Bridge N4 up stream (Kvirila River)



Figure 5-2 Bridge N4 downstream (Kvirila river)



Figure S-3 Bridge N3 upstream (Barimela River)



Figure 5-4 Bridge N3 downstream (Borimela River)



Figure 5-5 Bridge N2 upstream (Dzirula River)



Figure S-6 Bridge N2 downstream (Dzirula River)



Figure S-7 Bridge N1 up stream (Dzirula River)



Figure 5-8 Bridge N1 downstream (Dzinula River)



5.2. Air quality, Noise and Vibration monitoring field activities

Within the project, monitoring works were carried out at 15 points for two days. Among them, measurements at some points were carried out in 2 sessions - working and non-working hours in order to assess the background levels and the impact of the working process on the monitoring parameters. In addition, monitoring activities were conducted at night to evaluate vibration and noise in the different times of the day. Usually, the duration of monitoring was 30 minutes at each point, and in some cases - 15 minutes.

Field activities (measurements, samples collection) were performed by DG Consulting team.

Monitoring activities were conducted on June 8th and 9th, 2023. The weather was sunny, without wind on both working days. Temperature varied between 26-28°C.

Detail description and pictures of field activities are presented in **Attachment 1** of this report.

6. Analytical results and conclusions

6.1. Surface water monitoring

The results of surface water monitoring are indicated in the tables below:

Table 6-1 Bridge N1 (Dzirulo river) up and down stream monitoring results

Parameters	EIA Standards (National MAC)	Baseline results (March 2022)	Upstream	Downstream
pH	6.5-8.5	7.87	8.14	8.12
BOD	6mg/l	<3	<3	<3
COD	30mg/l	80	12	15
TSS	Increase no more than 0.75mg/l	12	12	15
Total N	N/A	1.5	0.1	0.11
Total P	2mg/l	0.28	<0.02	<0.02
Nitrates	40mg/l	<1	<1.0	<1.0
Phosphates	3.5mg/l	0.8	<0.06	<0.06
Oil and Grease	0.3mg/l	<0.3	<0.3	<0.3
Total Coliforms	400MPN	2400	1200	1500

According to analytical results, there was no significant fluctuation between up and down stream results. With exception of TSS results what could be explained with increased turbulence of the river at the down stream sampling location.

Table 6-2 Bridge N2 (Dzirulo river) up and down stream monitoring results

Parameters	EIA Standards (National MAC)	Baseline results (June 2021)	Upstream	Downstream
pH	6.5-8.5	8.12	8.1	8.14
BOD	6mg/l	<3	<3.0	<3
COD	30mg/l	28	10	11

TSS	Increase no more than 0.75mg/l	15	18	20
Total N	N/A	<0.5	0.12	0.12
Total P	2mg/l	0.083	0.03	0.03
Nitrates	40mg/l	2	<1.0	<1.0
Phosphates	3.5mg/l	0.25	0.09	0.09
Oil and Grease	0.3mg/l	<0.1	<0.3	<0.3
Total Coliforms	400MPN	ND	1500	1500

No significant fluctuations between up and down-stream sampling results were observed. With exception of slightly increased TSS results. This could be explained with increased turbulence of the river at the down-stream sampling location.

Table 6-3 Bridge N3 (Borimela River) up and down stream monitoring results

Parameters	EIA Standards (National MAC)	Baseline results (June 2021)	Upstream	Downstream
pH	6.5-8.5	8.16	8.12	8.16
BOD	6mg/l	<3	<3	<3
COD	30mg/l	32	12	13
TSS	Increase no more than 0.75mg/l	20	20	21
Total N	N/A	1.5	0.1	0.11
Total P	2mg/l	0.15	<0.02	<0.02
Nitrates	40mg/l	4	<1	<1
Phosphates	3.5mg/l	0.45	<0.06	<0.06
Oil and Grease	0.3mg/l	<0.1	<0.3	<0.3
Total Coliforms	400MPN	ND	1200	1300

Slight increase of the TSS results were observed in down-stream sample.

Table 6-4 Bridge N4 (Xvirila River) up and down stream monitoring results

Parameters	EIA Standards (National MAC)	Baseline results (June 2021)	Upstream	Downstream
pH	6.5-8.5	8.12	8.11	8.14
BOD	6mg/l	<3	<3	<3
COD	30mg/l	30	15	16

TSS	Increase no more than 0.75mg/l	2085	15	18
Total N	N/A	<0.5	0.12	0.12
Total P	2mg/l	0.092	0.04	0.03
Nitrates	40mg/l	2	<1	<1
Phosphates	3.5mg/l	0.28	0.12	0.09
Oil and Grease	0.3mg/l	<0.1	<0.3	<0.3
Total Coliforms	400MPN	250000	1500	1600

No significant fluctuations between up and down-stream sampling results were observed. The slight elevation of the TSS results caused by increased turbulence of the river at the down-stream sampling location.

6.2. Dust and Air Quality Monitoring

Dust monitoring

Trotec PC220 was used to monitor the dust concentrations in the ambient air. The device is specifically designed to perform dust monitoring and has own calibrator device, auto zero adjustment and all tools required by the standard document to undertake the measurement.

Dust concentration in the air was measured at the following points:

1. Batch Plant 1 TA – near the batch plant N1, between the E-60 highway and the batching plant;
2. Tunnel 3 – between the portal of tunnel N3 and local residents' houses;
3. Spoil disposal area N2 – near interchange N2, in the yard of local resident's house;
4. Tunnel 5 AT portal – between the construction area and local residents' houses. 2 sessions were carried out – during working and non-working hours;
5. Shavgulidze_Khijakadze's houses - near the former tunnel N6, adjacent to the local residents' houses;
6. Gocha Kapanadze's house - near the former tunnel N6, adjacent to a local resident's house;
7. Tunnel 6 (2) – near the former tunnel N6, at the construction area;
8. New Batch Plant – adjacent to the nearest residential house.

The results of the measurements carried out are presented below in both table and graph:

Table 6-5 The results of dust monitoring at Batch Plant 1 TA (microgram/m³ - μg/m³)

PM ₁₀			PM _{2.5}		
30-minute average value	min	max	30-minute average value	min	max

264.45	10	3621	27.05	4	249
PM_{total}					
30-minute average value		min	max		
264.45		10	3 621		

Table 6-6 The results of dust monitoring at Tunnel 3 (microgram/m³ - µg/m³)

PM ₁₀			PM _{2.5}		
30-minute average value	min	max	30-minute average value	min	max
21.2	13	32	6.6	5	10
PM_{total}					
30-minute average value		min	max		
21.2		13	32		

Table 6-7 The results of dust monitoring at Spoil disposal area N2 (microgram/m³ - µg/m³)

PM ₁₀			PM _{2.5}		
30-minute average value	min	max	30-minute average value	min	max
32.1	10	73	8.4	3	23
PM_{total}					
30-minute average value		min	max		
32.1		10	73		

Table 6-8 The results of dust monitoring at Tunnel 5 AT portal (microgram/m³ - μg/m³)

Session	PM ₁₀			PM _{2.5}		
	30-minute average value	min	max	30-minute average value	min	max
Non-working	28.35	12	61	7.3	5	14
Working	15	6	25	4.75	3	7
Session	PM _{total}					
	30-minute average value		min		max	
Non-working	28.35		12		61	
Working	15		6		25	

Table 6-9 The results of dust monitoring at Shavgulidze_Khijakadze's houses (microgram/m³ - μg/m³)

PM ₁₀			PM _{2.5}		
30-minute average value	min	max	30-minute average value	min	max
20.2	12	32	5.3	3	7
PM _{total}					
30-minute average value		min		max	
20.2		12		32	

Table 6-10 The results of dust monitoring at Gocha Kapanadze's house (microgram/m³ - μg/m³)

PM ₁₀			PM _{2.5}		
30-minute average value	min	max	30-minute average value	min	max
15.8	10	23	4.7	3	6
PM _{total}					
30-minute average value		min		max	
15.8		10		23	

Table 6-11 The results of dust monitoring at Tunnel 6 (2) (microgram/m³ - μg/m³)

PM ₁₀			PM _{2.5}		
30-minute average value	min	max	30-minute average value	min	max
9.1	4	14	4.05	2	5
PM _{total}					
30-minute average value		min		max	
9.1		4		14	

9.1	4	14
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Table 6-12 The results of dust monitoring at New Batch Plant (microgram/m³ - µg/m³)

PM ₁₀			PM _{2.5}		
30-minute average value	min	max	30-minute average value	min	max
8.7	4	12	3.8	3	5
PM _{total}					
30-minute average value		min	max		
8.7		4	12		

According to Georgian legislation, the permissible limit of dust concentration is 150 microgram/m³. The results show that exceedance of the established limit was observed at Batch Plant N1 TA. The exceedance is 114.45 µg/m³. Heavy equipment moves frequently near the mentioned point, which causes a significant spread of dust. Therefore, it is necessary to water the surface regularly.

Measurement graphs are given in **Attachment 1**

Air Quality monitoring

In order to determine Nitrogen oxide and Sulphur Dioxide levels in ambient air, two passive sampler tubes from Gradko Environmental (England) were installed, One for NO_x and one for SO_x for long term monitoring, according to the ordinance N38/n of Minister of Labor, Health and Social Affairs of Georgia, which determined maximum permissible concentration levels.

The exact time is written when tubes are installed and after their removal. Total hours recorded are calculated as a result of these exact times. Table 6-13 shows the exposure time of the tubes, the maximum permissible concentration (MPC) according to the legislation of Georgia and the results of the analysis.

Table 6-13 Air Quality monitoring results

Monitoring Point	Exposure Time	*MPC – Average Daily for NO ₂ -mg/m ³	*MPC – Average Daily for SO ₂ -mg/m ³	Results of Measurements For NO ₂ , mg/m ³	Results of Measurements For SO ₂ , mg/m ³
BP1 AT	841.17	0.04	0.05	0.018	<0.002
BP1 TA	841.08	0.04	0.05	0.034	<0.002

KM 5.8	865.83	0.04	0.05	0.020	<0.002
Nika Kvizinadze	846.17	0.04	0.05	0.013	<0.002
KM 6.4	863.92	0.04	0.05	0.014	<0.002
tunel 5 AT Portal	839.92	0.04	0.05	0.020	<0.002
KM 12.6 TA	840.58	0.04	0.05	0.011	<0.002
KM 12.6 AT	840.75	0.04	0.05	0.011	<0.002

*Maximum permissible concentrations (MPC) of atmospheric air pollutants in populated areas hygiene norms 2.1.6. 002 -01.

The laboratory test results show that the concentrations of NO₂ and SO₂ in ambient air are lower than maximum allowable limits.

6.3. Noise Monitoring Results

Noise monitoring works were carried out at 9 points, according to the client's request. The points are:

1. Batch Plant 1 TA – between the E-60 highway and the batching plant;
2. Tunnel 3 – between the portal of tunnel N3 and local residents' houses, day and night sessions were conducted;
3. Spoil disposal area N2 – near interchange N2, in the yard of local resident's house;
4. Tunnel 5 AT portal – between the construction area and local residents' houses. 2 sessions were carried out – during working and non-working hours;
5. Shavgulidze_Khijakadze's houses - near the former tunnel 6 adjacent to the local residents' houses;
6. Gocha Kapanadze's house - near the former tunnel N6, adjacent to a local resident's house;
7. Tunnel 6 (1) – near the former tunnel N6, near the local resident's house;
8. Tunnel 6 (2) – near the former tunnel N6, at the construction area;
9. New Batch Plant – adjacent to the nearest residential house.

The results are provided below in a form of table and graphs as well:

Table 6-14 Noise measurement results

Value	BP1 TA	Tunnel 3 – day session	Tunnel 3 – night session	Spoil disposal area N2	Tunnel 5 AT portal – non working	Tunnel 5 AT portal – working
L _{Aeq}	71.4	70.1	62.8	60.7	50.2	53.6
L _{Amax}	86.1	83.4	76.8	84.7	70.6	69.0
L _{Amin}	49.4	57.9	48.7	49.5	42.6	42.7
L10	74.5	72.3	65.9	62.0	51.8	56.1
L90	57.0	63.6	55.3	53.7	47.8	48.5
Value	Shavgulidze_Khijakadze's houses	Gocha Kapanadze's house	Tunnel 6 (1)	Tunnel 6 (2)	New Batch Plant	
L _{Aeq}	50.4	63.7	60.9	62.4	59.8	
L _{Amax}	65.4	80.5	78.0	82.2	89.1	
L _{Amin}	42.8	51.8	42.9	51.8	41.1	

L10	53.0	66.2	63.2	65.2	58.7
L90	46.3	57.5	52.8	57.7	46.9

The points where noise level exceeded the established limit are considered below in details:

Batch Plant 1 TA: The recorded LAeq exceeds the established noise limit (60 dB¹) by 11.4 dB. The observed exceedance is caused by the movement of heavy equipment. It should be noted that L90, which indicates the noise level recorded 90% of the time, is within the limit. This fact proves that the noise was not constant.

Tunnel 3. During the daytime monitoring session, exceedance of the established limit was 15.1 dB, the probable cause of the result is an operation of hydraulic hammer and heavy traffic on the highway (E-60). As for the night session, LAeq should be compared with the night standard given in the Ordinance of the Government of Georgia #398, which is 40 dB for the areas that directly borders residential houses (number of floors ≤6). Accordingly, in the night hours, exceedance of the established noise limit was 22.8 dB, which is a very high. The source of noise at night was the concrete paving works in the tunnel, and the movement of trucks on the highway. It is important to take into account working time or reduce the duration of work in order to reduce the impact of noise on local residents.

Spoil disposal area N2. In this case, the noise level exceeds the established limit by 5.7 dB. The source of noise at the mentioned point was the working activities near the interchange N2 and the frequent movement of vehicles on the existing E-60 highway. However, L90, which indicates the noise level recorded 90% of the time, is within the limit.

Gocha Kapanadze's house. At this point, the exceedance of the established limit is 8.7 dB. The result is caused by the operation of heavy machinery.

Tunnel 6 (1). At this point, the exceedance of the established limit is 5.9 dB. The cause of the result is the operation of excavators and the movement of trucks. In this case, L90 value was low which means that the noise was not constant.

Tunnel 6 (2). At this point, the exceedance of the established limit is 7.4 dB. The cause of the result is the operation of excavators and movement of trucks.

New Batch Plant. Exceedance of the established noise limit at this point is 4.8 dB. However, the high LAeq was caused by a peak at the end of the session (99.1 dB), which was caused by a car beep and was not related to construction noise. Besides, L90 is very low, indicating that the noise at the measurement point was within the limit.

At all other monitoring points, the noise level was within the limit.

At points where noise limits have been exceeded, caused by construction works in the area, it is important to plan and implement appropriate mitigation measures to reduce an adverse impact on the population.

¹ Resolution of the Government of Georgia No. 398, August 15, 2017, Tbilisi. Areas directly adjacent to hotels, trade, service, sports and public organizations.

Noise measurement graphs are given in Attachment 1:

6.4. Vibration Monitoring Results

Vibration was monitored at 9 points, at some of them in 2 sessions to identify the background vibration level and compare it with the vibration levels observed during the works. In addition, night session was performed at one point. On some points monitoring lasted for 15 minutes according to the methodology established in advance. The vibration monitoring points are:

1. Tunnel 3 – between the portal of tunnel N3 and local residents' houses, day and night sessions were conducted;
2. Spoil disposal area N2 – near interchange N2, in the yard of local resident's house.
3. Uznadze Street 75 – near the portal of Tunnel 5, Adjacent to local resident's house; 15-minute session was conducted during working hours;
4. Tunnel 5 AT portal – between the construction area and local residents' houses. 2 sessions were carried out – during working and non-working hours;
5. Shavgulidze_Khijakadze's houses - near the former tunnel 6, adjacent to the local residents' houses;
6. Gocha Kapanadze's house - near the former tunnel N6, adjacent to a local resident's house;
7. Tunnel 6 (1) – near the former tunnel N6, near the local resident's house;
8. Tunnel 6 (2) – near the former tunnel N6, at the construction area;
9. New Batch Plant – adjacent to the nearest residential house.

The results of vibration monitoring are given below in tables.

Table 6-15 Vibration results – Tunnel 3 – day session

Geophone	Tran	Vert	Long	Unit
PPV	0.102	0.079	0.095	mm/s
ZC Freq	64	17	85	Hz
Time (Rel. to Trig)	71.491	1305.781	71.492	sec
Peak Acceleration	0.007	0.007	0.007	
Peak Displacement	0.006	0.005	0.007	
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.5	7.3	Hz
Overswing Ratio	4.1	4.5	4.7	

Peak Vector Sum 0.132 mm/sec, at 71.492 sec.

Table 6-16 Vibration results – Tunnel 3 – night session

Geophone	Tran	Vert	Long	Unit
PPV	0.110	0.102	0.095	mm/s
ZC Freq	<1.0	<1.0	8.1	Hz
Time (Rel. to Trig)	264.988	405.950	196.999	sec
Peak Acceleration	0.007	0.007	0.007	
Peak Displacement	6.000	0.675	0.137	
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.5	7.3	Hz
Overswing Ratio	3.9	4.2	4.5	

Peak Vector Sum 0.156 mm/sec, at 222.930 sec.

Table 6-17 Vibration results – Spoil disposal area N2

Geophone	Tran	Vert	Long	Unit
PPV	0.158	0.244	0.315	mm/s
ZC Freq	64	8.8	<100	Hz
Time (Rel. to Trig)	331.241	331.825	332.503	sec
Peak Acceleration	0.016	0.020	0.030	
Peak Displacement	0.087	0.011	0.008	
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.3	Hz
Overswing Ratio	3.8	4.4	4.5	

Peak Vector Sum 0.322 mm/sec, at 332.503 sec.

Table 6-18 Vibration results at Unadze Street 75

Geophone	Tran	Vert	Long	Unit
PPV	0.560	0.828	1.364	mm/s
ZC Freq	13	17	39	Hz
Time (Rel. to Trig)	674.009	538.989	813.049	sec
Peak Acceleration	0.035	0.040	0.055	
Peak Displacement	0.892	1.575	0.430	
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.5	7.3	Hz
Overswing Ratio	3.8	4.3	4.5	

Peak Vector Sum 1.495 mm/sec, at 813.049 sec

Table 6-19 Vibration results at Tunnel SAT portal – non-working hour

Geophone	Tran	Vert	Long	Unit
PPV	0.134	0.126	0.126	mm/s
ZC Freq	21	15	13	Hz
Time (Rel. to Trig)	1591.470	1543.078	1542.915	sec
Peak Acceleration	0.013	0.010	0.012	g
Peak Displacement	0.059	0.014	0.007	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.5	7.3	Hz
Overswing Ratio	3.8	4.2	4.5	

Peak Vector Sum 0.181 mm/sec, at 1543.145 sec.

Table 6-20 Vibration results at Tunnel SAT portal – working hour

Geophone	Tran	Vert	Long	Unit
PPV	0.221	0.150	0.173	mm/s
ZC Freq	32	20	32	Hz
Time (Rel. to Trig)	345.073	343.624	343.748	sec
Peak Acceleration	0.009	0.007	0.008	g
Peak Displacement	0.464	0.276	0.024	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.5	7.5	Hz
Overswing Ratio	3.8	4.2	4.4	

Peak Vector Sum 0.223 mm/sec, at 345.073 sec.

Table 6-21 Vibration results – Shavgulidze_Rhjakadze's houses

Geophone	Tran	Vert	Long	Unit
PPV	0.236	0.221	0.244	mm/s
ZC Freq	20	28	43	Hz
Time (Rel. to Trig)	45.686	73.421	45.690	sec
Peak Acceleration	0.007	0.007	0.007	g
Peak Displacement	2.334	0.427	0.123	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.5	7.5	Hz
Overswing Ratio	3.8	4.3	4.4	

Peak Vector Sum 0.302 mm/sec, at 1232.828 sec.

Table 6-22 Vibration results – Gocha Kaponozze's house

Geophone	Tran	Vert	Long	Unit
PPV	0.307	0.229	0.378	mm/s
ZC Freq	>100	>100	>100	Hz
Time (Rel. to Trig)	25.774	25.774	25.773	sec
Peak Acceleration	0.029	0.016	0.029	g
Peak Displacement	0.060	0.028	0.029	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.5	7.3	Hz
Overswing Ratio	4.0	4.5	4.7	

Peak Vector Sum 0.514 mm/sec, at 25.773 sec.

Table 6-23 Vibration results – Tunnel 6 (1)

Geophone	Tran	Vert	Long	Unit
PPV	0.205	0.205	0.134	mm/s
ZC Freq	21	>100	17	Hz
Time (Rel. to Trig)	1299.255	409.238	1239.668	sec
Peak Acceleration	0.008	0.012	0.007	g
Peak Displacement	0.197	0.032	0.028	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.5	7.5	Hz
Overswing Ratio	3.8	4.3	4.5	

Peak Vector Sum 0.239 mm/sec, at 409.238 sec.

Table 6-24 Vibration results – Tunnel 6 (2)

Geophone	Tran	Vert	Long	Unit
PPV	0.229	0.252	0.300	mm/s
ZC Freq	23	27	27	Hz
Time (Rel. to Trig)	999.014	998.977	998.531	sec
Peak Acceleration	0.014	0.013	0.012	g
Peak Displacement	2.708	1.082	0.181	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.5	7.3	Hz
Overswing Ratio	3.8	4.2	4.5	

Peak Vector Sum 0.374 mm/sec, at 998.531 sec.

Table 6-25 Vibration results – New Batch Plant

Geophone	Tran	Vert	Long	Unit
PPV	0.102	0.087	0.102	mm/s
ZC Freq	16	16	18	Hz
Time (Rel. to Trig)	534.242	539.579	534.813	sec
Peak Acceleration	0.007	0.007	0.008	
Peak Displacement	0.017	0.011	0.008	
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.3	7.3	Hz
Overswing Ratio	3.9	4.4	4.7	

Peak Vector Sum 0.133 mm/sec, at 840.360 sec

The Georgian legislation defines limits of peak vector values, which represent sum of vectors parallel to each axis. The device used for the survey provides data on maximum peak values measured for further

analysis of findings of vibration measurements. During the survey standard project values were applied. The project standards define the following requirements:

The Georgian vibration standards are established on the basis of human comfort levels. The Georgian legislation does not provide standards that ensure avoidance of impacts on buildings. The standard establishes the permissible vibration levels in residential buildings, hospitals and holiday houses (ref: Sanitary norms and regulations- 2001).

Table 6-26 Permissible Vibration Levels According to the Georgian Legislation

Mean Geometric Frequencies of Octave Bands	Permissible Values			
	Vibration Acceleration		Vibration Speed	
	m/sec ²	dB	m/sec 10 ⁻⁴	dB
2	4.0	72	3.2	76
4	4.5	73	1.8	71
8	5.6	75	1.1	67
16	11.0	81	1.1	67
31.5	22.0	87	1.1	67
63	45.0	93	1.1	67
Corrected and equivalently corrected values and levels	4.0	72	1.1	67

Source: EIA for Khvili-Libisa and Shorapani-Argveta road sections

The data provided in the above-mentioned table shows that if vibration lasts for a specific period of time, permissible vibration levels can be exceeded by 5 dB. When vibration is not constant, exceedance by 10 dB is allowable; in this case the absolute vibration value is multiplied by coefficient of 0.32. Moreover, according to the regulation, permissible vibration levels in hospitals and other healthcare facilities should be reduced by 3dB.

The device used for monitoring of vibration levels measures vibration speed. Consequently, measured values are presented in m/sec not db. The formula below shows how to calculate measured values in dB: Value of transverse vibration provided in dBV can be calculated on the basis of data on speed (mm/sec) using following formula:

$$Lv = 20 * \lg(V/Vref)$$

Lv = speed levels in decibels, mm/sec (dBV)

V = rms speed amplitude

Vref = reference for speed amplitude, mm/sec (Vref=0.00005 mm/sec)

Results of measured vibration at construction area:

Table 6-27 Vibration measurement results and legislation limits

Point / session	Peak Vector Max Values		Legislation limits	
	mm/sec	db	mm/sec	db
Tunnel 3 – day session	0.132	68.4	1.1	67 (+10)
Tunnel 3 – night session	0.156	69.9	1.1	67 (+10)
Spoil disposal area N2	0.322	76.2	1.1	67 (+10)
Uznadze Street 75	1.495	89.5	1.1	67 (+10)
Tunnel 5 AT portal – nonworking	0.181	71.2	1.1	67 (+10)
Tunnel 5 AT portal - working	0.223	73	1.1	67 (+10)
Shavgulidze_Khijakadze's houses	0.302	75.6	1.1	67 (+10)
Gocha Kapanadze's house	0.514	80.2	1.1	67 (+10)
Tunnel 6 (1)	0.239	73.6	1.1	67 (+10)
Tunnel 6 (2)	0.374	77.5	1.1	67 (+10)
New Batch Plant	0.133	68.5	1.1	67 (+10)

Table 6-28 British and German standards set for vibration

Minimal risk of damage to the building	PPV < 5 mm/s
Risk of cosmetic damage to the building	PPV 5 to 15 mm/s
Risk of structural damage to the building	PPV > 15 mm/s

Source: British Standard BS 6472 and are German Standards DIN 4150-3:1999

Vibration results fully meet British and German standards, however, exceedance of the established limit set by Georgian legislation (67+10 dB) was observed at the following points:

Uznadze Street 75. The exceeded value is 12.5 dB at the point. It should be noted that in this case, the vibration level is affected not only by the ongoing works in tunnel 5, but also by the frequent movement of trucks, minibuses and cars on the road next to the point.

Gocha Kapanadze's house. The exceedance of the established limit was 3.2 dB at the point. The probable cause of the result is the operation of heavy machinery near the point.

Tunnel 6 (2). The exceedance of the established limit at a given point is low (0.5 dB). The vibration level was probably affected by the excavation works.



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აკრედიტაციის მოწმობის N GAC-TL-0160
განკარგულეს N06/177
თარიღი: 28.07.2021

„ამტკოდ“
აკრედიტაციის ცენტრის გენერალური დირექტორი
ნათია მიტელიძე



საგამოცდო ლაბორატორიის აკრედიტაციის სფერო
შპს „დგ კონსალტინგი“

მისამართი: ქ. თბილისი, მ. გვლოვანის N10

სამხვედი ღობრატორის კრედიტის სფერი

გამოცანების აღნიშვნა						
ღობრატორის სამუშაო უნიტის აღნიშვნის (სერვის ანგარიშის) №						
№	სერვის კოდი	გამოსცემლის აღნიშვნის პროდუქციის სახელი	გამოცემლის სახელი	საჯარო პარამეტრები	გამოცანების აღნიშვნის იდენტიფიკაციის და დასახელება	მოქალაქის სერვისის ტიპი
1	2	3	4	5	6	7
1		გარე მიტოვებული და სამუშაო გარე ოს და დახურულ სერვისები	ინტერნეტული მუთიდი ხელსაწყო - Micromate	უბრავა	DGI-N 15-G-02 ჯალიდირებული მუთიდი	
			ინტერნეტული მუთიდი ხელსაწყო Rion NL-52	ხსური	DGI-N 09-G-03 ჯალიდირებული მუთიდი	
2		პერი	ინტერნეტული მუთიდი ხელსაწყო - Distrak DRX 8533	მტერი კტოუი (მუთიდი)	DGI-N 16-G-04 ჯალიდირებული მუთიდი	
			ინტერნეტული მუთიდი მტერის საზომი Microdust Pro-ამრავი	მტერი მპოუი	DGI-N 13-G-02 ჯალიდირებული მუთიდი	

		ინსტრუმენტალური მეთოდი ანემომეტრი PCE-423	სერვის მოწოდების სინქრე	ვალიდირებული მეთოდი DGL-IV 14-G-03	
		ინსტრუმენტალური მეთოდი ანემომეტრი PCE-423	ტემპერატურის გამაზღვრა	ვალიდირებული მეთოდი DGL-IV 14-G-03	
		ინსტრუმენტალური მეთოდი GASTEC GV-1105 (იაპონია)	CO - ნაბნირ (IV) ანეტი	ვალიდირებული მეთოდი DGL-IV 85-G-02	
		ინსტრუმენტალური მეთოდი GASTEC GV-1105 (იაპონია)	NO _x - აზოტის (IV) ანეტი	ვალიდირებული მეთოდი DGL-IV 85-G-02	
		ინსტრუმენტალური მეთოდი GASTEC GV-1105 (იაპონია)	SO ₂ - ნაბნირ (IV) ანეტი	ვალიდირებული მეთოდი DGL-IV 85-G-02	
		ინსტრუმენტალური მეთოდი GASTEC GV-1105 (იაპონია)	O ₃ - ოზონის გამაზღვრა	ვალიდირებული მეთოდი DGL-IV 85-G-02	
3	წყლები, ბუნებრივი 2201/22 მტკნარი წყლები 02 ნატურალური ან ხელოვნური მინერალური	პოტენციომეტრიული მეთოდი	წყალბადის მანკენტი (პH)	სტ. იბი 10523:2020	

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წლების ჩაღვლით, გარე, შერის ან სხვა დანატვირთი ან საცემო-არმატული ნივთიერების დანატვირთი გარეშე ყრული და თივლი/ წლები, მინერალისა და გარეშის ჩაღვლით, შერის ან სხვა დანატვირთი ან საცემო-არმატული ნივთიერების დანატვირთის შემცველია.					
	პლასტიკური მუხლი	კლემენტის, მინერალიზაცია (TDS)	სტ ინი 7888 : 2007		
	პლასტიკური მუხლი	კაბონილი ვანგალი	სტ ინი 5814:2012/2020		
	ტენილიმეტრი	სიმღრივე	სტ ინი 7027-1:2016/2017	1	
	სტრუქტურული	ფერი	სტ ინი 7887:2011/2013		
	ტენილიმეტრი	ვანგალის კომპლექსური მონიტორინგის	სტ ინი 8467:2007		

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		ვრცობები	შეტყუარებული ნაწილები	სსტ იხი 11523:2007	
		ვრცობები	ნაუბი და ხუთი	EPA 1664 EPA 413.1	
		საექოლოგიური	NO2	სსტ იხი 6777:2008	I
		საექოლოგიური	NO3	სსტ იხი 7890-3:2008	I
		საექოლოგიური	NO4	სსტ იხი 7150-1:2010	I
		საექოლოგიური	PO4	სსტ იხი 6878:2004/2020	I
		ფაბრიკა	ნარინი ქლორი	იხი 7393-2:1985	I
		ტარიბები	კალოები	სსტ იხი 6058:2008	
		ტარიბები	შენიუბი	სსტ იხი 6059:2008	
		ტარიბები	სახიბე	სსტ იხი 6059:2008	
		ტარიბები	ხუთუბის განახლრა	ვოტ 4389-78	
		ტარიბები	ქლორის განახლრა	სსტ იხი 5297:2008	
		ტარიბები	სიღრი კარმინტის განახლრა	ვოტ 23268-3-78	

ს. შ. შ.

	ვარჯიხი და საგებობათმშენებელი	ფენილი	EPA 420.1	I
	საგებობათმშენებელი	ჩუნი	EPA 8008	I
	საგებობათმშენებელი	ხილაყუბი	სახელმწიფო დოკუმენტი 52.24.433- 2005	
	ტექნიკური	ბარიუმი	ვალდებულებული ტოლი DGL-IV 70-G-01	
მიწისმოვლენის ნაწილები				
	წიბრის მოწმადგა დათქმა კულტურის	მზიფილური აქრობის და ფალბატური საქრობის ჩილფინი	სსტ ინი 6222-2008	I
	ფილტვის	საქრობის ჩიბის კოლონი საქრობის და E. coli	სსტ ინი 5908- 1:2014/2014	I
	ფილტვის	S. fecalis	სსტ ინი 7899-2-2007	I
	ფილტვის	Pseudomonas aeruginosa	სსტ ინი 25266-2007	I
	ფილტვის	საქრობის ჩიბის კოლონი (C. perfringens)	სსტ ინი 6461-2-2007	

6.2/13

2022/22 01	ზედასრული წლები წელსტევის მდინარე, ტყის, ხეების და ა.შ. და ჩამდინარე წლები	პოტენციომეტრული მეთოდი	წელსადის მანქანები (სმ)	სსტ იხი 80523:2010	
		პოტენციომეტრული მეთოდი	ვლავტარობა, მინერალიზაცია (TDS)	სსტ იხი 7888 : 2007	
		პოტენციომეტრული მეთოდი	გაზბალი ვანგსადი	სსტ იხი 5814:2012/2020	
		ტერმადიმეტრია	ხიმურივე	სსტ იხი 7027- 1:2016/2017	1
		ტერმომეტრია	ვანგსადის ქაბიური მობირეს COO	სსტ იხი 6060:2010	
		სპექტროფოტომეტრია	მგ/ლ	იხი 15705:2002	
		ტერმომეტრია	ვანგსადის კონსტანტული მობირეს მგ/ლ	სსტ იხი 8467:2007	
		პოტენციომეტრია	ვანგსადის ბიოლოგიური მობირეს BOD5 მგ/ლ O2	სსტ იხი 5815- 2:2003/2020	
		ვანგსადი	მეტროლოგიური წარმოები	სსტ იხი 11923: 2007	

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	გრაფიკული	ნაგონი და წილები EPA 413.1	
	საეპროფიტოები	NO2	სტ ინი 6777: 2008
	საეპროფიტოები	NO3	სტ ინი 7890-3: 2008
	საეპროფიტოები	NO4	სტ ინი 7150-1: 2010
	საეპროფიტოები	Total N	სახელმწიფო დოკუმენტი 52.24.364-95
	საეპროფიტოები	PO4	სტ ინი 6878:2004/2020
	ფიტოები	ნარინი ქლორი	ინი 7393-2:1985
	ტერმები	კალციუმი	სტ ინი 6058:2008
	ტერმები	მაგნიუმი	სტ ინი 6059:2008
	ტერმები	სულფატის გამაზღრა	ვოსტ 4389-78
	ტერმები	ქლორიდის გამაზღრა	სტ ინი 5297:2008
	ტერმები	სიდროკარბონატის გამაზღრა	ვოსტ 23268.3-78
	უპიტრეა და საეპროფიტოები	ფნოლი	EPA 420.1

		სპექტროფოტომეტრი	ჩენა	EPA 8008	I
			ფორმალდეჰიდი	Hach Lang 200 Formaldehyde Test Kit, Model FM	I
			გლუტარალდეჰიდი	Hach, Glutaraldehyde Test Kit GT-1 (2587200)	
		მკრამილოგიური მსვენებელი			
		ნიტრის მოძადება, დათესვა, კულტურება	მუხიფორული აქრობებისა და ფალსტაქტური ანაერობების ჩიგვრება	სსტ იბი 6222:2008	I
		ფლურაგია	სეროი კოლონიზული შეტყობები და E. Coli	შეთადური მითითებები 4.2.1884-04	I
		ფლურაგია	S. faecalis	სსტ იბი 7899-2:2007 შეთადური მითითებები 4.2.1884-04	I
5	წინადაგი	პოტენციომეტრული მეთოდი	pH	სსტ იბი 10390 : 2011	I
		პოტენციომეტრული მეთოდი (Soil Digest Meter)	კაბონული-დინამი მეთოდი	კალიბრებული DGI-IN 28-G-01	I
		პოტენციომეტრული მეთოდი	მარიაონობა	იბი 11265:1994	I

		პოტენციური შედეგი (LMP 1)	ტენიონი	იხი 10573:1995	1
		მეცოდინი	სიმკრევე	იხი 11272:2017	1
		გრეობტრია	გრანულბტრია	სტ იხი 11277:2020	1
		სტტროფობტრია	ფონური გამაზღვრა	იხი 11263:2015	1
6	წელი სსმელი წარის წელი ზედაბრელი წლები სამდინარე წელი		წიბუბის აღბ	ბუნაური რეკლბმბტი წლის სბნგის აღბის სბნტარული წლები სბტროფობ მბაფობის დადგენილებს #25, 03.01.2014) სტ იხი 19458 - 11 - წლის სარბბი. წიბუბის აღბ მბტრობობლოფობური მბლონსბბუბ	
7	წიბაფი		წიბუბის აღბ	გარბმის სარბბობობრივი მბფობობობ წიბმბბის დამბტობებბ მბსბბებ' ბობმბბა ჩსმბნ 2003 წლის 24 თბებრელი დბსბბებელი აფგობლებს წიბაფის მბფობობობობ მბფობური მბფობებბ	

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				მთავარი მითითება 2.1.7.003-02
8	სერვისი		ინჟინერების ჯგუფი	კონტრაქტი 17.2.1.01-86. სერვისის დაცვა. აგროსერვისი დასახლებული სუბიექტების სერვისის ხარისხის უზრუნველყოფის წყობი.

საქ GAC



სსიპ „აკრედიტაციის მართიანი პროფესიული ორგანო –
აკრედიტაციის ცენტრი“

აკრედიტაციის მოწმობა GAC-TL-0160

ადასტურებს, რომ

**შპს „დგ კონსალტინგი“-ს
საგამოცდო ლაბორატორია**

მდებარე: ქ. თბილისი, მ. ველოვანის #10

შეესადა და აკმაყოფილებს ეროვნული სტანდარტის

სსტ ისო/იეკ 17025:2010-ის მოთხოვნებს

აკრედიტებულია შემდეგ სფეროში: 1. გარეშო ქაღალდოვანი და საბუთო გარეშო ღია და დახურულ სივრცეებში); 2. პერი; 3. წყალი - სასმელი (მუტალორებული, წყალმომარაგების და ა.შ.); 4. წყალი ზედაპირული, ჩამდინარე; 5. ნიადაგი (იხ. დანართი აკრედიტაციის სფერო“)

აკრედიტაციის ცენტრის
გენერალური დირექტორი

რეგისტრაციის თარიღი
15 აგვისტო 2017 წ.

ძალაშია
15 აგვისტო 2021 წ.

საქ GAC



0186 თბილისი, ალ. ყაზბეგის გამზ. #42ა

დამკვეთი: სსიპ აკრედიტაციის მართიანი პროფესიული ორგანო - აკრედიტაციის ცენტრი
დამამზადებელი: შპს „საქ GAC“ სსიპ რეგისტრაციის № 06-3938

Laboratory of Excellence

DG Consulting Limited

*This laboratory has been recognized by ERA as a
Laboratory of Excellence for achieving 100% acceptable data in the*

May 2018 WP ERA Proficiency Testing Round 280

*which included 479 participating laboratories. This achievement is a demonstration of
the superior quality of this laboratory in evaluation of the analyte(s) listed below.*

n-Hexane Extractable Material(C&G)(Grav)




Matthew Seebeck, Quality Officer



Laboratory of Excellence

DG Consulting Limited

This laboratory has been recognized by ERA as a
Laboratory of Excellence for achieving 100% acceptable data in the

May 2018 WS ERA Proficiency Testing Round 262

which included 255 participating laboratories. This achievement is a demonstration of
the superior quality of this laboratory in evaluation of the analyte(s) listed below.

E.coli
Total Coliforms




Matthew Seeseck, Quality Officer



Certificate of Recognition

DG Consulting Limited

ERA congratulates this laboratory for successful completion of the

January 2018 WS ERA Proficiency Testing Round 258

We recognize the performance of this laboratory for achieving an acceptable evaluation for the analyte(s) listed below.

Chloride
Nitrate as N
Turbidity

Conductivity at 25°C
Sulfate



A handwritten signature in black ink, appearing to read 'Matthew Seebeck', is written over a horizontal line.

Matthew Seebeck, Quality Officer



ხელშეკრულება საკონსულტაციო მომსახურებაზე თბილისი, საქართველო 26 ივნისი, 2021 წ
მხარეები
<p>მპს ესდეფსი (SDSC) ს/ნ: 405335025 მისამართი: ქ. თბილისი, ვაკე-საბურთალოს რაიონი, მიხეილ თამარაშვილის გამზირი, #13, ბინა 17 მიხი დირექტორის გიორგი გულიაშვილი-ს სახით (შემდგომში - დაამკვეთი)</p> <p>და</p> <p>მპს DG Consulting (ს/კ 205 280 998) მისამართი: თბილისი, შირვა გელოვანის 10, წარმოდგენილი მისი უფლება-მოხილი პირის, ბ-ნი დავით გირგვლიაშის სახით (შემდგომში "კონტრაქტორი")</p> <p>დაამკვეთი და კონტრაქტორი ერთობლივად მოიხსენებენ როგორც მხარეები, ხოლო ცალ-ცალკე, როგორც მხარე.</p>
1. ხელშეკრულების საგანი
E-60 მაგისტრალის F4 მონაკვეთზე (ქედა წყა - არგეთა ზესტაფონის შემოვლითი გზა) გარემოსდაცვითი მონიტორინგის სამუშაოების განხორციელება
2. შესასრულებელი სამუშაო
<p>2.1. სამუშაო ითვალისწინებს შესრულებლის მიერ პერიოდული (ყოველთვიური) გარემოსდაცვითი მონიტორინგის სამუშაოების წარმოებას დანართ 1-ში მოცემული ერთეული ღირებულებების შესაბამისად. სამუშაოები შესრულდება სტანდარტული მეთოდების გამოყენებით. მონიტორინგული სამუშაოები მოიცავს:</p> <p>2.2. ატმოსფერული ჰაერის მონიტორინგს;</p> <p>2.3. მტერის კონცენტრაციების განსაზღვრას</p> <p>2.4. ხმაურისა და ვიბრაციის დონეების განსაზღვრას</p> <p>2.5. ნიადაგისა და წყლის ქიმიურ და მიკრობიოლოგიურ ანალიზს</p> <p>2.6. მიმდინარე ხელშეკრულების შესაბამისად შესასრულებელი სამუშაოები დაზუსტდება ყოველთვიურად მონიტორინგული სამუშაოების საჭიროების და მშენებლობის ეტაპების მიხედვით.</p>
3. ღირებულება და გადახდის პირობები
<p>3.1. "კონტრაქტორის" მიერ გაწეული მომსახურების სრული ღირებულება გამოითვლება ყოველთვიურად ფაქტურად შესრულებული სამუშაოს მიხედვით, დანართში 1 მოცემული ერთეული ღირებულებების გათვალისწინებით, ერთეული ღირებულებების ცხრილი არ მოიცავს დამატებული ღირებულების გადასახადს, რომელიც დაემატება თვის განმავლობაში შესრულებული სამუშაოს ჯამურ ღირებულებას.</p> <p>3.2. ანაზღაურება მოხდება ყოველთვიურად, ანაზღაურების დაგვიანების შემთხვევაში, მომდევნო თვის სამუშაოები გადაიწევს.</p> <p>3.3. შესასრულებლის მიერ ინვოისის წარდგენისას ასევე ელექტრონულად წარდგენილ უნდა იქნას ოფიციალური ანგარიშ ფაქტურა შემოსავლების სამსახურის ვებ-გვერდის (www.rg.gov.ge) საშუალებით.</p> <p>3.4. ანაზღაურება მოხდება ინვოისების წარდგენიდან 10 სამუშაო დღის ვადაში.</p>

<p>3.5. ხელშეკრულების ერთეული ფასები მოცემულია ღარიში 2021 წლის ივნისისათვის არსებული ოფიციალური კურსის გათვალისწინებით იმ შემთხვევაში, თუ გაცვლითი კურსი შეიცვლება 20%-ზე მეტი სიდიდით, ერთეული ღირებულებებიც შეიცვლება ურთიერთმოლაპარაკების საფუძველზე.</p>
<p>4. მხარეთა ვალდებულებები</p> <p>4.1. შემსრულებელი ვალდებულია:</p> <p>4.1.1. გულისხმობისა და პასუხისმგებლობით შესარულოს მასზე დაკისრებული მოვალეობები მისი კომპეტენციისა და კვალიფიკაციის გათვალისწინებით;</p> <p>4.1.2. დაიცვას კონფიდენციალურობა ხელშეკრულების ძალაში ყოფნის მთელი ვადის განმავლობაში და ამ ვადის გასვლიდან 6 (ექვსი) თვის განმავლობაში.</p> <p>4.2. დამკვეთი ვალდებულია:</p> <p>4.2.1. დროულად მიაწოდოს კონტრაქტორს სრული ინფორმაცია სახელშეკრულებო ვალდებულებების კერძოვანი შესრულებისთვის;</p> <p>4.2.2. უზრუნველყოს შემსრულებლის ხელშეწყობა საეკლესიო სამუშაოების პროცესში.</p> <p>4.2.3. უზრუნველყოს კონტრაქტორის მიერ წარდგენილი დოკუმენტაციის დროულად განხილვა და მიღება.</p>
<p>5. ხელშეკრულების მოქმედების ვადა</p> <p>5.1. ხელშეკრულება ძალაში შედის მხარეთა მიერ მისი ხელმოწერის მომენტიდან და სრულ და კერძოდ შესრულებამდე.</p> <p>5.2. ხელშეკრულება ითვალისწინებს დანართი 1-ით განსაზღვრული სამუშაოების შესრულებას</p> <p>5.3. საჭიროების შემთხვევაში, მხარეები შეთანხმდებიან ხელშეკრულების გაგრძელებაზე ან ახალი ხელშეკრულების გაფორმებაზე.</p>
<p>6. ხელშეკრულების ვადაში შეწყვეტა</p> <p>6.1. წებისმიერ მხარეს ყოველგვარი საფუძვლის გარეშე შეუძლია წინამდებარე ხელშეკრულების ვადის გასვლამდე შეწყვეტა მხოლოდ მხარისთვის არა უფიანეს ურთი თვით ადრე წერილობითი შეტყობინების გაგზავნით.</p> <p>6.2. ხელშეკრულების შეწყვეტისას დამკვეთი ანაზღაურებს მხოლოდ კონტრაქტორის მიერ შეტყობინების მიღების თარიღისთვის შესრულებულ სამუშაოს. თუ ამ დროისათვის ანალიტიკური სამუშაოები განხორციელების პროცესშია, მაშინ, დამკვეთი ვალდებულია ანაზღაურდოს აღნიშნული ანალიტიკური სამუშაო.</p>
<p>7. ინტელექტუალური საკუთრების უფლება</p> <p>6.1. წინამდებარე ხელშეკრულების საფუძველზე, კონტრაქტორისათვის სრული ანაზღაურების განხორციელების შემდეგ, დამკვეთს გადაეცემა ინტელექტუალური საკუთრების უფლებები ხელშეკრულების ფარგლებში მოწოდებულ ყველა მასალაზე.</p>
<p>8. მოქმედი სამართალი და დავების გადაწყვეტის წესი</p> <p>8.1. წინამდებარე ხელშეკრულება შედგენილია და რეგულირდება ქართული სამართლის შესაბამისად.</p>

<p>8.2. მხარეთა შორის წარმოქმნილი სადავო საკითხები შესაძლებლობიდან გამომდინარე წყდება ურთიერთშეთანხმებითა და მოლაპარაკების გზით;</p> <p>8.3. იმ შემთხვევაში, თუ კონსულს არ ექნება მიღწეული, დავა გადაწყდება სასამართლოს გზით საქართველოს კანონმდებლობის შესაბამისად.</p>			
<p>9. დასკვნითი დებულებები</p> <p>8.1 ნებისმიერი გადახრა ან ევლილება ამ ხელშეკრულების პირობებში დაიშვება მხოლოდ ორივე მხარის მიერ ხელმოწერილი წერილობითი შეთანხმების საფუძველზე.</p> <p>8.2 ხელშეკრულება შედგენილია 2 ევზემალარად ქართულ ენაზე.</p>			
<p>10. საბანკო რეკვიზიტები</p> <table border="1"> <tr> <td style="text-align: center;"> <p>„დაშკვეთი“:</p> <p>შპს ესდიესი (SDSC) ს/ნ: 405335025 მისამართი: ქ. თბილისი, ვაკე-საბურთალოს რაიონი, მიხეილ თამარაშვილის გამზირი, #13, ბინა 17. სს "საქართველოს ბანკი" ანგარიში ნომერი: GE18BG000000365814743</p> </td> <td style="text-align: center;"> <p>„კონტრაქტორი“:</p> <p>შპს DG Consulting, ს/კ 205 280 998 მისამართი: თბილისი, შირზა გულუჯანის 10, მიმღები: შპს "დგ კონსალტინგი" მიმღების ბანკი თბილისი ბანკი ანგარიში (ლარი) - GE16TB0669136020100005</p> </td> </tr> </table>		<p>„დაშკვეთი“:</p> <p>შპს ესდიესი (SDSC) ს/ნ: 405335025 მისამართი: ქ. თბილისი, ვაკე-საბურთალოს რაიონი, მიხეილ თამარაშვილის გამზირი, #13, ბინა 17. სს "საქართველოს ბანკი" ანგარიში ნომერი: GE18BG000000365814743</p>	<p>„კონტრაქტორი“:</p> <p>შპს DG Consulting, ს/კ 205 280 998 მისამართი: თბილისი, შირზა გულუჯანის 10, მიმღები: შპს "დგ კონსალტინგი" მიმღების ბანკი თბილისი ბანკი ანგარიში (ლარი) - GE16TB0669136020100005</p>
<p>„დაშკვეთი“:</p> <p>შპს ესდიესი (SDSC) ს/ნ: 405335025 მისამართი: ქ. თბილისი, ვაკე-საბურთალოს რაიონი, მიხეილ თამარაშვილის გამზირი, #13, ბინა 17. სს "საქართველოს ბანკი" ანგარიში ნომერი: GE18BG000000365814743</p>	<p>„კონტრაქტორი“:</p> <p>შპს DG Consulting, ს/კ 205 280 998 მისამართი: თბილისი, შირზა გულუჯანის 10, მიმღები: შპს "დგ კონსალტინგი" მიმღების ბანკი თბილისი ბანკი ანგარიში (ლარი) - GE16TB0669136020100005</p>		
<p>მხარეთა ხელმოწერები</p>			
<p>„დაშკვეთი“-ს სახელით:</p> <p>შპს ესდიესი (SDSC) ს/ნ: 405335025 მისამართი: ქ. თბილისი, ვაკე-საბურთალოს რაიონი, მიხეილ თამარაშვილის გამზირი, #13, ბინა 17.</p>	<p>„კონტრაქტორი“-ს სახელით</p> <p>შპს DG Consulting, ს/კ 205 280 998 მისამართი: თბილისი, შირზა გულუჯანის 10.</p>		
 	 		
<p>დირექტორი - გიორგი გულიაშვილი</p>	<p>დირექტორი - დავით კორკველიძე</p>		
<p>დამატებითი დოკუმენტები - დანართი 1</p>			



TRAINING ATTENDANCE/დასწრების ფორმა/培训签到表

LOCATION: E60 EWH F4:

DATE: 16.05.23

ადგილმდებარეობა E60 EWH F4: Interchange N2

位置: E60 EWH F4:

TRAINING TUTOR:

ტრენერი: Levan Ozbetelashvili; Davit Kurdadze

培训讲师

SUBJECT:

საკითხი: Waste management (Hazardous) / პროგრამის განხილვები ჰეჯს

主题:

No	NAME and SURNAME/სახელი და გვარი/姓名	POSITION/თანამდებობა/位置	SIGNATURE /ხელმოწერა/签名
1	სვითანდილი შენაძე	მუქანიკოსი	<i>[Signature]</i>
2	თემური შვიციანი	მუქანიკოსი	<i>[Signature]</i>
3	სივლითა კოვალენკო	მუქანიკოსი	<i>[Signature]</i>
4	ვიქტორია ბეზუაძე	მუქანიკოსი	<i>[Signature]</i>
5	ბეკა სამხილაძე	მუქანიკოსი	<i>[Signature]</i>
6	ნინო შვედათელაძე	მუქანიკოსი	<i>[Signature]</i>
7	მანა ნუბუაძე	დატექტიკის დეპარტამენტი	<i>[Signature]</i>
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TRAINING ATTENDANCE/დასწრების ფორმა/培训签到表

LOCATION: E60 EWH F4:

ადგილმდებარეობა E60 EWH F4: Tunnel N2

DATE: 11.04.2023

位置: E60 EWH F4:

TRAINING TUTOR:

ტრენერი: Levan Ozbetelashvili D. Kurdadze

培训讲师

SUBJECT:

ბაკაობი: Waste management გასაგებების შიპი

主题:

No	NAME and SURNAME/სახელი და გვარი/姓名	POSITION/თანამდებობა/位置	SIGNATURE /რეგისტრაცია/签名
1	<u>სპეციალ. მენეჯერი</u>	<u>პროექტი</u>	<u>[Signature]</u>
2	<u>სპეციალ. მენეჯერი</u>	<u>მენეჯერი</u>	<u>[Signature]</u>
3	<u>სპეციალ. მენეჯერი</u>	<u>მენეჯერი</u>	<u>[Signature]</u>
4	<u>სპეციალ. მენეჯერი</u>	<u>მენეჯერი</u>	<u>[Signature]</u>
5	<u>სპეციალ. მენეჯერი</u>	<u>მენეჯერი</u>	<u>[Signature]</u>
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TRAINING ATTENDANCE/დასწრების ფორმა/培训签到表

LOCATION: E60 EWH F4:

DATE: 07.04.2023

ადგილი/მდებარეობა E60 EWH F4: Tunnel N2

位置: E60 EWH F4:

TRAINING TUTOR:

ტრენინგორ: Levan Ozbetelashvili; Davit Kurdadze

培训讲师

SUBJECT:

საგანი: Waste Management/ბაზრების მართვა

主题:

No	NAME and SURNAME/სახელი და გვარი/姓名	POSITION/თანამდებობა/位置	SIGNATURE /ბეჭდვა/签名
1	ვაჟა პაპიაშვილი	პროექტის მენეჯერი	3.3.16
2	მარიამ ჯუღაძე	მ.მ.	მ.ჯუღაძე
3	ვანო ვანოშვილი	მ.მ.	ვ.ვანოშვილი
4	დავით მუხომბიძე	დაცვის უწყისი	დ.მუხომბიძე
5	გიორგი ჯუღაძე	მ.მ.	გ.ჯუღაძე
6	გიორგი ჯუღაძე	მ.მ.	გ.ჯუღაძე
7	ნეკეტილი თეიმურაზი	სამსახურის მ.მ.	ნ.თეიმურაზი
8	ანდრონიკ ვანოშვილი	მ.მ.	ანდრონიკ
9	ვახტანგ თევზაძე	მ.მ.	ვ.თევზაძე
10	გიორგი ჯუღაძე	მ.მ.	გ.ჯუღაძე
11	ბორის ვანოშვილი	მ.მ.	ბ.ვანოშვილი
12	გიორგი ვანოშვილი	მ.მ.	გ.ვანოშვილი
13	ვახტანგ თევზაძე	მ.მ.	ვ.თევზაძე
14	ვანო ვანოშვილი	მ.მ.	ვ.ვანოშვილი
15	ნეკეტილი თეიმურაზი	მ.მ.	ნ.თეიმურაზი
16	დავით მუხომბიძე	დაცვის უწყისი	დ.მუხომბიძე
17	გიორგი ჯუღაძე	დაცვის უწყისი	გ.ჯუღაძე

TRAINING ATTENDANCE/დასწრების ფორმა/培训签到表

LOCATION: E60 EWH F4:

DATE: 07.04.2023

ადგილმდებარეობა E60 EWH F4: Tunnel N2

位置: E60 EWH F4:

TRAINING TUTOR:

ტრენინგი: Levan Ozbetelashvili; Davit Kurdatze

培训讲师

SUBJECT:

საგანები: Waste Management / საჩხვებლის მართვა

主题:

No	NAME and SURNAME/სახელი და გვარი/姓名	POSITION/თანამდებობა/位置	SIGNATURE რეგისტრირება/签名
1	ლევან ოზბეტელაშვილი		ლ. ოზბეტელაშვილი
2	დავით კურდათზე		დავით კურდათზე
3	ნინო საჩხვებელი		ნ. საჩხვებელი
4	ბიძინა ბიძინაძე		ბ. ბიძინაძე
5	გიორგი გომიგაძე	კადრების დეპარტამენტი	გ. გომიგაძე
6	სერგო მუხომბე	საპროექტო განყოფილება	ს. მუხომბე
7	დავით ნუბუაძე	კადრების დეპარტამენტი	დავით ნუბუაძე
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TRAINING ATTENDANCE/დასწრების ფორმა/培训签到表

LOCATION: E60 EWH F4:

DATE: 01.30.2023

ადგილმდებარეობა E60 EWH F4: Interchange N1

位置: E60 EWH F4:

TRAINING TUTOR:

ტრენერი: Levan Dzbetelashvili

培训讲师

SUBJECT:

საკონბო: Concrete mixer trucks wash-out issues; Management of leftover concrete in the concrete mixer trucks; Refueling process and prevention of fuel spills

主题: in the concrete mixer trucks; Refueling process and prevention of fuel spills

No	NAME and SURNAME/სახელი და გვარი/姓名	POSITION/თანამდებობა/位置	SIGNATURE რეგისტრაცია/签名
1	რამიშვილი სერგეი	მძღოლი	[Signature]
2	გამბეი ისაყბეი	მძღოლი	[Signature]
3	ბეგვილი სერგეი	მძღოლი	[Signature]
4	გვებეი სერგეი	მძღოლი	[Signature]
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6	ვახუშტიანი სერგეი	მძღოლი	[Signature]
7	ბერიძე სერგეი	მძღოლი	[Signature]
8	ბერიძე სერგეი	მძღოლი	[Signature]
9	ბერიძე სერგეი	მძღოლი	[Signature]
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TRAINING ATTENDANCE/დასწრების ფორმა/培训签到表

LOCATION: E60 EWH F4:

DATE: 01.28.2023

ადგილმდებარეობა E60 EWH F4: TUNNELS 4-5

位置: E60 EWH F4:

TRAINING TUTOR:

ტრენინგი: Levan Dabetelashvili

培训讲师

SUBJECT:

საკითხი: Spoil management; Remaining concrete management from the cement

主题: mixer truck, and unsystematic mixer washin issues; Tires washing

No	NAME and SURNAME/სახელი და გვარი/姓名	POSITION/თანამდებობა/位置	SIGNATURE რეგისტრაცია/签名
1	<i>ქიქოძე ზაზა</i>	<i>მდივანი</i>	<i>[Signature]</i>
2	<i>გაბრიელ ნუბუკიძე</i>	<i>მდივანი</i>	<i>[Signature]</i>
3	<i>მურმანიანი ზორბერძ</i>	<i>მდივანი</i>	<i>[Signature]</i>
4	<i>სვ. ნუბუკიძე</i>	<i>მდივანი</i>	<i>[Signature]</i>
5	<i>მანუჩი ბერიძე</i>	<i>მდივანი</i>	<i>[Signature]</i>
6	<i>მანუჩი ბერიძე</i>	<i>სანგ' ბრუნის</i>	<i>[Signature]</i>
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TRAINING ATANDANCE

LOCATION: E60 EWH F4

Interchange #1 and #2

DATE: 21.04.23

TRAINING TUTOR:

D. Kurdadze, L. Dabdelashvili

SUBJECT:

WMP, PPMP, Spoil disposal, Air emission, Refueling

No	NAME and SURNAME	POSITION	SIGNATURE
1	ძიქარი ალექსანდრე	შემსრულებელი	[Signature]
2	ვარციანი ლევანტო	შემსრულებელი	[Signature]
3	ბაგდაშვილი მამია	შემსრულებელი	[Signature]
4	ბ. ბერიძე ვანო	შემსრულებელი	[Signature]
5	გონიანი გიორგი	შემსრულებელი	[Signature]
6	გონიანი ვახტანგ	შემსრულებელი	[Signature]
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TRAINING ATANDANCE

LOCATION: E60 EWH F4

Interchange n°2, Processing yard DATE: 24.01.23

TRAINING TUTOR:

D. Kurdadze, L. Debetelashvili

SUBJECT:

WMP; PMP; Hazardous material handling; Metal waste disp

No	NAME and SURNAME	POSITION	SIGNATURE
1	Qghasm Bzoboda	ბერბობა	Q. Bzoboda
2	გაბია (ბ) ბ) ებახ)	ბერბობა	გ. გაბია
3	ბუბუა გუბუა	ბერბობა	ბ. გუბუა
4	მამია ბობობა	ბერბობა	მ. ბობობა
5	გობუა ბობობა	ბერბობა	გ. ბობობა
6	ბობუა ბობობა	ბერბობა	ბ. ბობობა
7	ბობუა ბობობა	ბერბობა	ბ. ბობობა
8	ბობუა ბობობა		ბ. ბობობა
9	ბობუა ბობობა	ბერბობა	ბ. ბობობა
10	ბობუა ბობობა	ბერბობა	ბ. ბობობა
11	ბობუა ბობობა	ბერბობა	ბ. ბობობა
12	ბობუა ბობობა		ბ. ბობობა
13	ბობუა ბობობა	ბერბობა	ბ. ბობობა
14	ბობუა ბობობა	ბერბობა	ბ. ბობობა
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TRAINING ATANDANCE

LOCATION: E60 EWH F4

Interchang 1 & Batchine Plant DATE: 20.02.23

TRAINING TUTOR::

David Kurdadze / Debetelashvili

SUBJECT:

Polution Prevention, Concrete mixers washing procedur

No	NAME and SURNAME	POSITION	SIGNATURE
1	სმ სს ჭრჭხიძე	მდგომარეობა	[Signature]
2	ჭრჭხიძე სტეფან	მდგომარეობა	[Signature]
3	სტეფან ჯგერგია	მდგომარეობა	[Signature]
4	სტეფან ჯგერგია	მდგომარეობა	[Signature]
5	სტეფან ჯგერგია	მდგომარეობა	[Signature]
6	სტეფან ჯგერგია	მდგომარეობა	[Signature]
7	სტეფან ჯგერგია	მდგომარეობა	[Signature]
8	სტეფან ჯგერგია	მდგომარეობა	[Signature]
9	David Kurdadze	EPO	[Signature]
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TRAINING ATTENDANCE/დასწრების ფორმა/培训签到表

LOCATION: E60 EWH F4:

DATE: 16.06.2023

ადგილმდებარეობა E60 EWH F4: Comp N4 / Tunnel N4004-4005

位置: E60 EWH F4:

TRAINING TUTOR:

ტრენინგორ Levan Ozbatelashvili; Davit Kurdatze

培训讲师

SUBJECT:

საკონობო: Pollution prevention; Waste management

主题:

No	NAME and SURNAME/სახელი და გვარი/姓名	POSITION/თანამდებობა/位置	SIGNATURE რეგისტრაცია/签名
1	მამია დიბუჯ	სამს. უწყვეტად	<i>[Signature]</i>
2	ზურაბი ვახტანგაძე	მშენებლის მუშაკი	<i>[Signature]</i>
3	ბიბიანი ივანე	მუშაკი	<i>[Signature]</i>
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17			<i>[Signature]</i>

Annex 6: Clearance, Re-vegetation and Restoration Management Plan & Tree Compensation Plan

	
 <p style="text-align: center;">Shorapani-Argveta F4 Section</p>	
	Road department of Georgia of The Ministry of Regional Development and Infrastructure of Georgia
 <p>ULUSLARARASI BİRLEŞMİŞ MÜŞAVİRLER MÜŞAVİRLİK HİZMETLERİ A.Ş.</p> <p>Construction Supervision Consultant for E60 Highway F4 Shorapani-Argveta Project</p>	Engineer: UBM Uluslararası Birleşmiş Müşavirler Müşavirlik Hizmetleri A.Ş. (Turkey)
	Contractor: Guizhou Highway Engineering Group Co. & China National Technical Import and Export Corporation Joint venture
CONSTRUCTION OF SHORAPANI-ARGVETA SECTION (E60 HIGHWAY ROUTE) LOT F4 Contract No. SARP/CW/OCB-01 <h2 style="margin: 0;">Clearance, Re-Vegetation and Restoration Management Plan</h2>	
Prepared by: Guizhou Highway Engineering Group Co. & China National Technical Import and Export Corporation Joint venture	
Reviewed by: Mei Shilun, Project Manager	
Submitted for: Approval	

Clearance, Re-Vegetation and Restoration Management Plan

Clearance, Re-Vegetation and Restoration Management Plan

Prepared by: Guizhou Highway Engineering Group Co. & China National Technical Import and
Export Corporation Joint venture

Reviewed by: Mei Shilun Project Manager



F4 Section (Kveda Tseva-Argveta) - Khevi-Ubisa-Shorapani-Argveta, E60 EWH

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1. INTRODUCTION

1.1 Project Overview

The East–West Highway (EWH) Improvement Project involves construction of a new road section of the E60 highway located in Imereti Region of central Georgia (see **Figure 1**). Section F4 forms the Shorapani-Argveta (Kveda Tseva-Argveta) portion of the Khevi-Ubisa-Shorapani-Argveta section of the E60. The length of the Project road is as follows:

- Right lane (TA – meaning Tbilisi – Argveta direction) - 14.778 km;
- Left lane (AT – meaning Argveta – Tbilisi direction) - 14.726 km.

The Project also includes construction of five long span bridges and one short span bridge. The total length of the five bridges is 4,912 meters, the longest of which is 941 meters.

Six tunnels will be constructed with double tubes with length from 399 meters to 1166 meters.

There are four interchanges planned in F4 Section.

The Project is financed by the Asian Development Bank (ADB).

The Roads Department (RD) of the Ministry of Regional Development and Infrastructure of Georgia (MRDI) is wholly responsible for the implementation of the Project.

RD has selected an Engineer (Works Supervisor) a JV between international engineering/construction companies UBM Uluslararası Birleşmiş Müşavirlik Hizmetleri A.Ş. (Turkey) and SMEC International PTY LTD (Australia).

Construction Contractor is Guizhou Highway Engineering Group Co.

Construction Contractor's Consultant in occupational health and safety, social and environmental issues is Capto BMG LLC.

1.2 Abbreviations

Abbreviation/ Acronym	Description
ADB	Asian Development Bank
CBPP	Concrete Batching Plant Plan
CLO	Community Liaison Officer
EO	Environmental Officer
EIA	Environmental Impact Assessment
EPRP	Emergency Preparedness and Response Plan
E&S	Environmental and Social
ESMP	Environmental and Social Management Plan
EWH	East–West Highway
GoG	Government of Georgia
GRM	Grievance Redress Mechanism
H&S	Health and Safety
MEPA	The Ministry of Environmental Protection and Agriculture of Georgia
MRDI	Ministry of Regional Development and Infrastructure of Georgia
PAP	Project Affected Person
PK	Picket – 100 meter long section of the road
PM	Project Manager
RD	The Roads Department

Clearance, Re-Vegetation and Restoration Management Plan

Abbreviation/ Acronym	Description
RoW	Right of Way
STP	Sewage Treatment Plant

1.3 Definitions

Term	Definition
Project	F4 Section (Kveda Tseva-Argveta) - Khevi-Ubisa-Shorapani-Argveta, E60 EWH
Engineer	Work Supervisor selected by RD JV UBM Uluslararası Birleşmiş Müşavirler Müşavirlik Hizmetleri A.Ş. (Turkey) and SMEC International PTY LTD (Australia)
Contractor	Construction Contractor Guizhou Highway Engineering Group Co.
Contractor's Consultant	Contractor's Consultant in occupational health and safety, social and environmental issues Capto BMG LLC
Sub-Contractor	Means any party to a sub-contract including its employees and agents
Stakeholder	Means any party that has an interest in a Project and can either affect or be affected by the Project
Waste	Materials produced during operational activities which are of no use or value to the process that generated them

1.4 References

Document Number	Document Title
Project Number: 53178-001	Environmental Impact Assessment (EIA) - ADB
Contract No.: RCIP/CS/QCBS-17	Environmental Impact Assessment (EIA) - Georgia
	The Site Programme for F4 Project
	Air Quality Plan
	Community Health and Safety Plan
	Emergency Preparedness and Response Plan
	Environmental and Social Management Plan
	Grievance Redress Mechanism
	Groundwater Management Plan
	Noise Management Plan
	Occupational Health and Safety Plan
	Re-cultivation Plan
	Spill Response Plan
	Traffic Management Plan
	Waste Management Plan

1.5 Purpose and Objectives of the Document

The purpose of this document is to provide the framework for site clearance, including tree cutting and permanent reinstatement (restoration) activities for all areas disturbed by project works, including temporary facilities, such as construction camps, work areas, batching plants, laydown areas and temporary access roads/tracks and other transport facilities. The plan also covers biorestitution and off-set planting of Georgian Red List trees removed from State Forest Fund land as required by ADB EIA and MEPA's Environmental Decision approval condition. While briefly overviewed in the plan, Spoil Disposal Sites (for spoil generated during tunneling/slope cutting works) are covered under separate Spoil Disposal Plans that

Clearance, Re-Vegetation and Restoration Management Plan

are approved by the Engineer and MEPA. Therefore, site specific details regarding those areas will be described in noted standalone plans. Same applies to topsoil stripping and storage. Details regarding those activities are presented in Topsoil Stripping and Storage Plan.

Objectives of the plan is to ensure:

- Restoring, or facilitating the conditions to restore the complex ecology existing before construction, particularly the variety and distribution pattern of plant species;
- Habitat restoration through planting and maintenance of trees and shrubs;
- Restoring the contours, topography, soil profile and drainage patterns of the corridor and ancillary facility sites to pre-existing conditions, to the maximum extent practicable;
- Re-establishing soil profiles and sufficient vegetative cover to minimize erosion through restoration of the native plant community;
- Restoring to original condition, or better, any watercourse, infrastructure, structures, buildings, or agricultural land disturbed by the road corridor during construction;
- Maintaining soil stability and road integrity in the short term until longer term restoration occurs;
- Ensuring that no net loss of habitat occurs.

This Plan will apply to all works conducted by Contractor, including those of its subcontractors and relevant suppliers to the extent that Contractor has influence over HSE performance (e.g. aggregate sourcing site pollution prevention).

Contractor will carry out reinstatement and erosion control in accordance with project Environmental Impact Assessments and commitments made in EIAs. Clearance, Re-Vegetation and Restoration specific commitments are summarized in the **Table 1** below.

Table 1: ADB and Georgian EIA Commitments related to Clarence, Re-Vegetation and Restoration

Source of Commitment	Topic	Commitment Text
ADB EIA	Soil Erosion	Measures to control erosion will be outlined in the Contractors Clearance, Re-vegetation and Restoration Management Plan.
ADB EIA	Biodiversity/Land Clearance	<ul style="list-style-type: none"> - The Contractor shall prepare a Clearance, Re-vegetation and Restoration Management Plan for prior approval by the Engineer. The Clearance Plan shall be followed strictly by the contractor. Areas to be cleared should be minimized as much as possible. - As part of this plan prepare an action plan for the restoration of modified habitat that will be cleared prior to the start of construction. The plan shall be prepared by qualified biodiversity specialists. - The plan shall include restoration of the existing site, re-planting of spoil disposal site and re-planting at any other locations requested by MoEPA. - The total area to be restored / re-planted shall be 14.9 hectares as per Table 85. - The contractor re-vegetation and restoration management plan will meet ADB requirements for No Net Loss for Natural Habitat. - Prior to the commencement of works the Contractor shall stake the boundary of the entire site, including intersections and areas under bridges. The Contractor will then undertake a survey of all trees within 5 meters of the boundary of the staked site and identify if any Georgian red-list species are located within this zone. This survey will form part of the Contractors Clearance, Re-vegetation and

Clearance, Re-Vegetation and Restoration Management Plan

Source of Commitment	Topic	Commitment Text
		<p>Restoration Management Plan.</p> <ul style="list-style-type: none"> - All temporary construction facilities should be located on already heavily disturbed ground where secondary forest growth has not yet become well-established.
ADB EIA	Loss of Topsoil	<ul style="list-style-type: none"> - Material that is less susceptible to erosion will be selected for placement around bridges and culverts. - Re-vegetation of exposed areas including; (i) selection of fast growing and grazing resistant species of local flora; (ii) immediate re-vegetation of all slopes and embankments if not covered with gabion baskets; (iii) placement of fiber mats to encourage vegetation growth. - The Engineer and the Contractor will both be responsible for ensuring that embankments are monitored continuously during construction for signs of erosion.
ADB EIA	Drainage and Flooding	<ul style="list-style-type: none"> - During the construction phase the Contractor will be required to construct, maintain, remove and reinstate as necessary temporary drainage works and take all other precautions necessary for the avoidance of damage to properties and land by flooding and silt washed down from the works. - Arrange with the village representatives those works which might interfere with the flow of irrigation waters to be carried out at such times as will cause the least disturbance to irrigation operations. - Should any operation being performed by the Contractor interrupt existing irrigation facilities, the Contractors will restore the irrigation appurtenances to their original working conditions within 24 hours of being notified of the interruption. - The Contractor will also be responsible for ensuring that no construction materials or construction waste block existing drainage channels within the Project corridor.
ADB EIA	Habitat	<p>The Contractor, shall implement a Clearance, Re-vegetation and Restoration Management Plan which includes the measures for the restoration of modified habitat. The plan should be prepared by qualified national biodiversity specialists. The Contractor will be responsible for planting and maintenance of trees and shrubs in accordance with the plan during the construction and defects liability period of the Project. During this phase the Engineer will undertake monthly monitoring of the re-planted areas and report on the success rate of the planted areas, which should be above 80%. If the success rate falls below 80% the Contractor will re-plant on a 1:1 basis to compensate for losses. The Contractor will be responsible for paying for any compensational re-planting. The Contractor shall also include in his Clearance, Re-vegetation and Restoration Management Plan measures to restore any affected habitat at his spoil disposal sites. Siting of spoil disposal areas within natural habitat will not be allowed under the Project.</p> <p>The Contractor will prepare a Biodiversity Action Plan - BAP (An outline of the plan is provided by Appendix L). The Plan</p>

Clearance, Re-Vegetation and Restoration Management Plan

Source of Commitment	Topic	Commitment Text
		specifies the specific actions to be undertaken to ensure no net loss of natural habitat. The actions required (e.g. locations for planting) will be determined between the Contractor, RD and the National Forestry Agency. The National Forestry Agency will be responsible for implementation of the natural habitat restoration specified in the BAP via direct funding from the RD.
ADB EIA	State Forest Fund	Prior to cutting trees in the identified State Forest Fund areas, it is required to obtain permit (Decree of the Government of Georgia on the "exclusion of certain areas from the State Forest Fund"), also known as 'delisting' the trees from the State Forest Fund and for compensation payments to be made.
ADB EIA	State Forest Fund	<ul style="list-style-type: none"> - The Contractor will be provided with plans indicating the areas of State Forest Fund. - Tree-cutting works in the State Forest Fund areas shall be implemented under the supervision of specialists of the National Forestry Agency. - Contractor to remove the trees to a location specified by the National Forest Agency.
ADB EIA	Protection of Vulnerable Species	The Contractor will place protective wood fencing around the any Georgian red-list species identified within 5 meters of the site boundary in the pre-construction survey in order to protect the tree during construction works, including its root zones.
ADB EIA	Habitat Restoration Vegetation Clearance	No chemicals shall be used to clear vegetation.
Order N2-181 of the Minister of Environment Protection and Agriculture on Approval of Environmental Decision (3.9)	Tree cutting	As it is impossible to reinstate and maintain forest areas in their current form, prior to start of highway operation, submit offset or eco-compensation measures (equivalent forest habitat reinstatement plan) to the Ministry of Environment Protection and Agriculture that places special emphasis on red data species.
Georgian EIA	Topsoil Management	Topsoil shall be stripped prior to starting construction of plain sections of the road. Topsoil will be used for seeding of perennial plants on slopes.
Georgian EIA	Site Preparation for Final Reinstatement	Construction process cover number of activities, namely: <ul style="list-style-type: none"> - Clearance of ROW prior to start of construction; topsoil stripping and temporary storage in order to use it after completion of construction for reinstatement (re-cultivation) of land damaged or used temporarily; - Profiling of the area and arrangement of drainage/culverts; - Tunneling; - Tunnel spoil disposal; - Arrangement of bridge pillars and foundations; - Arrangement of road foundation. Soil compaction using equipment. Delivery aggregate, spreading and compaction;

Clearance, Re-Vegetation and Restoration Management Plan

Source of Commitment	Topic	Commitment Text
		<ul style="list-style-type: none"> - Arraignment of upper layer of the road; - Finalizing of road construction as per international standards and marking; - Landscaping – tree planting on temporarily disturbed areas and grass seeding as per re-cultivation plan.
Georgian EIA	Topsoil Management	Volume of topsoil to be stripped during project implementation is approximately Xm3. It will be temporarily stored along the ROW or adjacent land as per applicable permit. Storage location will be specified by the construction contractor.
Georgian EIA	Topsoil Management	<p>Impact on topsoil is relatively conditional, since soil stripped within the ROW will be used for re-cultivation after completion of construction.</p> <p>Area used for storage of topsoil (before use for re-cultivation) will be selected based on environmental norm and surrounding environment and will include as a minimum the following: area will be as far as possible from surface water bodies; will be plain; will be protected from scouring and wind erosion. Selected area will be agreed with the environmental regulator. In case of usage of private land/lands temporarily, compensation will be paid as per Land Acquisition and Resettlement Plan.</p> <p>To avoid damage, requirements of the Technical Regulation approved by Governmental Decree N424 dated December 31, 2013 on "Topsoil Stripping, Storage, Usage and Re-Cultivation" will be followed.</p> <p>Topsoil will be stored separately from the material used for road construction. Safe height and slope of the stockpiles will be maintained. Area will be protected from movement/compaction/contamination from construction vehicle/equipment.</p>
Georgian EIA	Topsoil Management	<p>In order to avoid or minimize impact on soil, the following measures will be implemented:</p> <ul style="list-style-type: none"> - Vegetation cover will be retained as much as possible; - To prevent loss of topsoil, it will be stripped and stored temporarily prior to use for re-cultivation; - To maintain quality of topsoil, it will not be mixed with subsoil during stripping; - Topsoil will be stripped and stored in compliance with applicable regulations; - Safe slope will be maintained when arranging the stockpiles, surface water drainage will be arranged; For stability, height of stockpiles will not exceed 2 meters. Stockpiles will be located considering protection from erosion and scouring; - Topsoil compaction will be avoided by strict adherence to boundaries of roads, works areas and camps (if applicable); - As soon as there is no more impact, reinstatement activities will commence; - Temporary fuel storage tank (if applicable), will be located within impermeable area surrounded by berms. Any spill

Clearance, Re-Vegetation and Restoration Management Plan

Source of Commitment	Topic	Commitment Text
		<p>will be retained inside the bund and cleaned up using absorbents;</p> <ul style="list-style-type: none"> - Equipment maintenance and/or refueling on the works areas will be limited as much as possible. Priority will be given to usage of commercial maintenance workshops outside the work areas if possible. If it is necessary, special areas will be designated for such purpose. Area will be for protection from accidental spills (bunding, solid surface, etc.). Absorbents and drip trays will be available; - Conditions of vehicles/equipment working on sites will be regularly checked. If damages and oil/fuel spills are observed, they will be repaired right away. No damaged equipment/vehicles will be admitted to worksites; - No discharge will be done into surface water bodies. Water will only be released to the surface if adequately clean (TPH 0.3 mg/l and TSS 30 mg/l). No water release on erosion prone areas and land used for agricultural purposes; - No littering; - Materials and waste will be stored so that they are protected from erosion and washout. Drainage ditches will be arranged on such storage locations to divert drainage water; - Slopes will be protected from erosion with vegetation cover (as per design); - Contractor personnel will be trained in environment protection and H&S issues.
Georgian EIA	Visual Impact	<ul style="list-style-type: none"> - Visual impact of construction works will be mitigated by adherence to work area and access road boundaries; maintaining vegetation cover; regular clean-up of work areas; timely removal of waste and control of material stockpiles (to avoid accumulation of excess material); - By using existing quarries, impact on landscape, loss of vegetation cover and need for new access roads will be eliminated; - Mitigation measures directed at soil, vegetation cover and waste management will be implemented; - Waste bins on the work areas will be covered to avoid wind scattering the waste; littering will be prohibited; Waste removal schedule from work areas will be complied with; - Re-cultivation plan will be developed and agreed. After completion of works, area will be cleaned, temporary structures dismantled, equipment removed and waste material disposed. After this re-cultivation activities will be carried out (as per plan mentioned above); - Noise barrier color and design will be selected to maximally fit into the existing environment.
Georgian EIA	Tree Cutting	<p>As it is impossible to reinstate and maintain forest areas in their current form, prior to start of highway operation, submit offset or eco-compensation measures (equivalent forest habitat reinstatement plan) to the Ministry of Environment Protection and Agriculture that places special emphasis on red data species.</p>

Clearance, Re-Vegetation and Restoration Management Plan

Source of Commitment	Topic	Commitment Text
Georgian EIA	Flora	<p>On the pre-construction and construction stages, the following mitigation measures are planned to reduce impact on vegetation cover:</p> <ul style="list-style-type: none"> - Strict adherence to boundaries of access roads, vehicle/equipment parking, construction camps (if applicable); - Prohibition of diverting from the approved routes; - Maintaining vegetation cover as much as possible; - Protection of protected species as per applicable regulations; - It is recommended to replace cut vegetation (especially protected species) with local new trees (as required), with aftercare of minimum 2 years. It is advisable to replant small diameter (<8cm) protected species outside the ROW (with follow up monitoring of condition); - Fencing of the critical root zone of the vegetation on the border of the ROW to ensure protection from works and equipment; - Waste Management - regular clean-up of the works areas, as per waste management requirements; - Re-cultivation of the impacted areas upon completion of construction; - Implementation of mitigation measures on soil and water; - Training of contractor personnel in environment protection and H&S issues including protection of the vegetation cover adjacent to project areas.
Georgian EIA	Fauna	<p>In order to mitigate impact on fauna the following will be implemented:</p> <ul style="list-style-type: none"> - Mitigation measures for impacts on vegetation, water and soil will be adhered to; - Usage of vehicle horns will be prohibited (except when absolutely necessary for safety purposes) to avoid disturbance of wildlife; - Tree cutting will be avoided during sensitive period for birds in spring-autumn (April-July); - No works will be carried out in the river beds or adjacent areas during fish spawning period (June-September); - In order to control potential impact, avoid it and in case of necessity define compensation measures, short term (construction phase) monitoring of aquatic and water dependent species will be carried out (no water dependent species were observed directly within the project impact area); - Excavations, trenches will be fenced to avoid animal fall/damage. For larger animals (cattle) bright colored tapes will be used, for smaller animals metal, plastic or other shields/fences. Despite this measure, after completion of shifts, wooden plans or branches will be placed inside the excavations/trenches to enable smaller animals to escape. Trenches will be inspected prior to backfilling. - No hunting, poaching; - Train/instruct personnel in best construction practices including mitigation measures on fauna during construction

Clearance, Re-Vegetation and Restoration Management Plan

Source of Commitment	Topic	Commitment Text
		works.

2. CLEARANCE WORKS

2.1 Site Demarcation

Prior to start of any works on site, Contractor will ensure proper demarcation (staking) of the project boundaries, including intersections and areas under bridges (this excludes within rivers and tunnels, but not tunnel portals). The project footprint is approved by the Road Department. The boundaries are legal boundaries handed over to the Contractor. The demarcation of the boundary on site is responsibility of topography/survey team. The demarcation will be very clear in order to ensure that all staff understand the project impact zone very clearly. All works will be conducted inside the land allocated for the project and this will be clearly communicated to construction personnel through E&S induction as well as daily toolbox talks.

Contractor will apply same approach to all other land that will be acquired for project purposes including temporary access roads, batching plant sites, camps, borrow pits, stockpiling areas, spoil disposal sites or other territories temporarily used for construction purposes.

2.2 Tree Cutting

2.2.1 Tree Inventory and Permitting

Tree cutting is managed through different methods depending on the ownership of the land where trees are cut. There are three main types of landowners for tree cutting purposes: privately owned land, State Forest Fund land and state/municipality owned land. Red List species on any land are governed by same approach and require approval of Prime Minister through Governmental Decree for cutting that has to be facilitated by the Ministry of Environment Protection and Agriculture.

Trees (except for Red List species) on privately owned land only require payment of compensation to the affected tree owners as per the Project LARP.

For trees on State Forest Fund land, forest land usage rights and tree cutting permit acquisition are carried out in parallel. Forest land usage rights can be permanent, which require desilting of the land from the State Forest Fund or temporary, that require granting of special use rights. In either case tree cutting permit is acquired similarly. The process is managed by National Forestry Agency.

For trees on state/municipal lands National Property Management Agency under Ministry of Economy and Sustainable Development or Municipality are the entities that manage the process.

Initial step for permit acquisition from any entity is tree inventory. Trees with diameter at breast height (DBH) 8 cm and higher are subject to inventory. Inventory information included tree species, timber volume, location, coordinates and Forestry land details in case of State Forest Fund land. Tree inventory on Forrest Fund land has special forms that have to be completed. Inventory has to be done by qualified specialists in the area.

Tree cutting permit acquisition within land allocated for the project is responsibility of RD. The RD is responsible for inventory of the species as well. The RD shall also apply to the MEPA in writing regarding the identified Red-List species in the project area so that Governmental Decree is issued for their removal. As per ADB ESIA, a total of 7,232 trees have been identified in State Forest Fund areas. Of these, 204 are Georgian Red Listed species greater than 8cm in diameter and 431 are Georgian Red-listed species less than 8cm in diameter. The trees cut in these areas will need to follow the procedures as described below. Compensation payments for the tree cutting in State Forest Fund areas will be paid to the Government as follows:

- (i) User (RD) shall pay onetime payment for the use of forest land during implementation of land activities. The payment shall be paid according to Table 2 of Appendix 7 of The Resolution No.242 of Government of Georgia on Approval of Rules for Forest Use taking into account the area of used land.
- (ii) User (RD) shall pay compensation for cutting the trees according to the Table 1 of Appendix 7 of The Resolution No.242 of Government of Georgia on Approval of Rules for Forest Use.
- (iii) In case of cutting the red list trees the user (RD) shall pay compensation four times as great than the amount shown in the table 1 of Appendix 7 of The Resolution No.242 of Government of Georgia on Approval of Rules for Forest Use.
- (iv) The payment shall be made before beginning of forest usage.

No compensation in the form of re-planting is required under this resolution unless specified by the MEPA in the Approval of Environmental Decision. However, to ensure no net loss of habitat replanting, in addition to the compensation payments, is required by ADB EIA and by MEPA also and is discussed below.

2.2.2 Removal of Trees

Trees will be removed by Contractor as per requirements set out in tree cutting permits and applicable regulations. Trees will be removed mechanically without use of chemicals as required by ADB EIA. Cut trees will be properly preserved to ensure handover process is not impacted. For cutting of Red List species presence of representative of Forestry Agency may be required. Red List species will be stored separately from other species. Tree removal from steep slopes may be done by equipment due to safety concerns, but timber will be collected and preserved for handover.

As per requirements of biodiversity Action Plan Tree cutting shall not occur during bird nesting seasons, it is recommended to undertake the cutting during late autumn-winter period.

Although Pre-construction Ecological Survey confirmed that there are no active bat roosts or squirrel drays within project impact zone, prior to felling, trees will be checked for presence of active bat nests, bats in the hollows and squirrel drays. E&S Induction will provide sufficient information to workforce on how to act if they identify any of the above species. Any follow up actions in case of identification will be planned in consultation with the ecologist.

2.2.3 Handover of Timber

Timber cut during the tree removal process has to be handed over to the responsible authority, which in most cases is local branch of National Forestry Agency or can be Municipality for trees on State/Municipal land. Handover location is in most cases specified in the cutting permit.

The National Forest Agency provides free service for special marking and issuing timber origin certificate for transportation of timber resources. The timber resources obtained as a result of cutting of the trees from the State Forest Fund, shall be sorted out according per species by the Contractor and collected at the area indicated by National Forest Agency and handed over to the National Forest Agency by signing an official handover act.

Contractor will ensure cut trees are properly collected, managed and handed over. Volume of inventory and handover shall correspond to each other with allowable variation as defined by applicable regulation. Handover act is signed between the representatives of Contractor and entity receiving timber.

2.2.4 Survey of Georgian Red-list Species within 5-meter Buffer Zone

As noted above, inventory of trees within the land allocated for project purposes is RD responsibility. Contractor was responsible for inventory/marketing of trees protected by the Georgian Red List within a 5-meter buffer zone of the project corridor as per requirements of ADB EIA. All Georgian Red List trees having more than 8 cm diameter at breast height (DBH) were inventoried and marked. The purpose of the survey was to mark trees with number and DBH and record GPS coordinates of those individuals that do not fall within the boundaries of the project corridor and thus avoid unnecessary tree-cutting.

Table below summarized the inventory results. Complete inventory report is provided in **Annex 1**.

Table 2: Summary of the Inventoried Trees within 5 meter Buffer Zone

Species	Number of Inventoried Trees	Inventoried Trees within the 5-meter Buffer Zone of the Project Area	Inventoried Trees within the Project Area
All Trees	599	384	215
Georgian Red List Trees	597	384	213
Zelkova	413	295	118
Walnut	143	47	96
Chestnut	25	25	
Bladdernut	9	9	
Quercus Imeretina	7	7	
Betula	1	1	
Pterocarya	1		1
N/A	2		

As per ADB EIA commitment, protective wood fencing will be placed around the Georgian Red List species identified within 5 meters of the site boundary in order to protect the tree during construction works, including its root zones.

2.3 Topsoil Management

The issue of topsoil management is described in details in Contractor's Topsoil Stripping and Storage Plan. It can be briefly noted here that stripping will be preceded with topsoil depth survey. After the survey stripping will be undertaken as per relevant requirements. Topsoil storage will be arranged as close as possible to the areas where stripping was carried out depending on land availability. Topsoil stockpiles will be regularly maintained and special approach will be used for managing topsoil in sensitive locations (slopes and thin topsoil layer).

2.4 Subsoil Management

Contractor will assess alternative methods of excavation (blasting, boring and various mechanical methods) and make a selection for each project area that minimizes surplus excavated material as far as practicable. All material that is excavated shall be re-used to the maximum extent practicable, for example, by use of screening / crushing plant or as road subbase/fill material. Reuse is subject to review and approval by Engineer depending on the quality of the material.

Blasting will only be used in solid geological formation for tunnels 1 through 5. All blasting shall be in accordance with the vibration levels described in the Project environmental standards. Tunnel Blasting

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Plans will be prepared accordingly. Contractor will conduct regular vibration monitoring as per Vibration Management Plan.

Estimates indicate that around 1,027,200 m³ of spoil material will be generated from the tunneling. Another 1,184,100 m³ of cut will be generated from excavation works on slopes, etc. Where practical the spoil will be re-used as embankment material at the Project site (for example on the embankments behind Zestaphoni). Approximately 1,519,800 m³ can be re-used as embankment material, which would leave approximately 691,500 m³ as static balance.

The creation of excess excavated material will be minimized as far as practicable. Excess material will be recovered and re-used to the greatest extent possible.

- Under no circumstances shall the Contractor dump excess materials on private lands.
- Excess spoil shall not be dumped or pushed into any river at any location.
- Spoil disposal sites shall be prohibited in areas of natural habitat.

Irrespective of the disposal location, disposal of waste soil and rock shall not adversely affect re-use of an area by landowners. For example, rock shall not be buried in agricultural land where this is inconsistent with pre-existing condition and land use agreements.

2.5 Temporary Erosion Control Works

Temporary erosion control measures to be installed and maintained by Contractor especially on steep slopes and all other work areas during construction in order to protect the environment in accordance with the requirements. Permanent anti erosion structures for slopes will be determined as per design.

The following general principles of erosion and sediment control, to be observed:

- Plan and integrate erosion and sediment control with construction activities.
- Minimize the extent and duration of disturbance.
- Divert or control stormwater flows onto, through and from the site.
- Minimize soil erosion.
- Stabilize disturbed areas progressively.
- Maximize sediment retention onsite.
- Maintain all erosion and sediment control measures in proper working order at all times.
- Inspect and maintain control measures.

The application of best practice erosion and sediment control is based upon the appropriate integration of three groups of control measures:

- Runoff control measures;
- Erosion control measures (including re-vegetation measures);
- Sediment control measures.

Wherever reasonable and practical, control measures from all three groups must be integrated in a total treatment system.

Temporary erosion control measures to be installed to maintain stability, minimize erosion and washout, and protect watercourses include:

- a) Diversion berms shall be constructed as needed on the steep slopes to control surface water runoff and erosion. Diversion berms shall be designed to simulate the slope contour and drain surface water away from the disturbed area;
- b) Where slopes require cutting, flumes shall be installed. These shall carry water from drainage sumps on the upslope;
- c) The work areas shall be monitored for:
 - Subsidence of excavations (below natural grade);

- Slope wash from improperly placed berms;
- Slumping and soil movements from cut and fill slopes;
- Loss of stored topsoil, subsoil or cuttings; and
- Off project-area disturbances.

If it is necessary to demobilize from any section due to the onset of winter weather, temporary erosion control measures required to stabilize the areas during the entire demobilization period will be installed where appropriate.

2.6 Spoil Disposal Sites

Spoil Disposal Plans for each individual spoil disposal site will provide detailed information, including pre-construction baseline. All details, including site selection and reinstatement will be in line with ADB and Georgian EIA requirements and applicable legislation.

2.7 Works at or Adjacent to Watercourses and Watercourse Crossings

Detailed Method of Working in the Water and Workplan will provide more details regarding management of construction activities in the watercourse crossings. Bridge Construction Plans will have site specific details.

Method will cover:

- Recording of the original channel width, depth and slope prior to disturbance to allow Reinstatement as near to the original as is practicable
- Re-contouring of banks to match surrounding slopes
- Installation of erosion protection measures at areas susceptible to washout or run-off as required by project design
- Replacement of the channel substrate
- Replacement of the bank Topsoil
- Re-seeding of the banks.
- Measures to minimise erosion and sedimentation through erosion control devices such as silt fencing.

The principles to minimise surface run off and reduce flash increase in flow rates in local surface water and drainage ditches should be applied to the construction areas.

The disturbed portion of the watercourse bed shall be returned to pre-construction contours where possible.

In addition to the works required to for bridge construction, there is a requirement to construct an access way across the watercourse to facilitate the movement of vehicles, plant and equipment across the river, and also to permit access for cranes to lift the construction material.

There are three different types of construction methodologies for access ways:

- Temporary bridge;
- Bridge with culverts;
- Fords.

In all cases, Contractor shall minimize compaction of soft and waterlogged ground to aid subsequent reinstatement.

Detailed Method of Working in the Water and Workplan will address construction through soft ground, which will include consideration of the use of load-bearing materials (e.g. bog mats, geotextile membranes or other) to support heavy loads in soft ground.

Temporary bridge with or without culverts

In this case, a 'bridge' would be constructed across the watercourse to provide vehicular access. It would consist of a pre-fabricated structure or two steel ramps with or without culverts.

Fords

A ford is a bed level crossing that is typically stabilized with mats or other materials. The banks are graded down to the ford to provide safe access for vehicles, however, there is minimal disturbance of the creek bed.

3. REINSTATEMENT (RESTORATION) WORKS

3.1 Reinstatement of Subsoil

As noted above project subsoil (spoil) will be re-used as embankment material. Subsoil and topsoil shall not be mixed with subsoil during placement.

Any imported soil will have similar physical characteristics to soil in the area where it will be deposited. The soil will be free from contaminants. After placement subsoil will be adequately (but not excessively) compacted to prevent future settlement. Subsoil beneath the running track will be ripped prior to reinstatement of agricultural land.

3.2 Reinstatement of Topsoil

Topsoil shall not be mixed with subsoil during replacement. Topsoil from unstripped / undisturbed areas shall not be used to cover disturbances.

Where original topsoil depth was less than or equal to 20 cm (as per project BOQ), Contractor shall provide any topsoil, or equivalent covering necessary to restore the original fertile depth. Make-up topsoil shall only be obtained from stockpiles of pre-excavated material and its use is subject to approval.

Where the original topsoil depth was more than 20 cm, Contractor shall restore to at least 20 cm.

Topsoil shall be replaced and harrowed to protect the stability of topsoil and to promote the re-growth of vegetation. On sites where harrowing is not practical (e.g. steep slopes, rocky areas, etc.), the sites should be dozer-tracked perpendicular to the slope or otherwise left with adequate roughness following topsoil placement.

Topsoil shall be replaced at locations furthest from each stockpile first, then successively working back to the stockpile; this is to minimize running over the re-instated soil.

Depending on the site-characteristics, the reinstated topsoil could be sown and / or covered with an erosion matting.

In agricultural areas, replaced topsoil shall be ready for re-seeding as agreed with Engineer and landowner. Any rocks brought to the surface shall be hand-picked and disposed of accordingly following completion of reinstatement in agricultural land parcels.

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Spreading		
Construction of embankment		
Distribution of top soil on fill slope thickness 20 cm	m ³	42,200
Construction of dividing strip		
Distribution of top soil on dividing strip thickness 20 cm	m ³	5,770
Construction of berms for standard road signs		
Distribution of top soil on the surface and slopes of berms thickness 20 cm	m ³	4,980
SUM	m³	52,950

3.3 Slopes

Slopes will be restored as per Project design requirements. Different methods are applied to cut and fill slopes. For examples of cut and fill slopes refer to Figure 1.

Figure 1: Cut (light brown) and Fill (green) Slopes around Tunnel 4.0.02



Fill slopes will be covered with topsoil of thickness of 2 cm and seeded with perennial grass.

On cut slopes one of the 5 proposed slope protection measures will be applied following the additional geophysical investigations consisting of seismic refraction tests with a minimum 24 channel instrumentation and with a minimum distance between each geophone of 5 meters to confirm the hypothesis of the design regarding the inferred faults. For details regarding the stability analysis refer to Cut Slopes Analysis – Calculation Report (MA.SLO.4900.GE.GD-0001-3).

As noted, slope protection measures are divided into 5 types based on gradients, formations, unstable rock volumes etc. Those are summarized in Table 3 below:

Table 3: 5 Typical Slope Protection Interventions

Protection Type	Characteristics
SP1	<ul style="list-style-type: none"> cut slope 3/5 on the PzGr and K1 formations with intermediate

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Protection Type	Characteristics
<p>Slope Protection type 1 J2b2A and J2b2B formations</p>	<p>horizontal plane</p> <ul style="list-style-type: none"> • for outcrops that during the time of the works don't show any kind of unstable rock, no slope protection has to be adopted • for outcrops having unstable rock volumes up to 0.3m, rock slope stabilization/protection CASE 1-A have to be adopted • for outcrops having unstable rock volumes up to 0.5m, rock slope stabilization/protection CASE 1-B have to be adopted • for outcrops having unstable rock volumes up to 1.0m, rock slope stabilization/protection CASE 1-C have to be adopted • for outcrops having heavy jointed masses so that anchoring is not allowed in safety condition, rock fall protection CASE 2 have to be adopted • only if the water table is found out during the excavations coming from the rock at the bottom of the excavation, a drainage system at the toe of slope have to be installed, consisting of a raster 4 m x 4 m (quincuncial) draining pipe, 5° inclined, 10 m depth long (average length); the density of drainage (raster and depth) shall be calibrated in accordance with the real condition watched on site by mean of further field investigation • a drainage channel in correspondence of the higher berm has to be provided
<p>SP2 Slope Protection type 2 N₁² formation</p>	<ul style="list-style-type: none"> • The cut slope have to be not greater than 45° • For outcrops that during the time of the works don't show any kind of unstable rock, no slope protection has to be adopted • For outcrops having unstable rock volumes up to 0.3m, rock slope stabilization/protection CASE 1-A have to be adopted • For outcrops having unstable rock volumes up to 0.5m, rock slope stabilization/protection CASE 1-B have to be adopted • For outcrops having unstable rock volumes up to 1.0m, rock slope stabilization/protection CASE 1-C have to be adopted • For outcrops having heavy jointed masses so that anchoring is not allowed in safety condition, rock fall protection CASE 2 have to be adopted • A drainage system at the toe of slope have to be necessarily installed, consisting of a raster 4 m x 4 m (quincuncial) draining pipe, 5° inclined, 10 m depth long (average length); the density of drainage (raster and depth) shall be calibrated in accordance with the real condition watched on site by mean of further field investigation • a drainage channel in correspondence of the higher berm has to be provided
<p>SP3 Slope Protection type 3 J2b2A and J2b2B formations with covering layer of g5-sG</p>	<ul style="list-style-type: none"> • cut slope 3/5 on the P2Gr with intermediate horizontal plane and a 35° laying on the covering layer of g5-sG with intermediate horizontal plane • for outcrops that during the time of the works don't show any kind of unstable rock, no slope protection has to be adopted • for outcrops having unstable rock volumes up to 0.3m, rock slope stabilization/protection CASE 1-A have to be adopted • for outcrops having unstable rock volumes up to 0.5m, rock slope stabilization/protection CASE 1-B have to be adopted • for outcrops having unstable rock volumes up to 1.0m, rock slope stabilization/protection CASE 1-C have to be adopted • for outcrops having heavy jointed masses so that anchoring is not allowed in safety condition, rock fall protection CASE 2 have to be

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Protection Type	Characteristics
	<p>adopted</p> <ul style="list-style-type: none"> • only if the water table is found out during the excavations coming from the rock at the bottom of the excavation, a drainage system at the toe of slope have to be installed, consisting of a raster 4 m x 4 m (quincuncial) draining pipe, 5° inclined, 10 m depth long (average length); the density of drainage (raster and depth) shall be calibrated in accordance with the real condition watched on site by mean of further field investigation • a drainage channel in correspondence of the higher berm has to be provided
<p>SP4 Slope Protection type 4 N₁² formation with covering layer of sC</p>	<ul style="list-style-type: none"> • cut slope not greater than 45° and a 30° laying on the covering layer of sC with soil nailing intervention, with a raster 1.5 m x 1.5 m of anchor 250 kN working load, inclination 10°, 6 m long (average length), and reinforced geocomposite layer, vegetal hydro seeding layer, water drainage • for outcrops that during the time of the works don't show any kind of unstable rock, no slope protection has to be adopted • for outcrops having unstable rock volumes up to 0.3m, rock slope stabilization/protection CASE 1-A have to be adopted • for outcrops having unstable rock volumes up to 0.5m, rock slope stabilization/protection CASE 1-B have to be adopted • for outcrops having unstable rock volumes up to 1.0m, rock slope stabilization/protection CASE 1-C have to be adopted • for outcrops having heavy jointed masses so that anchoring is not allowed in safety condition, rock fall protection CASE 2 have to be adopted • only if the water table is found out during the excavations coming from the rock at the bottom of the excavation, a drainage system at the toe of slope have to be installed, consisting of a raster 4 m x 4 m (quincuncial) draining pipe, 5° inclined, 10 m depth long (average length); the density of drainage (raster and depth) shall be calibrated in accordance with the real condition watched on site by mean of further field investigation • a drainage channel in correspondence of the higher berm has to be provided
<p>SP5 Slope Protection type 5 N₁² formation with covering layer of sC</p>	<ul style="list-style-type: none"> • cut slope not greater than 45° and a 30° laying on the covering layer of sC with soil nailing intervention, with a raster 1.5 m x 1.5 m of anchor 250 kN working load, inclination 10°, 9 m long for the top anchors and 6 m long for the bottom anchors, and 25cm thick sprayed concrete with double steel mesh, water drainage • for outcrops that during the time of the works don't show any kind of unstable rock, no slope protection has to be adopted • for outcrops having unstable rock volumes up to 0.3m, rock slope stabilization/protection CASE 1-A have to be adopted • for outcrops having unstable rock volumes up to 0.5m, rock slope stabilization/protection CASE 1-B have to be adopted • for outcrops having unstable rock volumes up to 1.0m, rock slope stabilization/protection CASE 1-C have to be adopted • for outcrops having heavy jointed masses so that anchoring is not allowed in safety condition, rock fall protection CASE 2 have to be adopted • only if the water table is found out during the excavations coming from the rock at the bottom of the excavation, a drainage system at

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Protection Type	Characteristics
	<p>the toe of slope have to be installed, consisting of a raster 4 m x 4 m (quincuncial) draining pipe, 5° inclined, 10 m depth long (average length); the density of drainage (raster and depth) shall be calibrated in accordance with the real condition watched on site by mean of further field investigation</p> <ul style="list-style-type: none"> • a drainage channel in correspondence of the higher berm has to be provided

Annex 2 provides typical drawings per each Slope Protection Type.

Figures 2 to 5 provide example photos for Cases 1- A, B, C and Case 2 for unstable rock protection.

Figure 2: Example of Rock Slope CASE 1-A



Figure 3: Example of Rock Slope CASE 1-B



Figure 4: Example of Rock Slope CASE 1-C



Figure 5: Example of Rock Slope CASE 2



3.4 Watercourses Crossing

Due to the nature of bridge structures, no massive river bank and/or bed stabilization measures are required after completion of construction. Most attention will be directed towards construction period to ensure construction works as well as any structures/land within the project impact are not adversely affected. Those measures are summarized in the section 2.7 above.

The purpose of civil protection works at river crossings is to control the active zone of river movement, thereby protecting the installed pillars(s). For this purpose, at Bridges BRI (AT/TA) 4.1.01, 4.1.02 and 4.1.03 on rivers Dzirula (x2) and Kvirila stone rip raps will be arranged on top of pier plinth.

3.5 Temporary Facilities (Camps, Works Areas, Batching Plants, Laydown Areas, Spoil Disposal Sites)

Construction support facilities including camps, work areas, batching plants, laydown areas and spoil disposal sites will be reinstated as per land use requirements/plans. There are site specific plans for majority of the above facilities like camp, batching plants and spoil disposal sites that provide information on related reinstatement commitments. Any agricultural land will be reinstated to pre-construction condition. Reinstatement of additional non-agricultural land acquired by the Contractor for construction purposes is subject of agreement between the Contractor and landowner. RD acquired land will be reinstated as per RD/Engineer direction. In all cases LARP requirements will apply to ensure landowner rights are not adversely affected.

General approach to reinstatement will be as follows. Contractor will remove all aboveground and underground infrastructure and utilities placed temporarily for construction purposes, and reinstate the areas to near original condition. Contractor shall ensure that there shall be no encroachment onto adjacent land throughout the duration of the work. Temporary facilities/works shall be designed so that they can be removed completely (including all underground infrastructure), unless otherwise agreed between Contractor, landowner and Engineer/RD.

Temporary facility removal shall commence as soon as possible when it is no longer required to support construction. Reinstatement of the land shall commence immediately on removal of each individual facility. This is to ensure that misuse, degradation or erosion of the land does not occur. The support facilities shall be reinstated to near original condition including topography; soil characteristics and vegetation cover and composition. Contractor shall permanently reinstate the area as agreed with the owner/authority to their satisfaction.

4. RE-VEGETATION AND BIORESTORATION

4.1 Seeding

The long-term objectives of seeding are to restore variety and distribution pattern of the original plant species with the long-term objective of restoring the local ecology. The short-term objectives are to provide a rapid vegetative cover to achieve erosion control, to assist longer term objectives.

Seeding is mandatory for sections provided in **Table 4** below. Anyway, on all areas designated as non-agricultural, seeding can be carried out wherever it is likely to be required for achieving the objective of erosion control and the near-term reinstatement targets including vegetation cover.

Table 4: Seeding Locations

Seeding		
Seeding of perennial grass, watering and further treatment		
Seeding of perennial grass on fill slopes, in the dividing strip and on berms for standard road signs	m ²	264,750
Seeding of perennial grass on interchange roundabouts, interchange 1	m ²	1,380
Seeding of perennial grass on interchange roundabouts, interchange 2	m ²	690
Seeding of perennial grass on interchange roundabouts, interchange 3	m ²	1,380
Seeding of perennial grass on interchange roundabouts, interchange 4	m ²	690

Further areas / route sections where seeding has to be executed for achieving the targets of biorestorement of the sensitive habitats may be indicated by Engineer/RD.

At temporary facility sites, the need for seeding during the reinstatement will be determined as agreed with the Engineer.

The following has to be considered when implementing seeding:

- Type of seed mix to be used for achieving the erosion performance targets and the long-term objectives of biorestorement;
- Checking for alien and / or invasive species;
- Seed bed preparation measures;
- Appropriate sowing season;
- Seeding rates;
- Seeding methods (such as broadcast or hydroseeding methods);
- Soil additives selection and use;
- Watering requirements;
- Seeding schedule (allowing for growing season and site-specific meteorological conditions);
- Seed protection measures.

Contractor shall be responsible for procurement of commercially available seeds and the execution of all the seeding.

4.2 Red List Species Planting

As noted in the Tree Cutting Section above, although not explicitly required by Georgian legislation, compensation planting may be requested by MEPA or by International Banks funding the project.

In this particular case, both MEPA through their Environmental Decision approval condition and ABD EIA require offset planting to ensure no net loss to the affected habitats. For detailed wording of the commitments/requirements refer to the **Table 1** above.

4.2.1 Overview of Affected Tree Species

Project impact on tree species can be broadly subdivided into two main parts: first section up to Interchange 1 PK33 and section from PK33 till the end (Argveta). First section impacts Forest Fund land between PK0-PK12 portals and connections between BRI 4.0.01 and BRI 4.0.02 and PK17-PK24 around BRI 4.1.02 used for two internal roads construction. This is a relatively well-preserved forest habitat of high

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conservation value due to ecological function and occurrence of GRL tree species – Zelkova (*Zelkova carpinifolia*), Chestnut (*Castanea sativa*), Bladder nut (*Staphylea colchica*) and individuals of Yew (*Taxus baccata*) and Circassian walnut (*Juglans regia*). It should be noted that by the time of construction, monetary compensation will already been paid by RD for GRL trees, fulfilling legal requirements of applicable Governmental Decrees.

Tree species on the second section are more fragmented and mostly grow in roadside plantations and as solitary individuals. Undersized and coppiced plants found along the roads and between agricultural fields do not form continuous ecological corridor or habitat as they are under significant anthropological pressure. Solitary specimens scattered along the road have low ecological function and are mostly represented by common, cultivated, non-native and invasive species. Existing roadside plantations are degraded due to poor management practices and increasing man-induced disturbance; they are largely composed of non-native species. Therefore, they have low conservation value and limited ecological functionality. It should however be noted that there are sections where Red List Tree Inventory within the 5-meter buffer zone identified large number of Zelkovas (*Zelkova carpinifolia*) specially after the river Kvirila crossing Internal road near portal of TUN 4.0.04. For details refer to **Annex 2**. Those trees will be preserved as per relevant commitment.

Tree species to be removed on Forest Fund land are summarized in **Table 5** below.

Table 5: Inventory of Trees to be Cut on Forest Fund Land (Appendix G ADB EIA)

Species	Number of Inventoried Trees (>8 cm)	Number of Inventoried Trees (<8 cm)	Red List Species
Zelkova (<i>Zelkova carpinifolia</i>)	77	159	Y
Acacia (<i>Acacia dealbata</i>)	440	210	
Ashtree (<i>Fraxinus excelsior</i>)	6	15	
Alder (<i>Alnus barbata</i>)	79	n/a	
Willow (<i>Salix magnifica</i>)	30	n/a	
Oriental Hornbeam (<i>Carpinus orientalis</i>)	114	630	
Georgian Oak (<i>Quercus iberica</i>)	11	20	
Crab Apple (<i>Malus sylvestris</i>)	2	5	
Hazel (<i>Corylus avellana</i>)	50	1550	
Common Pear (<i>Pyrus communis</i>)	6	n/a	
Hornbeam (<i>Carpinus caucasica</i>)	137	25	
Chestnut (<i>Castanea sativa</i>)	85	22	Y
Lime (<i>Tilia caucasica</i>)	32	n/a	
Maple (<i>Acer</i>)	9	12	
Taller Ash (<i>Fraxinus excelsior</i>)	31	n/a	
Bladder nut (<i>Staphylea colchica</i>)	38	250	Y
Yew (<i>Taxus baccata</i>)	1	n/a	Y
Wild plum (<i>Prunus insititia</i>)	10	10	
Harthorn (<i>Crataegus microphylla</i>)	10	375	
Cedar (<i>Cedrus deodara</i>)	121	n/a	
Tree of heaven (<i>Ailanthus altissima</i>)	54	80	
Elm (<i>Ulmus foliacea</i>)	13	51	
Circassian walnut (<i>Juglans regia</i>)	3	n/a	Y
Fig (<i>Ficus carica</i>)	4	7	
Honey-locust (<i>Gleditschia caspica</i>)	2	n/a	
Mulberry (<i>Morus alba</i>)	13	41	
Asp (<i>Populus alba</i>)	1	n/a	
Persimmon (<i>Diospyros kaki</i>)	49	13	
Holly (<i>Ilex</i>)	n/a	22	
Blackberry (<i>Rubus</i>)	n/a	900	
Pine (<i>Pinus</i>)	n/a	2	
Wild Cherry (<i>Prunus avium</i>)	n/a	5	

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Species	Number of Inventoried Trees (>8 cm)	Number of Inventoried Trees (<8 cm)	Red List Species
Cornel (Plural cornels)	n/a	135	
Laurel Cherry (<i>Prunus laurocerasus</i>)	n/a	50	
Winterberry (<i>Ilex verticillate</i>)	n/a	55	
Greenbrier (<i>Smilax rotundifolia</i>)	n/a	1160	
Total	1428	5804	635

There may be need for removal of more trees on Additional Land acquired by Contractor to support construction activities. This section only focuses on re-planting and restoration scope of 635 GRL species inventoried on Forest Fund land as per Appendix G of ABD EIA (as summarized in Table 5 above). Any addition to the scope is subject to agreement between Contractor and Engineer/RD.

4.2.2 Compensation Planting Approach

Compensation planting locations haven't been determined yet. ADB's EIA requires restoration / re-planting of total of 14.9 hectares to compensate loss of trees/habitats for project purposes. Contractor is responsible for planting and maintenance of trees and shrubs in accordance with this Plan during the construction and defects liability period of the Project.

Locations will be selected following the negotiations with National Forestry Agency and RD. General approach to compensations has been allocations of land within the Forestry areas that have been somewhat degraded due to natural causes or illegal logging and remediating/restoring those. Those locations can be found around the cutting sites at TUN 4.0.01 or TUN 4.0.02 on both sides of river Dzirula. An example of potential planting site on the rights side of the river Dzirula close of portal of TUN 4.0.02 can be found on Figure 6.

Figure 6: Example of Planting Location close to TUN 4.0.02 (Forestry land inside green contours; proposed plating location in red)



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As detailed in **Table 5** above, a number of GRL species inventoried for removal is 635. Rare, endemic species replanting ratio is generally 1:5 meaning that 3,175 saplings have to be planted. Planting ratio will be further agreed as part of scope/location agreement after consultations with RD/Forestry Agency.

Inventoried Species	Status	Planting Ratio	Proposed Number of Saplings
Zelkova (Zelkova carpinifolia)	Red List	1:5	1180
Chestnut (Castanea sativa)	Red List	1:5	535
Bladder nut (Staphylea colchica)	Red List	1:5	1440
Yew (Taxus baccata)	Red List	1:5	5
Circassian walnut (Juglans regia)	Red List	1:5	15

Trees have to be acquired in local nurseries. Detailed planting and aftercare/maintenance plan will be developed in coordination with Forestry Agency/RD.

4.3 Planting of Shrubs on Dividing Strip

Contractor is also responsible for planting of the shrubs on the dividing strip between the highway lanes. Area to be covered with shrubs is approximately 28,850 m². Shrub species will be selected based on consultation with the Engineer/RD. Shrubs will be watered regularly to ensure survival success.

5. MAINTENANCE AND MONITORING

Contractor shall maintain the standard of reinstatement, taking all corrective action as necessary to ensure that the erosion protection and vegetative cover restoration takes place.

To achieve the vegetation cover restoration and the near-term outcomes of the biorecovery strategy, works will be monitored and aftercare provided for the entire duration of the defect liability period as per Contract.

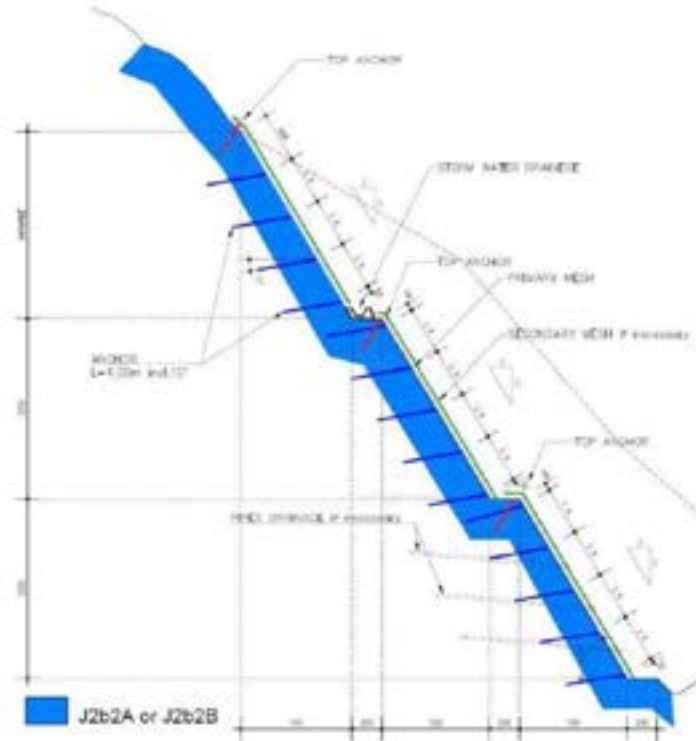
If success rate of GRL tree survival planted for the purposes of habitat restoration is below 80%, Contractor will replace dead trees with the ratio of 1:1.

ANNEX 1: RED LIST TREE SURVEY (WITHIN 5 METER BUFFER ZONE)

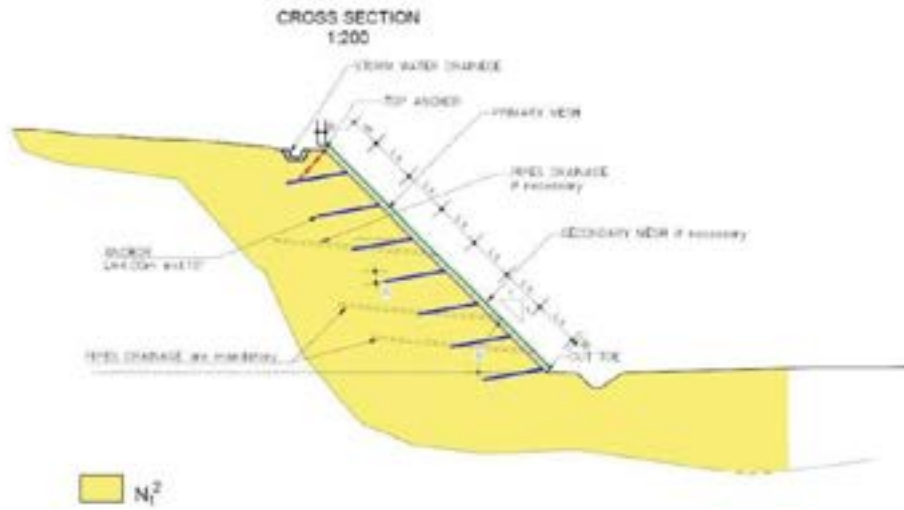


ANNEX 2: TYPICAL SLOPE PROTECTION DRAWINGS

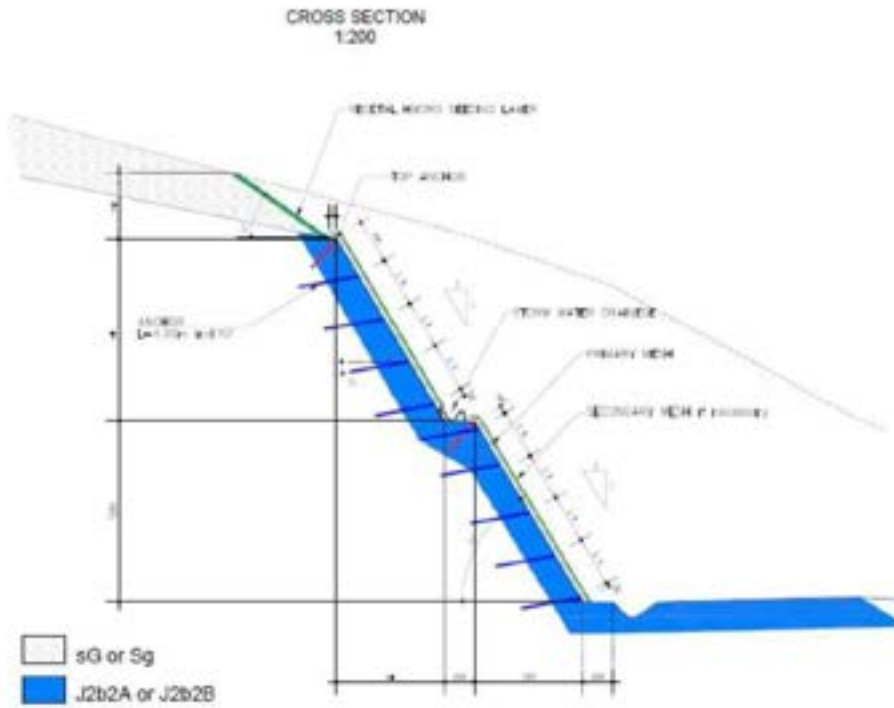
Typical Slope Protection Drawing for SP1



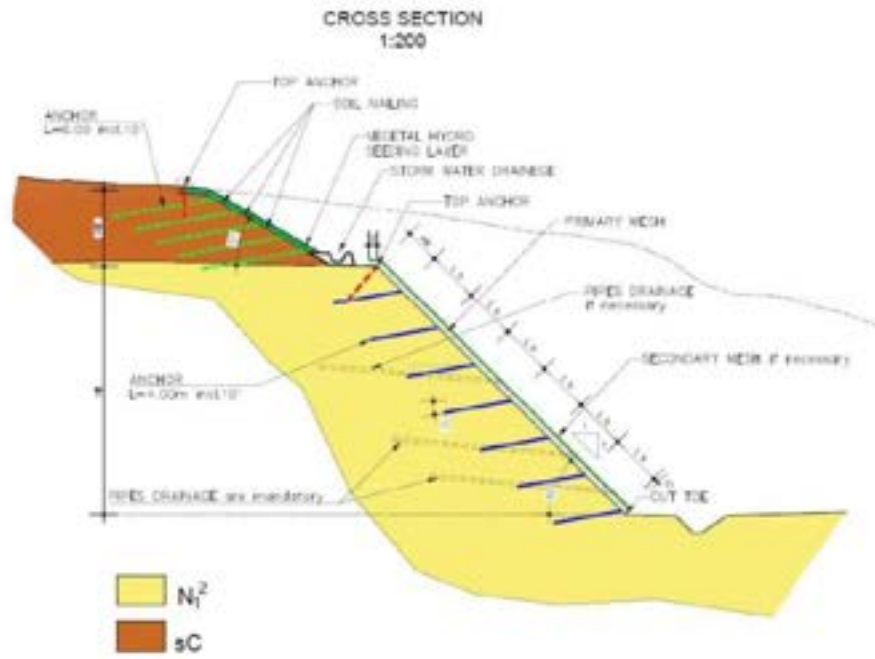
Typical Slope Protection Drawing for SP2



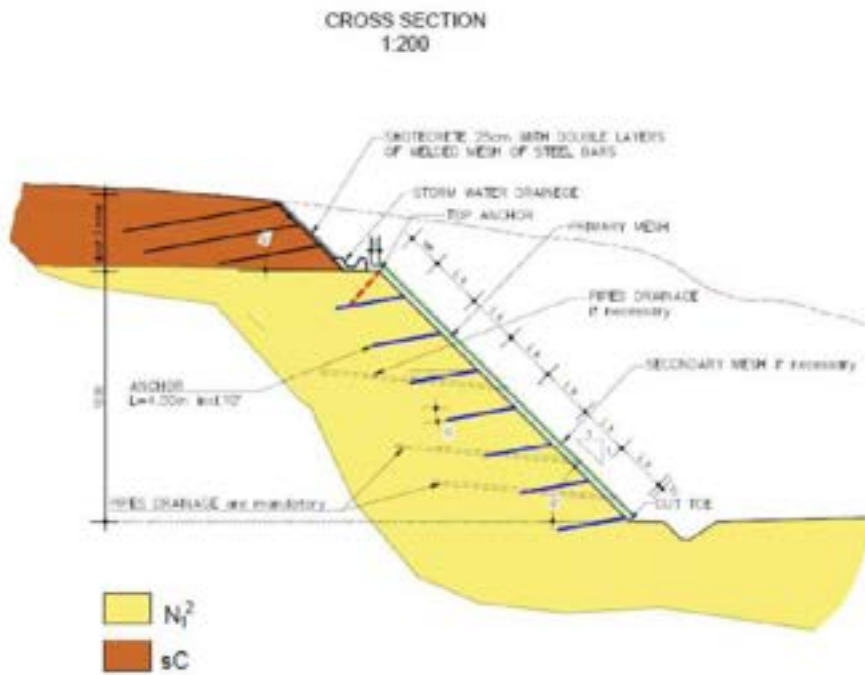
Typical Slope Protection Drawing for SP3



Typical Slope Protection Drawing for SP4



Typical Slope Protection Drawing for SPS



 <p style="text-align: center;">Shorapani-Argveta F4 Section</p>	
 <p style="text-align: center;">ROADS DEPARTMENT OF GEORGIA საგზაო დეპარტამენტი</p>	Road department of Georgia of The Ministry of Regional Development and Infrastructure of Georgia
 <p style="text-align: center;">ULUSLARARASI BİRLEŞMİŞ MÜŞAVİRLER MÜŞAVİRLİK HİZMETLERİ A.Ş.</p> <p style="text-align: center;">Construction Supervision Consultant for E60 Highway F4 Shorapani-Argveta Project</p>	Engineer: UBM Uluslararası Birleşmiş Müşavirler Müşavirlik Hizmetleri A.Ş. (Turkey)
	Contractor: Guizhou Highway Engineering Group Co. & China National Technical Import and Export Corporation Joint venture
<p>CONSTRUCTION OF SHORAPANI-ARGVETA SECTION (E60 HIGHWAY ROUTE) LOT F4 Contract No. SARP/CW/OCB-01</p> <h2 style="text-align: center;">Tree Compensation Planting Plan</h2> <p style="text-align: center;">F4 Section (Kveda Tseva-Argveta) - Khevi-Ubisa-Shorapani-Argveta, E60 EWH</p>	
Prepared by: Guizhou Highway Engineering Group Co. & China National Technical Import and Export Corporation Joint venture	
Reviewed by: Chen Yuqiang, Contractor's Representative	
Submitted for: Approval	

Prepared by

SDSC LLC

Tbilisi 2023

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1. INTRODUCTION

1.1 Project Overview

The East–West Highway (EWH) Improvement Project involves construction of a new road section of the E-60 highway located in Imereti Region of central Georgia. Section F4 forms the Shoropani-Argveta (Kveda Tseva-Argveta) portion of the Khevi-Ubisa-Shorapani-Argveta section of the E-60. The length of the Project road is as follows:

- Right lane (TA – meaning Tbilisi – Argveta direction) - 14.778 km;
- Left lane (AT – meaning Argveta – Tbilisi direction) - 14.726 km.

The Project runs through variety of terrains, starting from mountains to river valleys and plains.

The Project includes construction of 6 long span bridges and 1 short span bridge. The total length of the seven bridges is 4987.89 meters; the longest of which is 893.3 meters.

Six tunnels will be constructed with double tubes with length from 399 meters to 1166 meters.

There are four interchanges planned in F4 Section.

The following types of culverts will be constructed:

- Underpasses for rural roads;
- Cattle passes, which ensure cattle cross the Project road;
- Culverts to provide water discharge from ravines and canals.

Two different pavement structures will be used:

- Concrete pavement structure for the motorway and interchanges; and
- Asphalt pavement structure for all Slip Roads and all Minor Roads and bridges.

The Project is financed by the Asian Development Bank (ADB).

The Roads Department (RD) of the Ministry of Regional Development and Infrastructure of Georgia (MRDI) is wholly responsible for the implementation of the Project.

RD has selected an Engineer (Works Supervisor) a JV between international engineering/construction companies UBM Uluslararası Birleşmiş Müşavirler Müşavirlik Hizmetleri A.Ş. (Turkey) and SMEC International PTY LTD (Australia).

Construction Contractor is Guizhou Highway Engineering Group Co.

1.2 Abbreviations

ADB	–	Asian Development Bank
EIA	–	Environmental Impact Assessment
EUNIS	–	European Nature Information System
GRL	–	Georgia Red List
Ha	–	Hectare
KP	–	Kilometer point (1 km section of the road)
MEPA	–	Ministry of Environment Protection and Agriculture

1.3 Purpose and Objectives of the Document

Legal basis for the present plan is Governmental Decree N383 dated July 27, 2021 on approval of Rules for Forest Protection, Reinstatement and Care.

As per Article 18 Section 5, natural as well as artificial forests that have been affected by forest fires and also forests destroyed and degraded by other reasons.

In this case current plan has been developed to reinstate-develop degraded forest sections/plant on project affected land to compensate red list species cut for the construction of E60 Kveda Tseva-Argveta section (F4) (Zestafoni Municipality)

As noted above, the F4 section of the road is located in Imereti Region and runs through variety of terrains. The corridor in general, crosses mostly agricultural/industrial/urban land parcels. Habitats are significantly altered. Vegetation is highly modified, because the land has been cultivated using the agricultural equipment. At certain areas, where agricultural activities have been suspended, secondary vegetation is developed. The territory is also extensively used for grazing purposes. The fragments of natural vegetation, which alternates with the artificial groves, is sandwiched between the agricultural land parcels. Therefore, road construction has limited impact on natural habitats, however, there are some sections, especially in the beginning of the corridor around the Tunnels 1 and 2, that are forest areas and will require tree cutting for the purposes of tunnel construction. All trees to be cut for Project purposes have been inventoried and relevant permits have been obtained for their cutting. Decree of the Prime Minister of Georgia has been obtained for cutting of the Georgian Red List species as per legal requirements.

The purpose of this document is to set out compensation planting approach for Georgia Red List woody species to provide adequate mitigation for the loss of woody plants due to road construction and fulfil EIA commitment/approval condition summarized in **Table 1** below.

The present plan, therefore focuses on off-set planting of Georgian Red List trees removed from natural environment.

Table #1: Georgian EIA Approval Conditions 3.9

Source of Commitment	Topic	Commitment Text
Order N2-181 of the Minister of Environment Protection and Agriculture on Approval of Environmental Decision (3.9)	Tree cutting	As it is impossible to reinstate and maintain forest areas in their current form, prior to start of highway operation, submit offset or eco-compensation measures (equivalent forest habitat reinstatement plan) to the Ministry of Environment Protection and Agriculture that places special emphasis on red data species.

2. DETAILED DESCRIPTION OF PROPOSED COMPENSATION PLANTING LOCATIONS

2.1 Vegetation Cover and Habitats

Pre-construction habitat survey conducted in the Project corridor prior to start of construction activities revealed that in total, 101.21 ha of area is under the impact zone of Project corridor, of which the major part represents agricultural land (approximately 67 ha.), artificial landscape, existing roads and railway, etc. Accordingly, the mentioned areas do not represent natural habitats and in terms of biodiversity, do not belong to important areas.

As for other type of habitats, forest habitats are established on the area, river gorge vegetation habitats as well as floodplain habitats and forest groves. Most of the mentioned habitats are significantly changed, but fragments are present, which are more or less maintained with natural conditions, despite the close vicinity of infrastructure and population. These fragments are located in ravines and in the vicinity of rivers or on steep slopes.

Detailed information about the studied habitats is summarized in the Table 2 below:

Table 2: Existing Habitats in Construction Corridor as per EUNIS Classification

#	Type of Habitat	Code	Area of Habitat, Ha
1.	Agricultural land, urban and secondary landscape		66,59
2.	Areas occupied by existing infrastructure		1,79
3.	Artificial landscapes		7,79
4.	Forest of Quercus - Fraxinus - Carpinus betulus, on eutrophic and mesotrophic soils	G1.A1	13,44
5.	Forest of ravines and slopes	G1.A4	4,69
6.	Low and medium altitude meadows	E2.2	1,35
7.	Pebble river bank vegetation	C3.55	3,41
8.	Vascular plant community divided from pebble river bank vegetation	C 3,62	1,08
9.	Forest of Fraxinus – Alnus on river embankment, which is watered only, when water level rises	G1.21	1,07
	Total area under impact		101,21

As the table demonstrates, 70% of the total area is under anthropogenic pressure, and the rest 30% is represented by forest groves.

As noted, habitats of higher conservation value exist in patches and are mostly present in the first half of the road section starting from Tseva. The second half, mostly goes through the urban, sub-urban and agricultural locations as demonstrated by Figures 1, 2 and 3 below.

Figure 1: Project Habitat Map KP0-KP1.8

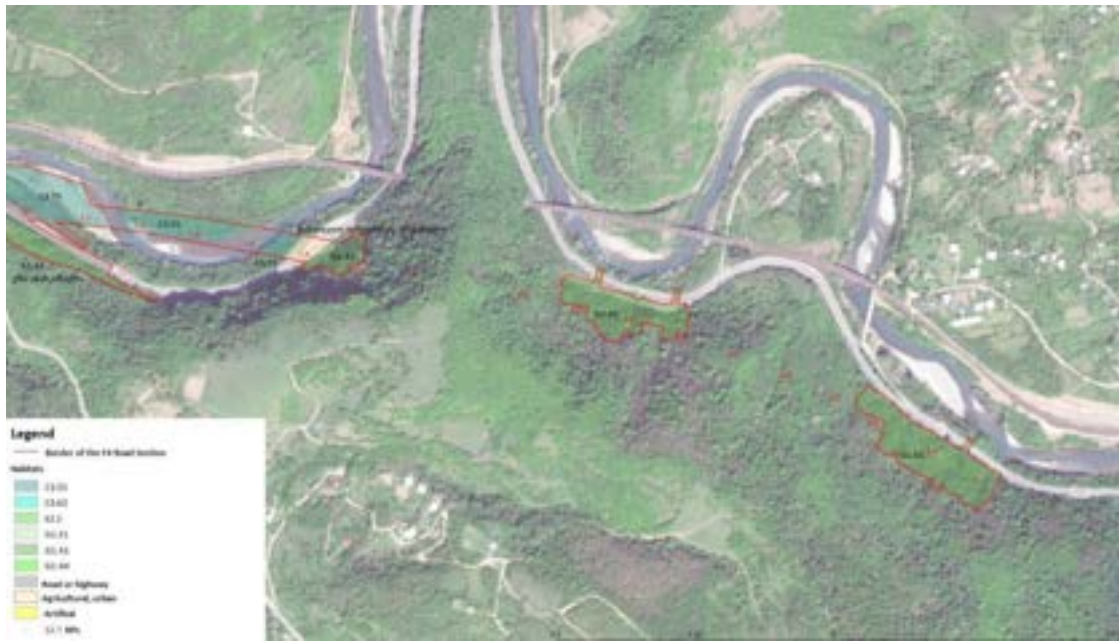


Figure 2: Project Habitat Map KP1.5-KP3

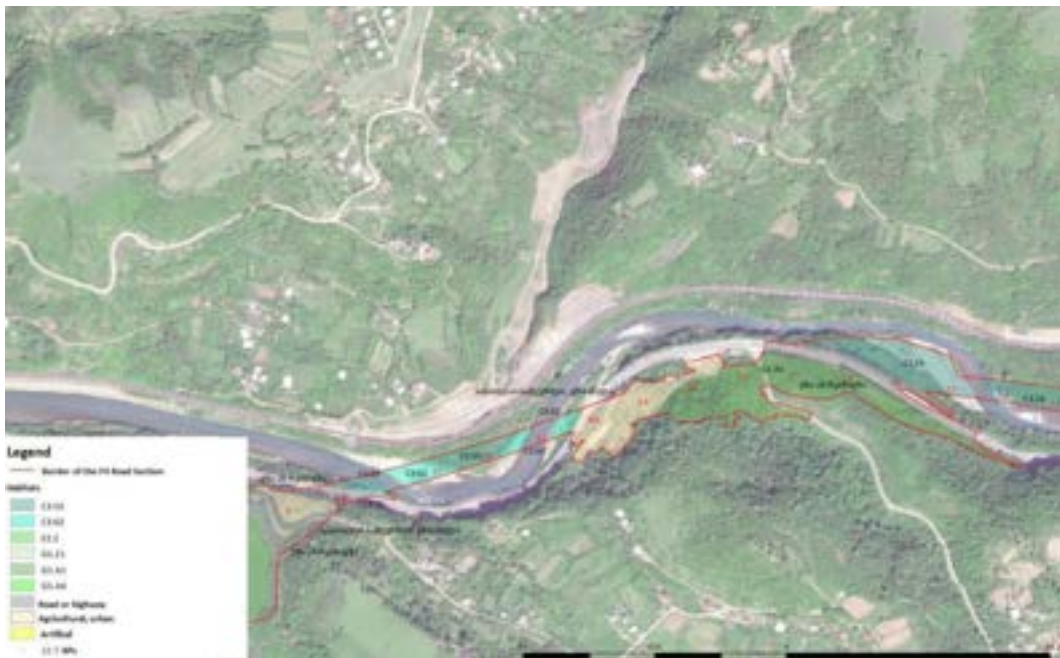


Figure 3: Project Habitat Map KP10.2-KP12.5



2.2 Affected Tree Species

Project impact on tree species can be broadly subdivided into two main parts: first section up to Interchange 1 KP3.3 and section from KP3.3 till the end (Argveta). First section impacts Forest Fund land between KPO-PK1.2 portals and connections between Bridge N1 and Bridge N2 and KP1.7-KP2.4 around Bridge N2 used for two internal roads construction. This is a relatively well-preserved forest habitat of high conservation value due to ecological function and occurrence of GRL tree species – Zelkova (*Zelkova carpinifolia*), Chestnut (*Castanea sativa*) and Walnut (*Juglans regia* L.). It should be noted that, monetary compensation has already been paid by RD for GRL trees, fulfilling legal requirements of applicable Governmental Decrees.

Tree species on the second section are more fragmented and mostly grow in roadside plantations and as solitary individuals. Undersized and coppiced plants found along the roads and between agricultural fields do not form continuous ecological corridor or habitat as they are under significant anthropological pressure. Solitary specimens scattered along the road have low ecological function and are mostly represented by common, cultivated, non-native and invasive species. Existing roadside plantations are degraded due to poor management practices and increasing man-induced disturbance; they are largely composed of non-native species. Therefore, they have low conservation value and limited ecological functionality.

GRL tree species to be removed as per governmental decrees (see **Annex 1**) are summarized in **Table 3** below. There is a plan to remove additional 42 red list species - Zelkova, for which relevant documentation has been submitted for the administrative proceedings. No GRL trees will be removed until relevant permission is granted through Governmental decrees.

Table 3: GRL Trees to be Cut under Governmental Decrees

Species	Status	>8 cm	<8 cm
Zelkova (<i>Zelkova carpinifolia</i>)	Red List	237	-
Chestnut (<i>Castanea sativa</i> Mill)	Red List	1	-
Walnut (<i>Juglans regia</i> L.)	Red List	9	20

There were also non-GRL species removed for the proposed of highway construction, but the plan focuses on compensation planting of GRL species only due to their increasingly high value to local biodiversity and ecosystems.

2.3 General Description of Compensation Planting Locations

For the selection of the sites both ecological and socio-economic aspects were considered.

It is general knowledge that restoration efforts should be undertaken only in areas which were formerly covered by forest. If possible, the site should be situated in close proximity to already existing forest systems: this will enhance the likelihood of long-term success and sustainability of the endeavor. Isolated sites face greater threats from hazardous events – such as droughts – because there is little or no existing buffer capacity in the surrounding environment for natural recolonization. It is recommended to plan the planting activities in accordance with the selected topography, ensuring trees planted on slopes are adequately protected from erosion to ensure the new plants are not affected by heavy rainfalls before they develop strong enough root systems.

Planting sites which enhance the protection of both soils and water resources can generate important economic benefits within the sites and for the surrounding communities. It may also be desirable to select areas where the restoration measures can enhance the status of an already endangered habitat type.

Traditional/informal land use, such as livestock grazing, were taken into consideration when proposing the planting site. Given the limited land availability in the mountainous area close to the start of the road section, preference was given to restoring already degraded forest patches with no signs of grazing. This lowers the risk of conflicts with other land use options (such as livestock grazing) and guarantees local

support. There may be need to undertake additional local consultations as part of the final selection process.

There is potential that restoration measures will provide new temporary employment opportunities for the local residents and this may generate interest and support for the planting. Two of the proposed compensation planting species (Chestnut and Bladder nut) can generate future income and are traditionally used by communities in the area. This can potentially increase local support.

Proposed tree species follow the natural species composition. They were removed in approximately the same area. This increases the chances of long-term sustainability of the proposed plantations since they are well adapted to the local environment. They will also exhibit better resilience to major changes such as in climate change.

The preferred approach to compensations is allocation of land that have been somewhat degraded due to natural causes or illegal logging and remediating/restoring those. Those locations were identified around the cutting sites at Tunnel N1, also on other locations affected by the construction along the entire perimeter or the road. Proposed planting locations are provided in Section 8 (Cartographic Data).

Some planting locations are covered with forest fragments and trees. Caressingly, only the so-called windows (openings) will be used for planting. Some locations are currently used for construction activities and are fully free of vegetation. They will be used for planting following the reinstatement. Area available for planting is taken at 60/40 for each plot (considering that some areas are fully free of vegetation) and relevant calculations are also based on this approach.

2.4 Natural Conditions of the Planting Locations

2.4.1 Climate

Climate in Western Georgia is tropical, which is influenced by dry air coming from the Eastern Caspian and Central Asia and humid air coming from the Black Sea. Location of Caucasus Mountains in the North-East protects territory from cold air coming from the North. High mountains result in condensation and consequently, humidity is high. Area is characterized by high precipitation.

Territory is located in humid sub-tropical section and is characterized by zonal distribution of climate. More specifically, in the valleys of the rivers Dzirula and Chkherimela up till 600 m above sea level humidity is high, winters are moderately cold and summers are relatively hot. Average annual temperature is 10°C – 13°C. Absolute minimum can drop down to - 22°C – 24°C and absolute maximum can reach 38°C – 40°C. Annual precipitation is 1,200- 1,400 mm.

2.4.2 Soils

Imereti region is characterized with wide variety of soils. In the elevated areas forest ash-grey soil is common. Road itself is located on the Imereti lowland, which is characterized by podzol and alluvial soils. Their occurrence is dependent on the age of the landscape. Podzol soil are present on the older landscapes and on younger (upper quaternary) river terraces weakly developed alluvial soil are common. On most parts of the higher terraces along the road, podzol soils are present.

Maximum temperature of soils occurs in July-August and equals to 26-25 °C. Soil temperature is several degrees higher compared to the average air temperature. In winter, soil and air temperatures are the same, which is most probably caused by the Black Sea. Soil freezing depth is 0 cm. Topsoil depth along the road varies between 0.2-0.7 m.

3. Compensation Planting Approach

3.1 Basic Principles

As already noted above, the objective of the proposed compensation planting approach is adequate mitigation of GRL woody plant loss due to construction for F4 section of E 60 Highway as described in subsequent sections. The planting fits into the over aim of the project, which is to achieve no net biodiversity loss by ensuring that the biodiversity is protected and enhanced where possible.

Due to the permanent loss of natural forest habitats, offsetting through the creation of similar habitats is required to reduce the long-term impacts. Although there will be a delay before the new habitats become of equal conservation value, the habitat creation is an important component in offsetting the overall impacts of the Project on biodiversity.

3.2 Replacement Species

Various options have been analyzed when selecting the replacement species. Major emphasis was placed on substituting what was removed. Additionally, habitat suitability and values of replacement species to the local biodiversity was also factored in during decision making. Comment/recommendation on the first revision of the plan received from the National Environmental Agency regarding positive experience of planting Chestnut (*Castanea sativa*) and Walnut (*Juglans regia*) along the highways in Georgia was also taken into consideration.

The decision was made to plant all three affected species (Zelkova, Chestnut and Walnut) in equal numbers. This area is natural habitat for these species, which will be additional positive factor for their adaptation to the environment.

As detailed in Table 3 above, number of GRL species inventoried for removal is 309. This includes both <8cm and >8cm. Due to importance of all three species to local ecosystem and considering recommendation of the National Environmental Agency, the decision was made to plant all three species in equal numbers. This is further supported by the fact that Chestnut plantations in Georgia were adversely affected by the disease. There is also positive experience of planting Walnut along the highways in the country. Rare, endemic species replanting ratio is generally 1:5 meaning that 1,545 saplings have to be planted. As noted, these quantities were equally distributed between all three species. Further details are provided in **Table 3**.

Table 4: Number of Trees to be Planted

Inventoried Species	Status	Planting Ratio	Proposed Number of Saplings
Zelkova (<i>Zelkova carpinifolia</i>)	Red List	1:5	515
Chestnut (<i>Castanea sativa</i>)	Red List	1:5	515
Walnut (<i>Juglans regia</i>)	Red List	1:5	515

It is planned to purchase saplings of all trees from local nurseries. As an alternative for Zelkova (*Zelkova carpinifolia*) propagation from seeds is considered. Seeds have to be collected sometime end of October and planted into the soil. These saplings will then be transplanted into the planting areas similar to saplings acquired from nurseries. For details refer to section 4. Noting again that this option is only an alternative in case enough sapling cannot be obtained from the local nurseries.

Planting and maintenance/aftercare provide further information regarding the post planting activities.

3.2.1 Zelkova

Zelkova grows on the terraces and slopes of medium inclination, mostly on the southern parts. It is a tertiary relict has a very limited distribution area.

In general, there are 5-6 varieties of the species, mostly in eastern Aisia. Only this particular variety (*Zelkova carpinifolia*) is found in Georgia. It has to be noted that the scientific name of the species “Zelkova” is derived from the Georgian word “Dzelkva”.

Zelkova is a deciduous plant. Its height is 15-30 m, the diameter of the main trunk is 2 m. Trunk is greyish-green. Leaves are prolonged egg shaped or elliptical, with pointed ends, stemless or with very small stem, with unequal sides and jagged. Flowers are brown, thin, with 4-5 parts. Some flowers are hermaphrodite, some male. Fruit is greenish, angled-wrinkled with bent “beak” on the back.

Plant blossoms in March, fruit ripen in August-September. Branches with fruits fall in Autumn and Winter.

As noted, Zelkova is a very rare species. Apart from Georgia it is only found in North-Eastern Turkey, Lankaran, Azerbaijan and Hirkan, Northern Iran, along the Caspian shore. In Georgia it is found in Samegrelo, Imereti, Guria and Kakheti, in lowland and lower parts of mountains (in some places reaching up to 1600-1700 m above sea level); It forms small plantations in deciduous forests.

Zelkova has heavy, elastic, very durable trunk.

This species is included in Georgian Red Book (1982) and Red List (2006).

Relatively larger populations can be found in Ajameti and Babaneuri Natural Reserves.

3.2.2 Chestnut

There are over 10 varieties of chestnut on the Atlantic Coast of the North America, Eastern Asia, Caucasus and Mediterranean. Only this particular variety can be found in Georgia (*Castanea sativa*).

Chestnut is a deciduous tree. Its height reaches 30 m, with the diameter of the main trunk reaching 2 m. Branches are reddish-brown with warts. Leaves are lancet shaped or egg shaped, narrowing towards the end, pointy towards the front and dentate-leaved. Dentate is pointy and bent. Leaves are 1-25 cm long. Flowers are male or female. They are greenish or yellowish. Fruit is a nut, rarely with more than 2-3 seeds. It is brown, covered with shiny layer, located in the nest covered with thorny layer from the outside.

It blooms in June, fruit ripens in September and falls in September-October.

It is spread in Western and Southern Georgia, in Borjomi and Liakhvi valleys, on the Kakheti section of Caucasus on lower and medium mountains from 500 m above sea level to 1200-1400 m, sometimes reaching 1600m. It creates chestnut plantations or is in mixed forests with other species. In the past chestnut was found on Kolkheta lowland also. This is confirmed by solitary individuals found there up till today.

Chestnut is a very useful plant. Both its fruit and trunk are very valuable. It also supports honey making.

This species is included in Georgian Red Book (1982) and Red List (2006).

3.2.3 Walnut

Up to 20 (or up to 40 according to other sources) varieties of walnut can be found in temperate, subtropical and partially in tropical regions, mostly in southern Europe, Eastern Asia and Northern and Southern America. Only this particular variety can be found in Georgia (*Juglans regia*).

Walnut is a deciduous tree, reaching height of 35 meters. It has round crown. Main trunk and branches are covered with grey, cracked peelings. Leave system is comprised of 3-5 leaves of 20-40 cm long. They are oval/egg (reverse egg) shaped, end is with small point or blunt. Flower is male or female. Male flowers create long, green raceme located on the year-old branches. Female flowers are relatively hard to see. Fruit is with stone, covered first with green and then brown outer layers and then solid inner layer. There is one seed with two parts, wrinkled, covered with white yellowish layer.

Walnut blooms in April, before tree grows leaves. Fruit ripens in August-September. It can be found in almost all parts of Georgia, on lower and medium mountains 1500-1700 m above sea level. It grows on river banks, deciduous forests, sometimes creating small plantations.

Walnut is a useful plant. Fruit contains 60-70% edible oil. Trunk is grey, solid, elastic with good texture. Leaves, stem and bark contain substances that can be used for making paints.

This species is included in Georgian Red Book (1982) and Red List (2006).

4. Scope of Activities and Works

4.1 Saplings

Priority option of obtaining the saplings is from the existing nurseries. Due to their relatively widespread nature, obtaining walnut and chestnut is unlikely to be an issue.

If enough Zelkova saplings cannot be found in nurseries. Seeds will be collection and propagated as described in Section 4.2 below.

4.2 Zelkova Propagation from Seeds (Alternative Option)

This will only be implemented if enough saplings cannot be obtained from nurseries.

The source populations for collection of seeds of Zelkova will be selected in Imereti region, preferably adjacent to the territories where trees were removed subject to seed availability. Collection will be done end of October.

Selection criteria were as follows:

1. The population is wild, self-sown and not planted or cultivated
2. The population is likely to be genetically similar (defined, for example, by soil, climate, altitude, close proximity to the affected populations, etc.)
3. Healthy populations with no signs of damage and / or diseases
4. Availability of high number of mature specimens producing large seed-sets (at least 50 individuals can be sampled randomly and evenly)
5. Stands growing in the road sides and other man-made habitats were avoided.

Seed collection will be carried out in compliance with the following:

1. Small, representative sample of seeds will be carefully examined using the cut test and a hand lens. This allows estimation of the frequency of empty or damaged seeds, and confirmation of seed maturity
2. Mature, dry seeds to be collected into bags well secured with tape
3. No more than 20% of the available seeds were collected from the selected source specimens. This ensured that the sampled population is not endangered by the seed collecting.

All seeds will be collected manually from mature trees which produce abundant fruits in the vicinity.

Collected seeds will be dried 2-3 days in a dry well-ventilated room. Seeds to be turned 2-3 times a day to prevent overheating and die-back. The seeds were tested manually to confirm dry condition. Then they were sown at seed-beds prepared in advance.

Planting sites will be prepared in advance by making 1-1.5 cm and 6-8 cm deep trenches covered with topsoil and graded on elevated planting beds seeds.

Maintenance activities to be implemented as follows:

- Manual tillage and soil loosening
- Manual weeding
- Manual watering.

Manual soil tillage and weeding will be required approximately twice a month in June, July and August while watering was carried out twice per month in July and August.

Seedlings to be inspected regularly during active vegetative period from early May to late September.

Depending on growth rate after 2-3 years seedling will be ready for planting in the natural environment.

4.3 Planting Specifications

Preferred time for planting in the target area is autumn when night temperatures are above zero. Planting can be implemented in spring as well, but it is essential to ensure temperatures are above zero at all times. Allowance should be made for mortality rate in the first and second years after the planting, in particular: approximately 25-30% mortality in the first year and 10-15% - in the second year via provision of adequate replacement planting.

All plant material shall be materially undamaged, sturdy, healthy, vigorous, of good shape and without elongated shoots, grown in a suitable environment and hardened off, free from pests, diseases, discoloration, weeds and physiological disorders, with balanced root and branch systems.

The following specifications should apply to bare-root saplings:

- Height: range 20-60 cm
- Basal caliper (measured 25 mm above the root collar): 5 mm minimum caliper with approximately 70% of the saplings between 6 and 9 mm
- Root systems characterized by an abundance of fibrous, flexible, heavily branched roots, and an absence of heavy, stringy, unbranched roots, root mass dense enough to indicate a good balance with the shoot
- Healthy branches or buds along the full-length of the stem
- Free from disease and top-damage.

For the purpose of transplanting the saplings from nursery to the planting site, saplings should be carefully uprooted first. This procedure should start by tying the branches together loosely. Approximately 65 cm deep trench should be dug around the tree at least 30 cm larger than the size of the root ball (or as much intact viable root material as practical). Roots extending from the ball should be carefully pruned. When the ball is partially exposed, it should be wrapped in jute starting from the base of the tree down using twine to secure the wrapping. Digging should be kept until the ball is undercut and sitting on a soil pedestal. After the above procedures, the tree should be tilted and wrapping finished securing the jute underneath.

For the safe transportation of saplings to the planting site, trees should be securely tied to the truck so they do not roll around during transportation. Rolling or other movement during shipping can crack the root ball and break roots. Trees transported on open trucks lose more water than those shipped in a closed truck and can come to the planting site in poor condition unless appropriately covered during transportation. The cover should be tightly secured so air moves over the cover and does not penetrate under it. Never transport trees uncovered; this can reduce its ability to survive planting. Trees should be irrigated just prior to shipping to help minimize desiccation.

Closed trucks should not be allowed to remain standing in the sun unless they are air conditioned. Trees could be injured if the temperature inside the truck is maintained at more than about 35°C.

Site preparation for planting should include mechanical leveling, removal of stones and waste and shrub residues.

Dimensions of pits for planting should be at least twice the diameter of the root spread, and 1.5 times the depth of the roots to be planted. The bottom and sides of the hole should be forked to break up the subsoil. The topsoil removed in the course of pit excavation should be placed into pits first (approximately 0.15 m thick for trees); the rest should be filled up with fertile soil, planting compost or other suitable growing media.

The wrapping around the rootballs should be removed directly before planting. The root system of saplings should be maintained in moist condition during delivery of the planting material to sites. Saplings should have smooth robust stem and undamaged root system. Rootballs of saplings should be enclosed within the soil. Adequate planting depth is a pre-requisite to fast growth; saplings should be planted so that the root collar is at a depth of 3-4cm from the ground surface and root system is located entirely in the fertile soil. In order to facilitate good adaptation and growth of the saplings, slow-release fertilizers should be incorporated into the backfill soil at a rate of 15-20g per sapling.

Lower branches up to a half of sapling height are cut off directly to the stem by pruning shears prior to planting deciduous saplings. At the top of the sapling, above the damaged free bud approximately 0.1m long ends are clipped so that the bud is located beneath the cutoff (partial clipping of branches reduces number of leaves, which slows down transpiration process as roots of newly planted saplings fail to function at full scale after planting). It is also necessary to shorten / prune damaged or long roots. If the roots were pruned, cutoffs must be renewed. Root bending should not be allowed during planting. Soil must be firmed / compacted thoroughly above the roots of the planted sapling.

Newly planted saplings should be held secure at the base until a new anchorage develops. A single stake and a tie should provide adequate support. Single stakes, which should generally be on the windward side of a tree, should be driven into the ground vertically. Vertical stakes should be driven before planting and should extend above the ground level to a maximum of one-half of the total sapling height. The stakes should be free from bark, snags, pests and diseases and should be of sufficient size to withstand the weight of sapling when exposed to the prevailing winds of the planting site. Tree sapling should be secured to the stake so as to prevent excessive movement. Abrasion should be avoided by using a buffer of rubber or plastics between the tree and the stake. The tree should be secured at the top of the stake; normally one tie should be used. Ties should be checked after strong winds and at least twice a year (as described in Maintenance/Aftercare Section 6), and should be adjusted or replaced to allow the growth. They should be removed as soon as anchorage has been achieved.

A circular shallow trench is made around the planted sapling to maintain moisture; saplings are watered immediately after the planting (10 liters of water per sapling).

To conserve moisture and promote water and air penetration, the back filled soil surrounding newly-planted trees can be covered with mulch consisting of material such as bark, wood chips, sawdust, fallen leaves or straw. The recommended mulch depth is 8 to 10cm.

During the growing season newly planted trees should be watered to ensure that the soil is kept constantly moist, although this will vary with local climate fluctuations.

At completion of planting, all debris should be removed and the works left in a clean and tidy condition.

At the initial planting stage, it is required to protect plantations from grazing via installation of barbed wire fence along entire perimeter of the planted area. The fence should be a four-strand barbed wire with line post spaced at 3m intervals; the line post height should be in the order of 1.6m above the ground.

Warning signs are to be erected to make local residents aware of the presence of the barbed wire. As part of the aftercare program the fencing shall be re-enforced where damage has occurred.

5. Pest Control Measures

Harmful insects comprise a biological factor, which may have a substantial negative effect on tree plantations. Particularly dangerous are pests, which propagate in numerous numbers in certain years and inflict significant damage on plantations, especially – those of deciduous plants. It is recommended to make use of mechanical and chemical pest control measures. Chemicals have to be selected so that they are approved for use in the country by the National Food Agency of Georgia (Legal Entity of Public Law, MEPA).

Zelkova pests haven't been properly researched. Based on different observations, below listed pests can create problems for this species:

- *Operophtera brumata* L. - 1,5-2 cm long yellowish-greenish worm, with grey lines on the back. It feeds on soft parts of leaves and leaving veins behind.
- *Byrsocrypta* sp. - Form of pathogenesis, damages leaves. Tips of damaged leaves bend towards the bottom and bulge between the veins. These sections become yellow in the beginning and then change color to red.
- *Anisandrus dispar* Fabr. – In general Zelkova bark has very few pests, but this one has been observed on young as well as older individuals.

- *Sinoxylon perforans* Schr. – Is also a bark pest. It is a brownish beetle with black head, 5-7 mm long with several appendices in the back. It makes cylindrical or branched holes in the bark.

As noted above, fungal disease (so called chestnut cancer) of bark created serious problems for chestnut population in Georgia. Disease is caused by pathogenic fungus (*Cryphonectria parasitica*). Through the damage in bark, fungus gets into the tree and damages fibers of the bark that affects plants ability to intake nutrients and water from the soil. Due to this, the tree dies. Process starts from the top. This fungus is mostly countered by hypervirulent fungus derived in the labs. The following are also chestnut pests: *Cameraria ohridella*) and other fungi (*Phyllosticta castaneae* Ell. Et Ev.; *Cylindrosporium castanicola* (Desm) Bert etc.).

The following are chestnut pests:

- *Carpocapsa pomonella* Z. – The worm of the pest is approximately 18 mm. The butterfly is also the same size. Worm is covered with thin grey spots that have single hair. It is pink from the top and lighter from the bottom, chest is yellowish. Worms move on the surface of the fruit for some time, then drill through the skin and start eating the inside. Worms create holes and chambers inside the fruit.
- *Epidiaspis leperii (betulae)* Sign – Prior to start of feeding, body of the pest is pink, then it becomes red. It is roundish, flat and grey. During mass reproduction, pests create colonies on stems, branches and sprouts of the plant. Pests in the colony suck liquid from the plant, due to this certain growths are formed on the damaged sections, sprouts wither and if number of pests is very high, plant dies.
- *Palaeolecanium bituberculatum* Targ. – Female pest is light brown and has greyish or brownish spots and stripes, there are dents and some growth from the top. Pest is oval shaped. Its width is 4-6,5 mm, height is 2,5mm. Worms suck liquid from the leaves and leave excrement on the surface of the leaves. Leaves are covered with dark coating. Therefore, leaf functionality decreases and plant productivity is affected.
- *Xyleborus (Anisandrus) dispar* F. – Body of the female pest is brownish. Feet and mustache are yellow. Upper wings have lines of thick dots. Females have swelling on the back. Body of the males is covered with long fur and its back is almost flat and slightly roundish. Length of the female beetle is 3-3,5 mm. Length of the male beetle is 2 mm. Beetles eat bark of the trees, which is especially problematic for young trees.
- *Chromaphis juglandicola* Kalt. – Body and mustaches are light yellow. They have mustaches, red eyes and small tail. Pest feeds on leaf liquid. Damaged leaves become weaker and brownish damaged spots develop. These leaves are highly susceptible to sunlight.

All these pests are managed by removal of damaged parts (branches, leaves etc.) and their destruction and by use of relevant insecticides. If pests are detected, decision making measures to be implemented will be made following the consultations with the relevant specialists.

6. Aftercare

Maintenance is a key factor for establishment of plantations, which requires particular care during the first

two-three years after the planting. Maintenance periods should be in line with the local environmental conditions. Particular care should be provided in the first year after planting when saplings are too weak and not established. At this time slight carelessness might result in sapling mortality. It is also necessary to implement a pest monitoring in the plantations, identify pest type in case of disease and plan appropriate elimination / control measures.

It is recommended to carry out maintenance works four times in the first year of planting. The recommended periods for tillage / loosening and watering are May, June, July and August (first weeks of the above months). Tillage and loosening of plantations should be conducted in a circular fashion (at a diameter of 0.8m) on an area of 0.5m².

The plantations should be watered immediately after planting and at least five – seven more times throughout the year (June, July and August). It is desirable to conduct watering in dry periods of these months. Watering rate is 20 l water for one tree.

Mowing should be conducted using special mowing appliances 3-4 times throughout the year (on as required basis) so that height of herbaceous cover does not exceed 10-15cm at any time.

In late fall it is necessary to assess plantation establishment / mortality rate, identify various damaging factors / causes, check firmness of plant supporting stakes so that all planted saplings are securely tied. All failed saplings should be replaced next spring via planting the same species and numbers of trees.

It is recommended to implement maintenance at least four times a year (second half of May and second half of June) and watering at least twice a year (June, July, August) in the second to fifth years. Mowing should be conducted as described above.

In the sixth-tenth years of the planting annual maintenance should be implemented twice (first half of June and August) while watering should be conducted only once (July). However, annual mowing should be conducted as described above.

If success rate of GRL tree survival planted for the purposes of habitat restoration is below 80%, Contractor will replace dead trees with the ratio of 1:1.

Typical aftercare activities are summarized in the table below.

Table 3: Overview of Main Maintenance/Aftercare Activities

#	Activity	Season
1.	Weeding (removal of unwanted plants)	Spring/Summer
2.	Tillage/loosening of soil	Spring/Autumn
3.	Grass cutting	Spring/Summer
4.	Application of fertilizers	Spring/Autumn
5.	Mulching	Autumn
6.	Watering	Spring/Summer
7.	Repair of tree stakes and ties	As required
8.	Repair of fencing	As required
9.	Pest control	As required
10.	Trimming (removal of overgrown lower branches)	As required
11.	Replacement of dead trees	Spring/Autumn
12.	Assessment by botanist	Spring/Autumn

7. Monitoring

Annual monitoring of the plantations will be carried out to evaluate survival rate and develop intervention measures if required. The monitoring will include the following:

- The number of planted trees (and hence percentage) of trees showing clear signs of healthy growth (e.g., buds, leaves, evidence of green vascular cambium)
- Likely reasons for plant die-back if any
- Recommendations for intervention / plant replacement.

Annual monitoring should be carried out on a quarterly basis in the first three years after planting; thereafter, monitoring will include two field visits in early and late vegetative seasons for 2-3 more years dependent on planting success.

Monitoring of floristic diversity in the newly developed forest plantations is recommended to confirm transformation of the plantations to natural habitats.

8. Cartographic Material

Below cartographic material for 15 land plots proposed for compensation planting are provided including GPS coordinates and other technical information (area, perimeter etc.). As noted, in the areas that are covered with forests planting will be carried out in windows (openings).

15 potential locations were selected for compensation planting. Potentially, all 15 areas are suitable for planting. Some locations are directly adjacent to the highway, in some cases it is within the buffer zone. Following the start of the operation of the highway, existing conditions may change, therefore after the completion of the construction and start of the highway operation, selected areas should be reinspected and their suitability for planting confirmed.

All 15 locations are currently considered for planting. However, they are potential locations and not all of them will be used for planting. As noted above, locations will be finally confirmed after the completion of the construction and highway operation. Based on the number of trees to be planted and the area requirement per plant, it is planned to use maximum 5 locations out of 15. Cost estimate is based on the

first 5 proposed plots. Company is also willing to consider any alternative suggestions that Ministry might have with this regard.

Areas have been selected so that habitats of proposed species are maintained and areas are easily accessible for maintenance/aftercare.

Figure 4: Proposed Planting Plot N1 near Tunnel N1, Zestafoni Forestry District, Pesticide Forestry, Former Ilemi Farming Forestry (Left Bank for the River Dzirula)



N	Coordinates	
	X	Y
1	345086.8348	4661923.407
2	345147.9645	4661927.882
3	345183.8828	4661913.879
4	345197.206	4661892.969
5	345192.7841	4661870.861
6	345074.5066	4661899.887

Perimeter: 296 m

Area: 4,317 m²

Figure 5: Proposed Planting Plot N2 near Interchange N1 (Left Bank of the River Dzirula)



N	Coordinates	
	X	Y
1	838863.242	4668144.35
2	838827.566	4668115.054
3	838825.9515	4668112.808
4	838809.8123	4668090.363
5	838803.6014	4668063.578
6	838800.5398	4668036.943
7	838799.1159	4667986.227
8	838792.3241	4667982.749
7	838779.9214	4667987.877
8	838774.5999	4668006.572
9	838775.7442	4668018.687
10	838783.3963	4668032.412
11	838783.4094	4668040.359
12	838781.4406	4668050.028
13	838780.3116	4668055.573
14	838776.8946	4668061.97
15	838757.7689	4668074.637
16	838744.5012	4668091.744
17	838749.9041	4668114.207
18	838764.9694	4668128.411
19	838784.5414	4668135.736
20	838863.242	4668144.35
21	838827.566	4668115.054

Perimeter: 469 m

Area: 6,631 m²

Figure 6: Proposed Planting Plot N3 near Interchange N2 (Left Bank of the River Kvirila)



N	Coordinates	
	X	Y
1	340456.6361	4662939.1
2	340432.1747	4662901.984
3	340301.1254	4662982.927
4	340330.8486	4663013.315

Perimeter: 387 m

Area: 6,437 m²

Figure 7: Proposed Planting Plot N4 near Bridge N5 (32.03.44.018)



N	Coordinates	
	X	Y
1	337670.9252	4664532.9671
2	337776.7762	4664603.4325
3	337796.8502	4664577.9991
4	337688.0305	4664509.1151

Perimeter: 318 m

Area: 3,941 m²

Figure 8: Proposed Planting Plot N5 near Disposal at KP9.7



N	Coordinates	
	X	Y
1	337329.82	4664844.846
2	337329.2479	4664874.213
3	337419.2975	4664880.106
4	337421.4784	4664852.798

Perimeter: 239 m

Area: 2,584 m²

Figure 9: Proposed Planting Plot N6 near KP11.3



N	Coordinates	
	X	Y
1	336174.0516	4665907.957
2	336188.8343	4665929.263
3	336204.0061	4665957.659
4	336215.8459	4665952.117
5	336184.9263	4665900.104
6	336143.175	4665865.02
7	336135.2375	4665873.275
8	336153.419	4665887.128

Perimeter: 250 m

Area: 1,339 m²

Figure 10: Proposed Planting Plot N7 near KP10.9



N	Coordinates	
	X	Y
1	336539.0342	4665634.891
2	336529.0173	4665618.733
3	336463.4132	4665658.055
4	336476.9032	4665671.225

Perimeter: 186 m

Area: 1,381 m²

Figure 11: Proposed Planting Plot N8 near Interchange N4



N	Coordinates	
	X	Y
1	332885.9861	4667118.266
2	332958.832	4667081.264
3	332952.0389	4667050.98
4	332873.5045	4667085.328

Perimeter: 234 m

Area: 2,737 m²

Figure 12: Proposed Planting Plot N9 near Interchange N1 (Second Option)



	Coordinates	
	X	Y
1	342556.1472	4661842.254
2	342555.309	4661820.544
3	342437.9813	4661843.256
4	342443.0119	4661866.146

Perimeter: 280 m

Area: 2,639 m²

Figure 13: Proposed Planting Plot N10 near Interchange N3



N	Coordinates	
	X	Y
1	335582.094	4666035.055
2	335633.6742	4666010.722
3	335567.7111	4666008.954
4	335500.4731	4666015.808
5	335437.6449	4666029.614
6	335457.7733	4666037.883
7	335478.0803	4666048.667
8	335485.173	4666053.118
9	335504.3333	4666072.597

Perimeter: 422 m

Area: 5,582 m²

Figure 14: Proposed Planting Plot N11 near Interchange N4 (Second Option (32.03.49.358))



N	Coordinates	
	X	Y
1	332863.9484	4667137.571
2	332850.9459	4667107.808
3	332777.8799	4667179.596
4	332784.0455	4667190.685

Perimeter: 244 m

Area: 2,161 m²

Figure 15: Proposed Planting Plot N12 near Exit of Tunnel N5



N	Coordinates	
	X	Y
1	338515.5654	4664457.411
2	338623.8204	4664440.397
3	338624.1232	4664433.135
4	338515.1747	4664447.481

Perimeter: 237 m

Area: 934 m²

Figure 16: Proposed Planting Plot N13 near Interchange N4 (Third Option)



N	Coordinates	
	X	Y
1	332483.5227	4667421.242
2	332664.9458	4667231.355
3	332659.4484	4667223.554
4	332475.6402	4667411.851

Perimeter: 548 m

Area: 2,835 m²

Figure 17: Proposed Planting Plot N14 Near Bridge N5 (Second Option)



N	Coordinates	
	X	Y
1	337722.1067	4664712.175
2	337722.5468	4664714.466
3	337735.77	4664720.125
4	337736.9964	4664718.086
5	337737.78	4664718.74
6	337754.26	4664696.41
7	337762.29	4664692.775
8	337781.5025	4664693.576
9	337781.7961	4664692.592
10	337792.7552	4664687.427
11	337793.7796	4664688.192
12	337807.1697	4664679.665
13	337796.1691	4664670.076
14	337739.0058	4664691.025
15	337724.8544	4664693.97

Perimeter: 215 m

Area: 1,370 m²

Figure 18: Proposed Plot N15 Adjacent to Bridge N5 (Third Option)



N	Coordinates	
	X	Y
1	337703.4568	4664622.192
2	337720.1741	4664599.522
3	337699.8467	4664582.121
4	337689.3764	4664595.128
5	337681.0658	4664610.789

Perimeter: 114 m

Area: 832 m²

9. Cost Estimate

Table below presents approximate cost estimate for proposed compensation planting. As noted above, on the areas covered with forest planting is planned on existing windows (openings) that are unequally spread and saplings will be distributed as per size of openings. Saplings are assigned as per total available area 1,43 ha with 1,080 plant per 1 ha. This number (1,545 on 1,43 ha) in combination with existing vegetation on the land plots will ensure proper reinstatement of the areas. Saplings will be distributed in windows and open areas (in certain areas symmetrically and in some areas sporadically, that will create settings characteristic to natural forests).

#	Activity	Unit	Quantity
1	Total compensation planting area:	m²	23,911
1.1	Including actual compensation planting area (60% of total area)	m ²	14,346
1.1.1	Including Plot N1	m ²	2,590
1.1.2	Including Plot N2	m ²	3,979
1.1.3	Including Plot N3	m ²	3,862
1.1.4	Including Plot N4	m ²	2,365
1.1.4	Including Plot N5	m ²	1,550
2	Cleaning of the Area from Sub-forest (blackberry, rhododendron) and weed (fern, hogweed etc.), cutting and removal	m²	14,346
3	Fencing:		
3.1	Perimeter	m	1,709
3.2	Wooden Poles (D=10-12 cm; H=1.6 m)	pcs	855
3.3	Barbed Wire (5-lanes)	m	8,545
3.4	Nails (7 mm) for Fixig Wires to the Poles	pcs	4,273
3.5	Gate	pcs	5
4	Marking/Preparation of pits for planting with Sizes: 0.3 m X 0.4 m	pcs	1,545
5	Preparation of Saplings in the Nurseries: Removal, Sorting, Delivery (Zelkova, Walnut, Chesnutt)	pcs	1,545
6	Plating in the Prepared Locations	pcs	1,545
7	Driving Stakes into the Soil	pcs	1,545
8	Tying of Sapling to the Stakes (rope)	pcs	1,545
9	Post Palting Watering	liter	15,450
10	Fertilizer (slow soluble)	gram	30,900
11	Mulching (10 cm thick)	m²	185
12	Phytosanitary	kg	as required
13	Preparation and Installation of Banners Indicating Compensation Planting Activity and Plating Date	pcs	5

Annex 1: Decrees of the Government of Georgia On Removal of Red List Species from Natural Environment

Decree N1328



საქართველოს მთავრობის გ ა ნ კ ა რ ბ უ ლ ე ბ ა

N1328 2022 წლის 25 ივლისი ქ. თბილისი

საქართველოს რეგიონული განვითარებისა და ინფრასტრუქტურის სამინისტროს გამგებლობაში არსებული სახელმწიფო საქვეუწყებო დაწესებულებისთვის – საქართველოს საავტომობილო გზების დეპარტამენტისთვის საქართველოს „წითელი ნუსხით“ დაცული მცენარეთა სახეობების ბუნებრივი გარემოდან ამოღებაზე თანხმობის მიცემის შესახებ

1. „საქართველოს „წითელი ნუსხისა“ და „წითელი წიგნის“ შესახებ“ საქართველოს კანონის 24-ე მუხლის პირველი პუნქტის „ვ“ ქვეპუნქტისა და ამავე მუხლის 2³ პუნქტის შესაბამისად, E-60 აღმოსავლეთ-დასავლეთ მაგისტრალის შორაპანი-არგვეთის (F4) მონაკვეთის მშენებლობის მიზნით, საქართველოს რეგიონული განვითარებისა და ინფრასტრუქტურის სამინისტროს გამგებლობაში არსებულ სახელმწიფო საქვეუწყებო დაწესებულებას – საქართველოს საავტომობილო გზების დეპარტამენტს მიეცეს უფლება, ბუნებრივი გარემოდან ამოიღოს ზესტაფონის მუნიციპალიტეტში, პროექტის განთავსების ზოლში მდებარე (მიწის უძრავი ქონების) საკადასტრო კოდები: №32.16.38.363, №32.17.32.390 და №32.15.42.347), საქართველოს „წითელ ნუსხაში“ შეტანილი მცენარეების შემდეგი სახეობები:

ა) „ჩვეულებრივი წაბლი“ (*Castanea sativa* Mill.) – 1 (ერთი) ინდივიდი;

ბ) „ძელქვა“ (*Zelkova carpinifolia* Pall.) – 236 (ორას ოცდათექვსმეტი) ინდივიდი.

2. საქართველოს რეგიონული განვითარებისა და ინფრასტრუქტურის სამინისტროს გამგებლობაში არსებული სახელმწიფო საქვეუწყებო დაწესებულება – საქართველოს საავტომობილო გზების დეპარტამენტი ვალდებულია:

ა) საქართველოს გარემოს დაცვისა და სოფლის მეურნეობის სამინისტროს სახელმწიფო საქვეუწყებო დაწესებულებას – გარემოსდაცვითი ზედამხედველობის დეპარტამენტს (შემდგომში – გარემოსდაცვითი ზედამხედველობის დეპარტამენტი) წინასწარ აცნობოს საქართველოს „წითელ ნუსხაში“ შეტანილი მცენარეთა სახეობების ბუნებრივი გარემოდან ამოღების დაგეგმილი ვადების შესახებ;

ბ) ამ განკარგულების პირველი პუნქტით განსაზღვრულ ტერიტორიაზე არსებულ მიწის ნაკვეთებზე მოჭრილი მერქნული რესურსი, კანონმდებლობით დადგენილი წესით, გადასცეს სსიპ – ეროვნულ სატყეო სააგენტოს.

3. ამ განკარგულების პირველი პუნქტით გათვალისწინებული, საქართველოს „წითელ ნუსხაში“ შეტანილი მცენარეების ბუნებრივი გარემოდან ამოღებაზე კონტროლი განახორციელოს გარემოსდაცვითი ზედამხედველობის დეპარტამენტმა.

პრემიერ-მინისტრი



ირაკლი ღარიბაშვილი

Decree of Government of Georgia

N 1328 25 July, 2022, Tbilisi

[TRANSLATION]

on provision of permission to Roads Department of Georgia subordinate entity to Ministry of Regional Development and Infostructure of Georgia on removal of species protected under Georgian Red List from natural environment

1. In accordance with Georgian Law on Red List and Red Book, article 24 clause 1 sub-clause v and clause 2³ of the same article, for the construction of Shorapani-Argveta section of the E60 highway permission shall be granted to Roads Department of Georgia subordinate entity to Ministry of Regional Development and Infostructure of Georgia, to remove from natural environment the following red list species located in Zestafoni Municipality within the project corridor (cadastral codes of the land (immovable property): N32.16.38.363; N3217.32.390 and N32.15.42.347):
 - a) Chestnut (*Castanea sativa* Mill) – 1 individual
 - b) Zelkova (*Zelkova carpinifolia*) – 236 individuals
2. Roads Department of Georgia subordinate entity to Ministry of Regional Development and Infostructure of Georgia is obliged to:
 - a) Notify in advance regarding the planned timeframe of removal of red list species from the natural environment to the Environmental Supervision Department subordinate entity to Ministry of Environment Protection and Agriculture of Georgia (hereafter referred to as Environmental Supervision Department)
 - b) Timber removed from the land indicated in the article 1 of this decree shall be handed over to LEPL National Forestry Agency as per legal requirements
3. Control over removal from natural environment of the species indicated in article 1 of this decree shall be exercised by the Environmental Supervision Department.

Prime Minister

[Stamped]

Irakli Garibashvili



საქართველოს მთავრობის გ ა ნ კ ა რ ბ უ ლ ე ბ ა

N2095 2019 წლის 3 ოქტომბერი ქ. თბილისი

საქართველოს რეგიონული განვითარებისა და ინფრასტრუქტურის
სამინისტროს გამგებლობაში არსებული სახელმწიფო საქვეუწყებო
დაწესებულებისთვის – საქართველოს საავტომობილო გზების
დეპარტამენტისთვის საქართველოს „წითელი ნუსხით“ დაცული მცენარეთა
სახეობების ბუნებრივი გარემოდან ამოღებაზე თანხმობის მიცემის შესახებ

1. „საქართველოს „წითელი ნუსხისა“ და „წითელი წიგნის“ შესახებ“
საქართველოს კანონის 24-ე მუხლის პირველი პუნქტის „ვ“ ქვეპუნქტისა და
ამავე მუხლის 2³ პუნქტის შესაბამისად, E-60 აღმოსავლეთ-დასავლეთ
მაგისტრალის შორაპანი-არგვეთის (F4) მონაკვეთის მშენებლობის მიზნით,
საქართველოს რეგიონული განვითარებისა და ინფრასტრუქტურის
სამინისტროს გამგებლობაში არსებულ სახელმწიფო საქვეუწყებო
დაწესებულებას – საქართველოს საავტომობილო გზების დეპარტამენტს
(შემდგომში – საქართველოს საავტომობილო გზების დეპარტამენტი) მიეცეს
უფლება, ბუნებრივი გარემოდან ამოიღოს ზესტაფონის მუნიციპალიტეტის
ტერიტორიაზე, პროექტის განთვისების ფოლში მდებარე, საქართველოს
„წითელ ნუსხაში“ შეტანილი მცენარეების შემდეგი სახეობები:

2

ა) 8 სანტიმეტრიზე მეტი დიამეტრის:

ა.ა) „კაკლის ხე“ (*Juglans regia L.*) – 9 (ცხრა) ინდივიდი;

ა.ბ) „ძელქვა“ (*Zelkova carpinifolia Pall.*) – 1 (ერთი) ინდივიდი;

ბ) 8 სანტიმეტრზე ნაკლები დიამეტრის „კაკლის ხე“ (*Juglans regia L.*) – 20 (ოცი) ინდივიდი.

2. საქართველოს საავტომობილო გზების დეპარტამენტი ვალდებულია:

ა) საქართველოს გარემოს დაცვისა და სოფლის მეურნეობის სამინისტროს სახელმწიფო საქვეუწყებო დაწესებულებას – გარემოსდაცვითი ზედამხედველობის დეპარტამენტს (შემდგომში – გარემოსდაცვითი ზედამხედველობის დეპარტამენტი) წინასწარ აცნობოს საქართველოს „წითელ ნუსხაში“ შეტანილი მცენარეთა სახეობების ბუნებრივი გარემოდან ამოღების დაგეგმილი ვადების შესახებ;

ბ) მოჭრილი მერქნული რესურსი, დაუკოტრავი სახით, სახეობების მიხედვით, დაასაწყობოს სსიპ – ეროვნული სატყეო სააგენტოს მიერ მითითებულ ტერიტორიაზე და გადასცეს მას მიღება-ჩაბარების აქტით.

3. ამ განკარგულების პირველი პუნქტით გათვალისწინებული, საქართველოს „წითელ ნუსხაში“ შეტანილი მცენარეების ბუნებრივი გარემოდან ამოღებაზე კონტროლი განახორციელოს გარემოსდაცვითი ზედამხედველობის დეპარტამენტმა.

პრემიერ-მინისტრი

გიორგი გახარია

Decree of Government of Georgia

N 2095 3 October, 2019, Tbilisi

[TRANSLATION]

on provision of permission to Roads Department of Georgia subordinate entity to Ministry of Regional Development and Infostructure of Georgia on removal of species protected under Georgian Red List from natural environment

4. In accordance with Georgian Law on Red List and Red Book, article 24 clause 1 sub-clause v and clause 2³ of the same article, for the construction of Shorapani-Argveta section of the E60 highway permission shall be granted to Roads Department of Georgia subordinate entity to Ministry of Regional Development and Infostructure of Georgia, to remove from natural environment the following red list species located in Zestafoni Municipality within the project corridor:
 - c) With the diameter larger than 8 cm
 - a. Walnut (*Juglans regia* L.) – 9 (nine) individuals
 - b. Zelkova (*Zelkova carpinifolia*) – 1 (one) individual
 - d) With the diameter smaller than 8 cm a. Walnut (*Juglans regia* L.) - 20 (twenty) individuals
5. Roads Department of Georgia subordinate entity to Ministry of Regional Development and Infostructure of Georgia is obliged to:
 - c) Notify in advance regarding the planned timeframe of removal of red list species from the natural environment to the Environmental Supervision Department subordinate entity to Ministry of Environment Protection and Agriculture of Georgia (hereafter referred to as Environmental Supervision Department)
 - d) Timber removed from the land in uncut state, segregated per species to be delivered for storage to the location indicated by the LEPL National Forestry Agency and handed over to them with delivery-acceptance act.
6. Control over removal from natural environment of the species indicated in article 1 of this decree shall be exercised by the Environmental Supervision Department.

Prime Minister

[Stamped]

Giorgi Gakharia