Semi-annual Environmental Monitoring Report

#7 Semestral Report

Reporting period: January-June 2025

July 2025

Batumi Bypass Road Project— Construction of Poti Bridge and Access Roads

(Financed by the Asian Development Bank)

Loan No GEO 3520-GEO

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

ACRONYMS & ABBREVIATIONS

ADB	Asian Development Bank
CAREC	Central Asia Regional Economic Cooperation
CC	Construction Contractor
CLO	Community Liaison Officer
CPR	Cardiopulmonary Resuscitation
EHS	Environment, Health and Safety
EIA	Environmental Impact assessment
EMP	Environmental Management Plan
EMR	Environmental Monitoring Report
GRM	Grievance Redress Mechanism
H&S	Health and Safety
IFC	International Finance Corporation
km	Kilometer
MAC	Maximum Allowable Concentration
Ministry	Ministry of National Development and Infrastructure
MoEPA	Ministry of the Environmental Protection and Agriculture
NCR	Non-Conformance Report
PAM	Project Administration Manual
PIU	Project Implementation Unit
PMCS	Project Management Consultancy Services
PPE	Personal Protective Equipment
RD	Roads Department
SAEMR	Semi-annual Environmental Monitoring Report
SC	Supervision Consultant
SEMP	Specific Environmental Management Plan
SSEMP	Site Specific Environmental Management Plan
TEM	Trans-European North-South Motorway
ToR	Terms of Reference
WWF	World Wildlife Fund

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1 INTRODUCTION

1.1 Preamble

1. Batumi Bypass Road Project: Major Change in the Project (Change in Scope, Amount, and Implementation Arrangements) was conducted in September 2019. The significant change is an increase in project scope through the addition of a fourth output under the project comprising two additional construction subprojects: a new bridge and approach roads over the Rioni River in Poti and a new bypass road from Bakurtsikhe to Tsnori. Reallocation of existing savings can be utilized to fund the new output, reinforcing the project's impact of improving regional connectivity in Georgia. The change is significant because it fundamentally affects the approved project scope and outcome by doubling the length of roads and/or bridges to be built.

2. The project, managed by the Roads Department under the Ministry of Regional Development and Infrastructure, aims at the Construction of the Poti Bridge and Access Roads, financed by the Asian Development Bank (ADB).

3. This report is the seventh Semi-Annual Environmental Monitoring Report (SAEMR/EMR) for constructing the Poti Bridge and Access Roads Project and covers the period of January – June 2025.

4. The Contract for Project Management Consultancy Services (PMCS) between Roads Department (RD) and "Joint Venture ULUSLARARASI BİRLEŞMİŞ MÜŞAVİRLER MÜŞAVİRLİK HİZMETLERİ A.Ş-IRD Engineering SRL" was signed on 11 June 2021. The Contract for the Construction of the Poti Bridge and Access Roads between RD and Joint Venture MIRBUD-CS (Poland, Georgia) was signed on 29 November 2021. Work is expected to be completed within two years. However, there is extensions to the project timeline, with completion anticipated before the end of 2025. Awarded contracts included Environmental Management Plans (EMP) cleared by ADB and conditions of national Environmental Impact Assessment (EIA) clearance.

2 PROJECT DESCRIPTION AND CURRENT ACTIVITIES

2.1 Project Description

5. The Poti-Grigoleti-Kobuleti bypass section is part of the E-60 and E-70 highways and the larger East-West Road corridor in Georgia, which is an integral part of one of the six key Central Asia Regional Economic Cooperation (CAREC) corridors (Corridor 2) providing the shortest transit link to connect Central Asia with Europe and East Asia. The Project is located along the Black Sea coastal area within the Samegrelo-Zemo Svaneti Region and on the border between Khobi Municipality and the Poti administrative center.

6. The details of the proposed road project are as follows: The 2.5 km road Project consists of a 2-lane (one lane in each direction) multi-span bridge over the Rioni River and its connection with the existing highway on both sides of the river. The starting point is located on the E-60 highway to Senaki at the right riverbank of the Rioni River on the northern outskirts of the city of Poti. The new section of road will pass next to a residential area (Patara Poti Village) using the exact alignment and parallel to the existing railway bridge over the river. In addition, a small section (approximately 1 km) of an existing secondary road that runs to the Kulevi Oil Terminal from Patara Poti and parallels the river will also be upgraded with a modified alignment to accommodate the new bridge and road approaches.

7. The Project's geometric design standards have been selected based on traffic flow, road category, and relief to ensure safe and unimpeded traffic flow (see Table 1). The road design is based on Georgian National Standard SST 72: 2009 "Standard on Geometrical and Structural Requirements for the Public Motor Roads of Georgia" and Trans-European North-South Motorway (TEM) Standards.

Table 1. Design Parameters

Parameter	Main Alignment	Interchanges: Ramps and Loops
Design speed	100 km/h	40 km/h, 60 km/h, 80 km/h or 100 km/h
Speed limit	90 km/h	90 km/h
Spiral Transition Curves	As per TEM Standards	As per TEM Standards
Bend (Superelevation)	As per Georgian Standards	As per Georgian Standards
Min. crossfall and min. bend	2,50%	2.50%
Max. superelevation	7,00%	7.00%
Expansion width in curves	No necessary widening (each lane is 3,75 m wide)	As per Georgian Standards
Min. Vertical Gradient	0.30%	0.30%

Max. Vertical Gradient	4.00%	5% (100 km/h) and 6% (<100 km/h)
Convex Vertical Curves	22.600	10,000 (100 km/h), 5,000 (80 km/h), 1,800 (60 km/h), 400 (40 km/h)
Concave Vertical Curves	7.700	4,900 (100 km/h), 3,200 (80 km/h), 1.700 (60 km/h), 850 (40 km/h)
Acceleration Lane	-	150 m acceleration lane + 80 m taper
Deceleration Lane	-	100 m deceleration lane + 80 m taper

8. The map of the project road is given in Figure 1 below.

Figure 1. Map of Project Road

9. The Project is classified as category A for the environment under ADB's Safeguard Policy Statement (2009). Project implementation period is between 2021 and 2025.

10. The Roads Department of Georgia, under the Ministry of Regional Development and Infrastructure of Georgia, submitted the EIA to the Ministry of the Environmental Protection and Agriculture of Georgia (MoEPA) on 26.02.2018 for approval. Based on the submitted documentation, Environmental Decision was issued by the MoEPA on 26.04.2018 (order N2-284).

2.2 Project Contracts and Management

11. Following the EIA and the Project Administration Manuel (PAM) requirements, the Project Management Consultancy Services Company (hereafter, referred as the Engineer) and Construction Contractor (CC) have mobilized national and international Environmental, Health and Safety (EHS) specialists (the names for the Engineer and Construction Contractor (CC) staff are presented in Table 2).

12. The Terms of References (ToR) for the Project Management Consultancy Services Company contains the following tasks for the Environmental Specialists:

a. Ensure that the provisions of the approved Environmental Management Plan are reflected in the Contractor's contract site-specific environmental management plan (SSEMP) before its acceptance by the Engineer, the Employer, and ADB after that, ensure that the Contractor complies in every respect with the provisions of the SSEMP;

b. Develop an environmental auditing protocol for the construction period, regularly supervise the environmental monitoring, and submit periodic reports based on the monitoring data and laboratory analysis reports. These reports will be included as an annex to the Consultant's Monthly Report;

c. Develop a program for hands-on training of Contractor's staff in implementing the SSEMP.

d. Conduct Post-Construction Environmental Audit and prepare a post-construction environmental audit report with a filled environmental audit checklist.

13. The names of ADB, the Engineer, CC, and RD representatives are given in Table 2 below.

Table 2. Main Environmental Staff of ADB, CC, the Engineer, and RD

Organization	Position	Name
ADB	Head Office, Environmental Specialist, Portfolio, Results, Safeguards and Gender Unit (PSG), CWRD	Ninette Pajarillaga
	ADB National Environmental Safeguards Consultant	Giorgi Kobaladze
	Associate Safeguards Officer Georgia Resident Mission	Nino Nadashvili
RD	Environmental Specialist	Tamar Nasuashvili
	Head of Environmental Unit	Gia Sopadze
Engineer	International Environmental Specialist	Emre Duran
	Environmental Expert	Keti Nadirashvili
CC	Project Manager	Nino Gabunia
	Environmental Specialist	Ana Kvaratskhelia

2.3 Project Activities during the Current Reporting Period for Construction of Poti Bridge and Access Roads

14. Within the scope of the project, works have started and the drilling phase of the on-shore piles is completed, while leveling works on the access road and some auxiliary works are ongoing. All project activities are listed in Table 3 below.

Table 3. Project Activities Carried Out during the Reporting Period

Month	Activity
January	Transportation sand-gravel materials from borrow - Axe 17 km 1+255-1+500; Transportation of crashed aggregate 15-40mm - Axe 17, km 0+680 - 0+807; Transportation of crashed aggregate 0-60mm - Axe 17, km 0+400; Gravel Column for improving soil - Axe 17, km 0+680 - 0+807; Boring of Cast in situ piles d1500mm with steel casing pipes, including pile cut off (Pier N3, Pile N51-44-47-49-52-50-54-55-48-53) - Axe 17, km 1+070 Reinforcement steel B500C - Axe 17, km 1+070; Sheet pile Wall (width 0.6 m) – Axe 17 km 1+170 - 1+080; Leveling and compaction of fill, from borrow, by layers,

	included additional transport distance. – Axe 17 km 1+255-1+500; Axe 17 km 0+000-0+100; Installation of 24 meter bridge - axe 14 KM 0+060; Concrete for piles, C30 - Axe 17, km 1+070; Installation of 33 meter bridge - axe 49, KM 0+372
February	Transportation sand-gravel materials from borrow - Axe 17 km 1+255-1+500; Transportation of crashed aggregate 15-40mm - Axe 17, km 0+680 - 0+807; Gravel Column for improving soil - Axe 17, km 0+680 - 0+807; Selected material on top layer of embankment, included additional transport distance - Axe 6 km 0+000-0+080; Axe 17 km 1+255-1+500; Reinforcement steel B500C - Axe 17, km 1+070; Sheet pile Wall (width 0.6 m) – Axe 17 km 1+170 - 1+070; Leveling and compaction of fill, from borrow, by layers, included additional transport distance. – Axe 17 km 1+255-1+500; Transportation of crashed aggregate 0-60mm - Axe 17, km 0+400; Installation of 24-meter bridge - axe 14 KM 0+060; Concrete for leveling pad C15 - Axe 17, km 1+070; Pile cut off - axe 17, KM 1+070; Installation of 33-meter bridge - axe 49, KM 0+372
March	Transportation sand-gravel materials from borrow - Axe 17 km 1+255-1+500; Transportation of crashed aggregate 15-40mm - Axe 17, km 0+680 - 0+807; Gravel Column for improving soil - Axe 17, km 0+680 - 0+807; Selected material on top layer of embankment, included additional transport distance - Axe 6 km 0+000-0+080; Axe 17 km 1+255-1+500; Reinforcement steel B500C - Axe 17, km 1+070; Sheet pile Wall (width 0.6 m) – Axe 17 km 1+170 - 1+070; Concrete for foundation, C30 - Axe 17, km 1+070; Arrangement of geotextile - Axe 17 km 0+680-0+807; Subbase - Sand-gravel mix (0-80mm), thickness 20cm. - Axe 6 km 0+080-0+580; Transportation of crashed aggregate 0-60mm - Axe 17, km 0+400; Pile cut off - axe 17, KM 1+070; Arrangement of filter layer - Axe 17 km 0+680-0+807
April	Transportation sand-gravel materials from borrow - Axe 17 km 1+255-1+500; Transportation of crashed aggregate 15-40mm - Axe 17, km 0+680 - 0+807; Axe 17, km 0+700 - 0+780; Subbase - Sand-gravel mix (0-80mm), thickness 20cm. - Axe 6 km 0+080-0+580; Gravel Column for improving soil - Axe 17, km 0+680 - 0+807; Selected material on top layer of embankment, included

	additional transport distance - Axe 6 km 0+000-0+080; Axe 17 km 1+255-1+500; Transportation of crashed aggregate 0-60mm - Axe 17, km 0+400; Reinforcement steel B500C - Axe 17, km 1+070; Axe 49, km 0+374; Sheet pile Wall (width 0.5 m) – Axe 17 km 0+895-0+980; Concrete for Column and cross-beam, C30 - Axe 17, km 1+070; Arrangement of geotextile - Axe 17 km 0+680-0+807; Arrangement of filter layer - Axe 17 km 0+680-0+807; Construction of temporary island - Axe 17 km 0+895-0+980;
May	Reinforcement steel B500C - Axe 49, km 0+374; Axe 14, km 0+060; Construction of temporary island - Axe 17 km 0+895-0+980; Sheet pile Wall (width 0.5 m) - Axe 17 km 0+895-0+980; Subbase - Sand-gravel mix (0-80mm), thickness 20cm. - Axe 6 km 0+000-0+580; Axe 17 km 1+260-1+500; Sliding finger expansion joint for movements - Axe 49, km 0+374; Gravel Column for improving soil - Axe 17, km 0+680 - 0+807; Concrete C35/45 - Axe 49, km 0+374; Stone bed - Axe 17, km 0+160 - 0+200
June	Transportation sand-gravel materials from borrow - Axe 17 km 0+400-0+680; Reinforcement steel B500C - Axe 14, km 0+060; Construction of temporary island - Axe 17 km 0+895-0+980; Concrete for Piles, C30 - Axe 17 km 0+989; Selected material on top layer of embankment, included additional transport distance - Axe 17 km 0+400-0+620; Leveling and compaction of fill, from borrow, by layers, included additional transport distance. - Axe 17 km 0+620-0+680; Boring of Cast in situ piles d1500mm with steel casing pipes, including pile cut off (pier N2, pile N31, 27,38, 32, 26, 28,33); Subbase - Sand-gravel mix (0-80mm), thickness 20cm. - Axe 49, km 0+020- 0+200

2.4 Information on Personnel Working at the Construction Site

15. Overall, the Contractor has hired a total of 94 personnel as of June 2024. The details of these Contractor's (CC's) personnel can be found in Table 4. Furthermore, Table 5 provides information on the monthly changes in staff hiring. It is important to note that all of the hired personnel are local.

Table 4. Information of Personnel Working at Site as of December 2024

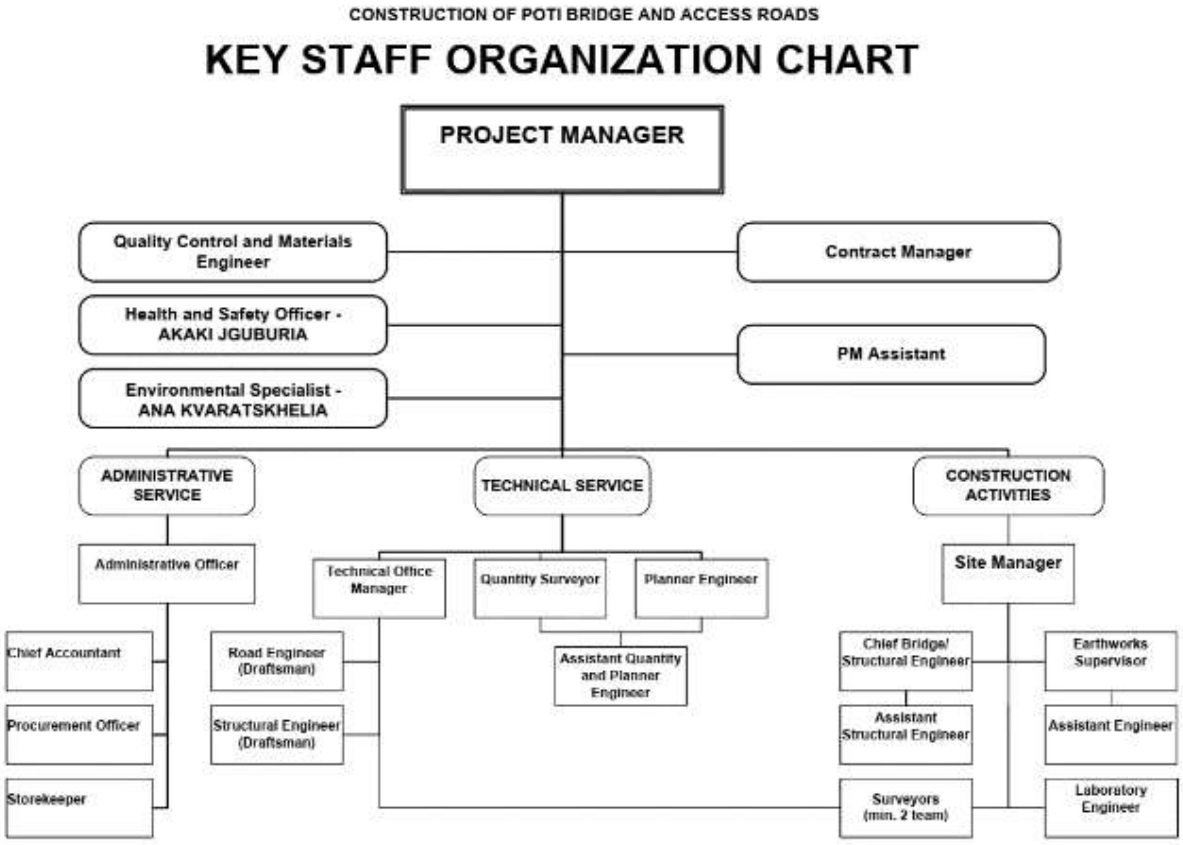
#	**Human Resources**	**Total**
1	Project manager	1
2	Assistant project manager	1
3	Drilling manager	1
4	Warehouse manager	1
5	Environmental specialist	1
6	Health and safety manager	2
7	Site manager	2
8	Transport manager	1
9	Site engineers	2
10	Surveyors	1
11	Operators	40
12	Skilled workers	18
13	Unskilled workers	12
14	Security	9
15	Janitor	2
	TOTAL	**94**
HSE Staff (breakdown of 2 personnel)		
1	Gela Talabadze	H&S Officer
2	Ana Kvaratskhelia	Environmental officer

Table 5. The Monthly Change of the Personnel

	Jan 2025	**Feb 2025**	**Mar 2025**	**Apr 2025**	**May 2025**	**Jun 2025**
Personnel	96	99	99	95	99	94

16. The Project organization chart for key management staff is provided in Figure 2.

Figure 2. The Key Staff Organization Chart of CC



2.5 Description of Any Changes to Project Design for Construction of Poti Bridge and Access Roads

17. No changes were made to the agreed-upon Project Design during this reporting period.

2.5 Description of Any Changes to Agreed Construction Methods for Construction of Poti Bridge and Access Roads

18. No changes were made to the agreed-upon construction methods during this reporting period.

3 ENVIRONMENTAL SAFEGUARD ACTIVITIES

3.1 General Description of Environmental Safeguard Activities

19. The Engineer has employed a local environmental specialist since the commencement of the Project. Additionally, Emre Duran was appointed as the International Environmental Specialist in June 2022. On the other hand, the Contractor hired an environmental specialist at the beginning of October 2022. The environmental specialists from both the Engineer and Contractor teams are working together to assess the environmental impacts caused by the construction activities and ensure compliance with the requirements of the Environmental Impact Assessment (EIA), Site-Specific Environmental Management Plan (SSEMP), and topic-specific Environmental Management Plans (EMP). Please refer to Supplementary Documents 1 for the EMP.

20. Both the Engineer's and Contractor's environmental teams conduct regular site visits to monitor SSEMP compliance. Additionally, both the Contractor and Engineer have dedicated Health and Safety (H&S) teams, which also conduct regular site visits to ensure compliance with Personal Protective Equipment (PPE), traffic safety, and other safety-related issues. Detailed information about the environmental site visits can be found in Section 3.2, 'Site Audits'.

21. During the reporting period no grievances have been received or recorded.

3.2 Site Audits

22. Ms. Keti Nadirashvili was appointed as the Local Environmental Specialist in February 2025. Since her appointment, she has conducted regular weekly and monthly site visits, covering both the office facilities and active construction areas.
23. The site visits involve visual inspections of the construction activities. A photographic record of these audits is available in Supplementary Document 2.
24. During the reporting period, both the Local and International Environmental Specialists identified several issues related to hazardous waste management, general site organization, occasional minor oil spills, and the storage conditions of hazardous materials. The Contractor was instructed to undertake corrective measures, including the proper collection and designated storage of hazardous waste, appropriate segregation and disposal of various waste streams, and enhanced storage practices for hazardous substances.
25. In addition, a Non-Conformance Report (NCR) was issued due to the absence of a sedimentation pool at the pile drilling location, which had been previously noted. Following the issuance of the NCR, the Contractor constructed the required sedimentation pool within two days (*see* Supplementary Document 8)
26. Despite repeated warnings, oil-contaminated areas continue to be inadequately cleaned. The Contractor is also required to improve the maintenance and cleaning frequency of the oil collection pit and its surrounding area within the workshop zone.

3.3 Issues Tracking (Based on Non-Conformance Notices)

Environmental Issues

27. The Engineer's environmental team conducts regular site visits to the construction areas to address various environmental issues. As mentioned above they focus on hazardous material practices, including proper handling and storage of fuel and hazardous materials. The team assesses waste and hazardous waste management for regulatory compliance. Fuel and oil spills are closely monitored, with emphasis on prevention and cleanup. Additionally, dust control is a priority due to its impact on air pollution. Finally, the team evaluates topsoil management, ensuring excavation and construction activities preserve and restore topsoil.
28. As mentioned above, the majority of the environmental issues encountered are shared with the Contractor and are being resolved within an appropriate timeframe. However, as previously noted, the response time for cleaning oil spills needs to be expedited. This has been reiterated with the Contractor

Health and Safety Issues (Based on Non-Conformance Notices)

29. The Health and Safety (H&S) teams of both the Engineer and the Contractor are independently monitoring key H&S aspects across the construction sites. These include:

- Working at height
- Use of power tools and equipment
- Lifting gear
- Housekeeping
- Electrical safety and energy management
- Excavation safety
- Heating conditions in rest areas
- Use of Personal Protective Equipment (PPE)

30. During the reporting period, a total of twelve (12) Non-Conformance Reports (NCRs) were issued in relation to H&S practices. These NCRs addressed deficiencies such as unsafe working at height, lack of warning signs on electrical distribution boxes, improper storage of oxygen cylinders, and inadequate use of PPE.
31. Additionally, one (1) NCR was issued regarding an environmental non-conformance, specifically the absence of a sedimentation pool at the pile drilling location, as noted above.

3.4 Trends

32. Environmental observations during the reporting period indicate recurring challenges in hazardous material management and occupational safety practices. While minor oil and fuel spills remain infrequent, issues related to the storage of hazardous chemicals and the

condition of designated containment areas continue to require attention. Although corrective actions have been implemented—such as the timely construction of a sedimentation pool following the issuance of a Non-Conformance Report (NCR)—preventative measures must be reinforced through targeted training and stricter oversight.

33. On the health and safety front, repeated non-conformances were recorded related to working at height, electrical safety, and improper use or absence of personal protective equipment (PPE). These trends highlight the need for strengthened supervision and continuous safety awareness initiatives. Excavation safety and proper handling of lifting gear also remain ongoing areas of concern.
34. No community health and safety (CHS) incidents were reported during the reporting period; however, traffic safety remains a potential risk. The provision of additional training and the deployment of more traffic marshals or flagmen may further mitigate this risk and support continued positive performance in this area.

3.5 Unanticipated Environmental Impacts or Risks

35. There are no unanticipated environmental impacts or risks.

4 RESULTS OF ENVRIONMENTAL MONITORING

4.1 Overview of Monitoring Conducted during Current Period

36. In March 2023, the CC hired a consultant firm Ltd „Naseto Group" to conduct instrumental environmental monitoring, which includes assessing air and water quality, as well as measuring vibration and noise levels. The findings from this study are detailed in the subsequent sections. The most recent environmental monitoring report is provided as Supplementary Document 3.
37. There were six monthly environmental monitoring conducted during this reporting period.

Surface Water Quality

38. Following the project extension and the corresponding revision of the monitoring schedule, surface water sampling has been conducted on a quarterly basis. As a result, two sampling events were carried out during the reporting period—in July and December 2025. Surface water samples were collected from both upstream and downstream locations along the River Rioni. The geographic coordinates of the sampling points are provided in Table 6, and their locations are illustrated in Figure 3.

Table 6. Surface Water Quality Monitoring Locations

Location	Coordinates	
	X	Y
River Rioni downstream	722788	4674713
River Rioni upstream	723505	4674040

Figure 3. Water Quality Sampling Locations on the Rioni River

39. The results of surface water quality monitoring for the upstream and downstream sections of the River Rioni are presented in Table 7 and Table 8, respectively. None of the monitored parameters exceeded the national Maximum Allowable Concentration (MAC) limits during the reporting period.
40. The Contractor is obligated to ensure full compliance with the Environmental Impact Assessment (EIA) requirements during all construction activities conducted near the Rioni River and the amelioration canal, both of which are vital local water resources. To safeguard these sensitive environments, the Contractor must implement appropriate measures to prevent oil and fuel spills. The discharge of untreated wastewater into these water bodies is strictly prohibited. In addition, erosion control measures must be implemented to prevent sediment-laden runoff from entering the river, thereby preserving the ecological integrity of the surrounding area.

Table 7. Surface Water Quality Monitoring Result for Upstream of River Rioni

Parameters	Unit	EIA Standards (National MAC)	*Baseline results (Apr 2023)*	*Baseline results (May 2023)*	*Jul 2024*	*Oct 2024*	*Jan 2025*	*Apr 2025*
pH	-	6.5-8.5	8.20	7.70	8.28	8.39	8.40	8.03
Saltiness	-	-	0.10	0.10	0.10	0.10	0.16	0.15
TDS	-	-	106.00	166.30	139.00	121.00	322.40	324.70
Electr. Conductivity	-	-	212.00	234.00	244.00	196.00	244.00	225.00
Turbidity	-	-	429.00	452.00	127.00	57.60	537.40	381.10
Ammonia/ammonium ion NH3	mg/L	0.39	1.81	0.25	0.27	0.29	0.21	0.09
Chlorides Cl[1]	mg/L	300.00	647.00	35.90	78.00	86.00	67.30	19.70
Weighted particles TSS	mg/L	Increase no more than 0.75 mg/L	212.00	240.20	124.00	116.10	483.66	298.40
Total nitrogen N	mg/L	-	8.83	1.53	2.96	3.17	3.02	1.19
Total iron Fe	mg/L	0.30	0.05	0.17	0.23	0.26	0.24	0.15
Arsenic (total) As	mg/L	0.05	<0.001	<0.001	0.0056	0.0043	0.0038	0.0022
Total Coliforms	MPN	300.00	-	-	-	-	-	-

Table 8. Surface Water Quality Monitoring Result for Downstream of River Rioni

Parameters	Unit	EIA Standards (National MAC)	*Baseline results (Apr 2023)*	*Baseline results (May 2023)*	*Jul 2024*	*Sep 2024*	*Jan 2025*	*Apr 2025*
pH	-	6.5-8.5	8.30	7.70	8.23	8.38	8.43	7.94
Saltiness	-	-	0.10	0.10	0.10	0.10	0.17	0.16
TDS	-	-	107.00	116.80	140.00	122.00	324.70	322.40
Electr. Conductivity	-	-	214.00	236.00	246.00	198.00	247.00	228.00
Turbidity	-	-	435.00	457.00	129.00	58.10	541.10	387.30
Ammonia/ammonium ion NH3	mg/L	0.39	1.70	0.25	0.27	0.29	0.21	0.11
Chlorides Cl[2]	mg/L	300.00	640.00	35.00	81.00	86.20	67.80	21.40
Weighted particles TSS	mg/L	Increase no more than 0.75 mg/L	210.00	239.80	132.00	116.40	484.27	312.60
Total nitrogen N	mg/L	-	8.72	1.52	3.01	3.19	3.03	1.21
Total iron Fe	mg/L	0.30	0.05	0.16	0.24	0.27	0.25	0.22
Arsenic (total) As	mg/L	0.05	<0.001	<0.001	0.0056	0.0042	0.0038	0.0021
Total Coliforms	MPN	300.00	-	-	-	-	-	-

[1] Local meat and fish processing facilities in the vicinity employ chlorine for wastewater treatment

[2] Local meat and fish processing facilities in the vicinity employ chlorine for wastewater treatment

Noise and Vibration Monitoring

41. The Contractor and the Engineer have identified two points for the monitoring of noise and vibration. The coordinates of these monitoring locations are provided in Table 9, and their positions are illustrated in Figure 4.

Table 9. Noise and Vibration Monitoring Locations

Location	Coordinates	
	X	Y
Axis 49	723230	4674705
Axis 17	722690	4674127

Figure 4. Noise, Vibration and Air Quality Sampling Locations

42. Noise monitoring results at Axis 17, as presented in Table 10, exceeded the International Finance Corporation (IFC) noise level standards during the months of January and April. However, according to the U.S. Federal Highway Administration's Noise Measurement Handbook, indoor noise levels may be reduced by up to 25 dB(A) when windows are closed. It is also noted that the nearest receptor at this location is the Nikora Meat Production factory, which is classified as a less noise-sensitive facility compared to residential areas.
43. Elevated noise levels were consistently recorded at Axis 17, where the factory is situated. In response, the Contractor is expected to implement several mitigation measures to reduce

noise impacts in this area. These include avoiding the simultaneous operation of multiple high-noise-generating equipment, adjusting work schedules to limit noise exposure during sensitive hours, and, where necessary, replacing existing machinery with lower-noise alternatives.

Table 10. Measured Noise Levels

	Average Equivalent Noise level (LAeq) Measurement dB(A)		
Location/Month	Axis 49	Axis 17	**IFC Standard**
Jan-25	63.6	77.1	**70.0**
Feb-25	61.8	58.3	
Mar-25	64.5	68.7	
Apr-25	63.7	82.2	
May-25	61.9	56.1	
Jun-25	56.7	67.1	

44. Vibration monitoring results, as presented in Table 11, indicate that all recorded levels remained below detectable or permissible thresholds. Nonetheless, continuous monitoring during pile driving activities remains essential to ensure that potential vibration impacts on nearby receptors are effectively managed and controlled.

Table 11. Measured Vibration Levels

Location/Session	**Month**	**Vibration Speed**		**Vibration Acceleration**		***MPC for Vibration Speed (dB)**	***MPC for Vibration acceleration (dB)**
		mm/sc	dB	**mm^2/sc**	dB		
Axis 49	**Jan-25**	<0.1	<66	<0.1	<100	112	126
	Feb-25	<0.1	<66	<0.1	<100	112	126
	Mar-25	<0.1	<66	<0.1	<100	112	126
	Apr-25	<0.1	<66	<0.1	<100	112	126
	May-25	<0.1	<66	<0.1	<100	112	126
	Jun-25	<0.1	<66	<0.1	<100	112	126
Axis 17	**Jan-25**	<0.1	<66	<0.1	<100	112	126
	Feb-25	<0.1	<66	<0.1	<100	112	126
	Mar-25	<0.1	<66	<0.1	<100	112	126
	Apr-25	<0.1	<66	<0.1	<100	112	126
	May-25	<0.1	<66	<0.1	<100	112	126
	Jun-25	<0.1	<66	<0.1	<100	112	126

Air Quality

45. Air quality monitoring will utilize the existing noise and vibration monitoring locations (Figure 4) to assess construction impacts on nearby sensitive receptors (Table 12). These locations will be used for passive SO_x (Sulfur Oxides), NO_x (Nitrogen Oxides), sampling, and dust measurements.

Table 12. Air Quality Monitoring Locations

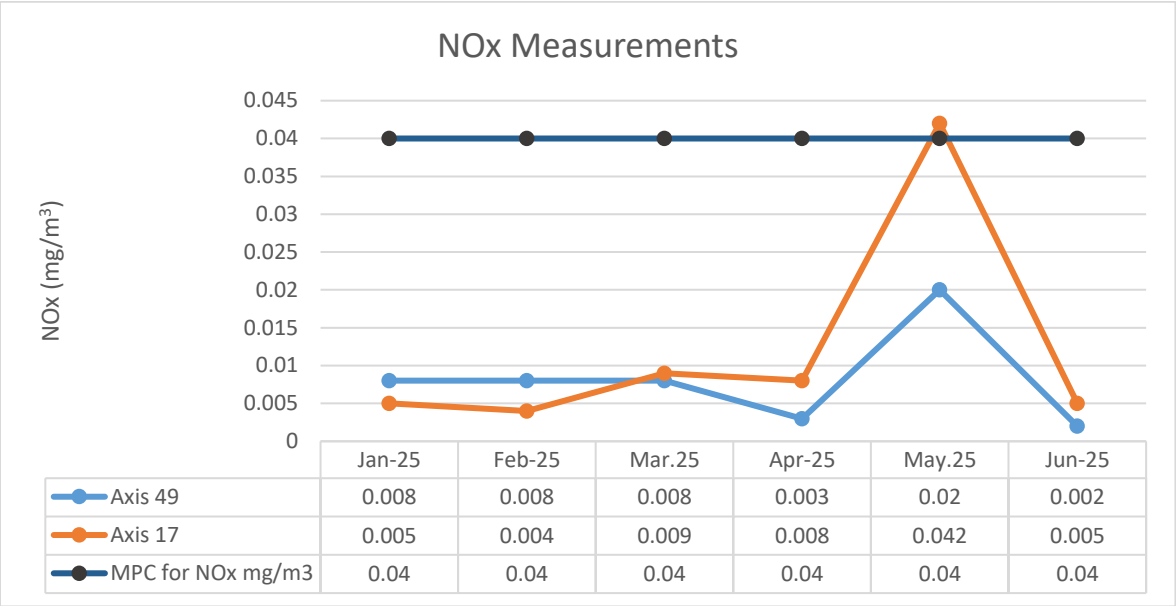
Location	Coordinates	
	X	Y
Axis 49	723230	4674705
Axis 17	722690	4674127

46. Air quality monitoring results for nitrogen oxides (NO_x), sulfur oxides (SO_x), and carbon monoxide (CO) are presented in Table 13, with corresponding visual representations provided in Figures 5, 6, and 7, respectively. Results for particulate matter (PM) are provided in Table 14 and illustrated in Figure 8.
47. The monitoring data indicate that concentrations of SO_x, NO_x, CO, and PM remained within the national air quality standards of Georgia throughout the reporting period, with the exception of a single NO_x exceedance recorded in May 2025 at Axis 17

Table 13. NO_x SO_x CO Measurement Results

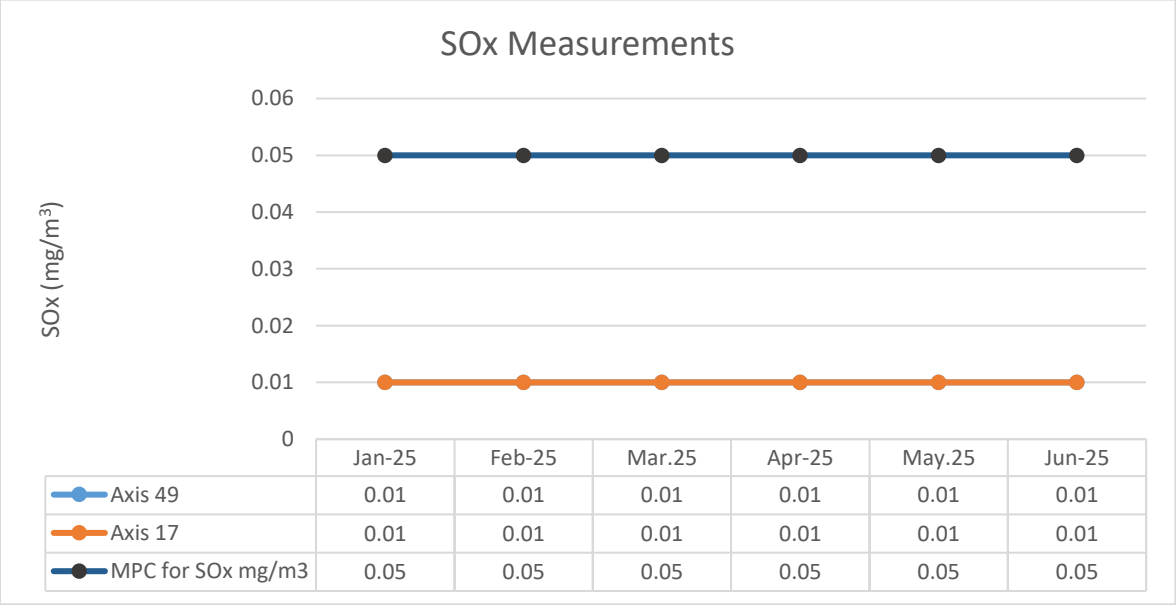
Location	Month	SO_x mg/m³	NO_x mg/m³	CO mg/m³	MPC for SO_x mg/m³	MPC for NO_x mg/m³	MPC for CO mg/m³
Axis 49	Jan-25	<0.01	0.008	0.65	0.05	0.04	-
	Feb-25	<0.01	0.008	0.16	0.05	0.04	-
	Mar.25	<0.01	0.008	0.26	0.05	0.04	-
	Apr-25	<0.01	0.003	0.43	0.05	0.04	-
	May.25	<0.01	0.02	0.13	0.05	0.04	-
	Jun-25	<0.01	0.002	0.21	0.05	0.04	-
Axis 17	Jan-25	<0.01	0.005	0.51	0.05	0.04	-
	Feb-25	<0.01	0.004	0.22	0.05	0.04	-
	Mar.25	<0.01	0.009	0.31	0.05	0.04	-
	Apr-25	<0.01	0.008	0.67	0.05	0.04	-
	May.25	<0.01	0.042	0.23	0.05	0.04	-
	Jun-25	<0.01	0.005	0.26	0.05	0.04	-

Figure 5. NO_x Measurement Results



	Jan-25	Feb-25	Mar.25	Apr-25	May.25	Jun-25
Axis 49	0.008	0.008	0.008	0.003	0.02	0.002
Axis 17	0.005	0.004	0.009	0.008	0.042	0.005
MPC for NOx mg/m3	0.04	0.04	0.04	0.04	0.04	0.04

Figure 6. SO_x Measurement Results



	Jan-25	Feb-25	Mar.25	Apr-25	May.25	Jun-25
Axis 49	0.01	0.01	0.01	0.01	0.01	0.01
Axis 17	0.01	0.01	0.01	0.01	0.01	0.01
MPC for SOx mg/m3	0.05	0.05	0.05	0.05	0.05	0.05

Figure 7. CO Measurement Results

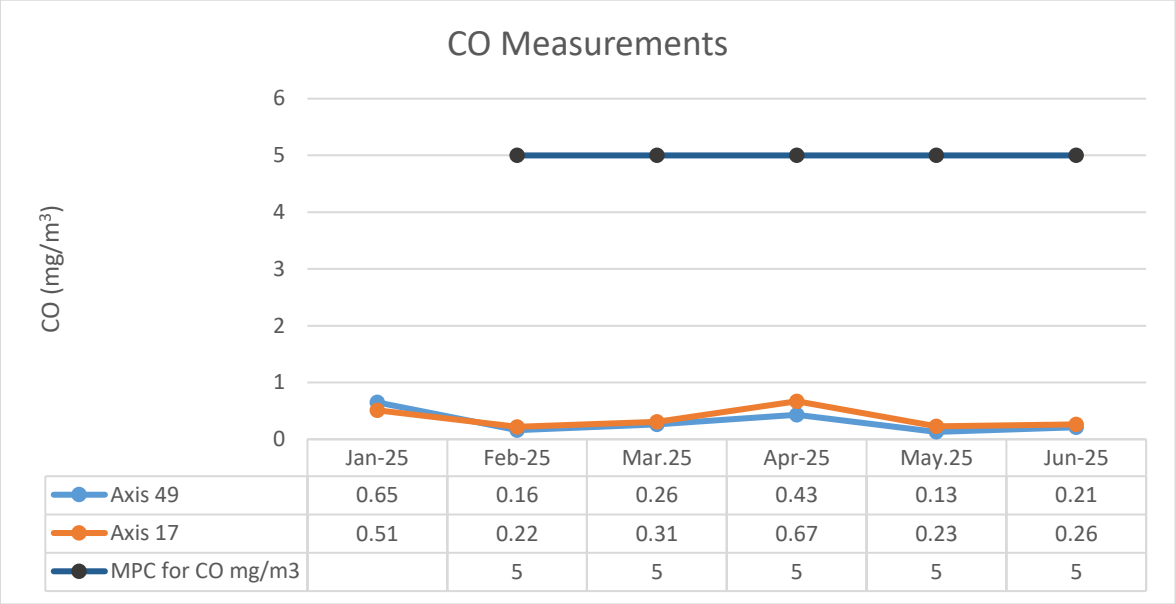
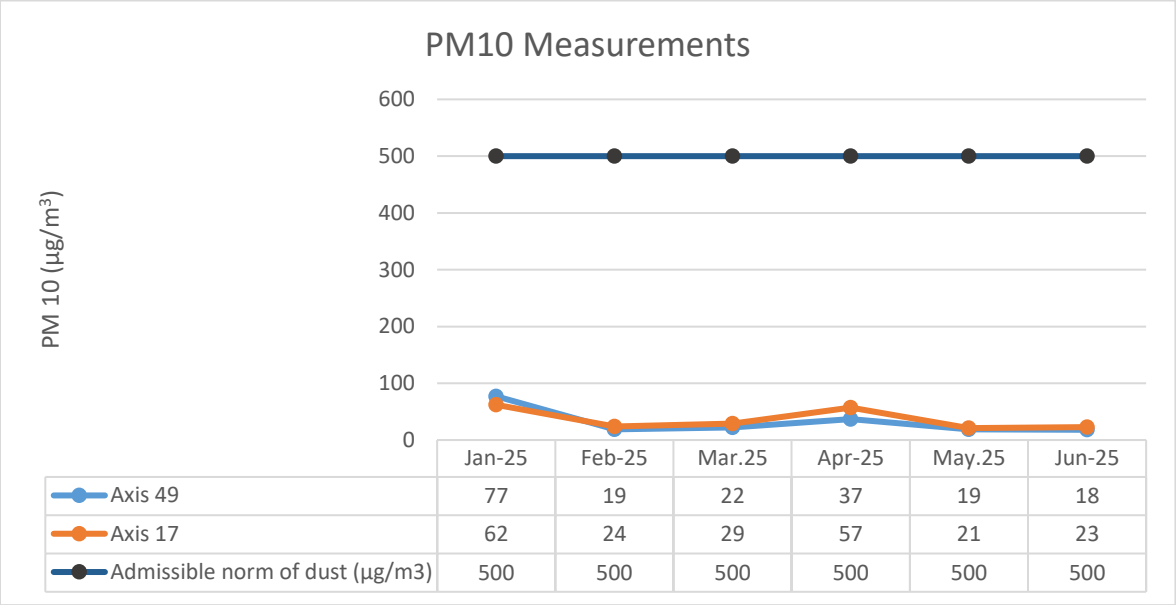


Table 14. PM Measurement Results

Location	Session	PM2.5 (µg/m³)	PM10 (µg/m³)	PM Total (µg/m³)	Admissible norm of dust (µg/m³)
Axis 49	Jan-25	53	77	84	500
	Feb-25	11	19	23	500
	Mar.25	18	22	25	500
	Apr-25	22	37	62	500
	May.25	11	19	31	500
	Jun-25	13	18	22	500
Axis 17	Jan-25	46	62	75	500
	Feb-25	17	24	31	500
	Mar.25	24	29	33	500
	Apr-25	38	57	81	500
	May.25	9	21	37	500
	Jun-25	16	23	39	500

Figure 8. PM10 Measurement Results



48. An ichthyological study focusing on sturgeon species in the Rioni River has been initiated. The Construction Contractor engaged a certified third-party team to carry out the sturgeon survey, which aims to establish a baseline biodiversity assessment—an element not included in the final Environmental Impact Assessment (EIA) but required in accordance with Asian Development Bank (ADB) policy.
49. Under national legislation, fishing activities in the Rioni River are restricted to scientific research and require a permit. The third-party team submitted a permit application to the Ministry of Environmental Protection and Agriculture (MoEPA) on 1 May 2024. The permit was granted in May 2025. The field survey will commence once river flow conditions are deemed suitable.
50. While awaiting the permit, the team conducted a desk review of available studies and existing biodiversity records relevant to the project area. A draft English-language report was completed in May 2025, and the findings of this preliminary assessment are included in Supplementary Document 5.

4.2 Trends

51. Water, noise, vibration and air quality parameters exhibited consistent results when compared to the previous reporting period. Overall environmental monitoring data followed similar trends.

4.3 Summary of Monitoring Outcomes

52. The CC engaged the consultancy firm Ltd “Naseto Group” in March 2023 to undertake comprehensive instrumental environmental monitoring. This program encompasses the collection and analysis of air quality, surface water quality, noise, and vibration data. The monitoring activities are carried out periodically at pre-identified locations within the project area. These measurements aim to evaluate environmental impacts related to construction activities and to ensure compliance with national environmental standards and international requirements, such as those set by the International Finance Corporation (IFC).
53. The monitoring results during the reporting period reflect general compliance with national and international environmental standards across several parameters, with a few notable exceptions requiring attention and corrective action.

54. **Surface Water Quality**: Surface water samples collected upstream and downstream of the Rioni River remained within national Maximum Allowable Concentration (MAC) limits for all tested parameters. This indicates stable water quality conditions in relation to construction activities. However, continued preventive measures—particularly to prevent erosion and spillages near water bodies—remain critical to sustaining this trend.

55. . **Air Quality**: Air quality monitoring results for SO_x, PM, and CO were within national limits. A single exceedance was recorded for NO_x in May 2025 at Axis 17. This outlier highlights the need for localized mitigation efforts in high-activity zones, particularly around heavy machinery operation.

56. **Noise Monitoring**: Noise levels exceeded International Finance Corporation (IFC) thresholds at Axis 17 during January and April. Despite this, the closest receptor—a meat processing facility—is less sensitive than residential receptors, partially mitigating the impact. Several noise reduction measures have been planned, including equipment scheduling adjustments and the use of lower-noise machinery.

57. **Vibration Monitoring**: No exceedances of vibration thresholds were recorded during the reporting period. Nevertheless, continued monitoring during pile driving is recommended to ensure protection of nearby structures and receptors.

58. **Biodiversity Monitoring**: An ichthyological (sturgeon) study has been initiated in accordance with ADB requirements. Although delayed due to permitting processes, preliminary assessments were completed through a desk review, and field activities are expected to begin once river conditions are suitable.

4.4 Material Resources Utilization

59. The detailed overview of material deliveries to the construction site during the semi-annual period from January to June 2025 is given such as: Gravel shipments totaled 30,744 m^3, contributing to a cumulative project amount of 192,665 m^3. This period there were 2,519.372 tons of Structural Steel Type S 355 J2W+N. The total number of structural steels reached 2,780.271 kg, and Steel Sheet Piles amounted to 445.55 tons. The supply of Prefabricated Vertical Drains totaled 332,150.00 m. Notably, no deliveries of Separation Geotextile or Steel sheet piles, with cumulative amounts maintaining at 32,400 m^2 and 445.55 tones, respectively. The supply of Crushed Aggregate 15-40mm were recorded as 3,213.00 during this period, with cumulative amounts maintaining at 24,848.00 m.

4.5 Waste Management

60. The Contractor has developed a Waste Management Plan outlining the procedures and requirements for the proper handling, storage, and disposal of waste materials. The plan aims to minimize environmental risks by promoting systematic and compliant waste management practices throughout the construction site.
61. To ensure proper waste disposal, the Contractor has established formal agreements with authorized service providers. An agreement has been signed with Black Sea Waste Management for the collection and transportation of hazardous waste. Additionally, a separate agreement with the Khobi Municipality governs the collection and transportation of domestic waste. To improve on-site waste handling, garbage bins have been placed in the camp area and across various construction zones. Furthermore, under a separate arrangement, all replaced materials—such as used tires and oils—are transferred to the Tegeta Motors facility for storage, rather than being kept at the construction site.
62. During the reporting period, the Contractor estimated that approximately 220 m^3 of municipal waste was generated. The site is equipped with two septic tanks, each with a capacity of 8 m^3. A total of 32 m^3 of domestic wastewater was removed through two separate evacuations. Detailed waste management data for the period is provided in Table 15.

Table 15. Waste Log (July-December 2024)

Domestic/Hazardous Waste & Sewage	Volume /kg/m^3	Licensed Company	Transferred
Household waste	220		
Sewage water	32		
Used tires	-	Tegeta Motors	Stored in the Company
Hydraulic and used oil	-	Tegeta Motors	Stored in the Company
Waste paints and varnishes	-		Stored in a designated area
Chemical additive tanks	-	-	-
Oil drums	-	-	Stored in a designated area
Printer tonner	-	-	-
Absorbents (e.g., oil filters, polluted clothes and materials)	-	-	Stored in a designated area
Medical Waste	-	-	-
Metal Scraps	-	-	Stored in a designated area
Wood Waste	-	-	Stored in a designated area
Contaminated soil	-	-	-

63. The Contractor has signed a contract with Gocha Tsaava, a local individual who will provide appropriate equipment and services for toilet cleaning and sanitation.

4.5.1 Current Period

64. The primary source generating a large amount of spoil is earthworks, specifically the excavation of topsoil and subsoil materials. The excavated materials are stored in a land plot designated for topsoil and spoil with a registration number 45.08.25.076. The estimated volumes for spoil generation in this reporting period are as follows:

- Estimated spoil volume: 600 m^3
- Estimated topsoil volume: 0 m^3

4.6 Health and Safety

65. The H&S Team is responsible for daily implementation, supervision, and monitoring of on-site construction activities to ensure occupational and community health and safety.

66. No incidents involving community members or traffic incidents were reported during the reporting period.

4.6.1 Worker Safety and Health

67. The Health and Safety (H&S) teams of both the Engineer and the Contractor conduct regular site inspections to monitor compliance with safety protocols. In addition, mandatory H&S and environmental induction training is provided to all newly mobilized personnel. Specialized training sessions are also delivered to reinforce a strong safety culture, covering critical topics such as working at height, driving safety, earthwork activity requirements, and lifting operations. H&S specialists are responsible for preparing training materials, conducting risk assessments for high-risk activities, and developing specific work procedures to address identified hazards.
68. During the reporting period, a total of twelve (12) Non-Conformance Reports (NCRs) were issued in relation to H&S practices. These NCRs addressed a range of issues including unsafe working at height, scattered electrical cables, outdated or missing safety signage, improper storage of oxygen cylinders, and insufficient use of Personal Protective Equipment (PPE). Nine (9) identified non-conformances have been addressed and closed by the Contractor, while the remaining cases are in the process of being resolved. Supporting documentation and selected examples of the NCRs are provided in Supplementary Document 6.
69. The recurring nature of certain H&S non-conformances—particularly those related to working at height, electrical safety, and PPE usage—emphasizes the need for enhanced supervisory oversight and ongoing safety awareness programs. In addition, excavation safety and the proper handling of lifting gear remain key areas for continuous improvement.

4.6.2 Training

70. The Contractor continues the training program to foster a culture of responsible behavior encompassing mandatory inductions and job-specific training. Four training sessions were conducted by the H&S inspectors and six training sessions were conducted by Alcotest during this period.

71. During the reporting period, the training program covered the following topics:

- Induction training,
- Tree cutting,
- Tops soil stripping and storage,
- Hazardous non-hazardous waste handling storage,
- Driving safety,
- Lifting operations Refueling process,
- Refueling Process,
- Earthwork activities,

72. Throughout the reporting period, ninety-four (94) toolbox talks were conducted for the employees of both the contractors and subcontractors, addressing the following subjects:

- Suspended loads and lifting;
- Working at height;
- Moving vehicles;
- Usage of power tools (angle grinder, chain saw);
- Fire safety;
- Use of paints and solvents;
- Emergency Evacuation and Fire Extinguisher use
- Excavation;
- Lifting of gas pipes;
- Hazards related to the excavator and controls;
- Handling/storage of fuel;
- The hazards and controls, related to the diesel truck.
- First aider
- Hand signals and safety signs

73. The Contractor conducted Environmental and Social (E&S) training sessions for 11 personnel and Health and Safety (H&S) training sessions for 32 personnel during the reporting period. The training covered a wide range of topics, including basic environmental legislation, topsoil preservation, dust and air quality management, waste management, land contamination, spill prevention, biodiversity protection, noise control, resource efficiency, chemical management, community health and safety, grievance redress mechanisms, cultural heritage awareness, code of conduct, concrete handling procedures, emergency preparedness and response, working at height, lifting operations, and incident reporting protocols.
74. Sample attendance sheets and photographic documentation of the E&S and H&S training sessions are provided in Supplementary Document 7.

5 FUNCTIONING OF THE SEMP

5.1 SEMP Review

75. The Contractor has developed Site-Specific and Topic-Specific Environmental Management Plans (EMPs) in accordance with the guidance of the Supervision Consultant. These plans were endorsed by the Supervision Consultant (SC) and approved by the Project Implementation Unit/Resident Department (PIU/RD), and, if necessary, by the Asian Development Bank (ADB), prior to the commencement of civil works. During the preparation of the Site Specific Environmental Management Plans (SSEMPs), the existing EMP serves as a baseline document for the Contractor (Supplementary Document 1).

76. Throughout the reporting period, the Engineer held regular meetings with the Contractor's environmental team to finalize outstanding environmental management plans and update previously approved versions, where necessary. This review and revision process remains ongoing. The current status of all environmental plans is summarized in Table 16.

Table 16. Reviewed Site Specific Environmental Management Plans

No	Plan / Method Statement	Status
1	Site Specific Environmental Management Plan	Updated/Waiting for Approval
2	Environmental Management Plan	Approved
3	Waste Management Plan (Construction Phase)	Approved
4	Emergency Response Plan	Approved
5	Spill Management Plan	Approved
6	Wastewater Management Plan	Approved
7	Chance Find Procedure	Approved
8	Labor Management Procedures	Approved
9	Clearance Cultivation Restoration Plan	Approved
10	Aggregate and Borrow Pit Management Plan	Approved
11	Asphalt Rock Crushing Batching Plant Management Plan	Approved
12	Topsoil Disposal and Erosion Management Plan	Approved
13	Air Quality Management Plan	Approved
14	Bridge Construction Management Plan	Approved
15	Laydown Area and Camp Management Plan	Approved
16	Spoil Disposal Management Plan	Approved
17	Biodiversity Action Plan	Approved
18	Tree compensation plan	Approved

6 GOOD PRACTIVE AND OPPORTUNITY FOR IMPROVEMENT

6.1 Good Practice

77. The Contractor continues to implement environmentally responsible practices and demonstrates a strong commitment to health and safety across the project site, as confirmed through routine site inspections. One notable example includes the effective management of waste in both the camp and active work areas. In particular, the designated hazardous waste storage area is being utilized appropriately and in accordance with regulatory requirements.

6.2 Opportunities for Improvement

78. The following areas have been identified as requiring improvement in relation to environmental and H&S performance.
    - Strengthen procedures for the handling, storage, and disposal of hazardous materials by ensuring proper labeling, secure containment, and controlled access to minimize risks to workers and the environment.
    - Enhance dust suppression efforts, particularly during the hot season, by increasing the frequency of watering on auxiliary roads to maintain acceptable air quality for both site personnel and nearby communities.
    - Improve safety measures during piling operations to provide adequate protection for workers and mitigate environmental risks. This should include the installation of visible signage and physical barriers around excavation areas to clearly mark boundaries and restrict unauthorized access.
    - Implement comprehensive fall prevention systems, including the provision of safe access and egress points and the routine inspection of work-at-height equipment to ensure its integrity.
    - Enforce the mandatory use of appropriate Personal Protective Equipment (PPE) for all personnel working at height. This includes safety harnesses, helmets, eye protection, and anti-slip footwear.
    - Improve electrical safety by ensuring proper management of electrical cables and the upkeep of clear, up-to-date warning signage throughout the site. This includes eliminating scattered cables and maintaining adequate safety signage to prevent hazards.

7 SUMMARY AND RECOMMENDATIONS

7.1 Summary

79. Activities conducted during the reporting period included the transportation of sand, gravel materials, and crushed aggregates; implementation of gravel column improvements; construction of a peninsula to facilitate river-based works; execution of borehole casting; and placement of stone bedding for abutments and concrete piles.
80. During the reporting period, agreements with authorized service providers ensure waste collection and disposal. Environmental and Social (E&S) as well as H&S training sessions have been successfully delivered to personnel, covering a wide range of relevant topics such as working at heights, chemical management, emergency response, and incident reporting, contributing to enhanced workforce awareness
81. Surface water quality monitoring indicates that all tested parameters remained within national Maximum Allowable Concentration (MAC) limits, with no exceedances observed, reflecting stable water quality conditions near the Rioni River. Air quality measurements generally complied with national standards, except for a single NO_x exceedance recorded at Axis 17 in May 2025. Noise monitoring revealed some exceedances at Axis 17, near the Nikora Meat Production factory, though indoor noise attenuation and the non-residential nature of the receptor reduce potential impacts. Vibration levels remained below detectable thresholds, with continued monitoring recommended during pile driving activities.
82. Health and Safety teams from both the Engineer and Contractor actively monitor key aspects including working at height, electrical safety, lifting operations, excavation safety, housekeeping, and PPE usage. Despite this, twelve Non-Conformance Reports (NCRs) were issued, primarily related to unsafe working at height, scattered electrical cables, outdated signage, improper oxygen cylinder storage, and inadequate PPE use. These NCRs have been addressed and closed, but recurring issues underscore the need for strengthened supervision and continuous safety training.
83. The ichthyological study on sturgeon species in the Rioni River has commenced following permitting delays, with preliminary desk-based assessments completed and field surveys planned when river conditions permit.

7.2 Recommendations

84. The following recommendations are proposed for implementation during the next reporting period:

- Strengthen hazardous material management by enforcing proper labeling, secure storage, and containment protocols to mitigate risks to workers and the environment
- Increase dust suppression activities, particularly by enhancing watering frequency on auxiliary roads during dry and hot conditions to improve air quality.

- Enhance safety measures during piling and excavation operations, including the installation of clear signage and physical barriers to prevent unauthorized access and protect personnel.
- Improve fall prevention efforts by ensuring safe access and egress, conducting regular inspections of work-at-height equipment, and enforcing mandatory use of appropriate Personal Protective Equipment (PPE), such as safety harnesses, helmets, eye protection, and non-slip footwear.
- Address electrical safety hazards by maintaining organized cable management and up-to-date warning signage throughout the site.
- Continue comprehensive Environmental, Social, and Health & Safety training programs to reinforce safety culture and regulatory compliance.
- Maintain vigilant noise and vibration monitoring, particularly during piling activities, to ensure adherence to applicable standards and minimize impacts on nearby receptors.
- Expedite commencement of ichthyological field surveys following receipt of permits to fulfill biodiversity baseline data requirements under ADB policy and national legislation
- Ensure all management plans are reviewed and updated regularly to reflect current site conditions, operational risks, and regulatory requirements.
- Provide targeted training sessions for site personnel based on the identified areas for improvement, with a focus on practical application and risk mitigation.

8 SUPPLEMENTARY DOCUMENT 1 – ENVIRONMENTAL MANAGEMENT PLAN

Environmental Management Plan for Pre-Construction Phase

Affected Aspect	Potential Impact/ Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
Pre-Construction Stage					
No Net Loss / Net Gain Approach	Impacts on sturgeon species in the Rioni River	• Measure to achieve no net loss / net gains: Implement high standard monitoring program for sturgeon.	Project Cost	RD, ADB	N/A
EMP contractual obligations	Implementation of Project EMP and Specific Environmental Management Plan (SEMP)	• Before the commencement of civil works, the Contractor shall prepare a Specific EMP (SEMP) for Engineer endorsement and RD approval. ADB shall also review the SEMP. The SEMP will present a detailed implementation plan based on the Contractor's actual construction methodologies, work schedule, type/specifications, and number of construction plants to be used • The SEMP shall be (a) consistent with the SEMP template included in the EIA (see), (b) consistent with the project EMP, and (c) prepared based on the Contractor's activities and corresponding locations. • The SEMP will provide the following: i. The Contractor's organizational structure shows the implementation, supervision and reporting, and responsibilities of key personnel ii. The Project program and work activities iii. The Contractor's topic and site-specific plans are as follows: ○ Waste Management Plan ▪ Wastewater Management Plan ▪ Spoil Disposal Management Plan ○ Soil Erosion Management Plan ○ Traffic Management Plan ○ Method Statement for Temporary Roads ○ Aggregate and Borrow Pits Management Plan ○ Employment and Procurement Procedure ○ Occupational and Community Health and Safety Management Plan ○ Emergency Response Plan ○ Waterway Safety Plan ○ Method Statement for River Crossings ○ Air Quality Plan ○ Spill Management Plan ○ Clearance, Revegetation, and Restoration Management Plan ○ Noise Management Plan ○ Biodiversity Management Plan ○ Laydown Area and Construction Camp Management Plan ○ Asphalt, Rock Crushing, and Concrete Batching Plant Management Plans ○ Bridge Construction Plan • The Occupational and Community Health and Safety Management Plan shall be consistent with the template provided in the EIA. • The Soil Disposal Management Plan shall utilize the assessment template included in the EIA. • The Contractor will retain the expertise of a qualified Environment and Social Officer (ESO) and Community Liaison Officer (CLO). • The Contractor will obtain all necessary permits and approvals before commencing construction activities.	Contractor Cost	Contractor to Implement Mitigation	Engineer, RD, ADB
Training	The Contractor's training and awareness-raising programs	• All personnel shall undergo a Project site induction that includes the Project's environmental requirements.	Contractor Cost	Contractor to Implement Mitigation	RD, ADB

Climate Change	Future climate changes may cause damage to the bridge and approach roads	• The Project road will be constructed based on an embankment height (road centerline level) which accommodates the historic P1% (1 in 100 years) flood event. • Further climate change studies must be carried out as necessary to ensure that climate change considerations have been incorporated in the design of the bridge and approach roads.	Project Cost	Detailed Design Consultant	RD
Noise/Vibration	Vibration emissions resulting from the use of machinery and equipment and vehicle circulation	• The Contractor will survey the status of the buildings nearest to the project site. The surveys will cover the following aspects: ○ Overall condition of the structures, both exterior ○ and interior. ○ Document defects and preexisting cracks observed in the structure using digital imagery, notes, measurements, and sketches. ○ The survey findings shall be agreed upon by the property owner, who shall attend the survey and sign official documentation agreeing to the survey findings. • Conduct additional pre-construction noise surveys to confirm site conditions. Incorporate findings of such investigations in the updated EIA and EMP if necessary.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
Flora and Fauna Habitat, Distribution, and Species	Rehabilitation of the secondary road from Patara Poti to the oil terminal may extend into a proposed extension of the National Park (close to where the gas line crosses the Rioni River).	• Consult with the MoEPA to determine the extent of the proposed extension of the National Park (currently being considered by parliament), which will cover the Rioni River and may extend as far east as the railway bridge neighboring the Project. • Ensure that the rehabilitation of the secondary road does not extend into the proposed extension of the National Park.	Project Cost	Detailed Design Consultant	RD
	Cumulative impacts from the multiple developments in the region.	• The Consultation will be taken with IFI's, donors, and implementing units on other projects that are likely to contribute to cumulative impacts to reduce uncertainty and, where necessary, take appropriate action to minimize environmental harm.	Project Cost	RD	N/A
Aquatic Fauna Habitat, Distribution, and Species	Modification and fragmentation of habitat, including loss of spawning grounds for wild sturgeon species	• Ensure that all guidance on sand and gravel abstraction sites is followed as outlined in the ***Site Preparation, Construction, and Worksite Closure (i.e., project closure) Phases*** EMP table below are followed.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
	Displacement of species due to noise, presence of machinery, and equipment and of staff	• Before starting any in-the-water construction activities, conduct underwater noise measurements using hydrophones to establish in the water background noise levels. • The Contractor shall predict planned impact pile-driving noise levels in the water utilizing interim good practice guidelines before starting to pile. Where planned impact pile-driving appears likely to exceed Project thresholds, alternative pile-driving methods or mitigation will be selected.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
	Mortality of individuals from the operation of equipment and construction activities	• The Contractor will ensure that in-river construction activities are staged in periods least likely to affect the sturgeon fish spawning period. • All in-river activities will be avoided from March to September inclusive. Where possible, in-river activities will also be avoided in October and November.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
	Mortality of sturgeon from illegal fishing activities using the bridge structures.	• Institutional arrangements will be decided for monitoring the bridge piers by CCTV throughout the operation period to prevent poaching of the sturgeon by using fishing gear on bridge structures.	Project Cost	RD	ADB

Flora species	Mortality of individuals	• The Contractor shall survey construction to identify natural and modified habitats to ensure that natural habitats can be rehabilitated and compensated for where they will be permanently lost. • The Contractor shall identify through a site survey if any Georgian Red-listed tree species are located within five meters of the site boundary. This survey will form part of the Contractor's Clearance, Revegetation, and Restoration Management Plan. In addition, in case walkover surveys pre-construction reveal any protected plant species in the area, the latter will be removed from the environment [and translocated] following subparagraph (v), Article 24, the first paragraph of the law of Georgia on 'Red List and Red Book.' • Relocation of any specimens found during the surveys, where practical, will be provided with the help of biodiversity experts to ensure proper handling. Proper handling is crucial for species of conservation importance (e.g., Colchis Water-Chestnut (*Trapa colchica*) and spring snowflake (*Leucojum vernum*)). The practice will provide the best possible chance of survival for wildlife. The Contractor must develop a plan and schedule before implementing this task.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
Change of Land Use and Livelihoods	Land acquisition and livelihood loss to affected persons	• Before the commencement of the construction works of the Project, the RD must finalize and implement the Land Acquisition and Resettlement Plan (the LARP) designed in compliance with the ADB Safeguards Policy Statement 2009.	LARP Cost / Project Cost	RD to finalize the LARP and implement the Plan.	ADB to approve the LARP
	Barrier effect (impacts on mobility and access of locals to areas such as farmlands, aquaculture ponds, etc., across the Project road)	• Ensure designs retain a strip of riparian habitat along the edge of the river to reduce the impact on species (keep connectivity and possibility for free movement along the river edge).	Project Cost	Detailed Design Consultant	RD
Services Demand	The disruption of services, including energy, to surrounding communities due to the relocation of utilities.	• All telephone and electrical poles/wires and underground cables should be shifted before the start of construction. • Necessary permission and payments should be made to relevant utility service agencies to allow quick shifting and restoration of utility services. • Local people must be informed through appropriate means about the time of shifting of utility structures and potential disruption of services, if any.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
Grievance Redress	Complaints due to project implementation	• Before the commencement of site works, the Contractor will develop a grievance redress mechanism (GRM) or system that will allow for receiving/recording and immediate response to and resolution of construction-related complaints. The GRM shall be consistent with the GRM described in this EIA. • The Contractor will inform the communities along the alignment and other stakeholders affected by the Project about the GRM in place to handle complaints and concerns about the Project. • The Contractor will also install notice boards at the construction sites to publicize the name and telephone numbers of the representatives of the Contractor and the RD.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Environmental Management Plan - for Site Preparation, Construction, and Worksite Closure Phases

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
Site Preparation, Construction, and Worksite Closure (i.e., project closure) Phases					
Air Quality	Localized dust emissions resulted from the use of machinery and equipment and the circulation of vehicles.	• Dust-generating areas will be controlled by water spraying, particularly under dry weather conditions. • Stockpiles will be planned and sited to minimize the potential for dust generation by taking into account prevailing wind directions and the locations of sensitive receptors. • The drop height of potentially dust-generating materials will be kept as low as possible. • Where practicable, stockpiles will be located away from sensitive receptors. • If the crushing of construction materials is required, crushers will be located away from sensitive receptors. Keeping at least a 300 m distance from residences windward to concrete production plants should be ensured. • The Contractor will obtain an environmental impact permit for an asphalt plant (if planned to run its facility) before operation. • Onsite speed limits will be applied and enforced for trucks traveling on unpaved surfaces (20 km/h). • Trucks transporting spoil or dusty materials off-site will be covered before leaving the sites. • Wheel-washing facilities will be available and used so that trucks leaving the Site do not spread dust onto neighboring roads. • Public roads used by site traffic will be swept regularly to prevent the accumulation of dirt. • Conveyor belts (e.g., at batching plants and rock-crushing plants) shall be fitted with wind-boards, and conveyor transfer points and hopper discharge areas shall be enclosed to minimize dust emission.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
	Localized and long-term combustion gas emissions result from the use of machinery and equipment and the circulation of vehicles.	• Machines and construction plant items (e.g., trucks) in intermittent use will be shut down or throttled between work periods. • The burning of waste or vegetation on Site is prohibited. • Special attention will be given to the storage and handling of petrochemicals to avoid environmental hazards and risks. • Maintenance procedures will be implemented to keep equipment in good working condition to minimize exhaust emissions caused by poor performance. • Wherever possible, use electrically-powered equipment rather than gas or diesel-powered equipment. • Training will be provided for the operators of equipment and truck drivers regarding the air pollution potential of their activities.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
Noise	Noise and vibration emissions resulting from the use of machinery and equipment and vehicle circulation	• Work hours will be restricted between 07:00 to 20:00 hours within 500 m of the settlements. • The Contractor will establish the optimum travel speed during off-site travel. • Install temporary noise barriers made of plywood or acoustical blankets around noisy operations where necessary to comply with project noise limits. • Use newer equipment with improved noise muffling and ensure that all equipment items have the manufacturers' recommended noise abatement measures, such as mufflers, engine covers, and engine vibration isolators, intact and operational. Newer equipment will generally be quieter in operation than older equipment. All construction equipment should be inspected at periodic intervals to ensure proper maintenance and the presence of noise control devices (e.g., mufflers and shrouding, etc.). • The number of equipment operating simultaneously will be reduced as far as practicable. • Reduce the number of equipment operating simultaneously as far as practicable. • Orientate equipment is known to emit noise strongly in one direction so that the noise is directed away from receptors as far as practicable. • Locate noisy plants as far away from receptors as practicable.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
		• Avoid transportation of materials on- and off-site through existing community areas during nighttime hours. • Use material stockpiles and other structures to screen noise-sensitive receptors from onsite construction activities where practicable. • Record and respond to complaints according to the established grievance redress mechanism. • Keep nearby residences informed in advance about noisy activities during various construction phases. • Perform independent periodic noise and vibration monitoring to demonstrate compliance with Project noise and vibration limits. • When there is a possibility of human annoyance from construction activities, conduct such activity only during weekday daytime hours when the ambient background noise and the vibration are higher, and many residents are away from their homes at work.			
Soil Quality	Land pollution due to improper management of solid waste, as well as possible dripping of hydrocarbons from machinery and equipment, and improper storage of oil and fuel.	• Temporary fuel tanks will be located at least 50 m from any watercourse, drain, or channel leading to a water course. The tank will be placed in covered areas with berms or dikes installed to intercept any spills. Any fall will be immediately localized and cleaned up with absorbent materials. The bund will be able to accommodate 110% of the volume of the tank. • Onsite repairs /maintenance and fueling activities will be limited to the extent possible. • Onsite vehicles and equipment shall be inspected regularly for leaks, and all leaks shall be immediately repaired. Leaking vehicles/equipment will not be allowed onsite. • Secondary containment devices (drop cloths, drain pans) shall be used to catch leaks or spills while removing or changing oils from vehicles or equipment. For minor spills, absorbent materials will be used. • Tire washing units will be equipped with drainage settling facilities. The washout pit will be cleaned immediately upon 75% filling. • No washing of vehicles in the river will be allowed. • Usage of off-site vehicle wash racks or commercial washing facilities will be used whenever feasible. In addition, bermed wash areas for cleaning activities will be established if onsite cleaning is required. • The Contractor will implement a training program to familiarize staff with emergency procedures and practices related to contamination events. Operating personnel will be trained to visually inspect discharged water quality for oil and grease traces (that will be visible on the surface) periodically and take appropriate corrective actions.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
Soil Structure	Land erosion due to loss of vegetation coverage and changes in its structure	• Materials and waste will be stockpiled so as to avoid erosion (in stockpiles less than 2 m in height and with a slope gradient of less than 25%) and washing off into the river. In addition, drainage trenches will be established to divert surface runoff from the Site. • Under no circumstances shall the following habitats be used for spoil disposal sites: (i) Kolkheti National Park and the Wetlands of Central Kolkheti Ramsar Site; (ii) Kolheti Important Bird Area; (iii) low grass marsh areas; and (iv) within 50 meters of the Rioni River. • To avoid loss of the productive soil layer, all suitable topsoil and other material shall be saved and stockpiled separately for the future recultivation of the area. • Stockpiles of removed topsoil will be designed appropriately/shaped, and managed. • Sand and aggregates will be stored in a hopper or bunker, shielding materials from winds. The bunker should enclose the stockpile on three sides. The walls should extend one meter above the height of the maximum quantity of raw material kept on Site and two meters above the front of the stockpile. The hopper or bunker will be fitted with water sprays that dampen the stored material. • Store cement in sealed, dust-tight storage silos. All hatches, inspection points, and ductwork will be dust-tight.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
		• Temporary detention ponds or containment to control silt runoff will be provided. • Construct intercepting ditches and drains to prevent runoff from entering construction sites • Soil compaction may be reduced by strictly keeping to temporary road boundaries. • Slopes of the embankment will be protected from erosion by vegetation and slope drainage. The design considers the selection of a reasonable embankment height, establishing temporary berms, slope drains, temporary pipes, contour ditches, ditch checks, diversions, and sediment traps. • Disturbed vegetation must be replanted immediately after the construction/disturbance stops. • Appropriately set up temporary construction camps (if determined needed) and storage areas to minimize the land area required and impact soil erosion.			
Relief	Modification of geological formations - Quarries	• The Contractor will carry out the operation of quarries and borrow pits, as well as extraction of gravel from river terraces (if utilized), in strict accordance with the conditions of a license issued by the Ministry of Economic Development (MoED) and cleared by the Ministry of Environment Protection and Agriculture (MoEPA); and • The Contractor will be responsible for developing, agreeing, and strictly adhering to the quarry/borrow pit operation and re-cultivation plan (if the Contractor owns or establishes a new quarry site). • Borrowing from the river [at the Project site] will be prohibited. • Sourcing construction materials (e.g., sand, gravel) will avoid using licensed or unlicensed sites in the Rioni River or on its banks. • Borrow areas for materials, other than dredged sand fill, shall not be located in productive land, forested areas, and near water courses such as rivers, streams, etc.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
Water Quality	Pollution of nearby water bodies due to poor storage and management of construction materials	• Discharge of any untreated water into the surface water body will be strictly prohibited. • Discharge of cement /concrete contaminated water will be prohibited unless settled and neutralized first to avoid pollution from water with high alkalinity, which can be toxic to aquatic life. • To prevent runoff contamination, paving will be performed only in dry weather. • Compacted straw (straw bales), silt fences, fibber rolls, gravel bags, or other approved sediment control must be ensured in disturbed soil areas. At a minimum, all bare soil (whether it's an abutment slope or a stockpile) must be protected before it rains. • Drainage systems, erosion control, and silt removal facilities will be regularly inspected and maintained to ensure proper and efficient operation. • Vegetation will be preserved where feasible, particularly in areas near the river bank, to avoid erosion/sedimentation. Sites will be promptly revegetated where practicable and appropriate. • The construction camp (if needed), permanent or temporary, will not be located within 500 m of any river or irrigation channel. • Wastewater Management Plan and proper sewage collection and disposal system will be available to prevent pollution of watercourses (if discharge in the surface water is planned). • Stormwater drainage and wastewater will be treated according to the applicable World Bank/IFC guidelines. • Where applicable (i.e., to the irrigation canal in Patara Poti), the Project will, as much as possible, control the effluent and runoff discharged to the irrigation channel to below the "Severe" restriction on use according to the FAO Guidelines for Interpretations of Water Quality for Irrigation.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
	Impact on surface water contamination from inappropriate	• Construction materials and wastes will be stored appropriately to minimize the potential damage or contamination of the materials. • A construction materials inventory management system will be implemented to minimize the over-supply of construction materials, which may lead to the disposal	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
	waste management	of surplus materials at the end of the construction period. • Hazardous and non-hazardous waste will be segregated, and appropriate containers for the type of waste will be provided. • Waste will be stored systematically to allow inspection between containers to monitor leaks or spills. • Waste will be disposed of systematically by licensed contractors. • Stormwater drainage and wastewater will be treated according to the applicable World Bank/IFC guidelines.			
	Impacts on surface water due to contamination from accidental releases of hazardous substances	• Implementation of the specific mitigation measures outlined under Contamination of Soils above.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
	Water pollution from bridge construction	• Coffer dams, silt fences, sediment barriers, or other devices to prevent the migration of silt during construction within the river will be provided. • Dewatering and cleaning cofferdams to prevent siltation by pumping from cofferdams to a settling basin or a containment unit will be performed. • Ensure no waste materials are dumped in the river, including reinforced concrete debris. • Generators will be placed more than 20 m from the river. • No concrete waste from concrete mixers will be dumped in the river. • Areas where concrete mixers can wash out leftover concrete without polluting the environment, will be provided. This may be in the form of a lined settling pond. The Contractor will inform drivers of these locations and the requirements to use these settling ponds on a routine basis. • Dried waste from the settling ponds can be used as backfill for culverts, etc. (as long as not contaminated).	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
	Surface water contamination from accidentally spilled fuel/oil and road surface runoff.	• Construction of two retention chambers (one on each side of the bridge) to protect water quality from contaminated roadway surface runoff and in the event hazardous substances are accidentally spilled during the operation phase. • Development of detailed terms of reference on the maintenance requirements for the retention chambers based on a final design and technical specifications. The TOR should include the following information with regards to maintenance and servicing of the retention chambers: (i) timing and frequency; (ii) training requirements; (iii) necessary equipment; (iv) procedures; and (v) locations where contents of the chambers can be treated/processed.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
Vegetative Coverage	Loss of vegetation coverage in specific areas of the Project	• Delimitation of areas to be cleared will be made before the beginning of the construction activities to limit as much as possible the surface of vegetation to be removed. • Boundaries of ROW and operation area will be strictly kept to - avoid impact on the adjacent vegetation; Strict keeping to traffic routes during the construction will be ensured to prevent impact on vegetation. • The planned clearance area for the construction works shall be identified and marked to avoid accidental clearing. • Fencing of critical root zones of the trees at the boundary with the project area or on the way will be carried out. • The Project will utilize or upgrade existing roads to minimize unnecessary clearing requirements. • Training the staff in environmental and safety issues, including the protection of vegetation outside the boundaries of the project corridor. • Care will be taken to avoid the introduction of new invasive species to, and spread of existing invasive species within, the Project area through the washing of vehicles, equipment, and supplies before entry to the	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
		Project area; monitoring for invasive species; and control/eradication of invasive species where found. • Implement Clearance, Revegetation, and Restoration Management Plan. • Dispersion of fine dust and aerosol will be limited to the narrowest area possible through protective revegetation activities on both sides of the road. • All efforts will be made to minimize the removal of mature/significant trees and maintain connectivity between areas of forest habitats.			
	Planting of vegetation on the Site after rehabilitating disturbed areas	• Disturbed sites will be recultivated after the completion of work. • Any reseeding or replanting of selected areas to be restored will use locally collected seed mixes and saplings. • A local source of indigenous saplings suitable for replanting programs will be identified to facilitate restoration. • The Clearance, Revegetation, and Restoration Management Plan prepared before construction will be followed (see section. • No net loss of natural habitat will be ensured based on the site survey conducted during the Pre-Construction Stage.	Contractor Cost	Contractor to Implement Mitigation	Engineer to Monitor Success Rate (RD to determine success rate criteria)
	Tree cutting	• Plant maintenance will be carried out for at least two years. • The Contractor shall be responsible for replanting any trees cut in these areas on a 1:3 basis using species native to the Site.	Contractor Cost	Contractor and RD to Implement Mitigation	RD, Engineer
Terrestrial and Aquatic Fauna Habitat	Modification, fragmentation, and degradation of habitat	• Air, water, soil, and noise impact mitigation measures will be implemented. • Waste management – regular cleanup of the areas and management of waste according to the type and category. • Refueling all plants, vehicles, and machinery will not be allowed within 50 m of any watercourse, drain, or channel leading to a water course. • Construction materials and chemicals will be appropriately secured during flood season to avoid accidental release into the natural environment. • Oil, chemical, and solid waste will be stored, handled, and disposed of by appropriately licensed waste management contractors. • Dropping structures into rivers/streams will be avoided [construction will instead take place from the river bank or pontoons]. • Construction camp waste areas will be managed appropriately, so animals are not attracted that could be injured or ingest inappropriate food.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
	Introduction of invasive alien species	• Care will be taken to avoid the introduction of new invasive species to, and spread of existing invasive species within, the Project area through the washing of vehicles, equipment, and supplies before entry to the Project area; monitoring for invasive species; and control/eradication of invasive species where found.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
Terrestrial Fauna Species	Fauna mortality	• Speed limits to a maximum of 20 km/hr for construction vehicles will be enforced to minimize the potential for fauna strike. • Commitment will be made to raise awareness of the values of natural habitat areas to the construction workforce, and arrangements will be made to restrict poaching and forest product collection. • Hunting wild animals will be strictly prohibited to apply for all staff. • Excavations left open at night will be covered. • Any excavations will include slopes or boards to ensure species can self-rescue should they fall in. • Leaving water-filled excavations will be avoided. • Where possible, vegetation will be removed outside the core breeding season from spring to early summer to allow species to find alternative breeding sites or to disperse after breeding.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
Terrestrial Fauna Distribution	Displacement of species due to noise, machinery and	• Adherence to the no-horn policy will be enforced. • All vehicles, equipment, and machinery used for construction will be regularly maintained and	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
	equipment, and staff presence.	inspected/certificated to ensure that the noise levels conform to the standards prescribed. • Works will not be lit except in exceptional circumstances or required for safety reasons. • If lights are installed on the road or bridge in the future, ensure that lower-wattage lamps are used in street lights which direct light downwards to reduce glare.			
Aquatic Fauna Distribution	Displacement of species due to noise, presence of machinery, equipment, and of staff.	• Movement of machines inside rivers, streams, or on their banks will be prevented except when it is unavoidable due to the construction of a structure. • All in-river activities will be avoided during March-September inclusive to prevent disturbance to sturgeon during their overall spawning season. • The central bridge pier and adjoining two piers will be constructed (referring specifically to construction using coffer dams in the river) at two different times. • Implement a build-up of activity that slowly increases construction activities within the Rioni River to allow aquatic fauna to exhibit avoidance responses.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
Aquatic Fauna Species	Mortality of individuals, from the operation of equipment and construction activities or poaching by construction workers.	• The use of propeller-driven boats will be minimized during construction. • Warning signs and CCTV cameras will be installed on both sides of the bridge to deter and detect illegal fishing activities. • Poaching animals will be strictly prohibited to apply for all staff. • Fishing and use of illegal fishing gear anywhere along the river will be prohibited.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
	Cumulative impacts from the multiple developments in the region.	• The Consultation will be taken with IFI's, donors, and implementing units on other projects that are likely to contribute to cumulative impacts to reduce uncertainty and, where necessary, take appropriate action to minimize environmental harm.	Project Cost	Contractor to Implement Mitigation	RD, Engineer
	Pile driving for in-river construction	• Noise from pile-driving will be kept below current international interim good practice guidelines. • Ensure compliance with construction specifications that envisage the arrangement of cofferdams to protect water quality during construction and minimize the impacts on aquatic fauna during pile driving in the Rioni River. In addition, noise from pile driving will be kept below current international interim good practice guidelines. • The Contractor will model planned pile-driving and assess alignment with international interim good practice guidelines *before* starting to pile.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
Landscape Quality	Change to existing landscape and character	• Implementation of mitigation measures defined for soil, vegetation, and waste management. • The visual impact of construction works will be mitigated by keeping to the boundaries of the worksites and traffic routes; preservation of vegetation; cleanup and good management of construction sites and camps; timely removal of waste from the area; material stock control (to avoid the accumulation of surplus material on the Site) • An approved recultivation plan will be implemented. • After completion of works, the worksite will be cleaned up; surplus materials, temporary structures, and machinery will be removed. • Site compounds within the landform will be carefully placed. • Existing woodland, land features, and other key elements will be retained and protected within the proposed development corridor. • Commitment to high-quality design, materials, and specifications for the road and Rioni crossing.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
Change of Land Use and Livelihoods	Land acquisition and livelihood loss to affected persons	• Impacts of physical and economic displacement will be addressed through the resettlement plans designed in compliance with the ADB Safeguards Policy Statement 2009. • Written agreements with local landowners for temporary use of the property will be required, and sites must be restored to a level acceptable to the owner within a predetermined time period.	Project Cost	RD to Implement the Plan / Corrective Action Plan	ADB to Approve the LARP / Corrective Action Plan
Jobs	Impacts on employment and economy	• An Employment and Procurement Procedure should be established. In addition, the plan's development should involve Consultation with relevant stakeholders, including government authorities and local villagers.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
		• Opportunities to establish a skills training program with the aim of training interested local villagers to contribute to the Project should be reviewed. • Local villagers should be informed of job opportunities promptly. • Local businesses should be informed of contracting opportunities on time.			
Services Demand	Impacts on community infrastructure and services	• Traffic advisory signs (to minimize traffic build-up) will be posted in coordination with local authorities. • Accidentally damaged private property and/or infrastructure should be promptly restored. • The community will be kept informed about the schedule of works which could cause temporary restriction of services and the potential duration of the 'impact' in advance.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
Community Health and Safety	Impacts on social cohesion	• Construction camps (if established) will be located away from communities to avoid social conflict in competition for resources and basic amenities such as water supply. • Local residents should be given priority in the hiring of construction workers. • Employment of women will be encouraged. • Goods and services will be sourced from local commercial enterprises to the extent possible.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
	Risks to community health and safety due to increased traffic; the transport, storage, and use and/or disposal of materials (e.g., fuel and chemicals); and access to structural elements or components of the Project by members of the community.	• Air, water, soil, waste, and noise impact mitigation measures will be implemented. • The Contractor shall provide appropriate safety barriers with hazard warning signs attached around all exposed openings and excavations. • Noise, vibration, and emission impact mitigation measures will be implemented. • Signs advising road users that construction is in progress will be provided, specifically at the points where the new road connects with the E-60. • Flag persons will control traffic when construction equipment enters or leaves the work area. • Strictly impose speed limits on construction vehicles along residential areas and where other sensitive receptors such as schools, hospitals, and other populated places are located.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Occupational Health and Safety	Workers' exposure to various physical hazards may result in minor, disabling, catastrophic, or fatal injuries.	• Measures will be implemented to reduce the likelihood and consequence of the potential hazards. This shall include (but not be limited to) the following risks:
		  ○ Falling from height;
		  ○ Falling into the water;
		  ○ Entanglement with machinery;
		  ○ Tripping over permanent obstacles or temporary obstructions;
		  ○ Slipping on greasy walkways;
		  ○ Falling objects;
		  ○ Contact with dangerous substances;
		  ○ Electric shock;
		  ○ Variable weather conditions;
		  ○ Lifting excessive weights; and
		  ○ Traffic operations.
		• Conduct orientation for construction workers regarding health and safety measures, emergency response in case of accidents, fire, etc., and prevention of HIV/AIDS and other related diseases.
		• Competent and adequately resourced Subcontractors will be used where construction activities are to be subcontracted.
		• Provisions will be incorporated into all sub-contracts to ensure compliance with the SEMP at all tiers of the sub-contracting.
		• All persons working on the Site will be provided information about risks on the Site, and arrangements will be made for workers to discuss health and safety with the Contractor.
		• The Contractor will prepare and implement an Occupational and Community Health and Safety Management Plan before commencing work. This plan will include provisions on clean water, sewage and wastewater, solid waste, liquid chemical waste, personal protection, emergency preparedness and
			Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
		response, records management, safety communication, and training and awareness. • All workers will be adequately informed, consulted, and trained on health and safety issues. • The areas where the risk of injuries from falling objects exists will be marked with rope or flagging to minimize risks and damages. • Flag persons will control traffic when construction equipment enters or leaves the work area. • The approved traffic management plan Error! R eference source not found.will provide road signs. • Personal Protective Equipment (PPE) shall be worn at all times on the Site. This shall include appropriate safety shoes, safety eyewear, and hard hats. In addition, Non-slip or studded boots will be worn to minimize the risk of slips. • Before starting work, all the appropriate safety equipment and first-aid kits will be assembled and checked as being in working order. • All lifting equipment and cranes will be tested and inspected regularly. • All scaffolding will be erected and inspected, and the Contractor will maintain the appropriate records. • When there is a risk of drowning, lifebelts shall be provided, and it shall be ensured that personnel wears adequate buoyancy equipment or harness and safety lines and that rescue personnel is present when work is proceeding. • All safety harnesses, lifelines, reviving apparatus, and any other equipment provided for use in or in connection with emergencies will be adequately maintained and thoroughly examined at least once a month and after every occasion on which it has been used. • Drivers will be educated on safe driving practices to minimize accidents and prevent the spill of hazardous substances and other construction materials during transport. • Adequate sanitation facilities will be provided for all workers at the workers'/construction camps. • First aid facilities will be provided that are readily accessible to workers. • Fire-fighting equipment will be provided at the work areas, as appropriate, and at construction camps where fire hazards and risks are present. • Report all accidents and near misses and collect statistics to identify trends and requirements for further training or 'safety stand-downs' where incident numbers are growing.			
Cultural Heritage	Risks to built heritage, objects, and sites with archaeological, historical, religious, or other cultural value and significance.	• The chance finds procedure for managing cultural heritage will be implemented if any cultural heritage is discovered during construction.	Contractor Cost	Contractor and RD to implement mitigation	RD, Engineer
Grievance Redress	Complaints due to Project implementation	• The Contractor will be responsible for nominating a Community Liaison Officer (CLO) and implementing the grievance procedure. • Workers will not be restricted from joining or forming workers' organizations or from bargaining collectively. The Contractor will not discriminate or retaliate against workers who create or join collectives or bargain collectively. • Working relationships and work conditions are also to be managed and monitored in implementing the Project. • Continuous monitoring and review of complaints from neighboring communities around the Project activity areas per the grievance redress mechanism.	Contractor Cost	Contractor and RD to implement mitigation	RD, Engineer
Waste	Pollution of land, water, or air from poor waste management	• The Contractor will classify waste streams (hazardous, non-hazardous, or a waste that requires a full assessment to determine classification – so-called	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
		'mirror entry' waste) and manage them according to international best practice and Georgian law. • Construction and work sites will be equipped with sanitary latrines that do not pollute surface waters and are connected to septic tanks or wastewater treatment facilities. • The Contractor will agree with Poti municipality, and solid non-hazardous, and inert waste will be removed to the Poti municipal waste dump. • Domestic and Inert Waste ○ Provide garbage bins and facilities within the Project site to temporarily store domestic solid waste and construction waste. ○ Waste storage containers shall be covered, tip-proof, weatherproof, and scavenger-proof. ○ Ensure that wastes are not haphazardly dumped within the project site and adjacent areas. • Hazardous waste ○ On the Site allocated for the temporary, short-term keeping of hazardous wastes, ensure compliance with the following safety measures: ▪ Use containers suitable for each type of waste; ▪ Prohibit the use of damaged containers. Check the integrity of containers regularly. ▪ Mark containers adequately; ▪ Provide secondary containment; ▪ Refrain from mixing various waste streams. ○ Hire an authorized Contractor for hazardous waste removal and Keep agreements with hazardous waste management companies active. ○ Keep copies of waste manifests on Site. Keep a record of waste onsite and waste removed. ○ In case of large-scale spills of hazardous liquids, follow the Spill Management Plan.			

9 SUPPLEMENTARY DOCUMENT 2. SITE PHOTO LOG

Panoramic view of the bridge pier location near the Rioni river

Improperly stored hazardous waste

Oil spills near unused generator

Improperly stored hazardous material

Improperly stored hazardous waste

Hazardous waste storage area

Fuel Station on Site (with minor oil spills)

Improper refueling of a truck

Wastewater Spill into the River from the Peninsula

Wastewater Spill into the River from the Peninsula

10 SUPPLEMENTARY DOCUMENT 3: ENVIRONMENTAL MONITORING REPOT (APRIL 2025)

Batumi bypass road project - Poti-Grigoleti-Kobuleti bypass road

Construction of a bridge crossing and an access road in the territory of Patara Poti

Environmental instrumental monitoring report

Client - JV MIRBUD-CS

Performer:

Ltd "Naseto Group" Ltd

Direqtor: Nato Gabunia

Technical manager: Sergo Khatsava

April, 2025

Contents

1. Introduction

JV MIRBUD-CS, within the framework of the contract signed with the Department of Roads of Georgia, carries out the construction of the section of the E-70 highway of international importance of the Department of Roads of Georgia, the Senaki-Poti (bypass)-Sarfi (border of the Republic of Turkey) road, the Poti-Grigoleti section (stage 1) - the project of construction of a bridge and access roads on the river Rioni.

It should be noted that the government of Georgia is implementing the program of modernization of the country's main roads, which is led by the Roads Department under the Ministry of Regional Development and Infrastructure of Georgia. The goal of the program is to improve the condition of traffic and cargo transportation with neighboring countries, which is due to the significant increase in cargo transportation through Georgia in the last 10-15 years.

Today, Georgia is the main transit country. Almost two-thirds of the cargo transported in Georgia comes via land routes. Transportation operations by local and international shipping companies are visible on the highways of Georgia. However, the condition of the majority of roads is not up to the required standards and is not properly equipped to withstand the volume of traffic and the proportions of large vehicles. Factors such as insufficient number of two-way carriageways, shortage of routes passing through populated areas, inadequate technical services hinder road permeability and increase transportation time. This creates difficulties for transport companies and their customers, truck drivers, Georgian drivers and local residents. The main goal of the above-mentioned program is the modernization of Georgia's largest roads, such as E-60 and E-70. A number of road infrastructure construction/rehabilitation projects have been funded by the World Bank, Japan International Development Bank (JICA) and Asian Development Bank (ADB).

The construction of the Poti-Grigoleti-Kobuleti bypass road section and the Poti-Grigoleti section of the internationally important Senaki-Poti-Sarfi road is underway within the framework of financing allocated by the European Investment Bank.

2. Brief description of the project

The construction project of E-70 highway Senaki-Poti (bypass)-Sarfi (border of the Republic of Turkey) highway, Poti-Grigoleti section (stage 1) - bridge over Rion river and access roads is being carried out in the Black Sea coastline, Samegrelo-Zemo Svaneti and Western Georgia in the regions of Guria. The goal of the

project is to build a 4-lane Poti-Kobuleti highway in accordance with TEM standards and national standards related to highways. At the design stage, the highway was divided into two parts - Grigoleti Kobuleti bypass (lot 1) and Poti-Grigoleti (lot 2) section.

The starting point of Lot 2 is located on the E-60 highway leading to Senaki on the right bank of the Rioni River in the village of Patara Poti. The road bypasses Poti from the east and connects to the initial section of the Grigoleti-Kobuleti bypass road (lot 1) by the Supsa river.

The section included in Lot 2 is also divided into three steps. This report refers to the E60 from the beginning in the direction of the Rioni river, pk 0+000 - pk 1+500 to the picket mark (the section includes the bridge over the Rioni river and the access road).

The road surface will be elastic (asphalt-concrete). Due to the weak soil, the foundation of embankment requires strengthening. For high embankments reinforcement will be done with gravel columns, for low embankments high-strength geotextiles will be used. In both cases, it is planned to use a separating geotextile between the existing soil and the foundation.

Drainage channels will be arranged on both sides of the highway. The project envisages spreading top soil on the slopes of embankment and sowing grass. The length of the bridge will be 495 m, width 15.54 m.

3. Location of the project area

The section of the Poti bridge crossing and access road is located in Patara Poti, on the Rioni river.

situational map showing the location of the project area is given in Figure #3.1.1.

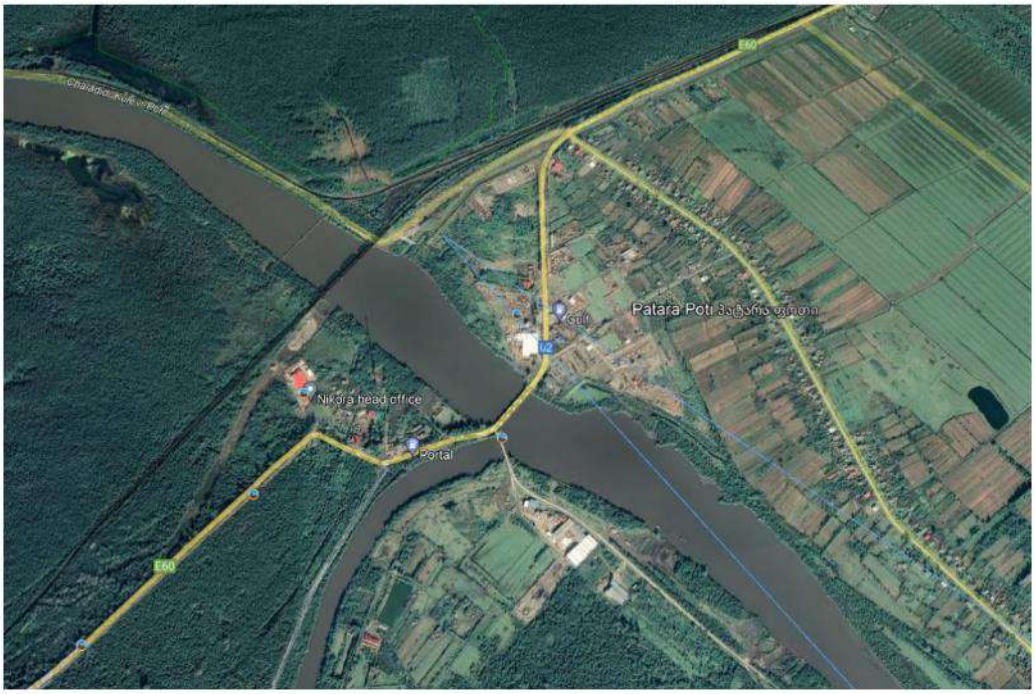


Fig. 3.1.1 - Location of the project area

4. Parameters of conducted monitoring, date of implementation of monitoring, used tools and monitoring points

JV MIRBUD-CS performs monthly environmental instrumental monitoring within the framework of the Poti bridge construction project.

In the month of April, environmental instrumental monitoring was conducted on April 25, 2025, between 11:20 a.m. and 12:50 a.m.

The monitoring was carried out by "Naseto Group" Ltd, based on the order of JV MIRBUD-CS. Instrumental environmental monitoring included the study of the following parameters:

- The spread of noise in the ambient air;
- The spread of vibration in the ambient air;
- The spread of dust in the ambient air ($Pm_{2.5}$, Pm_{10}, TSP total);
- The spread of nitrogen and sulfur dioxide and carbon monoxide in the ambient air;
- Surface water monitoring on the following parameters: Ph; saltiness, TDS, Electr. conductivity, turbidity, ammonia/ammonium ion NH3; chlorides Cl; weighted particles TSS; total nitrogen N, total iron Fe; Arsenic (Total) As; Total coliforms

Weather conditions during monitoring

- Air temperature - 17.3° C;
- Wind speed - 0,4m/sc;
- Wind direction - East;
- Air humidity - 67%;
- Atmospheric pressure - 1008 hPa.

Tools used in research

The Instrumental research was carried out by the technical group of "Naseto Group" LTD and the following instruments with the appropriate calibration certificate (certificates are presented as an attachment) were used:

- Pollination - Gasella Mikro Dust Pro (Self-calibration zero and optical filter);
- Vibration- Smart Sensor, AR63B Vibration Meter;
- Noise - Sound Tek ST-109;
- Air quality – Aeroqual (CO, NO2, SO2);

- Surface water - Multiparameter Water Quality Meter; LAQUA Horiba WQ-330; Turbid meter HANNA HI 98703

Fig. 4.1.1 - Gasella Mikro Dust Pro

Fig. 4.1.2 - AR63B Vibration Meter

Fig. 4.1.3 - Mini Sound Level Meter N05CC

Fig. 4.1.4 - Multiparameter Water Quality Meter

Fig. 4.1.5 – Air multimeter Aeroqua (CO,NO2, SO2)

Fig. 4.1.6 - Turbid meter HANNA HI 98703

Information about monitoring points

Instrumental monitoring of the spread of noise, vibration and dust in the ambient air, as well as the spread of other polluting substances in the ambient air was carried out at pre-selected places, in accordance with the instructions of the client. In addition, surface water was taken for instrumental monitoring at 2 points of the Rioni River, above the project area (upstream) and below the project area (downstream).

GPS coordinates of monitoring points for noise, vibration, dust and other pollutants in ambient air are given in table 4.1.1. while, the coordinates of water sampling points from Rioni River are given in Table 4.1.2. In addition, monitoring points are marked on maps 4.1.7 and 4.1.8.

Table 4.1.1 - Location and GPS coordinates of monitoring points for noise, vibration, dust and other pollutants in ambient air

Monitoring point		
#	Location	GPS coordinate
1	Axis 49	X - 723230 Y - 4674705
2	Axis 17	X - 722690 Y - 4674127

Table 4.1.2 - Location and GPS coordinates of water sampling points from Rioni River

Monitoring point		
#	Location	GPS coordinate
1	Riv. Rioni downstream point	X – 722788 Y – 4674713
2	Riv. Rioni upstream point	X - 723505 Y – 4674040

Fig. 4.1.7 - Location of monitoring points for noise, vibration, dust and other pollutants in ambient air

Fig. 4.1.8 - Location of monitoring points of water taken from Rion River

5. Norms established by legislation and results obtained during measurement

5.1 Norms established by legislation

Norms of the qualitative state of the environment are regulated by the Order No. 297/N of the Minister of Labor, Health and Social Protection of Georgia dated August 16, 2001 "On Approval of the Norms of the Qualitative State of the Environment" and also "On Acoustic Noise Norms in the Storerooms and Territories of Residential Houses and Public/Public Institutions Buildings" According to the technical regulations approved by the resolution No. 398 of the Government of Georgia on August 15, 2017.

Table 5.1.1 - Noise norms

№	*Functionality of the premises and areas*	*Admissible norms*		
		L Day (dbA)		
		Day	*Evening*	*L Night*
1	Educational institutions and reading rooms	*35*	*35*	*35*
2	Treatment cabinets of medical institutions	*40*	*40*	*40*
3	Living and sleeping rooms	*35*	*30*	*30*
4	Treatment and rehabilitation wards of a stationary medical institution	*35*	*30*	*30*
5	Hotel/guest house/motel rooms	*40*	*35*	*35*
6	Shopping halls and reception rooms	*55*	*55*	*55*
7	Halls of restaurants, bars, cafes	*50*	*50*	*50*
8	audience/audience halls and sacral rooms	*30*	*30*	*30*
9	Gyms and pools	*55*	*55*	*55*
10	Working rooms of small offices (≤100 m^3) and working rooms without office equipment	*40*	*40*	*40*
11	Working rooms of large offices (≥100 m^3) and working rooms with office equipment	*45*	*45*	*45*
12	Deliberative rooms	*35*	*35*	*35*
13	Areas directly adjacent to low-rise (number of floors ≤6) residential houses, medical facilities, children's and social service facilities	*50*	*45*	*40*
14	Areas directly adjacent to multi-storey residential buildings (number of floors > 6), cultural, educational, administrative and scientific institutions	*55*	*50*	*45*
15	Areas directly adjacent to hotels, trade, service, sports and public organizations	*60*	*55*	*50*

Table 5.1.2 - Norms of vibration and vibroacceleration

#	*Admissible norms*	
	Vibrospeed	*Vibroacceleration*
1	112 db	126 db

Table 5.1.3 - Norms of dust and other pollutants

#	*Admissible norm of dust mg/m3*	*Norm of nitrogen dioxide, mg/m3*	*Norm of sulfur dioxide mg/m3*	*Carbon monoxide norm, mg/m3*	*The norm of total hydrocarbons, mg/m3*
1	0.5 mg/m³	0.2	0.5 mg/m³	5 mg/m³	1 mg/m³

Table 5.1.4 - Maximum admissible norms in the surface water body

№	*Parameter*	Admissible norm
1	*PH*	*Unfixed*
2	*Saltiness*	*Unfixed*
3	*TDS/mg.1*	*Unfixed*
4	*Elect. conductivity*	*Unfixed*
5	*Turbidity*	*Unfixed*
6	*Ammonia/ammonium ion NH3*	*0,39*
7	*Chlorides Cl*	*300*
8	*Weighted particles TSS*	*Unfixed*
9	*Total nitrogen N*	*Unfixed*
10	*Total iron Fe*	*0,3*
11	*Arsenic (total) As*	*0,05*
12	*Total coliforms*	*It should not be found in 300 ml*

5.2 Results of conducted research (monitoring).

Table 5.2.1 - Results of conducted research, noise, vibration, dust

№	Measurement point		Measurement results							
	Location	GPS coordinate	Noise Amax db	Vibro speed		Vibro acceleration		Dust mg/m3		
				mm/sc	db	m/sc2	db	Pm2.5	Pm10	Total
1	Axis 49	X - 723230 Y - 4674705	63,7	<0.1	<66	<0.1	<100	0.022	0.037	0.062
2	Axis 17	X - 722690 Y - 4674127	82,2	0.1	66	0.1	100	0.038	0.057	0.081

Table 5.2.2 - Other ambient air pollutants

№	Measurement point		Measurement results		
	Location	GPS coordinate	Nitrogen dioxide	Sulfur dioxide	Carbon monoxide
	Axis 49	X - 723230 Y - 4674705	0,003	<0,01	0,43
	Axis 17	X - 722690 Y - 4674127	0,008	<0,01	0,67

Table 5.2.3 - Results of instrumental measurement of physico-chemical parameters of surface water

№	Sampling location	GPS Coordinate	Measured parameters				
			PH	Saltiness	TDS/mg.l	Electr. conductivity	Turbidity
	River Rioni, the lower point of a stream	X – 722788 Y - 4674713	7,94	0,16	322,4	228	387,3
	River Rioni, the upper point of a stream	X - 723505 Y - 4674040	8,03	0,15	324,7	225	381.1

Table 5.2.4 - Results of measurement of chemical and bacteriological parameters of surface water taken from Rioni river (upstream)

Sampling location	GPS coordinate of sampling	Determining characteristic, name	Unit	Research result	Research method
Riono River, upstream	X - 723505 Y - 4674040	Ammonia/ammonium ion NH_3	mg/l	0,09	GOST 33045-2014
		Chlorides Cl	mg/l	19,7	ISO 9297:198/2008
		Weighted particles TSS	mg/l	298,4	ISO 11923-97
		Total nitrogen N	mg/l	1,19	GOST 33045-2014
		Total iron Fe	mg/l	0,15	GOST 4011-72
		Arsenic (total) As	mg/l	0,0022	GOST 4152-89
		Total coliforms	300 ml will not be allowed	Not found	ISO 9308-1:2014

Table 5.2.5 - Results of measurement of chemical and bacteriological parameters of surface water taken from Rioni river (downstream)

Sampling location	GPS coordinate of sampling	Determining characteristic, name	Unit	Research result	Research method
Rioni River, downstream	X – 722788 Y - 4674713	Ammonia/ammonium ion NH_3	mg/l	0,11	GOST 33045-2014
		Chlorides Cl	mg/l	21,4	ISO 9297:198/2008
		Weighted particles TSS	mg/l	312,6	ISO 11923-97
		Total nitrogen N	mg/l	1,21	GOST 33045-2014
		Total iron Fe	mg/l	0,22	GOST 4011-72
		Arsenic (total) As	mg/l	0,0021	GOST 4152-89
		Total coliforms	300 ml will not be allowed	No found	ISO 9308-1:2014

6. Conclusion

As a result of the conducted environmental instrumental research, there was no exceedance of the established norm in any measurement point, in the case of any parameter.

7. Mitigation measures

No mitigation measures are required.

8. Instrument calibration certificates

8.1 Vibration meter calibration certificate

EF-03.G

შპს "მეტროლოგი"
"METROLOGY" LLC

0144, თბილისი, ბერი გაბრიელ სალოსის გამზ. 191
191 Beri Gabriel Salosi Ave, Tbilisi, 0144
ტელ./Phone: +995 (32) 2-700-800, www. metrology.ge

GAC – CL – 0017
სანქ. ობიექტის 17025:2017/2018
11.11.2021 – 11.11.2025

საკალიბრებელი ლაბორატორია
CALIBRATION LABORATORY

დაკალიბრების სერტიფიკატი № 2983
CALIBRATION CERTIFICATE

გაცემის თარიღი
Date of issue: 30.01.2023

დაკალიბრებან ობიექტი
Calibrated item: ვიბრაციის საზომი ხელსაწყო AR63B, SN 02292117
გასაზომი სიდიდეების დასახელება/ტიპი/ნომერი
measuring instrument identification

დამკვეთი
Customer: ფიზიკური პირი სერგო ხაცაია, თბილისი, ჰეკნის გამზ. 14/2
დასახელება, მისამართი
name of customer, address

დაკალიბრების მეთოდი
Method of Calibration: CP-062.G; გოსტ 30652-99
მეთოდის დასახელება/იდენტიფიკაცია
name of the method/identification

დაკალიბრება შესრულებულია
Calibration is performed by using: ვიბროგარდამქმნელი ABC-034-03 № 8113994
სერტ. № GE/MI/05-02093-21 21.09.21; ვიბრომეტრი ВЭДС-10А
სამუშაო ეტალონის დასახელება/ტიპის აღწერა
description of the standard measuring instrument /identification

მიკვლევადობა:
Traceability: GEOSTM/Ukrmetrteststandard/BIPM/CMC

დაკალიბრების ადგილი
Calibration Site: ☒ შესრულებლის ლაბორატორია/Supplier's Lab. ☐ დამკვეთის ობიექტი/Customer's Site

დაკალიბრების პირობები
Ambient condition: t 20.4°C; RH 40%

დაკალიბრების შედეგები იხილეთ ფურ-ზე გვერდ(ებ)ზე
See Calibration Results on page(s)

ლაბორატორიის უფროსი
Chief of laboratory: ლ. ნანობაშვილი
სახელი, გვარი
name

ხელმოწერა, ბეჭედი
signature, stamp

პირის ხელმოწერა, რომელმაც ჩაატარა დაკალიბრება
Signature of the person who performed calibration: ზ. ცქიტიშვილი
სახელი, გვარი
name

ხელმოწერა
signature

30 07 23

ფურ 1 2-დან

8.2 Noise meter calibration certificate

IF-03.G

შპს "მეტროლოგი"
"METROLOGY" LLC

0144, თბილისი, ბერი გაბრიელ სალოსის გამზ. 191
191 Beri Gabriel Salosi Ave, Tbilisi, 0144
ტელ./Phone: +995 (32) 2-700-800, www. metrology.ge

საკ GAC
GAC – CL – 0017
სსტ ისო/იეკ 17025:2017/2018
11.11.2021 – 11.11.2025

საკალიბრებელი ლაბორატორია
CALIBRATION LABORATORY
დაკალიბრების სერტიფიკატი № 2982
CALIBRATION CERTIFICATE

გაცემის თარიღი Date of issue	30.01.2023
დაკალიბრების ობიექტი Calibrated item	ხმაურმზომი, Sound Level Meter N 05CC measuring instrument identification
დამკვეთი Customer	ფიზიკური პირი სერგო ხაჯავა, თბილისი, ჰეკინის გამზ. 14/2 name of customer, address
დაკალიბრების მეთოდი Metrhod of Calibration	CP-092.G; გოსტ 8.635-2013 name of the procedure/identification
დაკალიბრება შესრულებულია Calibration is performed by using	ხმაურის კალიბრატორი Model ND9B SN 922509 სერტ. №01Ak0321 11.02.2021 description of the standard measuring instrument /identification
მიკვლევადობა Traceability	Protos/UME/BIPM/CMC
დაკალიბრების ადგილი Calibration Site	☒ შემსრულებლის ლაბორატორია/Supplier's Lab. ☐ დამკვეთის ობიექტი/Customer's Site
დაკალიბრების პირობები Ambient condition	20.4°C; RH 37%; 98.1kPa

დაკალიბრების შედეგები იხილეთ 2 გვერდ(ებ)ზე
See Calibration Results on ____ page(s)

ლაბორატორიის უფროსი Chief of laboratory	ლ. ნაჩობაშვილი name	signature, stamp
პირის ხელმოწერა, რომელმაც ჩაატარა დაკალიბრება Signature of the person who performed calibration	ნ. ცქიტიშვილი name	signature

გვ. 1 2-დან

8.3 Dust meter calibration certificate

CASELLA

Certificate of Calibration and Conformity

Instrument Type CEL-712 Microdust Pro
Serial Number [illegible] Probe Serial Number [illegible]
Firmware revision [illegible]

Calibration Principle:

[illegible]

Test Conditions:

Temperature :-	21.9	°C
Humidity :-	55	%RH
Pressure :-	1017	mBar

Equipment used for Calibration of "Reference Insert":

Wind Tunnel:-	Casella Wind Tunnel	Serial Number:	EQ10732
Microbalance:-	Cahn C-32	Serial Number:	EQ10060
Velocity Probe:-	Air Velocity Probe	Serial Number:	EQ11303
Flow Meter:-	Gilibrator 3	Serial Number:	EQ11242

Calibration Results:

Casella Factory Reference 'Calibration Insert' :-	Serial Number:	EQ11062	Value:	15.586
Supplied 'Calibration Insert' For Probe :-	Serial Number:	0325879	Value:	116.1

Declaration of conformity:

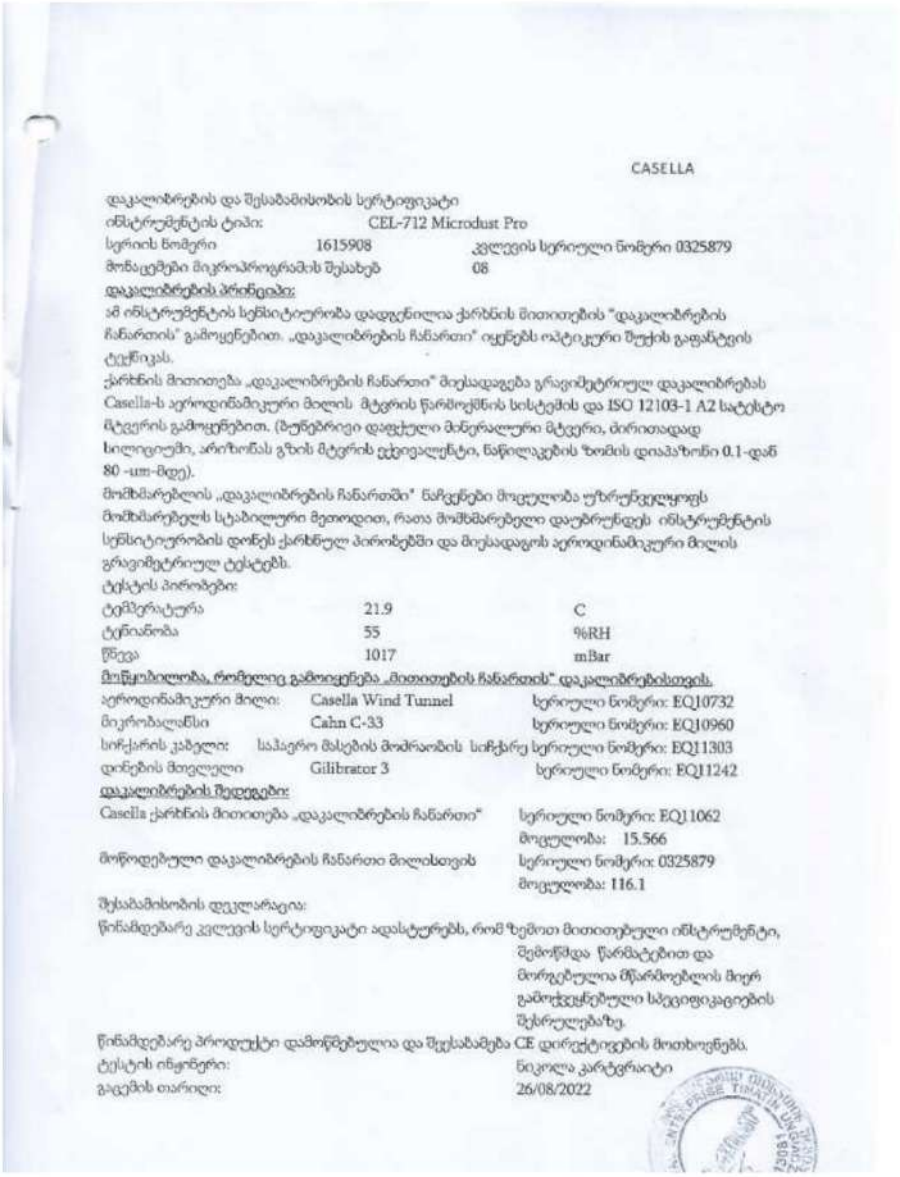
This test certificate confirms that the instrument as specified above has been successfully tested and adjusted to comply with the manufacturer's published specifications.

This product is certified as being compliant to the requirements of the CE Directive.

Test Engineer: Nicola Cartwright
Date of Issue: [illegible]

Casella [illegible] | Casella Inc. [illegible] | Ideal Industries India Pvt.Ltd. [illegible] | Ideal Industries China [illegible]

www.casellasolutions.com Solutions for Risk Reduction



CASELLA

დაკალიბრების და შესაბამისობის სერტიფიკატი
ინსტრუმენტის ტიპი: CEL-712 Microdust Pro
სერიის ნომერი 1615908 კვლევის სერიული ნომერი 0325879
მონაცემები მიკროპროგრამის შესახებ 08

დაკალიბრების პრინციპი:
ამ ინსტრუმენტის სენსიტიურობა დადგენილია ქარხნის მითითების "დაკალიბრების ჩანართის" გამოყენებით. „დაკალიბრების ჩანართი" იყენებს ოპტიკური შუქის გაფანტვის ტექნიკას.
ქარხნის მითითება „დაკალიბრების ჩანართი" მიესადაგება გრავიმეტრიულ დაკალიბრებას Casella-ს აეროდინამიკური მილის მტვრის წარმოქმნის სისტემის და ISO 12103-1 A2 სატესტო მტვერის გამოყენებით. (ბუნებრივი დაფქული მინერალური მტვერი, ძირითადად სილიციუმი, არიზონას გზის მტვრის ეკვივალენტი, ნაწილაკების ზომის დიაპაზონი 0.1-დან 80 -ამ-მდე).
მომხმარებლის „დაკალიბრების ჩანართში" ნარჩენები მოცულობა უზრუნველყოფს მომხმარებელს სტაბილური მეთოდით, რათა მოშხმარებელი დაუბრუნდეს ინსტრუმენტის სენსიტიურობის დონეს ქარხნულ პირობებში და მიესადაგოს აეროდინამიკური მილის გრავიმეტრიულ ტესტებს.
ტესტის პირობები:

ტემპერატურა	21.9	C
ტენიანობა	55	%RH
წნევა	1017	mBar

მოწყობილობა, რომელიც გამოიყენება „მითითების ჩანართის" დაკალიბრებისთვის.

აეროდინამიკური მილი:	Casella Wind Tunnel	სერიული ნომერი: EQ10732
მიკრობალანსი	Cahn C-33	სერიული ნომერი: EQ10960
სიჩქარის კამერა:	საჰაერო მასების მოძრაობის სიჩქარე	სერიული ნომერი: EQ11303
დინების მთვლელი	Gilibrator 3	სერიული ნომერი: EQ11242

დაკალიბრების შედეგები:

Casella ქარხნის მითითება „დაკალიბრების ჩანართი"	სერიული ნომერი: EQ11062 მოცულობა: 15.566
მოწოდებული დაკალიბრების ჩანართი მილისთვის	სერიული ნომერი: 0325879 მოცულობა: 116.1

შესაბამისობის დეკლარაცია:
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გაცემის თარიღი: 26/08/2022

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On two thousand twenty-two
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11 SUPPLEMENTARY DOCUMENT 5: RIONI RIVER PRELIMINARY ICHTHYOLOGICAL STUDY

Logo Aquage LLC

Ichthyological Study of the Rioni River
(with particular focus on sturgeon species)
Part of the Desk Research

Tbilisi 2004

Introduction

The research was held based on the agreement between MIRBUD-CS, ID No. 216501140 (hereinafter the "Client") and Aquage LLC, ID No. 400100680 (hereinafter the "Contractor") providing for the following:

- Determination of fish species composition at designated points on the Rioni River;
- Determination of intra-species structure and diversity of life strategies for fish species considered as target objects within the framework of the field research;
- Determination of categories of species (massive, rare, the Red Book species);
- Identification of indicator species reflecting the condition of river ecosystems;
- Assessment of species status (quantity, spawning periods, body length and weight, age and sex composition, distribution and localization in the sections of the river specified by the agreement);
- Assessment of anthropogenic impact, threats and sources of risks.

A Brief Characterization of the Rioni River

Hydrographical

The Rioni River originates on the southern slope of the Caucasian Mountain Range near the Phasismta peak, at 2,620 meters above sea level and flows into the Black Sea near city of Poti. The length of the river is 327 km, the average gradient is 7.2%, the drainage basin area, with an average elevation of 1,084 meters, is 13,400 km². The main tributaries are: the Jejora river (50 km in length), the Kvirila river (140 km), the Khanistskali river (57 km), the Tskhenistskali river (176 km), the Noghela river (59 km), the Tekhuri river (101 km), the Tsivi river (60 km).

The drainage basin of the Rioni River covers the half of the western Georgia. The largest part of it (68%) is located on the southern slope of the Caucasian mountain range. 13% of the river's basin is located on the northern slopes of Adjara-Imereti mountain range, while the rest 19% is located on Kolkheti lowland.

The mountainous part of the basin is located above 3000 meters off the sea level. This portion is heavily dissected by the tributary gorges and is characterized with distinctly pronounced glacial land forms. Approximately 12% of the basin is covered with glaciers and permanent snow.

The geology of the mountainous part is represented with granite, gneiss, sandstone, limestone and clay schist. In this part of the basin, mountain-meadow soils, podzolic brown soils, and yellow-brown clay soils are widespread. The vegetation cover consists of alpine plants and mixed forest.

The basin zone from 3,000 to 1,000 meters is characterized by relatively smooth relief contours and low gradients. In this zone, the Racha-Lechkhumi depression is clearly distinguished, the geological composition of which includes sandstone and marl. The mountains enclosing the depression, however, are composed of limestone, containing large amount of karst ridges and fissures. In the zone, red soils, yellow soils, and brown soils are widespread. The vegetation cover, however, consists of coniferous forest.

The river valley from its source to the city of Kutaisi is V-shaped. In certain areas, the valley forms a deeply incised rocky canyon. In some places, however, it widens and takes on a box-shaped form. The width of the bottom of the valley ranges from 0.1-0.4 km (in the V-shaped valley) to 0.4-1.5 km (in the box-shaped valley).

The river terraces are mostly found within the limits of the box-shaped valley. The width of the terraces range from 250 to 350 meters, the height ranges from 2 to 20 meters, while the length ranges from – 0.3 km to 2.0 km. The terraces are formed from alluvial-deluvial deposits covered by clayey soil. The terraces are cultivated with agricultural crops.

Gravelly pits are found along the entire length of the river. During floods and flashfloods the river pit is covered with 0.5-0.8 meter water layer. The river bed is moderately curved and splits into branches in certain areas. The width of the flow ranges from 6 to 60 meters, the depth ranges from 0.5 to 3.5 meters, while the speed changes from 2.0-4.2 m/s to 0.7-1.5 m/s.

The Rioni River is fed by glacial, snow, rain and ground waters, but is mainly sourced from snow and rain water. Its flow regime is characterized by the Spring-Summer flooding and flash-floods during the entire

year. The river's maximum runoff occurs in spring (April–June), accounting for 38.8% of the annual runoff. In autumn, 18% of the annual runoff flows, while in winter it accounts for 19.7% of the annual runoff. The annual runoff distribution is quite uneven. The maximum runoff of 13.9% usually occurs in May while the minimum runoff is recorded in January and accounts for only 5% of the annual runoff.

Among the ice phenomena observed on the river are ice shores, ice jams, anchor ice, and ice drift. The average duration of ice phenomena near Alpana village does not exceed 48 days. The Rioni River is vastly utilized for energy-generation and irrigation purposes.

The Climate

According to climatic regionalization (Sh. Javakhishvili), the Rioni River basin is located within the climatic region of the western Caucasian mountain range extending up to the Mamisoni Pass. It starts at the average of 700-1000 meters and extends up to 4000-5000 meters. A significant part of the ridge section is covered with glaciers. The location and the peculiar relief of the southern slopes of the western Caucasian range contributes to the diverse climate of this region. The western Caucasian range gradually raises towards the ridge section which influences the spacial distribution of precipitation and temperatures. At the same time, its territory and the Rioni River basin therein is influenced by the Black Sea and the moist winds blown from the west resulting in the heightened thermal regime of the region.

The climatic characterization of the Rioni River basin has been created based on the long term observation data of the Chrebalo Meteorological Station

According to the data from the above mentioned meteorological station, the duration of sunshine throughout the year does not exceed 2,000 hours. The total radiation is 140-150 kcal/cm², the annual indicator of the radiation balance is 40-60 kcal/cm².

Directly related to the Sun radiation is one of the main factors in creating climatic conditions – the air temperature, the average monthly, annual, and extreme values according to the Chrebalo Meteorological Station's long term observation data are given in Table No. 1.

The Average Monthly, Annual, and Extreme
Air Temperature Values T°C

Met. Station	Temp.	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Year
Chrebalo	Aaverage	-0.6	1.2	5.6	11.2	16.3	19.6	22.1	22.4	18.4	12.7	6.8	1.1	11.4
	Abs. Min.	17	22	30	33	35	37	40	40	40	34	29	20	40
	Abs. Max.	-27	-22	-15	-5	-1	5	8	6	1	-7	-20	-24	-27

As the Table #1 shows, the hottest months in the region are July and August, while the coldest months are – January and December.

The frosts in the region, or the fall of temperature below 0°C despite average daily temperatures being above freezing, at average start in November and ends in April. The beginning and the end of frost dates, as well as the period of no-frost in days, according to the same meteorological station data are given in the Table No. 2.

The Beginning and the End Dates of the Frost
and the Duration of No-Frost Days

Met. Station	Frost Dates						No-Frost Period/Days		
	Start			End					
	Average	Early	Late	Average	Early	Late	Average	Early	Late
Chrebalo	6,XI	-	-	5,IV			214		

The temperature of the surface of the soil, which depends on the type of the soil, its mechanical consistency, moisture level, its coverage with plants in Summer and the height of the snow cover – in Winter, means the temperature of the first several millimeters-thick layer of the soil. Its values are closely connected to the air temperature values. Additionally, its average annual value on the research territory exceeds more than 20 times the average annual air temperature value.

The average monthly, annual, the average maximum and minimum values of the soil surface according to the long term observation data by the same meteorological station are given in the Table No. 3.

The Average Monthly, Annual, Maximum and Minimum
Soil Surface Temperature T°C

Met. Station	Temp.	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Year
	Average	-2	0	6	13	20	25	28	27	22	13	6	0	13
	Abs. Minimum	6	9	19	31	40	47	48	48	40	28	17	9	28
	Abs. Maximum	-7	-6	-1	4	10	14	17	17	12	6	1	-5	5

The average dates of starting and ending of the frosting of the soil surface, as well as the duration of no-frost period in days according to the Chrebalo Meteorological Station's long-term observation data are given in the Table No. 4.

The Average Dates of Starting and Ending of the Frosting of the Soil Surface and the Duration of No-Frost Period in Days

Met. Station	Dates of Frost		Duration of No-Frost Days
	First in Autumn	Last in Spring	
Chrebalo	27.X	19.IV	190

The atmospheric precipitation which is one of the main elements creating the region's climatic and hydrology regime are abundant here. The total sum of the annual atmospheric precipitation here reaches 1088mm. Additionally, the annual precipitation movement is characterized as a continental type with one maximum in May-June and the other – the insignificant maximum in September-October.

The annual monthly quantity of atmospheric precipitation and the annual sum thereof per the same meteorological long term observation data are given in the Table No. 5.

Station	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XI	Year
Cherablo	77	79	84	89	109	103	84	82	90	102	97	92	1088

Compared to other regions of the western Georgia, here the maximum daily amount of precipitation is low. The maximum daily amount of precipitation recorded by the Chrebalo Meteorological Station on 21 November 1956 is 88mm.

The daily maximum amount of precipitation with different return periods based on the Chrebalo Meteorological Station's long term observation data is given in the Table No. 6.

The Daily Maximum Amount of Precipitation
with Different Return Periods in mms (annual)

Met.	Average	Return Periods %						Observed Max.	
Station	Max.	63	20	10	5	2	1	Mm	Date
Chrebalo	52	45	61	70	78	88	94	88	21.XI.1956

Moisture level of the air is one of the most important climatic factors. It is characterized in three main values: the water vapor elasticity or the absolute moisture; relative moisture, and the moisture deficit. The first determines the amount of water vapor in the air; the second – the degree at which the air is saturated with vapor, while the third – shows the potential evaporation value.

The air moisture levels in the regions are not high. The annual movement of the vapor saturation (the absolute moisture) and its deficit values practically matches with the annual air temperature movement.

The average monthly and yearly values of the moisture level per the same meteorological station's long term observation data are given in the Table No. 7.

Met. Station	Humidity	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Year
	Absolute mb	5.2	5.0	6.3	8.8	12.6	16	19	18.7	15.1	11	8.1	5.9	11
Chrebalo	Relative %	84	80	74	68	70	71	73	72	75	80	80	84	76
	Deficit mb	1.2	1.6	3.1	5.7	7.3	8.2	8.8	9.3	7	4	2.6	1.4	5

The snow cover, according to the Chrebalo Meteorological Station's long term observation data, in average, appears at the earliest by 18.X and disappears by 16.VI. Additionally, the average dekadal height of the snow, according to the same station, is 30cm, while maximum dekadal height is 48cm.

Dates of Snow Cover Appearance/Disappearance

Met. Station	No. of Snow Days	Snow Cover Appearance Date			Snow Cover Disappearance Date		
		Average	Early	Late	Average	Early	Late
Chrebalo	40	19.XII	15.X	10.II	18.III	8.II	16.IV

In the region, winds blow from all directions, but the prevailing west, east, and south-west winds are caused by the direction of the Rioni River valley. Wind directions and the number of calm days based on long-term observations from the same meteorological station are given in the Table No. 9.

Wind Directions and the Percentage of Calm Days from the Annual Total (%)

Met. Station	N	NE	E	SE	S	SW	W	NW	Calm
Chrebalo	15	7	18	4	10	20	21	5	65

Average annual wind speed in the region is not high. The average monthly maximum speed recorded in April-May does not exceed 1.2m/s.

Average monthly and annual wind speed per the same meteorological station are given in the Table No. 10.

Met. Station	Flugger Height	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Year
Chrebalo	11m	0.3	0.3	0.8	1.2	1.2	1.1	1.2	1.0	0.7	0.4	0.4	0.2	0.7

Maximum wind speeds for different recurrence intervals based on long-term data from the same meteorological station are given in the Table No. 11.

Maximum Wind Speeds in m/s

Met. Station	Maximum Wind Speed (m/s) One-Time Occurrence				
	1 year	5 years	10 years	15 years	20 years
Chrebalo	9	11	12	12	13

Lightning is a frequent occurrence in the region – 30-40 times a year. Lightning here occurs in the warm period of the year mostly (5-12 days a month). Rarely the lightning occurs in winter as well. Unlike lightning, hail occurs only in the warm period of the year, the most frequently in May-June. Number of hail days does not exceed 1-5 days. Fog is a frequent phenomenon here

The average monthly water temperature in the Rioni River fluctuates from 3.70°C (January) to 15.50°C (August).

The river flows into the Black Sea in two branches near the city of Poti. It is fed by up to 12 tributaries, out of which the most significant are the Tskhenistskhali, the Tekhuri and the Kvirila Rivers.

The Ichthyofauna of the Rioni River

Species	The Rioni River
Acipenser colchicus parcicus – Colchian sturgeon	+
Acipenser stellatus Pallas – Stellate sturgeon	+
Acipenser sturi+o Linne – Atlantic sturgeon	+
Alburnoides bipunctatus fasciatus Nordmann – Spirlin	+
Anguilla anguilla Linne – European eel	+
Atherina mochon pontica Eichwald – Pontic sand smelt	+
Barbus tauricus Escherichi Steindachner – Colchian Barbell	+
Carassius carassius Linnaeus – Crucian carp	+
Chalcalburnus chalcoides Derjugini (Berg) – Caspian shemaya	
Chondrostoma colchikum (Kessler) Berg – Colchic Nase	+
Cyprinus carpio Linne – Common carp	+
Esox lucius Linneaus - Pike	-
Gambusia affinis affinis Baird et Girard – Mosquitofish	+
Gobio gobio lepidolaemus natio caucasicus – Caucasian Gudgeon	+
Gobitis teania Satunin Gladkov – Spined Loach	+
Huso huso – Beluga sturgeon	+
Lamperta mariae Berg - Ukrainian brook lamprey	+
Leuciscus boristhenicus (Kessler) - Dwarf chub	+
Leuciscus cephalus orientalis Nordmann - Caucasian	+

chub	
Morena Labrax L – Sea bass	-
Mugil auratus Risso - Golden grey mullet	+
Mugil cephalus Linne - Flathead grey mullet	+
Nemachilus angorae Steindachner – Angora loach	+
Neogobius cephalarges constructor Nordmann - Caucasian goby	+
Neogobius fluviatilis Pallas - Monkey goby	+
Neogobius melanostomus Pallas - Round goby	+
Phoxinus phoxinus colchicus Berg - Colchic minnow	+
Proterorhinus marmaratus Pallas - Tubenose goby	+
Rhodeus sericeus ammarus Bloch - European bitterling	-
Salmo irideus Gibbons - Rainbow trout	+
Salmo trutta Labrax Pallas morpha fario – Brown trout, river form	+
Salmo trutta trutta Labrax Pallas – Sea trout	+
Scardinius erythrophthalmus Linnaeus - Rudd	+
Silurus glanis Linnaeus - Wels catfish	+
Syngnathus abaster - Black-striped pipefish	+
Varicorhinus sieboldi Steindachner – Colchian Cyprinid	+
Varicorhinus tinca Heckel - Tench	+
Vimba vimba tenella Nordmann - Vimba bream	+
Total	35

Ukrainian Brook Lamprey - Lamperta mariae Berg. It has elongated and naked body. The skin is covered with mucus and contains large number of glands. There are 7 gill openings on each side behind the eyes. It has a single nostril and lacks paired fins. It has only two dorsal fins and a short caudal (tail) fin. The mouth is round, funnel-shaped, and of a suction type. It has no jaws. The skeleton is cartilaginous. During the breeding season, the body shortens, the dorsal fins elongate and merge with each other. It has well-developed teeth. It is a freshwater inhabitant and can reach up to 21 cm in length. The body is grayish, and the belly has a metallic sheen. It is found in the rivers of western Georgia.

[Image of Ukraininan Brook Lamprey]

Common Carp - Cyprinus carpio (Linnem 1758). The body of common carp is tall and covered with thick scales, with a black border on the outer side. It has small mouth, which faces downward and carries two pairs of short barbels. The dorsal fin begins in front of the vertical line of the pelvic fins. Its color varies: the back and the fins are dark, the sides are yellowish-golden, and the caudal fin has reddish coloration. It may reach over 1 meter in length and weigh up to 16 kg, rarely up to 32 kg, it is usually found in smaller sizes. It lives up to 30 years and grows intensively until the age of 7–8.

It was acclimatized from the Amur River and has spread widely in the inland waters of Eurasia. In Georgia, it is found in inland water bodies such as the Mtkvari, Alazani, Iori, Chorokhi, Supsa, Rioni, Khobi, Jumi, Churia, Tikori, Enguri, Kodori rivers, and others. It also inhabits lakes such as Jandara, Paravani, Saghamo, Paliastomi, Bebesiri, Tabatskuri, and others, as well as reservoirs and ponds.

[Image of Common Carp]

It is a freshwater fish, primarily limnophilic, preferring slow-flowing rivers and lakes. It is also found in brackish areas of seas and habitats rich in aquatic vegetation. In western Georgia, it exhibits a semi-migratory characteristics. Sexual dimorphism is not strongly exhibited. It reaches sexual maturity at the age of 3–5 years, typically at a length of 30 cm, though occasionally the second year. Males mature slightly earlier than females. Spawning begins in April when the water temperature reaches 16°C.

Spawning occurs in vegetation-rich shallow areas of water bodies at depths up to 0.5 meters. Fecundity ranges from 96,000 to 1.8 million eggs. The eggs are yellowish, 1.4–1.5 mm in diameter, and affix to aquatic plants. The incubation period lasts 3–7 days depending on temperature. Newly hatched larvae initially remain attached to plants and feed on their yolk sacs; later, they detach and begin actively feeding on zooplankton.

The carp is euryphagous—it feeds on both animal and plant matter. Its diet largely depends on food availability. Juveniles primarily consume zooplankton and later shift to benthic organisms. The diet of adult carp is seasonal: in spring, it feeds mainly on plant matter and, to some extent, on the eggs of early-spawning fish. In summer, plant matter forms a smaller portion of the diet, while the main food includes insects, worms, crustaceans, snails, and others. In autumn, its diet consists entirely of animal-based food.

In high-mountain oligotrophic lakes like Paravani and Tabatskuri, under different vegetative conditions, carp form ecotypes with distinct plastic and biological characteristics. However, these are merely ecological variations and cannot be considered distinct species, so their classification as separate species is incorrect.

Carp is a valuable species in pond aquaculture, known for its rapid growth and high productivity. Among the cultivated strains, the mirror carp has been the primary breed used in Georgia's fish farms. It is mainly caught with cast and gill nets. Currently, wild carp populations in natural water bodies have significantly declined.

Pike - Esox lucius Linneaus, 1758. The body is elongated, with a large, long head and a flattened snout. The mouth is large, making up about half the length of the head. The dorsal fin is positioned far back on the body. It has well-developed teeth. The lateral line organ is continuous, although in juveniles it may sometimes appear interrupted.

[Image of Pike]

The body coloration varies from greenish-gray to yellowish-gray or brownish-gray. The back is darker, while the sides are lighter, marked with dark or dusky spots. The length can reach 1–1.5 meters, and the weight up to 15–24 kg, though it is usually found in smaller sizes. It inhabits swampy, vegetated areas along riverbanks and feeds on fish, amphibians, and other animal organisms. It reaches sexual maturity at the age of 3–4 years and spawns between March and April.

Common Roach - Rutilus rutilus Heskeli Nordmann, 1940. The mouth is oblique and slightly upward-facing. The head length makes up about 20% of the body length, and about 16.1% of its height. Behind the pelvic fins, there is a keel covered with scales. The dorsal and caudal fins are pale in color, while the other fins are orange or more or less red. The iris of the eye is sometimes red, sometimes yellow.

It reaches a length of up to 312 mm and a weight of up to 850 grams. It is a freshwater fish, spawning between March and April. It feeds on aquatic plants, mollusks, and other bottom-dwelling organisms.

[Image of Common Roach]

Caucasian chub - Leuciscus cephalus orientalis Nordmann. The length of the head exceeds, or is sometimes equal to, the height of the body. The body is elongated and has a darker coloration compared to the typical European chub. The back is dark greenish, the sides are whitish, and the belly is silvery. It can reach a length of up to 450 mm and a weight of 1.2 kg, sometimes more.

The **Caucasian chub** appears in different parts of the river depending on the season: in spring and summer, it is found in midstream areas and shallow waters; in autumn and winter, it inhabits the slow-moving, sandy sections near river mouths. It overwinters in the lower parts of rivers, in deep, slow-flowing waters.

It reaches sexual maturity and begins spawning at the age of 3. Spawning occurs from April to the end of May. It selects shallow, fast-flowing areas with sandy bottoms for spawning. The eggs are demersal (bottom-depositing) and adhesive, sticking to stones and other surfaces. Fecundity ranges from 14,000 to 120,000 eggs.

[Image of Caucasian Chub]

The chub adapts easily to both river and lake environments and can tolerate significant fluctuations in water temperature. It feeds on both plant and animal matter, though its primary diet consists of invertebrates.

Dwarf Chub – *Leuciscus borysthenicus* Kessler, 1859

The dorsal fin is either truncated or slightly rounded; the anal fin is rounded and slightly indented. The mouth is small, the forehead is flat, and the belly is not compressed from the sides. The dorsal area is dark in color. During the spawning period, the abdominal and anal fins turn bright orange.

It reaches up to 144 mm in length and up to 8 grams in weight. It is a freshwater species and feeds on benthic (bottom-dwelling) organisms.

[Image of Dwarf Chub]

Colchic Minnow - Phoxinus phoxinus colchicus Berg, 1910. The belly is either fully or partially covered with scales. Its coloration is mottled, with large pale spots on the sides. The body color is highly variable. Sexually mature males develop small tubercles on their heads. The mouth is located on the underside.

[Image of Colchis Minnow]

During the spawning season, the bellies, posterior edges of the mouths, and fins of males turn red. They display well-developed nuptial coloration. Sexual dimorphism is strongly expressed — males are relatively smaller in size. The species reaches up to 82 mm in length.

The Colchic minnow differs from the typical form in that the caudal peduncle is relatively higher, the sides are more compressed, and the caudal fin is less deeply forked. It feeds on benthos, plankton, and aquatic

plants. Spawning occurs in April–May, with a fecundity of up to 1,200 eggs.

Rudd - Scardinius erythrophthalmus Linnaeus. The body is laterally compressed and of medium height. The head is small, with the mouth directed upward. The upper jaw is slightly protruded, and the lateral line descends noticeably lower along the abdominal area.

[Image of Rudd]

The dorsal and anal fins are truncated or slightly emarginate, while the caudal fin is deeply forked with thickened lobes. The pectoral fins almost reach the pelvic fins. Coloration is light red, especially vivid during the spawning period: the pectoral, ventral, and caudal fins turn reddish, and the eyes become orange. Rudd typically reaches 200–250 mm in length, occasionally up to 300 mm, and weighs between 300–600 grams. It prefers slow-flowing waters rich in aquatic vegetation. Sexual maturity is reached at the age of 2 years. Spawning occurs from April to May. The eggs are adhesive, with fecundity ranging from 36,000 to 149,000 eggs. Egg diameter reaches up to 1.7 mm. Its diet includes phytoplankton, aquatic invertebrates, and fish eggs.

Colchic Nase - Chondrostoma colchikum (Kessler) Berg. The body is elongated and laterally compressed. The head is short and relatively tall; the mouth is subterminal, with a straight lower lip covered by a horny, cutting sheath. The snout is pointed and conical, and the forehead is convex. The peritoneum is black, the eyes are small, and the intestine is long—2 to 3 times the body length.

[Image of Colchic Nase]

The caudal fin is short and slightly emarginate. The dorsal surface is greenish to dark gray, while the flanks and belly are silvery. All fins except the dorsal are reddish or orange-tinted. Sexually mature males develop epithelial breeding tubercles on the head, which disappear after the spawning season. Maximum body length reaches up to 300 mm, and weight up to 200 grams. Colchic Nase is a benthic riverine fish that prefers fast-flowing, stony or gravel-bottomed stretches. Spawning occurs from March to May, with sexual maturity reached at 3 to 4 years of age. Fecundity ranges between 1,500 to 90,000 eggs, laid in three separate batches at different times and locations. Egg diameter ranges from 1.5 to 1.8 mm. Spawning typically takes place in shallow, fast-flowing water over coarse sand or gravel. This species is primarily herbivorous, scraping algae off stones and submerged objects using its lower lip. As a result, rocks in its habitat often show uniform parallel scraping marks. Colchic Nase endemic to western Georgia, found in almost all river systems of the Black Sea basin.

Caucasian Gudgeon - Gobio gobio lepidolaemus natio caucasicus. This fish has a single pair of barbels. The body is elongated, reaching the vertical line behind the eye. The caudal fin is deeply forked, and the mouth is subterminal (pointing downward). During the spawning period, small tubercles appear on the head resembling millet grains, which is why it is locally called "Fetvia."

The dorsal surface has a dark grayish-green tint, while the sides are yellowish with a dark spot along the flank. The snout is flat, and the caudal peduncle is slender. The length of the snout (from behind the eye to the operculum) is equal to the distance from the operculum edge to the vertical behind the eye. The minimal body height is 2.1–2.3 times smaller than the length of the caudal peduncle. The body length reaches up to 195 mm, and weight can exceed 48 grams. This the Caucasian Gudgeon inhabits slow-flowing river stretches with sandy bottoms. Its diet consists of crustaceans, insect larvae, fish eggs, lice, and aquatic plants. Spawning occurs in spring, with fecundity ranging from 2,000 to 13,000 eggs. Sexual maturity is reached between 2 and 3 years of age.

[Image of Caucasian Gudgeon]

Tench - Varicorhinus tinca Heckel. This species has two pairs of barbels, with the tips of the anterior pair reaching the front edge of the eye. The mouth is subterminal (pointed downward). The dorsal fin's posterior rays bear 16–17 small serrations. The dorsal fin is notched, and the caudal fin is considerably forked. The dorsal body is dark, while the sides and belly are grayish. The head length is 4.5 to 4.9 times smaller than the total body length. The body height is 4.9 to 5.3 times smaller than the body length. The total length can reach up to 45 cm, with a weight up to 0.5 kg, though individuals are usually smaller.

[Image of Tench]

According to Elanidze (1964), two distinct morphological forms of tench are found in the Chorokhi River basin in southwestern Georgia. One form has a low body, a blunt snout, and a notched dorsal fin. The gill rakers on the first gill arch are noticeably long, and the last ray of the dorsal fin has up to 18 serrations. In this form, the width of the forehead exceeds the length of the snout. The anal fin does not reach the base of the caudal fin.

The second form also has a low body, but the back, especially in front of the dorsal fin, is arched. The head is narrow, the snout is not blunt, and its length is equal to the width of the forehead. The caudal fin lobes are equal in size, and the anal fin nearly reaches the base of the caudal fin. This species is native to Georgia and inhabits the Chorokhi River and its tributaries. It typically lives in cold, fast-flowing waters but is also able to adapt to still or slow-moving water bodies. The Tench is omnivorous, feeding on both plant and animal matter. It scrapes algae from stones and other surfaces using its keratinized lower lip. Sexual maturity is reached at the age of 2 to 3 years. Spawning takes place from May through July in shallow, fast-flowing areas with stony or gravel bottoms. The species is moderately fecund, producing between 2,000 and 6,000 eggs, which are toxic during the reproductive period.

Colchic Cyprinid - Varicorhinus sieboldi Steindachner. The Colchic Cyprinid has two pairs of barbels, and the snout is protruding. The upper lip is fringed. The last ray of the dorsal fin is thickened and bears serrations. The body is slightly compressed laterally in front of the dorsal fin. The dorsal fin is obliquely notched, and the caudal fin is elongated with large lobes. The head length is equal to the body height and is 4.7 to 5.0 times smaller than the total body length. The body reaches up to 45.5 cm in length, and the weight can be up to 700 grams.

[Image of Colchian Cyprinid]

It has a yellowish body coloration with reddish-tinted fins. In males, epithelial tubercles become visible on the head during the reproductive period. This fish inhabits cold, fast-flowing river sections with stony and gravelly substrates. Its spawning period coincides with that of the Small-Asian Cyprinid. Fecundity reaches up to 30,000 eggs. The Colchic Cyprinid primarily feeds on periphyton and plant detritus. However, its diet also includes animal matter, such as chironomid larvae and oligochaetes.

Colchian Barbell - Barbus tauricus Escherichi Steindachner. The mouth is subterminal and crescent-shaped, with thick and well-developed lips. The snout is elongated, and there are two pairs of barbels. The body is elongated and slightly compressed laterally. The dorsal fin is slightly notched, while the caudal fin is more deeply forked. The eyes are small. The upper part of the body is uniformly dark, while the underside is yellowish or grayish. The body, and sometimes the fins, are covered with dark spots. The fins and lips are sometimes reddish. The eye diameter is 5 to 7 times smaller than the head length and 2 to 3 times smaller than the snout length. The body length reaches up to 25–28 cm.

[Image of Colchian Barbell]

It prefers habitats with stony or gravelly substrates. Sexual maturity is reached at the age of 3 to 4 years. Spawning occurs from May to August. Fecundity depends on body size, weight, and age, and can range from 3,000 to 49,000 eggs. The diameter of the eggs reaches 2.4–2.8 mm. During reproduction, the eggs are toxic.

According to Meskhiadze, the diet is dominated by benthic organisms, while plant material plays an insignificant role. Gogmachadze notes that important components of the Colchic Barbell's diet include oligochaetes, trichopterans, ephemeropterans, plecopterans, blepharocerids, insect imagos, coleopterans, mollusks, and nematodes.

Caspian Shemaya - Chalcalburnus chalcoides Derjugini (Berg). It has an unscaled keel on the belly that extends up to the anal opening. The coloration is silvery, and the body is covered with black pigment spots along the head and sides, forming a broad, somewhat distinct lateral stripe. Its size ranges from 96 to 205 mm, with a weight of up to 150 grams. Compared to the typical form, it differs by having a smaller body, larger eyes, a less deeply forked caudal fin, and a higher dorsal fin. It feeds on benthic organisms and spawns in spring when the water temperature reaches 14°C. According to Elanidze, its fecundity can reach up to 21,000 eggs.

[Image of Caspian Shemaya]

Schneider - Alburnoides bipunctatus fasciatus Nordmann. Its coloration is white-silver, with a dark greenish back. Along the lateral line, a double stripe is sometimes distinctly visible and sometimes faint. Pigment spots are scattered along the sides of the body. The body is laterally compressed, and its length reaches up to 125 mm. Schneider reaches sexual maturity in its third year, occasionally in the second year. Spawning takes place from May until the end of August, depending on the ecological conditions of its habitat. Fecundity is influenced by body size and the specific environmental conditions where it lives.

[Image of Spirlin]

According to Elanidze, the fecundity of Spirlin collected in 1960 from the Adjaristskali River ranged from 1,200 to 3,250 eggs. The diameter of the eggs varied between 0.59 and 1.66 mm. It feeds on benthic organisms, partially on plankton, and also on aquatic plants.

Vimba Bream - Vimba vimba tenella Nordmann. The mouth is subterminal and crescent-shaped. There is a well-defined keel between the dorsal and caudal fins. Small spots are present on both the dorsal and caudal fins.

[Image of Vimba Bream]

During the breeding season, males develop a black back, and their abdomen takes on a brownish-pink hue. The pectoral, abdominal, and anal fins become reddish. The body length can reach up to 220 mm, with a weight of up to 135 grams. This species prefers calm, slow-flowing habitats. Its growth rate mainly depends on environmental conditions. It feeds on benthic organisms and aquatic plants and reaches sexual maturity at 2 to 3 years of age. Spawning occurs from April to July, with the eggs laid multiple times. Fecundity can reach up to 20,000 eggs. The eggs are adhesive.

Colchic Bitterling - Rhodeus colchicus Bogutskaya & Komlev, 2001. The body is tall, short, and laterally compressed; the caudal peduncle is thin. Greenish-blue stripes run along the sides. The snout develops white horny tubercles shaped like a crescent or triangle, which is why in western Georgia it is called "Tavshakara." During the breeding period, the female develops long egg tubes that sometimes exceed the body length.

[Image of Colchic Bitterling]

Body coloration varies greatly depending on sex and age. Before spawning, individuals of both sexes have the same coloration; the sides are silvery, with a greenish or bluish stripe running along the back half of the body. The body length reaches up to 95 mm. It is a freshwater fish that prefers calm areas covered with vegetation. Its main diet consists of plant material. It reaches sexual maturity by the second year.

Angora Loach - Nemachilus angorae Steindachner. 1897. The body is low, elongated, and covered with fine scales. The upper jaw has a well or poorly defined tooth-like edge. The lateral line slightly falls short of

reaching the base of the caudal fin. The scales are very small in size. Sexually mature males typically have tubercles covering the head, body, and fins. The caudal fin is noticeably forked.

[Image of Angora Loach]

The body coloration is dark gray. It has three pairs of barbels: one pair at the corners of the mouth and two pairs at the end of the snout. The body is marked with irregular dark spots and stripes. Its length reaches up to 79 mm, and weight up to 30 grams. It primarily inhabits calm water areas with bottoms covered by stones, gravel, and rich vegetation. It feeds on planktonic and benthic organisms. Spawning occurs twice a year—in spring and summer. Eggs are laid in stony and gravelly places where the water level is low. The eggs stick to stones and other submerged objects. During the spawning period, both males and females develop bright coloration. Fecundity ranges from 100 to 4,800 eggs.

Spined Loach - Gobitis teania Satunin Gladkov, 1758. The body is laterally compressed. It has three pairs of short barbels: one pair, the longest, is located at the corners of the mouth, while the other two pairs are at the tip of the snout. The lower lip is wing-shaped. The anterior nostrils are represented by short tubes. There is a small flap under the eye at the corner. Sometimes, scales hidden beneath the skin are arranged like shingles and are mostly light yellow in color. Along the sides of the body, there is a series of 10–18 large, four-sided or rounded dark spots. Sometimes these spots connect, forming a continuous stripe. Above the spots, irregular dark pigmented spots are present, while the back features large grayish spots. Above the base of the tail fin, there is a dark spot; occasionally, two spots appear near the base of the tail fin. A narrow dark stripe runs from the tip of the snout to the eye. Rows of dark pigmented spots are arranged on the dorsal and tail fins. The body coloration varies somewhat, with a length of 95–115 mm and weight up to 10 grams.

[Image of Spined Loach]

It is a rheophilic–limnophilic fish. It spawns in March-April, choosing stagnant areas covered with grass for this purpose. Sexual dimorphism is expressed by the enlargement of the second ray of the dorsal fin. Fertility ranges from 700 to 1600 eggs.

Wels Catfish - Silurus glanis Linnaeus, 1758. This fish has elongated and slender body. It has a large mouth armed with teeth, indicating predatory behavior. Its body coloration varies depending on its habitat. The back is green, the belly is white, and there are irregular spots on the sides. The dorsal fins are dark-colored, and the paired fins have a yellowish stripe around them. The iris is yellowish with black spots. Additionally, it has one pair of long barbels on the upper jaw and two pairs of short barbels on the lower jaw. Its length in nature is usually up to 5 cm, weighing up to 300 grams, though it is often found in smaller sizes. This fish is semi-migratory, meaning it lives both in river lakes and streams.

[Image of Wels Catfish]

It inhabits deep, calm areas in rivers and buries itself in deep holes during winter. It reaches sexual maturity at 3–4 years of age, with fertility ranging from 10,000 to 500,000 eggs. Newly hatched larvae measure about

7 mm in length. They attach to aquatic plants and develop there. Three-month-old larvae of the catfish reach lengths of 11–15 cm.

Three-spined Stickleback - Gusterosteus aculeatus Linne. The body is covered with bony plates, which form 4–5 rows near the tail. There are usually three spines in front of the dorsal fin. The pelvic spine lacks a tubercle at its base. The dorsal spine and caudal peduncle are short. Its length reaches 40–90 mm, and its weight up to 4 grams.

[Image of Three-Spined Stickleback]

The three-spined stickleback is a marine semi-anadromous fish. In Adjara, it is mainly found at the mouth of the Chorokhi River and also in Nurigeli Lake. It reaches sexual maturity in its second year. Its lifespan is 3–4 years. The body coloration varies greatly but is mainly silvery. The head and back have a blue tint.

During spawning, males develop red coloration on their underside and belly, while females show dark oblique spots on their backs. Spawning lasts from March to August. The male builds a nest in coastal areas covered with vegetation using stems and leaves, attracts the female, stimulates her to lay eggs, fertilizes them, and then guards the nest to prevent the female from eating the eggs and larvae.

Black Sea Pipefish - Syngnathus nigrolineatus Eichwald, 1831. The body is slender, elongated, and cylindrically-angled, covered with bony plates. The mouth is small and toothless. The snout is also elongated and mostly cylindrical in shape. The gill cover is highly protruding. The body is made up of rings—15–17 trunk rings and 36–40 tail rings—arranged in a belt-like manner. It lacks pelvic fins. The coloration of the body is greenish-brown or reddish-brown, with light transverse bands along the sides, and the belly is whitish. The body length reaches 15–18 cm.

[Image of Black Sea Pipefish]

The Black Sea pipefish is a euryhaline species of the coastal marine zone. It primarily inhabits areas rich in aquatic vegetation. It feeds on small planktonic organisms. Its breeding period lasts from March to August. The female lays 28–85 eggs in two longitudinal rows into a groove located on the male's belly side, where the larvae hatch. Later, the groove opens and the juveniles emerge.

Mosquitofish - Gambusia affinis affinis Baird et Girard. The body is elongated and low; the dorsal fin is positioned quite far back. The caudal (tail) fin is rounded in shape. Sexual dimorphism is well expressed — the female is nearly twice as large as the male. The male's anal fin is much longer, with one ray elongated and serrated, forming a copulatory organ called a gonopodium. There is no lateral line. The female can reach up to 60 mm in length and weigh 2.5–3 g, while the male reaches up to 35 mm in length and weighs 0.35–0.50 g. Mosquitofish is a heat-loving fish. When the water temperature drops below 10°C, it burrows into silt and enters a dormant state. It inhabits shallow water areas.

[Image of Mosquitofish]

Mosquitofish is a predatory fish that feeds on fish eggs and fry, though it is also capable of consuming plant-based food. It reaches sexual maturity at about one month of age and is viviparous, meaning it gives birth to live young. Mosquitofish can produce 4–5 generations per year, giving birth to 60–390 fry at a time, with the number depending on the fish's age, size, and environmental conditions.

It is found in nearly all water bodies (except the upper courses of rivers), including both rivers and lakes. Mosquitofish plays a significant role in mosquito control, as it consumes large quantities of mosquito eggs, larvae, and pupae — a valuable contribution to malaria prevention. However, it also poses a threat to commercially important fish species by feeding on their eggs, larvae, fry, and food sources, causing considerable ecological damage.

Golden Grey Mullet - Mugil Auratus Risso. Like all mullets, its body is cylindrical in shape. This species differs from other mullets primarily by having a single row of lateral line grooves on the upper part of the head, appearing as small, dark-colored dashes. The coloration of the body is dark grayish-black on the dorsal side, and silvery on the sides. Along the sides, 6–7 dark longitudinal stripes can be seen, often accompanied by fine golden lines. There is also a golden spot on the operculum (gill cover). The maximum body length reaches 50–52 cm, with an average size of around 40 cm.

[Image of Golden Grey Mullet]

It is widely distributed along the European and African coasts of the Atlantic Ocean, as well as in the Mediterranean, Azov, and Black Seas. It enters bays and estuaries. In Georgia, it is found in Lake Paliastomi, river mouths, and lagoons connected to the sea.

In the Black Sea, spawning occurs from June to early October. Fecundity ranges from 1,200,000 to 2,100,000 eggs. Spawning is portion-based and takes place in open sea waters with salinity levels between 10 and 32‰. One female typically spawns with 7–10 males. The eggs are pelagic, spherical, and contain a fat droplet.

Overwintered juveniles (shkrebethuha) migrate en masse to estuarine areas in spring, where growth is rapid. By autumn, juveniles can reach 17–18 cm in length and weigh around 120 g. Later, they leave the estuaries and move into the open sea.

The golden grey mullet is an agile and fast fish capable of surviving in a wide range of temperatures and salinity levels. Juveniles can withstand temperatures up to 38°C and salinity levels up to 67.2‰.

By the third year, they reach 25–27 cm in length and 250–350 g in weight. Males reach sexual maturity at 3 years, females at 4 years, although only about 60% mature by that age. Unfavorable environmental conditions can delay maturity up to the 8th year.

Juveniles feed on plankton, insect larvae, small crustaceans, and mollusks. Adults primarily feed on detritus and plant remains, which they scrape from the bottom stones with their lips. Other food items are of minor importance.

Juveniles are important prey for predatory fish, while adults are eaten by dogfish (katran) and dolphins.

The golden grey mullet is a valuable commercial species, important in coastal fisheries and recreational angling. It is caught using seine nets and special mullet nets.

Flathead Grey Mullet - Mugil cephalus Linne. Externally, it closely resembles other mullets. The main distinguishing feature is a well-developed adipose eyelid, which partially covers the eye from both the front and rear. It also has a relatively large head and a well-developed auxiliary scale near the pectoral fin.

[Image of Flathead Grey Mullet]

It grows to relatively large sizes, reaching up to 1 meter in length and 12 kg in weight. In the Black Sea, however, it is usually no longer than 50 cm. It is widely distributed in the tropical and subtropical waters of all oceans, including the Mediterranean, Azov, and Black Seas. It enters bays and estuaries, and in Georgia, it is found in Lake Paliastomi and river mouth areas. It does not spawn in the Sea of Azov. In the Black Sea, spawning occurs from late May to the end of August. Fecundity ranges from 2.9 to 7.2 million eggs. Spawning is fractional, and the eggs are floating and pelagic. Spawning takes place in coastal marine zones, with one female and 7–8 males participating. The eggs mature simultaneously; they are spherical and have a diameter of 0.7 mm. The flathead mullet is a fast swimmer and can easily escape nets by jumping out of the water. It can survive across a wide range of temperatures and salinities, with lethal temperature limits between 1–38°C, and salinity tolerance up to 75–83‰, which are record-breaking values.

Juveniles feed on larvae of mollusks, while adults primarily feed on detritus and plant remains, which they scrape from bottom stones. The role of algae in their diet is minimal.

Juvenile mullets are an important food source for predatory fish, while adults are preyed upon by dogfish (katran) and dolphins.

To overwinter, the flathead mullet chooses lagoons, bays, and ports, and enters river mouths, lower stream sections, and coastal lakes such as Lake Paliastomi, overwintering in rivers like the Maltakva and Kaparchi.

This species is of commercial importance, although it is less numerous than the golden grey mullet. In Lake Paliastomi, it is one of the most significant commercial fish species. It is a key species in coastal fisheries and recreational angling, and is caught using gillnets and trap nets.

So-iuy Mullet (Temminck et Schlegel, 1845). "Redeye mullet" or locally known as "Krasnaglazka." The head of the So-iuy mullet (Liza haematocheilus) is relatively broad and flattened. The head and dorsal side are dark gray or black with a greenish-blue tint. The lower part of the head is grayish-golden, while the belly is silvery-white. Six to seven dark longitudinal stripes run along the sides. It is also distinguished by a less deeply notched caudal fin and reddish-colored eyes. It can reach up to 90 cm in length.

The natural distribution area of the So-iuy mullet includes the Japanese and Yellow Seas. Since 1972, it was introduced into the Sea of Azov for acclimatization purposes and has successfully adapted to the conditions of both the Azov and Black Seas. In recent years, it has also spread to the Marmara and Aegean Seas.

It is a biologically adaptable fish. Its biology in the Black-Azov Seas significantly differs from that of its native Yellow Sea population—exhibiting faster growth rates and various other differences. Unlike natural populations, in the Black and Azov Seas, it spawns in May–June. Fertility is relatively high, ranging from 550,000 to 6 million eggs. Males reach sexual maturity at 2 years, females at 3 years.

In the Black-Azov Seas, mullet remains active almost year-round, and even at low temperatures (as low as 2°C), the juveniles stay in schools. Most adult individuals overwinter in the Sea of Azov. A significant part of the Azov population migrates into the Black Sea, helping to replenish and maintain the Black Sea stock. It reaches the coast of Georgia in May.

Mullet in the Black and Azov Seas shows significantly faster growth and larger size than its counterparts in the Far East. Average growth rates are:

- 2-year-old: 640 g
- 3-year-old: 954 g
- 4-year-old: 1,341 g

In Azov limans, a 6-year-old mullet can reach 65 cm in length and weigh up to 5 kg, with even larger individuals occasionally caught.

In terms of feeding, it is a typical detritivore, though it also feeds on planktonic organisms.

Despite being a relatively new species in the Azov and Black Seas, mullet has become an important commercial fish. It is caught with gill nets, entangling nets, and trap nets. Purse seines are also used for its commercial capture. In Georgia, fishing for mullet is permitted year-round.

Pontic Sand Smelt - Atherina mochon pontica Eichwald, 1831. It is a small-sized, elongated fish, slightly laterally compressed. The body is semi-transparent. The back is brownish, with a noticeable net-like pattern, and the belly is light-colored. Along the sides, it has a clearly visible silvery-greenish stripe. It can grow up to 15 cm in length and weigh up to 15 grams.

It is distributed along the Atlantic coasts of Europe, as well as in the Mediterranean, Black, and Azov Seas, and it enters brackish waters. In the Black Sea, it ranks third in abundance after anchovy (Engraulis) and sprat (Clupeonella). Along the Georgian coast, it is found in small numbers, occasionally entering the mouth of the Rioni River.

[Image of Pontic Sand Smelt]

Atherina is a schooling, pelagic fish of the coastal zone, capable of tolerating a wide range of salinity. It reaches sexual maturity in its second year. Spawning occurs in portions from April to August, although some

individuals may spawn as early as March or as late as September. Fecundity averages around 600 eggs. The eggs are bottom-depositing and have filaments that attach them to aquatic vegetation.

It feeds on small planktonic crustaceans. Its lifespan is up to three years. Atherina serves as prey for more valuable commercial fish species.

While it is a commercially significant fish, its low abundance along the Georgian coast makes its fishing difficult. It is mainly used to produce fishmeal and technical fats, and is rarely salted. It has low culinary value.

Round Goby - Neogobius melanostomus Pallas 1814. The Black-spotted Goby differs from other gobies by the presence of a black spot on the first dorsal fin, which becomes difficult to notice against the dark "nuptial coloration" of males. The body coloration ranges from grayish-yellow to black, with large irregular gray-blue or black blotches and smaller brownish spots.

[Image of Round Goby]

The Round Goby has rust-colored bands on its dorsal fins. Its maximum body length reaches up to 25 cm (average: 13–16 cm). It is distributed throughout the Caspian, Azov, Marmara, and Black Sea basins. It has also been introduced into the Aral Sea and inland waters of Illinois, USA, where it has successfully established populations. In the Black Sea, it is found along all coastlines.

This species is a benthic coastal fish, mostly inhabiting sandy-shell gravel bottoms near shores, up to 20 meters deep. It is euryhaline, and it also enters the lower and middle reaches of rivers, but stays near coasts in the Black Sea.

Spawning takes place from March to August, in temperatures above 10–12°C, most intensively in April–May. The species prefers large stones, boulders, and other natural or artificial shelters for spawning. Females attach their eggs to the sides and upper surfaces of cavities. Several females may spawn in the same "nest." After spawning, the male guards the nest, chasing away females and potential threats, and fans the eggs with his pectoral fins to ensure water circulation.

Spawning is fractional, typically in two batches. Fecundity ranges from 200 to 2700 eggs (average: 1400). Sexual maturity is reached in the second year, at a length of 5.3 cm.

Feeding ceases at 5°C water temperature and resumes actively at warmer temperatures (around 27°C). The diet consists mainly of mollusks and worms, and to a lesser extent, crustaceans. Juveniles mainly feed on crustaceans. During spawning, males do not feed, leading to high mortality during this period.

The Round Goby is a significant food source for predatory fish, especially bluefish (Pomatomus saltatrix) in the Azov Sea basin.

Among goby species, the Black Sea population of this goby is the most abundant. It has commercial value mainly in the Azov Sea. It is caught using special dredges and bottom trawls, and in coastal fisheries with set nets and fish traps. It is also a popular species for recreational fishing.

Caucasian Goby - Neogobius cephalarges constructor Nordmann 1840. The body is eel-like, covered with medium-sized scales. The head is rounded, and the forehead is narrow, less than half the eye's diameter. The lips are thin; the upper lip is slightly widened near the corners of the mouth. The anterior nostrils are shaped like short tubes. The base of the pectoral fin and the area behind the throat are covered with scales. Adult individuals lack a swim bladder. The forehead width is twice smaller than the eye diameter. The body coloration is dark yellowish on the sides, with dark spots present on the dorsal and caudal fins. During the spawning period, males turn black. The species can reach a length of up to 150 mm and a weight of up to 35 grams.

[Image of Caucasian Goby]

It inhabits fast-flowing, rocky and sandy-bottomed areas. It feeds on small fish, benthic organisms, and partially on terrestrial insects and aquatic plants. It reaches sexual maturity at the age of 2–3 years and spawns in May–June. Fecundity ranges from 300 to 980 eggs. The eggs are demersal, measuring 2–2.5 mm in diameter. They are laid in clusters on the underside of stones, where they are carefully and precisely attached in a specific pattern.

Monkey Goby - Neogobius fluviatilis Pallas, 181. Conservation status: Vulnerable (VU).
Its head's thickness and height are equal. The upper lip is not widened at the corners of the mouth.
The body is dark gray or yellowish-gray. It has 8–12 longitudinal dark spots on the sides; on the head, it has blurred dark stripes. The dorsal and caudal fins are covered with dark spots, while the other fins are gray. The tip of the caudal fin is bordered with a white stripe. During spawning, the male turns completely black and its fins elongate. The body length reaches up to 20 cm.

[Image of Monkey Goby]

It inhabits coastal areas and also enters rivers. It is a bottom-dwelling fish of brackish waters. It buries itself in the sand so that only its eyes and dorsal fin are visible. The male builds a nest where several females lay eggs, and the male guards them. Its population has significantly declined in recent times.

Tubenose Goby - Proterorhinus marmaratus Pallas. The length of its head exceeds the height of its body. The upper jaw is slightly larger than the lower one, and the width of the forehead is less than the diameter of the eye. The body is dark yellowish in color, with several vertical dark spots on the sides. There is a large spot at the base of the tail fin. Its length reaches up to 115 mm.

[Image of Tubenose Goby]

It reaches sexual maturity at 1–2 years of age, with a fertility of up to 180 eggs. It is a coastal-dwelling fish that also enters the lower reaches of rivers.

European Flounder - Platichthys flesus luscus Pallas, 1814. The European Flounder is characterized by a strongly flattened and asymmetrical body shape from the sides. Both eyes are located on one side of the body. Most forms of river flounders have their bodies bent to the right side, and accordingly, the eyes are also located on the right side. Only a small portion (about 2.5%) are bent to the left side. The upper (ocular) side of the body has a small number of scales, which are located on the head and the front part of the lateral line. The lower (blind) side of the body does not have such scales. Both sides of the body are covered with a small number of cycloid scales. The upper side of the body is colored dark green, grayish, or brownish with star-shaped spots. Occasionally, individuals with a dark coloration are found. Rarely, specimens appear whose lower (blind) side is also pigmented, especially those inhabiting muddy bottoms. The European Flounder reaches a length of 48 cm excluding the tail fin (average 25–29 cm). It represents a subspecies of river flounder distributed in the Mediterranean, Adriatic, Aegean, Marmara, Black, and Azov Seas. It inhabits the coastal zone of Georgia, from where it enters rivers.

[Image of European Flounder]

It is a marine saltwater fish adapted to live in brackish limans (coastal lagoons). It spawns during the coldest time of the year, mostly from January to March, and later on the coast of Georgia—from February to May. Spawning occurs at depths of 4 to 50 meters. The average fecundity is about 2,750 thousand eggs. The optimal temperature for egg development is 2–15°C. The larvae have a pelagic lifestyle and are characterized by symmetrical body structure. During metamorphosis, the body flattens and the eyes migrate to one side. After this transformation, the juveniles settle on the bottom and adopt a benthic lifestyle. Sexual maturity is reached from the third year, rarely at 1–2 years of age. The river flounder lives up to 16 years. It feeds on polychaete worms, mollusks, crustaceans (mainly decapods), and small fish (gudgeons, gobies, sand smelts). Decapod crustaceans form its main diet.

Due to its small population, it has no commercial aquaculture significance. It is caught by bottom trawls, set nets, stationary nets (so-called "tridents"), and bottom longlines. It has high-quality meat used fresh, salted, and marinated.

Carp – Carassius Gibelio (Bloch, 1782). The body is tall and short, covered with silvery scales. The coloration is dark on the back, silvery on the sides, and dark on the belly. It has a snout. Unlike the golden carp, it has a long dorsal fin, large scales, relatively numerous rows of scales, and vertebrae. It lives 14–15 years, usually 7–10 years. It reaches up to 45 cm in length and up to 1 kg in weight.

[Image of Carp]

It is one of the most widely distributed freshwater fish species. It inhabits the temperate and cold inland waters across the entire Eurasian continent. In Georgia, it is found in practically all lakes and small reservoirs, as well as in the lower reaches of rivers. Unlike the goldfish (Carassius auratus), it mostly prefers large reservoirs and slow-flowing rivers. It is a freshwater limnophilic fish. It tolerates low oxygen saturation well.

It is an eurythermal fish, capable of living within a temperature range of 0–30°C. It is euryphagous — feeding according to the availability of food, including plankton, detritus, aquatic plants, insect larvae, crustaceans, and other invertebrates. Chironomid larvae and mayflies are among its preferred food. Sexual maturity is reached between 2 and 4 years, depending on environmental conditions.

Spawning is group-based and batch-wise. Fertility ranges from 30,000 to 400,000 eggs. The incubation period is 5–7 days. Spawning begins in spring after the water warms to 14°C.

This fish exhibits a special reproductive trait called gynogenesis (female-only reproduction). Often, the silver carp population consists only of females because its reproduction can be stimulated by the sperm of a related species (such as the carp family), which only activates egg development but does not fertilize the eggs, resulting in offspring that are exclusively female. This trait, combined with tolerance to temperature fluctuations and low oxygen, provides the fish with high biological plasticity, reflected in its widespread presence and abundance in all reservoirs.

European Perch - Perca Fluviatilis Pallas, 1811. The body is tall, laterally compressed, and covered with small scales. It has several rows of small teeth on its jaws, and its cheeks are covered with scales. It has two dorsal fins: the first one has unbranched rays, while the second one has both unbranched and branched rays. The body is greenish-yellow, with 7-8 vertical black stripes along its sides. The second dorsal fin is greenish-yellow, the pectoral fins are yellow, and the remaining fins are red. It can reach a length of up to 52 cm and a weight of up to 5 kg. It is a freshwater fish that feeds on crustaceans and smaller fish. It reaches sexual maturity at — (the sentence is incomplete).

[Image of European Perch]

The diversity of ichthyofauna in the Rioni River

No.	Scientific Name	Georgian Name	English Name	Protection Status/Endemism
I	Petromyzontidae Bonaparte, 1831	ოჯ. სალამურასებრნი	Fam. Lampreys	
1	Eudontomyzon mariae (Berg, 1931)	სალამურა	Ukrainian Brook Lamprey	
II	Acipenseridae Bonaparte, 1831	ოჯ. ზუთხისებრნი	Fam. Sturgeons	
2	Acipenser sturio Linnaeus, 1758	ფორონჯი	European Sturgeon	Icluded in the Red List of Georgia, with a CR (Critically Endangered) status.
3	Acipenser stellatus Pallas, 1771	ტარაღანა	Starry Sturgeon	Icluded in the Red List of Georgia, with a EN status.
4	Acipenser persicus colchicus Marti,	კოლხური ზუთხი	Colchic strurgeon	Endemic to the Black Sea basin, included in the Red

	1940			List of Georgia with a EN status.
5	Huso huso (Linnaeus, 1758)	სვია	Beluga Strurgeon	Icluded in the Red List of Georgia, with a EN status.
III	Salmonidae Cuvier, 1816	ოჯ. ორაგულისებრნი	Fam. Salmons	
6	Salmo labrax Pallas, 1811	შავი ზღვის ორაგული	Black Sea salmon	Endemic to the Black Sea basin, included in the Red List of Georgia with a EN status.
7	Salmo labrax fario Linnaeus, 1758	ნაკადულის კალმახი	Trout	Endemic to the Black Sea basin, included in the Red List of Georgia with a VU status.
8	Oncorhynchus mykiss Walbaum, 1792	ცისარტყელა კალმახი	Rainbow Trout	Invasive species.
IV	Gobiidae Fleming, 1822	ოჯ. ღორჯოსებრნი	Fam. Gobies	
9	Ponticola constructor (Nordmann, 1840)	მდინარის ღორჯო	Caucasian Goby	Caucasian endemic.
10	Neogobius melanostomus (Pallas, 1814)	შავპირა ღორჯო	Round Goby	Ponto-caspian relict.
11	Neogobius fluviatilis (Pallas, 1814)	მექვიშია ღორჯო	Monkey Goby	Ponto-caspian relict, included in the Red List of Georgia with a VU status.
V	Pleuronectidae Rafinesque, 1815	ოჯ. მდინარის კამბალასებრნი	Fam. Flounders	
12	Platichthys flesus (Linnaeus, 1758)	კამბალა-გლოსა	Flounder	
VI	Siluridae Cuvier, 1816	ოჯ. ღლავისებრნი	Fam. Sheatfishes	
13	Silurus glanis Linnaeus, 1758	ღლავი (ლოქო)	Wels Catfish	
VII	Atherinidae Risoo, 1827	ოჯ. ათერინასებრნი	Fam. Silversides	
14	Atherina boyeri pontica Eichwald, 1831	შავი ზღვის ათერინა	Black Sea Sandsmelt	Endemic to the Black Sea.
VIII	Syngnathidae, Bonaparte, 1831	ოჯ. ნემსთევზასებრნი	Fam. Pipefishes	
15	Syngnathus abaster Risso, 1827	ნემსთევზა	Black Sea Pipefish	
IX	Poeciliidae Swainson, 1839	ოჯ. გამბუზიასებრნი	Fam. Livebearers	
16	Gambusia affinis (Baird & Girard, 1853)	გამბუზია	Mosquitofis h	
X	Mugilidae Bonaparte, 1831	ოჯ. კეფალსიებრნი	Fam. Mullets	
17	Mugil cephalus Linnaeus, 1758	კეფალი	Flat-Headed Mullet	
18	Mugil soiuy Basilewsky, 1855	პილენგასი	So-iuy Mullet	
19	Liza aurata (Risso, 1810)	ოქროსფერი კეფალი	Golden Mullet	
XI	Pleuronectidae Rafinesque, 1815	ოჯ. მდინარის კამბალასებრნი	Fam. Flounders	
20	Platichthys flesus (Linnaeus, 1758)	კამბალა-გლოსა	Flounder	
XII	Gasterosteidae Bonaparte, 1831	ოჯ.	Fam. Sticklebacks	

		სამეკალასებრნი		
21	Gasterosteus aculeatus Linnaeus, 1758	სამეკალა	Three- Spined Stickleback	
XIII	Cobitidae Swainson, 1839	ოჯ. ხლაკუნასებრნი	Fam. Loaches	
22	Cobitis satunini Gladkov, 1935	ხლაკუნა (გველანა)	Satunini Loach	Caucasian endemic.
XIV	Balitoridae Swainson, 1839	ოჯ. გოჭალასებრნი	Fam. River Loaches	
23	Oxynoemacheilus angorae (Steindachner, 1897)	ანგორული გოჭალა	Angora Loach	
XV	Anguillidae Rafinesque, 1815	ოჯ. გველთევზასებრნი	Fam. Freshwater Eels	
24	Anguilla anguilla (Linnaeus, 1758)	ევროპული გველთევზა	European Eel	
XVI	Cyprinidae Fleming, 1822	ოჯ. კობრისებრნი	Fam. Carps	
25	Squalius cephalus (Linnaeus, 1758)	ქაშაპი	Chub	
26	Phoxinus colchicus Berg, 1910	კოლხური კვირჩხლა	Colchic Minnow	Endemic form of Colchis.
27	Chondrostoma colchicum Derjugin, 1899	კოლხური ტობი	Colchic Nase	Endemic form of Colchis.
28	Gobio lepidolaemus caucasica Kamensky, 1901	ციმორი	Caucasian Gudgeon	Endemic form of Colchis.
29	Luciobarbus escherichii (Steindachner, 1897)	კოლხურიწვერა	Colchic Barbel	Endemic form of Colchis-Anatolia.
30	Alburnus derjugini Berg, 1923	კოლხური თრისა (ელავი)	Colchic Bleak	Endemic form of Colchis.
31	Alburnoides fasciatus (Nordmann, 1840)	ფრიტა	Schneider	Endemic form of Colchis.
32	Capoeta tinca (Heckel, 1843)	ანატოლიური ხრამული	Anatolian Khramulya	Endemic form of Colchis-Anatolia.
33	Capoeta sieboldii (Steindachner, 1864)	კოლხური ხრამული	Colchic Khramulya	Endemic form of Colchis, included in the Red List of Georgia with a VU status.
34	Vimba vimba (Linnaeus, 1758)	ვიმბა	Zahrte	
35	Rhodeus amarus (Bloch, 1782)	ტაფელა	Bitterling	
36	Cyprinus carpio Linnaeus, 1758	გოჭა (კობრი)	Carp	
37	Rutilus rutilus (Linnaeus, 1758)	ნაფოტა	Roach	
38	Scardinius erythrophthalmus (Linnaeus,1758)	ფარფლწითელა	Rudd	
39	Tinca tinca (Linnaeus, 1758)	გუწუ (ლოქორია)	Tench	
40	Carassius carassius (LINNAEUS, 1758)	კარასი	Crucian carp	Invasive species.
41	Ctenopharyngodon idella Valenciennes in Cuvier and Valenciennes, 1844	თეთრი ამური	Grass carp	Invasive species.

The Species Composition and Bioecology of Sturgeons in Georgia.

Acipenser nudiventris Lovetsky, 1828 – Ship Sturgeon

The ship sturgeon is distributed (excluding introductions) in the Caspian and Aral Seas, and in much smaller numbers in the Black and Azov Seas (Berg, 1948; Reshetnikov, 1998).
According to our data, compared to the Azov Sea and the northwestern part of the Black Sea, the ship sturgeon is even rarer in the eastern part of the Black Sea, where it is currently found only in Georgian waters.

The maximum recorded length of the ship sturgeon is 221 cm, and the weight can reach up to 60 kg. The length of mature individuals exceeds 90 cm, with a weight over 10 kg. The maximum recorded age is 33 years.

The largest specimen in Georgian waters was caught in 1965 in the lower section of the Rioni River, with a total length of 122.5 cm, a weight of 9 kg, and an age of 15 years. It was a female in the second stage of maturity (Ninua, 1965).

[Image of Ship Sturgeon]

Ecological group:
Nekton, demersal (benthic-pelagic), anadromous or potamodromous.

Faunistic complex:
Ponto-Caspian endemic (relict).

Habitat and relationship with abiotic environmental factors:
It tolerates freshwater and brackish waters with salinity up to 14‰. It occurs in temperatures between 2°C and 21°C, stops feeding below 8°C, and spawns at 15–25°C. In seas, it is found up to 50 meters deep, mostly at depths of 11–25 meters. It tolerates sandy, sand-muddy, muddy, and gravelly substrates. It prefers water with oxygen saturation above 60%.

Biology:
Juveniles feed on benthos, while mature individuals feed on fish and benthos. During spawning, anadromous migrations (both upriver and downriver), and overwintering (below 8°C), it ceases feeding. It migrates upriver to spawn in March-April, less often in May. Spawning occurs at 15–25°C, usually in May-

June. The intervals between spawning events are typically 2–3 years. Fertility ranges from 100,000 to 1 million eggs, with an average of 440,000 eggs. Sexual maturity is reached at 6 years for males and 8 years for females. In the sea, it is found near and on the bottom substrate.

Acipenser sturio Linnaeus, 1758 – European Sturgeon

[Image of European Sturgeon]

Distribution:
The Atlantic sturgeon (Acipenser oxyrinchus, commonly known as Atlantic sturgeon or "poronghi" in Georgian) is distributed along the Atlantic Ocean coast from Morocco to Norway, and in the basins of the Baltic, Mediterranean, and Black Seas. Georgian waters represent the extreme eastern limit of the Atlantic sturgeon's range, the farthest point from the core of its distribution.

Size, weight, and age:
The Atlantic sturgeon can reach a maximum length of up to 6 meters and a weight of up to 400 kg. The maximum recorded age is 100 years (Froese, R. and D. Pauly, 2012).
The largest specimen caught in Georgian waters was in the Rioni River, measuring 215 cm in length, weighing 68 kg, aged 20 years, female, at the 4th stage of maturity.
The minimum length at first maturity in Georgian waters is 96 cm for males and 137 cm for females. The minimum weight at first maturity is 10 kg for males and 15 kg for females.

Ecological group:
Nekton, demersal (benthic-pelagic), anadromous.

Faunistic complex:
Boreo-Atlantic relict.

Habitat and relationship with abiotic environmental factors:
It tolerates high marine salinity up to 38‰. It occurs at temperatures between 6–25 °C, stops feeding below 8 °C, and spawns at temperatures of 13–20 °C. In seas, it is found up to 80 meters deep, mainly at depths between 10–55 meters.
It tolerates sandy and sand-muddy substrates. It prefers water with oxygen saturation above 60%.

Biology:
Juveniles feed on benthos and fish; mature individuals are piscivorous (fish-eating). During spawning, anadromous migration (both upriver and downriver), and overwintering (at temperatures below 8 °C), it ceases feeding.
It migrates upriver to spawn in March-April, less commonly in May. Spawning occurs at 13–20 °C, mainly in April-May, sometimes June. The spawning interval is usually 2–3 years.
Fecundity ranges from 700,000 to 2.4 million eggs, with an average of 1.2 million eggs.
Males reach sexual maturity at 7–9 years, females at 11 years.

In the sea, it is found near the bottom and in the near-bottom layer, but unlike the ship sturgeon and Colchic sturgeon, it is also found throughout the water column.

Acipenser stellatus Pallas, 1771 – Starry Sturgeon

[Image of Starry Sturgeon]

Distribution:
The stellate sturgeon is distributed (excluding introductions) in the Caspian, Black, and Azov Sea basins. It is very rare in the Bosphorus Strait, the Marmara Sea, and the Adriatic Sea.

Size, weight, and age:
The maximum length of the stellate sturgeon reaches 218 cm, with a maximum recorded age of 31 years (Borzhenko, 1942).
The largest specimen caught in Georgian waters was in 1981, measuring 186 cm in length and weighing 16 kg (Burchuladze et al., 1973, 1989).
The minimum length at first maturity in Georgian waters is 110 cm for males and 130 cm for females. The minimum weight at first maturity is 5 kg for males and 6 kg for females.

Ecological group:
Nekton, demersal (benthic-pelagic), anadromous.

Habitat and relationship with abiotic environmental factors:
Among the Ponto-Caspian sturgeons, it is the most euryhaline and thermophilic form, found in waters with salinity up to 22‰ and temperatures up to 30°C. It stops feeding below 10°C and spawns at temperatures between 13–26°C.
In seas, it is found at depths of 5–80 meters, mainly between 10–45 meters.
It tolerates sandy, sand-muddy, muddy, and gravelly substrates. It prefers water with oxygen saturation above 60%.

Biology:
Juveniles feed on benthos, while mature individuals feed mainly on benthos and less on bottom-dwelling fish. During spawning, anadromous migration (both upriver and downriver), and overwintering (below 10°C), it ceases feeding.
It migrates upriver to spawn in May–June, rarely in July. Spawning occurs at 13–26°C, mainly in June–July.
The intervals between spawning events are usually 2–3 years.
Fecundity ranges from 50,000 to 1 million eggs, with an average of 210,000 eggs.
Males reach sexual maturity at 6 years of age, females at 7 years.

Acipenser persicus colchicus Marti,1940 – Colchic Sturgeon

[Image of Colchic Sturgeon]

Distribution:
The Colchic sturgeon is distributed in the eastern and southeastern parts of the Black Sea. Its typical form—the Persian sturgeon—is found in the Caspian Sea basin.

Size, weight, and age:
The maximum length of the Persian sturgeon reaches 242 cm, weight up to 70 kg, and the maximum recorded age is 34 years.
The largest specimen of the Colchic sturgeon caught in Georgian waters (1975–1986) measured 178 cm (Zarkua, 1990).
The minimum length at first maturity in Georgian waters is 97 cm for males and 114 cm for females. The minimum weight at first maturity is 6 kg for males and 9 kg for females.

Ecological group:
Nekton, demersal (benthic-pelagic), anadromous.

Faunistic complex:
Ponto-Caspian endemic (relict).

Habitat and relationship with abiotic environmental factors:
It is found in waters with salinity up to 18‰ and temperature up to 28°C. It stops feeding at temperatures below 9°C and spawns at 17–25°C.
In seas, it occurs at depths of 5–80 meters, mostly between 10–45 meters.
It tolerates sandy, sand-muddy, muddy, and gravelly substrates. It prefers water with oxygen saturation above 60%.

Biology:
Juveniles feed on benthos, while mature individuals feed on bottom-dwelling fish and benthos (Zarkua et al., 1989; Zarkua, 1990).
During spawning, anadromous migrations (both upriver and downriver) and overwintering (at temperatures below 10°C), it ceases feeding.
It migrates upriver to spawn in late May and June–July, spawning occurs at 17–25°C in June–August.
The spawning interval is usually 2–3 years.
Fecundity averages about 250,000 eggs.
Males reach sexual maturity at 7 years, females at 9 years.

Acipenser gueldenstaedtii Brandt & Ratzeburg, 1833 – Russian Sturgeon

Distribution:
The Russian sturgeon is distributed (excluding introductions) in the Azov Sea and the Black Sea (mainly in the western and northeastern parts of the Black Sea), from where it enters rivers. Its typical form is found in the Caspian Sea basin.

Size, weight, and age:
The maximum length of the typical form of the Russian sturgeon reaches 236 cm, weight up to 115 kg, and the maximum recorded age is 46 years.
The largest specimen of the Russian sturgeon caught in Georgian waters measured 128.3 cm in length and weighed 14 kg.
The minimum length at first maturity is 90 cm (5 kg) for males and 100 cm for females.

Ecological group:
Nekton, demersal (benthic-pelagic), anadromous.

Faunistic complex:
Ponto-Caspian endemic (relict).

Habitat and relationship with abiotic environmental factors:
It is found in waters with salinity up to 16‰ (preferring waters with lower salinity) and temperatures up to 25°C. It stops feeding below 8°C and spawns at temperatures between 8–18°C.
In seas, it occurs at depths of 5–80 meters, mainly between 10–45 meters.
It tolerates sandy, sand-muddy, muddy, and gravelly substrates. It is mainly found in waters with oxygen saturation above 60%, but it is also tolerant to hypoxic conditions.

Table of Impacts on Biodiversity and Mitigation Measures

Anthropogenic impact is any relatively discrete event in time that disrupts an ecosystem, community, or population structure by altering resources such as substrate or physical environment availability.

Anthropogenic impacts, such as bridge construction, can significantly change the existing morphology of a riverbed, as well as the associated ecology, flora, and fauna.

At bridge sites, deep water reservoirs often form, causing environmental changes from a faunistic perspective.

However, restoration works and the reduction of harmful construction practices allow for the recovery of natural habitats, which is especially important for more sensitive species.

Description of Impacts

- Mortality of benthic food organisms in the riverbed during the installation of bridge support structures. By type, this impact can be characterized as direct; by extent, it is local; and by duration, long-term.
- Deterioration of spawning conditions in the river ichthyofauna for spring gravel-spawning phytophilic fish, including species such as Zeri, Korkhila, and Nafota. Suitable spawning areas in floodplains are disturbed as a result of works like the installation of bridge supports and bank reinforcement. Considering the operational lifespan of the constructed facility, the duration of negative impacts can be described as long-term. In terms of extent, the impact is local; by nature, it is indirect.

Other notable negative impacts include:

- Water pollution and increased turbidity, including activation of erosional processes in the coastal zone;
- Industrial noise pollution, which may interfere with fish migration processes.

Sources of Impact

- Installation of bridge piers;
- Earthworks, use of various polluting materials, generated waste;

Impact Area

- The Rioni River channel or its vicinity.

12 SUPPLEMENTARY DOCUMENT 6: SOME HSE NON-CONFORMANCE REPORTS

UBM

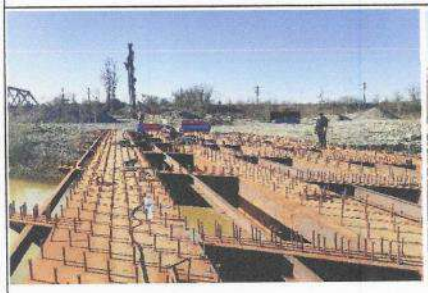
NON -CONFORMANCE REPORT
შეუსაბამობის აქტი

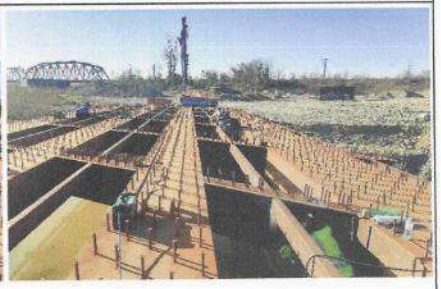
cs mirbud

NCR description /აღწერა	Issue Date /გაცემის თარიღი	Reference Number/ნომერი
OHS NON-Conformance/შეუსაბამობა	31-01-2025	010

Initiator *(Name of Engineer) /ინიციატორი (სახელი გვარი)*	*Goga Sumbadze/გოგა სუმბაძე*	**Receiver** *(Name of contractor representative) /მიმღები (სახელი გვარი)*	*Irakli Nadareishvili/ირაკლი ნადარეიშვილი*
Signature/ხელმოწერა		**Signature/ხელმოწერა**	

Description of the NCR *(to be filled by initiator)*
Include details of what has happened, where it has happened and possible root causes. Mention standard against which the deviation occurred.
/ NCR-ს აღწერა *(უნდა შეავსოს ინიციატორმა) აღწერეთ დეტალები, თუ რა მოხდა, სად მოხდა და შესაძლო ძირეული მიზეზი, აღნიშნეთ სტანდარტი, რომელიც ეწინააღმდეგება მოხდარ დარღვევას.*





PK 0+375-ზე მდებარე ხიდზე უსაფრთხოების წესების დარღვევით მიმდინარეობს შედუღების სამუშაოები. ამ საქმიანობაში ჩართული მუშები არ იყენებენ შესაბამის პერსონალურ დამცავ აღჭურვილობას (PPE). მათ შორის შედუღების დამცავ ხელსაწყოებს და ტანის მთელ აღკაზმულობას ვარდნისგან დაცვის მიზნით.

უსაფრთხოების უზრუნველსაყოფად, სიმაღლეზე მუშაობისას უნდა ჩატარდეს ტრენინგი ყველა ჩართული მუშაკისთვის და ისინი აღჭურვილნი უნდა იყვნენ საჭირო PPE-ით.

ხიდზე მოცურების, დაცემის სამიშროების გამო, სიმაღლიდან ვარდნის რისკი საგრძნობლად მაღალია. ამ საფრთხის აღმოსაფხვრელად და უსაფრთხოების სტანდარტებთან შესაბამისობის უზრუნველსაყოფად უნდა დამონტაჟდეს დამცავი მოაჯირი.

Form: FM-HSSE001
Rev: 00

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NON -CONFORMANCE REPORT
შეუსაბამობის აქტი

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ზემოაღნიშნული დარღვევები წარმოადგენს საქართველოს კანონმდებლობის დარღვევას, კერძოდ:

საქართველოს ორგანული კანომი შრომის უსაფრთხოების შესახებ - მე-5მუხლის პირველი პუნქტის „ა“, „ბ“ და „გ“ ქვეპუნქტები.
საქართველოს მთავრობის განკარგულებები- №590 და № 477

გთხოვთ დროულად გამოასწოროთ ეს შეუსაბამობები.

On the bridge located at PK-0+375, ongoing welding activities are being carried out in violation of safety regulations. Workers involved in these activities are not using appropriate personal protective equipment (PPE), including welding protective gear and full-body harnesses for fall protection.

To ensure safety, work- at-height training should be provided to all involved workers, and they must be equipped with the necessary PPE.

Due to slip, trip, and fall hazards present on the bridge, the risk of falling from height is significantly high. Guardrails must be installed to eliminate this hazard and ensure compliance with safety standards.

The above-mentioned violations constitute breaches of Georgian legislation, specifically:

Organic Law of Georgia on labor safety-Article 5, Clause 1, Sub-clauses (a), (b), and (c)
Ordinances of the Georgia-№590 and №477.

We kindly request that you promptly address and correct these nonconformities.

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NON-CONFORMANCE REPORT
შეუსაბამობის აქტი

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Root Cause, Correction and Corrective Action *(to be filled by receiver)*
Include details of why the nonconformity occurred. What will be done to immediately correct it and what corrective actions will be in place so that it does not recur.
ძირეული მიზეზი, კორექცია და მაკორექტირებელი მოქმედება (მიმღების მიერ შევსებული) *ჩართეთ დეტალები, თუ რატომ მოხდა დარღვევა,და რა კეთდება გამოსწორების მიზნით , ასევე რა მაკორექტირებელი ქმედება იქნება გამოყენებული*

დასაქმებულებს კერძოდ კი შემდუღებლებს ჩაუტარდათ დამატებითი ინსტრუქტაჟი შედუღებისას უსაფრთხოების წესების დაცვის შესახებ გარდა ამისა დასაქმებულებს ჩაუტარდათ ტრეინინგი სიმაღლეზე მუშაობის უსაფრთხოების მოთხოვნების შესახებ.

The welders received a refresher safety induction on welding safety. In addition, the frontline workers received a training session related to working at height.

Closeout *(to be filled by closeout authority or by resident engineer)*
/დახურვა *(შეავსოს უფლებამოსილი ან რეზიდენტ ინჟინრის მიერ)/*

NCR was property addressed by the contractor

Validator Name & Signature *ინსპექტორის სახელი & გვარი*	Giorgi Sumbadze	**Validation Date** */ინსპექტირების თარიღი*	24.03.2025

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NON-CONFORMANCE REPORT
შეუსაბამობის აქტი

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NCR description /აღწერა	Issue Date /გაცემის თარიღი	Reference Number/ნომერი
OHS NON-Conformance/შეუსაბამობა	11.02.2025	012

Initiator *(Name of Engineer) /ინიციატორი (სახელი გვარი)*	*Goga Sumbadze/გოგა სუმბაძე*	**Receiver** *(Name of contractor representative) /მიმღები (სახელი გვარი)*	*Irakli Nadareishvili/ირაკლი ნადარეიშვილი*
Signature/ხელმოწერა		**Signature/ხელმოწერა**	

Description of the NCR *(to be filled by initiator)*
Include details of what has happened, where it has happened and possible root causes. Mention standard against which the deviation occurred.
/ NCR-ს აღწერა *(უნდა შეავსოს ინიციატორმა) აღწერეთ დეტალები, თუ რა მოხდა, სად მოხდა და შესაძლო ძირეული მიზეზი, აღნიშნეთ სტანდარტი, რომელიც ეწინააღმდეგება მოხდარ დარღვევას.*

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NON -CONFORMANCE REPORT
შეუსაბამობის აქტი

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PK-1+100-ზე ოპერატორები ახორციელებენ სამუშაოებს უსაფრთხოების წესების დარღვევით. ისინი არ იყენებენ პირად დამცავ აღჭურვილობას (PPE). კერძოდ, ჩაფხუტს და მაღალი ხილვადობის უსაფრთხოების ჟილეტს.

- ჩაუტარეთ ოპერატორებს ტრენინგი და აღჭურვეთ ისინი სჭირო PPE-თი.

ზემოაღნიშნული შეუსაბამობა წარმოადგენს საქართველოს კანონმდებლობის დარღვევას, კერძოდ:

საქართველოს მთავრობის დადგენილებას №590.

დროულად გამოასწორეთ აღნიშნული შეუსაბამობა.

Root Cause, Correction and Corrective Action *(to be filled by receiver)*
Include details of why the nonconformity occurred. What will be done to immediately correct it and what corrective actions will be in place so that it does not recur.
ძირეული მიზეზი, კორექცია და მაკორექტირებელი მოქმედება (მიმღების მიერ შევსებული) *ჩართეთ დეტალები, თუ რატომ მოხდა დარღვევა,და რა კეთდება გამოსწორების მიზნით , ასევე რა მაკორექტირებელი ქმედება იქნება გამოყენებული*

დასაქმებულებს ჩაუტარდათ დამატებითი ინსტრუქტაჟი ინდივიდუალური დაცვის საშუალებების გამოყენების შესახებ. თანამშრომლებზე დამატებით დარიგდა ახალი ინდივიდუალური დაცვის საშუალებები.
PPE refresher induction has been delivered to the frontline workers.
Additionally, new PPE has been delivered to the employees.

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NON-CONFORMANCE REPORT
შეუსაბამობის აქტი

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Closeout *(to be filled by closeout authority or by resident engineer)* **/დახურვა** *(შეავსოს უფლებამოსილი ან რეზიდენტ ინჟინრის მიერ)/*	
NCR was property addressed by the contractor	
Validator Name & Signature *ინსპექტორის სახელი & გვარი* Giorgi Sumbadze	**Validation Date** */ინსპექტირების თარიღი* 25.03.2025

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შეუსაბამობის აქტი

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NCR description /აღწერა	Issue Date /გაცემის თარიღი	Reference Number/ნომერი
OHS NON-Conformance/შეუსაბამობა	11.02.2025	011

Initiator *(Name of Engineer)* /ინიციატორი (სახელი გვარი)	*Goga Sumbadze/გოგა სუმბაძე*	**Receiver** *(Name of contractor representative)* /მიმღები (სახელი გვარი)	*Irakli Nadareishvili/ირაკლი ნადარეიშვილი*
Signature/ხელმოწერა		**Signature/ხელმოწერა**	

Description of the NCR *(to be filled by initiator)*
Include details of what has happened, where it has happened and possible root causes. Mention standard against which the deviation occurred.
/ NCR-ს აღწერა *(უნდა შეავსოს ინიციატორმა) აღწერეთ დეტალები, თუ რა მოხდა, სად მოხდა და შესაძლო ძირეული მიზეზი, აღნიშნეთ სტანდარტი, რომელიც ეწინააღმდეგება მოხდარ დარღვევას.*

PK-1+070 -ზე ხიმინჯის თავის მომტვრევის სამუშაოები მიმდინარეობს უსაფრთხოების წესების დარღვევით. ამ საქმიანობაში ჩართული მუშები არ იყენებენ შესაბამის პირად დამცავ აღჭურვილობას (PPE). მათ შორის ჩაფხუტს, სახის დამცავ ფარს და ხმაურის ჩამხშობ მოწყობილობას.

არსებობს თხრილში ჩავარდნის რისკი, ვინაიდან მას არ აქვს დამონტაჟებული სიმაღლიდან ვარდნის საწინააღმდეგო დამცავი მოაჯირი. კიბე არაა სრულყოფილი და წარმოადგენს საფრთხეს იქ მომუშავე პერსონალისათვის საგანგებო სიტუაციის დროს უსაფრთხოდ უვაკუაციისათვის.

- უსაფრთხოების უზრუნველსაყოფად, თხრილში მომუშავე მუშებს უნდა ჩაუტარდეთ ტრენინგი და უზრუნველყოფილნი იყვნენ საჭირო PPE-ით.
- დაუმონტაჟეთ კიბეს სახელური ისე რომ იყოს მყარი და უსაფრთხო.
- თხრილის ირგვლივ დაამონტაჟეთ მოაჯირი.

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NON -CONFORMANCE REPORT
შეუსაბამობის აქტი

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ზემოაღნიშნული შეუსაბამობები წარმოადგენს საქართველოს კანონმდებლობის დარღვევას, კერძოდ:

საქართველოს მთავრობის დადგენილებას- № 477 და №590

დროულად გამოასწორეთ არსებული შეუსაბამობა.

Root Cause, Correction and Corrective Action *(to be filled by receiver)*
Include details of why the nonconformity occurred. What will be done to immediately correct it and what corrective actions will be in place so that it does not recur.
ძირეული მიზეზი, კორექცია და მაკორექტირებელი მოქმედება (მიმღების მიერ შევსებული) *ჩართეთ დეტალები, თუ რატომ მოხდა დარღვევა,და რა კეთდება გამოსწორების მიზნით , ასევე რა მაკორექტირებელი ქმედება იქნება გამოყენებული*

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NON-CONFORMANCE REPORT
შეუსაბამობის აქტი

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დასაქმებულებს ჩაუტარდათ დამატებითი ინსტრუქტაჟი ინდივიდუალური დაცვის საშუალებების გამოყენების შესახებ.

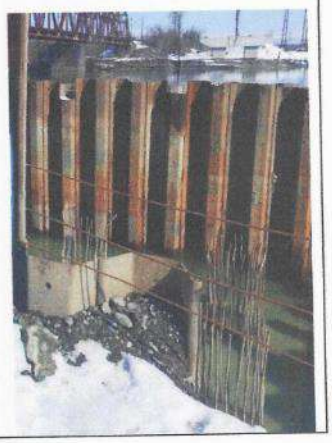
ექსკავაციაში ჩასასვლელ კიბეზე დამონტაჟდა ვარდნისგან დამცავი შემოღობვა.

შემოღობვა გაკეთდა იმ ადგილებში სადა არსებობდა ექსკავაციაში ადამიანის ჩავარდნის საფრთხე.

PPE refresher induction has been delivered to the frontline workers.

The excavation access ladder was equipped with guardrails to prevent falls.

Guardrails were installed in the areas that were hazardous to fall.



Closeout *(to be filled by closeout authority or by resident engineer)*
/დახურვა *(შეავსოს უფლებამოსილი ან რეზიდენტ ინჟინრის მიერ)/*

NCR was property addressed by the contractor

Validator Name & Signature *ინსპექტორის სახელი & გვარი*	Giorgi Sumbadze	**Validation Date** */ინსპექტირების თარიღი*	17.03.2025

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NON-CONFORMANCE REPORT
შეუსაბამობის აქტი

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NCR description /აღწერა	Issue Date /გაცემის თარიღი	Reference Number/ნომერი
OHS NON-Conformance/შეუსაბამობა	10.03.2025	016

Initiator *(Name of Engineer) /ინიციატორი (სახელი გვარი)*	*Goga Sumbadze/გოგა სუმბაძე*	**Receiver** *(Name of contractor representative) /მიმღები (სახელი გვარი)*	*Irakli Nadareishvili/ირაკლი ნადარეიშვილი*
Signature/ხელმოწერა		**Signature/ხელმოწერა**	

Description of the NCR *(to be filled by initiator)*
Include details of what has happened, where it has happened and possible root causes. Mention standard against which the deviation occurred.
/ NCR-ს აღწერა *(უნდა შეავსოს ინიციატორმა) აღწერეთ დეტალები, თუ რა მოხდა, სად მოხდა და შესაძლო ძირეული მიზეზი, აღნიშნეთ სტანდარტი, რომელიც ეწინააღმდეგება მოხდარ დარღვევას.*

PK-0+60-ზე ჭრა-ხეხვის სამუშაოები მიმდინარეობს უსაფრთხოების წესების დარღვევით. დასაქმებული ჭრა-ხეხვით სამუშაოს ახორციელებს ინდივიდუალური დამცავი საშუალების (სახის დამცავი ფარის) გარეშე, რაც საფრთხეს უქმნის მის ჯანმრთელობას.

- უზრუნველჰყავით დასაქმებული სახის დამცავი ფარით და ჩაუტარეთ ტრენინგი აღნიშნული სამუშაოების უსაფრთხოდ განხორციელების შესახებ.

ზემოაღნიშნული შეუსაბამობა წარმოადგენს საქართველოს კანონმდებლობის დარღვევას, კერძოდ:

საქართველოს მთავრობის დადგენილებას №590

დროულად გამოასწორეთ არსებული შეუსაბამობა.

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At PK-0+60, forest cutting and clearing work is being carried out in violation of safety regulations.
The worker performs cutting and grinding work without personal protective equipment (protective mask), which poses a danger to his health.

Provide the employee with a face mask and training on how to perform these tasks safely.

The above-mentioned violations constitute breaches of Georgian legislation, specifically:

Resolutions of the Government of Georgia No. 590

Remove existing discrepancies in a timely manner.

Root Cause, Correction and Corrective Action *(to be filled by receiver)*
Include details of why the nonconformity occurred. What will be done to immediately correct it and what corrective actions will be in place so that it does not recur.
ძირეული მიზეზი, კორექცია და მაკორექტირებელი მოქმედება (მიმღების მიერ შევსებული) *ჩართეთ დეტალები, თუ რატომ მოხდა დარღვევა,და რა ქეთდება გამოსწორების მიზნით , ასევე რა მაკორექტირებელი ქმედება იქნება გამოყენებული*

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NON-CONFORMANCE REPORT
შეუსაბამობის აქტი

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დასაქმებული უზრუნველყოფილ იქნა დამცავი ფარით გარდა ამისა ყველა დასაქმებულ ჩაუტარდა განმეორებითი ინსტრუქტაჟი კუთხოვანა სახეხის გამოყენების უსაფრთხოების შესახებ.

The face shield was given to the employee in addition to a refresher induction, with the subject of safe use of angle grinders delivered to the employees.

Closeout *(to be filled by closeout authority or by resident engineer)*
/დახურვა *(შეავსოს უფლებამოსილი ან რეზიდენტ ინჟინრის მიერ)/*

NCR was properly addressed by the contractor

Validator Name & Signature *ინსპექტორის სახელი & გვარი* Giorgi Sumbadze	**Validation Date** */ინსპექტირების თარიღი* 25.03.2025

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NON-CONFORMANCE REPORT
შეუსაბამობის აქტი

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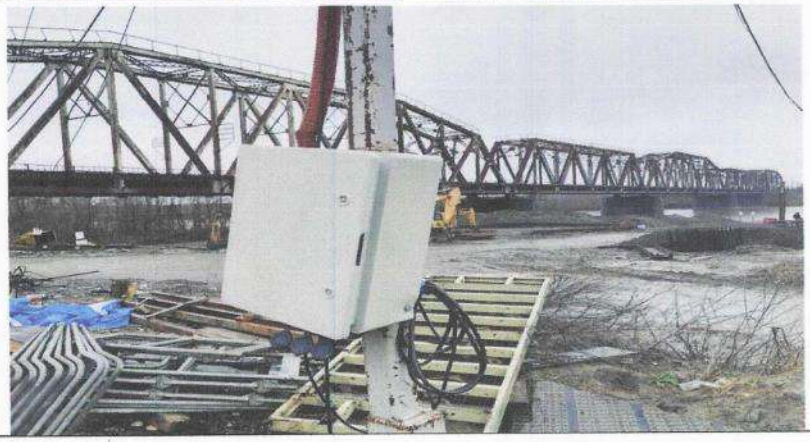
NCR description /აღწერა	Issue Date /გაცემის თარიღი	Reference Number/ნომერი
OHS NON-Conformance/შეუსაბამობა	19.03.2025	019

Initiator *(Name of Engineer) /ინიციატორი (სახელი გვარი)*	*Goga Sumbadze/გოგა სუმბაძე*	**Receiver** *(Name of contractor representative) /მიმღები (სახელი გვარი)*	*Irakli Nadareishvili/ირაკლი ნადარეიშვილი*
Signature/ხელმოწერა		**Signature/ხელმოწერა**	

Description of the NCR *(to be filled by initiator)*
Include details of what has happened, where it has happened and possible root causes. Mention standard against which the deviation occurred.
/NCR-ს აღწერა *(უნდა შეავსოს ინიციატორმა) აღწერეთ დეტალები, თუ რა მოხდა, სად მოხდა და შესაძლო ძირეული მიზეზი, აღნიშნეთ სტანდარტი, რომელიც ეწინააღმდეგება მოხდარ დარღვევას.*





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NON-CONFORMANCE REPORT
შეუსაბამობის აქტი

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PK-0+60, PK-1+100 და PK-1+200-ზე ელექტრო ფარები ღია მდგომარეობაშია და არ აქვს შესაბამისი გამაფრთხილებელი ნიშნები, რაც წარმოადგენს საფრთხეს დასაქმებულთათვის. არაკომპეტენტური პირის მიერ მათი გამოყენება ქმნის ელექტროშოკის რისკს.

• მოაწესრიგეთ ელექტროფარები და აღჭურვეთ შესაბამისი გამაფრთხილებელი ნიშნებით. მათთან წვდომა უნდა ჰქონდეს მხოლოდ შესაბამისი კვალიფიკაციის მქონე პირს.

ირღვევა ორგანული კანონი შრომის უსაფრთხოების შესახებ.

დროულად გამოასწორეთ აღნიშნული შეუსაბამობა.

The electric fences on PC-0+60, PC-1+100 and PC-1+200 are in the open position and do not have the appropriate warning signs, which poses a danger to workers.
Their use by an incompetent person creates a risk of electric shock.

• Repair the electric fences and equip them with appropriate warning signs. Only a person with the appropriate qualifications should have access to them.

The Organic Law on Occupational Safety and Health is violated.

Timely eliminate existing non-conformities.

Root Cause, Correction and Corrective Action *(to be filled by receiver)*
Include details of why the nonconformity occurred. What will be done to immediately correct it and what corrective actions will be in place so that it does not recur.

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ძირეული მიზეზი, კორექცია და მაკორექტირებელი მოქმედება (მიმღების მიერ შევსებული) *ჩართეთ დეტალები, თუ რატომ მოხდა დარღვევა, და რა კეთდება გამოსწორების მიზნით, ასევე რა მაკორექტირებელი ქმედება იქნება გამოყენებული*
შეუსაბამობაში მოცემულ პირველ სურათზე ასახული ელ გამანაწილებელი ყუთი ეკუთვნის კომპანია ენერგო-პროს შესაბამისად მის გამოსწორებაზე ჩვენ ვერ ავიდებთ პასუხისმგებლობას. ელ გამანწილებელ ყუთებზე გაკეთდა ელექტრო საფრთხის მიმანიშნებელი ნიშანი, შრომის უსაფრთხოების ინსპექტორს დაევალა ელექტრო გამანაწილებელ ყუთებზე აწარმოოს ყოვეკვირეული მონიტორინგი. The electrical box depicted in the first picture belongs to Energo-Pro; hence, we are not responsible for it. Additional electrical hazard signs are attached to the electrical boxes owned by the project. The safety officer will conduct weekly inspections of electrical distribution boxes.   

Closeout *(to be filled by closeout authority or by resident engineer)* **/დახურვა** *(შეავსოს უფლებამოსილი ან რეზიდენტ ინჟინრის მიერ)/*	
NCR was property addressed by the contractor	
Validator Name & Signature *ინსპექტორის სახელი & გვარი* Giorgi Sumbadze	**Validation Date** *ინსპექტირების თარიღი* 25.03.2025

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შეუსაბამობის აქტი

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NCR description /აღწერა	Issue Date /გაცემის თარიღი	Reference Number/ნომერი
OHS NON-Conformance/შეუსაბამობა	19.03.2025	020

Initiator *(Name of Engineer) /ინიციატორი (სახელი გვარი)*	*Goga Sumbadze/გოგა სუმბაძე*	**Receiver** *(Name of contractor representative) /მიმღები (სახელი გვარი)*	*Irakli Nadareishvili/ირაკლი წადარეიშვილი*
Signature/ხელმოწერა		**Signature/ხელმოწერა**	

Description of the NCR *(to be filled by initiator)*
Include details of what has happened, where it has happened and possible root causes. Mention standard against which the deviation occurred.
/ **NCR-ს აღწერა** *(უნდა შეავსოს ინიციატორმა) აღწერეთ დეტალები, თუ რა მოხდა, სად მოხდა და შესაძლო ძირეული მიზეზი, აღნიშნეთ სტანდარტი, რომელიც ეწინააღმდეგება მოხდარ დარღვევას.*

• დასაქმებულთათვის უნდა მოეწყოს მოსასვენებელი ადგილი ალტერნატიული გამათბობელი სისტემით. ჩაუტარეთ დასაქმებულებს ტრენინგი სახანძრო უსაფრთხოების შესახებ.

რღვევა ორგანული კანონი შრომის უსაფრთხოების შესახებ.
სასწრაფოდ გამოასწორეთ აღნიშნული შეუსაბამობა.

• A rest area with an alternative heating system must be provided for employees. Conduct training for employees in fire safety measures.

The Organic Law on Occupational Health and Safety is violated.
Timely eliminate existing non-conformities.

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შეუსაბამობის აქტი

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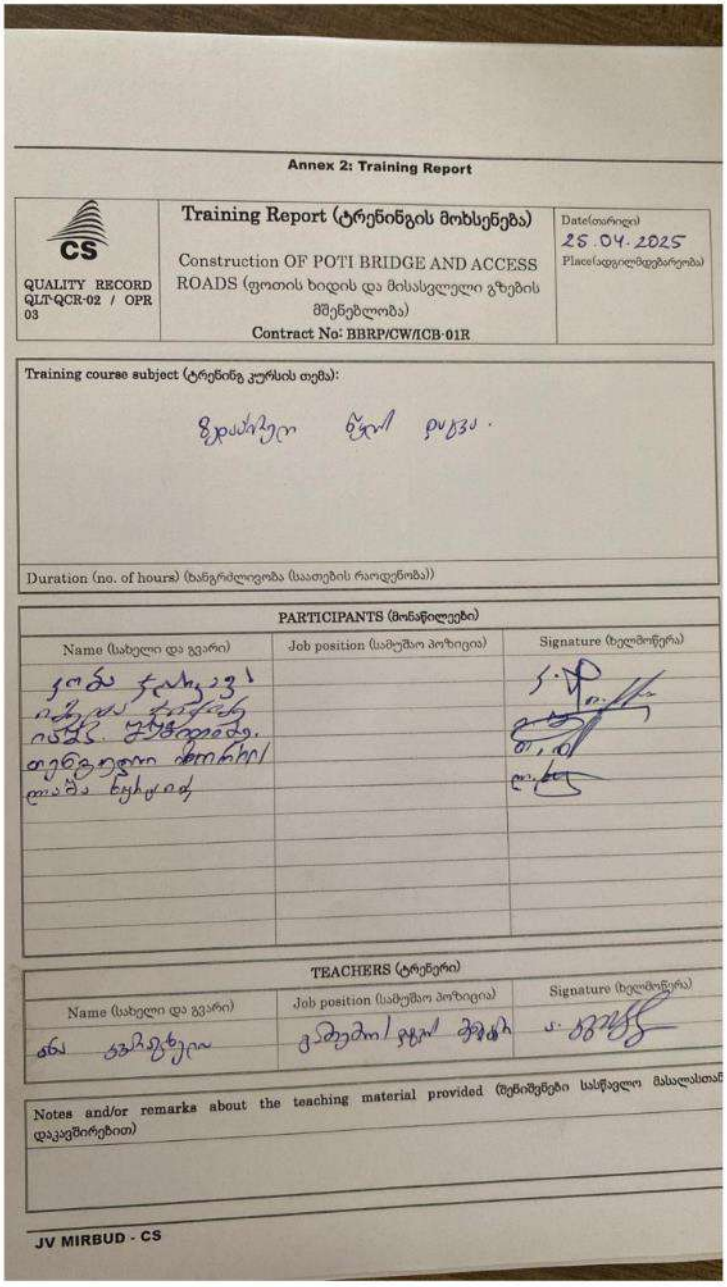
Root Cause, Correction and Corrective Action *(to be filled by receiver)* *Include details of why the nonconformity occurred. What will be done to immediately correct it and what corrective actions will be in place so that it does not recur.* **ძირეული მიზეზი, კორექცია და მაკორექტირებელი მოქმედება (მიმღების მიერ შევსებული)** *ჩართეთ დეტალები, თუ რატომ მოხდა დარღვევა,და რა კეთდება გამოსწორების მიზნით , ასევე რა მაკორექტირებელი ქმედება იქნება გამოყენებული*

Closeout *(to be filled by closeout authority or by resident engineer)* **/დახურვა** *(შეავსოს უფლებამოსილი ან რეზიდენტ ინჟინრის მიერ)/*	
Validator Name & Signature *ინსპექტორის სახელი & გვარი*	**Validation Date** */ინსპექტირების თარიღი*

13 SUPPLEMENTARY DOCUMENT 7: H&S AND E&S TRAINING ATTENDANCE SHEET SAMPLE AND SOME TRAINING PHOTOS

Some Photos from H&S and Environmental Trainings

Some Sample Training Attandance Sheets



Annex 2: Training Report

CS

QUALITY RECORD QLT-QCR-02 / OPR 03

Training Report (ტრენინგის მოხსენება)

Construction OF POTI BRIDGE AND ACCESS ROADS (ფოთის ხიდის და მისასვლელი გზების მშენებლობა)

Contract No: BBRP/CW/ICB-01R

Date(თარიღი) 25.04.2025

Place(ადგილმდებარეობა)

Training course subject (ტრენინგ კურსის თემა):

Duration (no. of hours) (ხანგრძლივობა (საათების რაოდენობა))

PARTICIPANTS (მონაწილეები)

Name (სახელი და გვარი)	Job position (სამუშაო პოზიცია)	Signature (ხელმოწერა)

TEACHERS (ტრენერი)

Name (სახელი და გვარი)	Job position (სამუშაო პოზიცია)	Signature (ხელმოწერა)

Notes and/or remarks about the teaching material provided (შენიშვნები სასწავლო მასალასთან დაკავშირებით)

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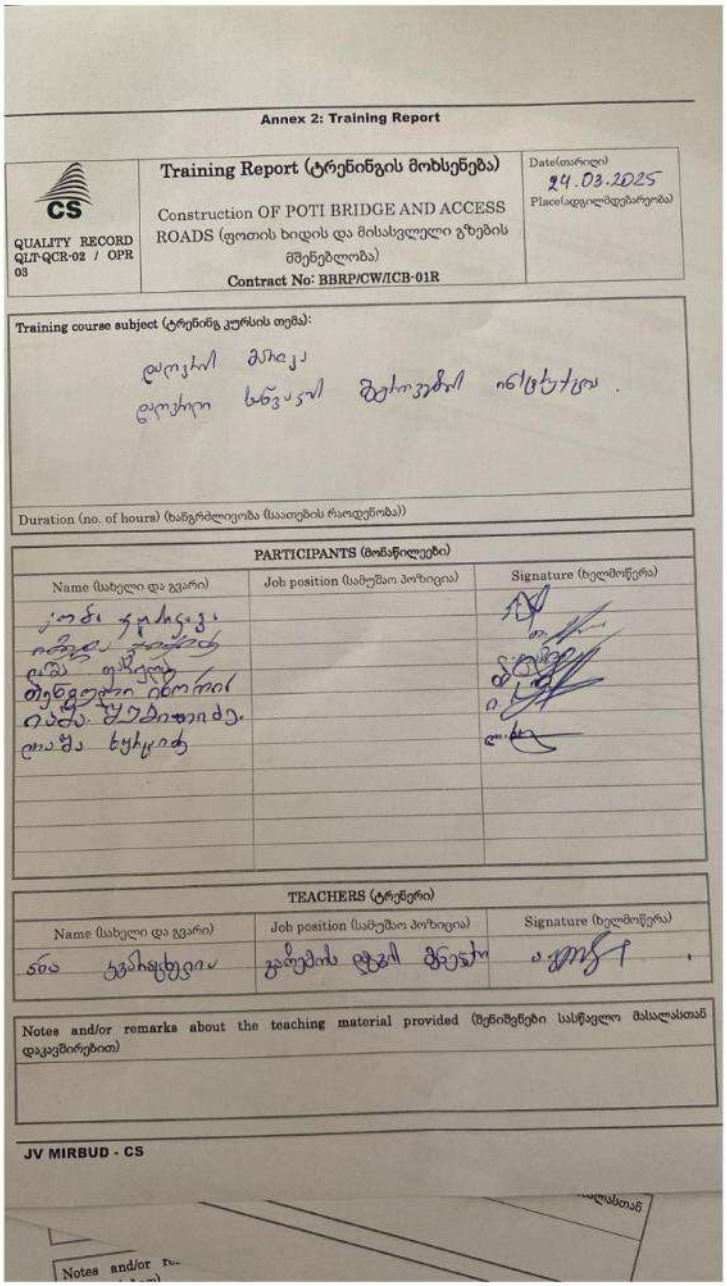

Annex 2: Training Report

CS QUALITY RECORD QLT-QCR-02 / OPR 03	**Training Report (ტრენინგის მოხსენება)** Construction OF POTI BRIDGE AND ACCESS ROADS (ფოთის ხიდის და მისასვლელი გზების მშენებლობა) **Contract No: BBRP/CW/ICB-01R**	Date(თარიღი) 24.03.2025 Place(ადგილმდებარეობა)

Training course subject (ტრენინგ კურსის თემა):

Duration (no. of hours) (ხანგრძლივობა (საათების რაოდენობა))

PARTICIPANTS (მონაწილეები)

Name (სახელი და გვარი)	Job position (სამუშაო პოზიცია)	Signature (ხელმოწერა)

TEACHERS (ტრენერი)

Name (სახელი და გვარი)	Job position (სამუშაო პოზიცია)	Signature (ხელმოწერა)
ანა		

Notes and/or remarks about the teaching material provided (შენიშვნები სასწავლო მასალასთან დაკავშირებით)

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14 SUPPLEMENTARY DOCUMENT 8: ENVRIONMENTAL NCR

NON-CONFORMANCE REPORT
შეუსაბამობის აქტი

NCR description /აღწერა	Issue Date /გაცემის თარიღი	Reference Number/ნომერი
Env. NON-Conformance/შეუსაბამობა	02.07.2025	022

Initiator *(Name of Engineer)* /ინიციატორი (სახელი გვარი)	*Emre Duran/ემრე დურანი*	**Receiver** *(Name of contractor representative)* /მიმრები (სახელი გვარი)	*Irakli Nadareishvili/ირაკლი ნადარეიშვილი*
Signature/ხელმოწერა		**Signature/ხელმოწერა**	

Description of the NCR *(to be filled by initiator)*
The absence of a required sedimentation pool during pile drilling and concrete pouring activities near the Rioni River has resulted in the direct discharge of untreated wastewater. Urgent construction of the pool is mandated by July 9, 2025, to avoid work suspension.

/ **NCR-ს აღწერა** *(უნდა შეავსოს ინიციატორმა) აღწერეთ დეტალები, თუ რა მოხდა, სად მოხდა და შესაძლო ძირეული მიზეზი, აღნიშნეთ სტანდარტი, რომელიც ეწინააღმდეგება მოხდარ დარღვევას.*

რიონის მდინარესთან სვეტების ბურღვისა და ბეტონის დასხმის სამუშაოების დროს სედიმენტაციის აუზის არარსებობამ გამოიწვია დაუმუშავებელი ფუჭი წყლების პირდაპირი ჩადინება. აუზის სასწრაფო მოწყობა სავალდებულოა 2025 წლის 9 ივლისამდე, რათა თავიდან იქნას აცილებული სამუშაოების შეჩერება.



Form: FM-HSSE001
Rev: 00

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NON -CONFORMANCE REPORT

შეუსაბამობის აქტი

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შეუსაბამობის აქტი

მდინარე რიონის მიმდებარედ, სამუშაო მოედანზე მიმდინარე ხიმინჯების ბურღვისა და ბეტონის სამუშაოების დროს დაფიქსირდა, რომ სავალდებულო სალექარი აუზი, რომელიც მანამდე იყო მოწყობილი, არარ არსებობდა. შესაბამისად, ზემოთ აღწერილი სამუშაოების შედეგად წარმოქმნილი ფუჭი წყლები პირდაპირ მდინარე რიონში ჩაედინებოდა ყოველგვარი წინასწარი დამუშავების ან დალექვის გარეშე, რაც მნიშვნელოვან გარემოსდაცვით რისკს წარმოადგენს.

გაუწმენდავი ფუჭი წყლების პირდაპირმა ჩაშვებამ მდინარე რიონში შეიძლება გამოიწვიოს:

- • მდინარეში სიმღვრივის და ნალექის მომატება.
- • წყლის ხარისხის პარამეტრების პოტენციური ცვლილება.
- • უარყოფითი ზეგავლენა წყლის ეკოსისტემებსა და ბიომრავალფეროვნებაზე.
- • გარემოსდაცვითი რეგულაციებისა და პროექტის კონკრეტული გარემოსდაცვითი ვალდებულებების შეუსრულებლობა.

გარდა ამისა, გარემოზე ზემოქმედების შეფასებაში (EIA) მკაფიოდ არის აღნიშნული, რომ მდინაარე რიონში ფუჭი წყლების ჩაშვება არ მოხდება.

სამშენებლო მოედანზე, შესაბამისი ზომების სალექარი აუზი დაუყოვნებლივ უნდა მოეწყოს და ამოქმედდეს. ეს გამომასწორებელი სამუშაო უნდა შესრულდეს, სალექარი აუზი ადგილზე ვიზვალურად და ფუნქციონლურად მოეწყოს, არაუგვიანეს ოთხშაბათი, 2025 წლის 09 ივლისისა.

თუ სავალდებულო სალექარი აუზი არ იქნება მოწყობილი და ამოქმედებული დადგენილ ვადაში (2025 წლის 9 ივლისი), მაშინ კონკრეტულ სამუშაო მოედანზე ყოველი ბურღვითი, ბეტონის ჩასხმის და სხვა სამუშაოები დროებით უნდა იყოს შეჩერებული, მანამ შეუსაბამობა არ გამოსწორდება და არ იქნება დადასტურებული გარემოსდაცვითი ჯგუფის მიერ.

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During the ongoing pile drilling and concrete pouring activities at the specified work area adjacent to the Rioni River, it was observed that the mandatory sedimentation pool, previously stipulated for on-site presence, was absent. Consequently, wastewater generated from these operations was directly discharged into the Rioni River without any form of pre-treatment or sedimentation, posing a significant environmental risk.

Direct discharge of untreated wastewater into the Rioni River can lead to:

- Increased turbidity and sedimentation in the river.
- Potential alteration of water quality parameters.
- Negative impact on aquatic ecosystems and biodiversity.
- Non-compliance with environmental regulations and project-specific environmental commitments.

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Furthermore, the Environmental Impact Assessment (EIA) explicitly states that there will be no wastewater discharge to the Rioni River.

An appropriately sized and functional sedimentation pool must be constructed and operational at the relevant field work area urgently. This corrective action must be completed and the sedimentation pool visible and functional on site no later than **Wednesday, 09.07.2025**.

If the required sedimentation pool is not constructed and operational by the stipulated deadline (09 July 2025), all drilling, concrete pouring and other works in the affected area shall be temporarily suspended until the non-conformance is rectified and verified by the environmental team.

Root Cause, Correction and Corrective Action *(to be filled by receiver)*
Include details of why the nonconformity occurred. What will be done to immediately correct it and what corrective actions will be in place so that it does not recur.
ძირეული მიზეზი, კორექცია და მაკორექტირებელი მოქმედება (მიმღების მიერ შევსებული) *ჩართეთ დეტალები, თუ რატომ მოხდა დარღვევა,და რა ქმედება გამოსწორების მიზნით , ასევე რა მაკორექტირებელი ქმედება იქნება გამოყენებული*

გაცნობებთ რომ კონტრაქტორი ჩასხმების დროს მუდმივად იყენებდა სალექარს. აღნიშნულ დღეს ფიზიკურად შეუძლებელი იყო სალექარის გამოყენება რის გამოც დაფიქსირდა აღნიშნული დარღვევა. მოთხოვნიდან მეორე დღესვე განთავსდა შესაბამისი სალექარი. ამ დროისთვის ხიმინჯების მოწყობის სამუშაოები დასრულებულია და პრობლემა აღმოფხვრილია.

We would like to inform you that the contractor was constantly using a sedimentation pool during the pouring process. On the day in question, it was physically impossible to use a sedimentation pool, which is why the above-mentioned violation was recorded. The appropriate sedimentation pool was installed the very next day after the request. At this time, the pile arrangement works has been completed and the problem has been eliminated.

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Closeout *(to be filled by closeout authority or by resident engineer)* /**დახურვა** *(შეავსოს უფლებამოსილი ან რეზიდენტ ინჟინრის მიერ)/*

Validator Name & Signature *ინსპექტორის სახელი & გვარი*	**Validation Date** */ინსპექტირების თარიღი*

UBM

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CS mirbud®

NCR description /აღწერა	Issue Date /გაცემის თარიღი	Reference Number/ნომერი
Env. NON-Conformance/შეუსაბამობა	02.07.2025	022

Initiator *(Name of Engineer)* /ინიციატორი (სახელი გვარი)	*Emre Duran/ემრე დურანი*	**Receiver** *(Name of contractor representative)* /მიმღები (სახელი გვარი)	*Irakli Nadareishvili/ირაკლი ნადარეიშვილი*
Signature/ხელმოწერა		**Signature/ხელმოწერა**	

Description of the NCR *(to be filled by initiator)*
The absence of a required sedimentation pool during pile drilling and concrete pouring activities near the Rioni River has resulted in the direct discharge of untreated wastewater. Urgent construction of the pool is mandated by July 9, 2025, to avoid work suspension.

/ **NCR-ს აღწერა** *(უნდა შეავსოს ინიციატორმა) აღწერეთ დეტალები, თუ რა მოხდა, სად მოხდა და შესაძლო ძირეული მიზეზი, აღნიშნეთ სტანდარტი, რომელიც ეწინააღმდეგება მოხდარ დარღვევას.*

რიონის მდინარესთან სვეტების ბურღვისა და ბეტონის დასხმის სამუშაოების დროს სედიმენტაციის აუზის არარსებობამ გამოიწვია დაუმუშავებელი ფუჭი წყლების პირდაპირი ჩადინება. აუზის სასწრაფო მოწყობა სავალდებულოა 2025 წლის 9 ივლისამდე, რათა თავიდან იქნას აცილებული სამუშაოების შეჩერება.