

## C. Alternatives

### C.1 General

90. One of the objectives of an EIA is to investigate alternatives to the Project. In relation to a proposed activity “alternatives” means different ways of meeting the general purposes and requirements of the proposed activity. The following section provides an assessment of alternative corridors, alignments, transport modes and technologies, as well as the ‘no action’ alternative.

### C.2 The No Action Alternative

91. The “No Action” Alternative in this instance is defined as a decision not to undertake the proposed construction of the Project Road. The “No Action” Alternative would result in the continued deterioration of the road, bridges and drainage structures along the RoW, thereby impeding the economic development of the Project Area and the Imereti region. All positive benefits would be foregone. The relatively minor, less than significant environmental impacts (such as noise and short-term air quality impacts due to maintenance activities) and inconveniences (such as traffic diversions) would be avoided in the short-run. In the long run, however, the steadily declining state of the roadway would severely hamper economic development in the area. In light of these considerations, the “No Action” Alternative is deemed to be neither prudent nor in the best interest of Georgia or those with an interest in, and attempting to assist restoration of, Georgia’s well being.

### C.3 Alternative Road Corridors

92. Given the complex topography of the region and Georgia in general, there are no other feasible alternative corridors that would be able to compete with the existing corridor in terms of travel times. In addition the Project forms part of the overarching program to upgrade the E-60 motorway which includes many sections that have recently been upgraded, or are in the process of upgrading (or detailed design), including the sections of road joining the start and end points of the Project road.

### C.4 Alternative Alignments

93. Feasibility Study - As part of the Projects feasibility study a range of alternative alignments were studied. The F2, F3 and F4 sections were grouped together under the heading of Section 2BC. Five alternative alignments were proposed for this 2BC section. The key features for each candidate alternative alignment with bidirectional 4 lane road are summarized below.

**Table 10: Key Features of Alternative Alignments with Bidirectional 4 Lanes**

Parameter	Alternative Alignment				
	Alt. 2BC-1 (Opt. Blue)	Alt. 2BC-2 (Opt. Green)	Alt. 2BC-3 (Revised Yellow Line)	Alt. 2BC-4 (Red)	Alt. 2BC-5 (Navy)
Total Road Length	50.6 km	49.9 km	48.7 km	48.3km	46.5m
Minimum Horizontal Radius	250 m	250 m	450 m	800	1,200m
Maximum gradient	6 % / 7%	6 %	5 %	5 %	4 %

Structure - Bridges	3,939 m	4,854 m	9,720 m	11,680m	8,140 m
Length - Tunnel	9,223 m	11,815 m	15,211 m	17,500m	28,680 m
Earthwork - Cut (m <sup>3</sup> )	4,878,844	7,999,914	3,556,837	3,128,890	-
- Fill (m <sup>3</sup> )	1,978,999	2,251,942	3,017,640	2,152,170	-
Demolishing of buildings	88 buildings	167 buildings	133 buildings	153 buildings	-
Affected forest area (tree cutting)	26.3 ha	43.9 ha	39.3 ha	20.8 ha	-
Length of river interference	2,980 m	1,741 m	n/a	n/a	-
Use of existing road	26,070 m	1,216 m	960m	650 m	-
Length through or nearby villages	12.0 km	16.1 km	9.7 km	9.5 km	-

\* Detailed information of Alt. 2BC-5 is not available since Navy Line is conceptual alignment of high speed line. The Consultant has estimated the cost using the plan drawing only.

94. The alternatives were assessed based on a multi-criteria analysis approach (MCA). Alignments Blue, Green and Yellow were assessed from an environmental perspective, including impacts on landscape, air quality, noise, and biological diversity and ecological integrity. From an environmental view the yellow alignment scored the best, but including all aspects (financial, social, engineering, etc) the blue alignment gained the highest score.

95. Detailed Design - The alignment has been updated based on the insights gained during the FS and previous phases of drafting the detailed design. Essentials of the update were as follows:

- (i) Adaptation to the design standards proposed by the Consultant and approved by the RD;
- (ii) Review of the Feasibility Study issues; □
- (iii) Analysis and verification of the solutions provided in the previous design phase, mainly based on the observations during several site visits;
- (iv) Explore the interactions between the road in project and the existing road network to find the most appropriate solutions;
- (v) Study of the best solutions to ensure the maintenance of traffic during the construction of the new road; and
- (vi) Reduction of impacts on environment and resettlement.

96. The analysis of the alignment shown in the Feasibility Study clearly indicates that the methodological approach was to try to update the existing road, maintaining as much as possible the old one.

97. This cost saving approach was the main drawback and compromised the geometry of the alignment: horizontal and vertical radii and slopes were often very close to the minimum and the overall geometry of the road needed smoothing in some sections.

98. In addition, the Feasibility Study showed some shortcomings in the definition (normal for that stage of Design) that may have led to a significant increase of costs in the Detailed Design. These are mainly found in:

- (i) **Local roads/accessibility:** because of the difficult terrain and (in this Section) presence of numerous settlements, the connecting road network must be identified and reorganized, considering also that the highway belongs to a higher road category, therefore it is not possible to maintain direct access for private properties or roads with very low category. This necessity, in particular, carried to the acknowledgement that the existing road should be maintained in some section.

- (ii) **Construction phases:** the construction of a highway in this area, with constraints caused from terrain and settlements, has the additional difficulty coming from the necessity to maintain traffic over the entire road section during the full construction. This carries to conflicting needs that shall be considered and addressed during the detailed design, that may require the modification of the “optimal” design: in some cases, the best option may not be feasible either for the possibility to organize the construction phases and maintaining the traffic, or because this requirement would carry to too expensive temporary arrangements.

99. These considerations have been translated into a series of updates of the alignment provided by the Feasibility Study.

100. The updating of standards has led to an increase in the minimum planimetric radius from 240 to 450m and the keeping of the road width of 3.75m even in the design speeds of 80km/h. Both choices improve road safety for increased visibility and perceived road continuity for the driver.

101. Considering the above a realignment of the whole section was made as part of the detailed design. The table below provides a summary of the main characteristic of F2 compared with the Feasibility Study.

**Table 11: Main Characteristics of Section F2 Compared with the Ones of the FS**

Item	Feasibility Study	Detailed Design
Maximum horizontal radius	244.5	550
Maximum gradient	4.50%	3.83%
Minimum vertical radius (crest)	4,000	15,000
Minimum vertical radius (sag)	4,000	15,000
Tunnel TA (number)	10	9
Tunnel TA (length)	6,155	4,340
Tunnel AT (number)	6	11
Tunnel AT (length)	3,790	5,020
Bridges TA (number)	8	18
Bridges TA (length)	1,170	4,160
Bridges AT (number)	8	17
Bridges AT (length)	1,175	4,140
Interchanges (number)	2	3

### C.5 Alternative Transport Modes

102. As noted above, the Project forms part of a program upgrading the E-60. The Khevi – Argveta section of the E-60 (including section F3) is one of the last remaining sections of the road requiring upgrading. Accordingly, the Project is focusing on the upgrading of the E-60 and will not consider any other transport mode as an alternative.

### C.6 Alternative Pavement Types

103. Only one pavement type was considered for the motorway and interchanges; rigid concrete.<sup>4</sup> The rigid pavement structure is recommended for the following reasons:

<sup>4</sup> Asphalt pavement structure will however be used for all Slip Roads, bridges and all Minor Roads and bridges.

- (i) Concrete pavements are already constructed on preceding sections of the E60 Highway. The pavement designs for the already constructed sections were carried out in accordance to the German pavement design standard RStO.
- (ii) The high traffic load over the design life with heavy truck traffic requires a high strength to prevent rutting. The concrete pavement has a flexural strength and is less dependent on variations in subgrade strength. Deformation in the subgrade is not transferred to the subsequent layers.
- (iii) Along the alignment extreme varying surface temperatures of the pavement are expected from hot summer temperature to freezing in winter. Also contraction and expansion of the concrete slabs have to be considered by expansion joints, the integrity of the concrete is not reduced. Asphalt pavements may become soft in summer leading to rutting and hard and brittle in winter.
- (iv) The concrete surface is not damaged by the unavoidable oil and grease leaking from passing vehicles. The life span of a concrete pavement is general higher compared to a flexible pavement and maintenance cost might be also lower as the initial construction costs could be higher.
- (v) For the actual situation in Georgia with no local bitumen production which requires all bituminous products to be imported, the concrete production from local available sources (gravel and cement) seem to be in more than one respect advantageous.

104. The option of low noise asphalt should also be considered as a potential option on the bridges where elevated noise levels have been identified. The low noise asphalt could potentially reduce the noise levels by 3 dBA. The use of low noise asphalt will require higher maintenance costs over the years to ensure the surface performs to its required level.

### **C.7 Alternative Spoil Disposal Locations**

105. Initially the static balance of spoil material generated by the Project was estimated to be a lower than the final calculated figures. spoil material from cut and tunnels was planned to be disposed of in the Kutaisi bypass. However, according to the RD this option would be too expensive given the huge volume of material to be moved there. Additionally, this option would have meant a large volume of daily truck movements (more than 200) travelling more than 50 kilometers along the E-60 through urban areas, including Zestaphoni.

106. Three additional alternative spoil location sites were then identified by the Detailed Design Consultant close to Boriti, see Figure 40. Initial desk-top screening of the sites indicated that the two locations north of the existing road would require a large amount of tree felling in an area which could potentially be described as natural habitat. In addition, these sites were considered quite complex in terms of their topography and hydrological conditions. Accordingly, these sites were screened out of the assessment.

107. That left one remaining potential location for the placement of the spoil material, the large area to the south of Boriti. In terms of location, it suits both sections F2 and F3, being at the start and end points of both road sections. This means that long distance vehicle movements will be eliminated. However, the original identified access road from the E-60 is located opposite the medical facility in Boriti, and as such, if this spoil disposal location is to be used, it is recommended a new alternative river crossing is constructed away from this sensitive site (dust could be a significant issue in the summer months).

108.

109. The site itself is located on a plateau area, meaning that hydrological issues would be minimized. It is also noted that this area comprises what appear to be open quarries, indicating that this site is already impacted quite heavily by human activity. Vegetation on this plateau is less dense than the other identified spoil areas meaning less tree cutting would be required. Also, the site is capable of containing all spoil material for both sections F2 and F3.

**Figure 40: Locations of Potential Spoil Disposal Sites**



110. A site visit to this area was made in May 2018. The site visit revealed the following issues:

- (i) The access road to the site is located adjacent to the Dostakari-Beriti Emergency Medical Care Clinic in Boriti. The bridge crossing the Dzirula river is in poor condition. As such, a new access point and bridge crossing would most likely be needed to access the site.
- (ii) A small cemetery is located at the start point of the access road. The access road is unpaved and currently only used by local residents as well as trucks accessing the quarry at the site.
- (iii) The site itself comprises a rolling landscape with some relatively flat plateau areas.
- (iv) Some small pockets of agricultural land can be found across the site, but there is no evidence of properties on the site except for the quarry located in the north eastern portion of the site.
- (v) Most of the area identified for the spoil area comprises pastureland with few trees. No cattle were observed at the site.
- (vi) No surface water features were noted at the site.

**Figure 41: Spoil Disposal Site**



**Figure 42: Spoil Disposal Site Access Road**

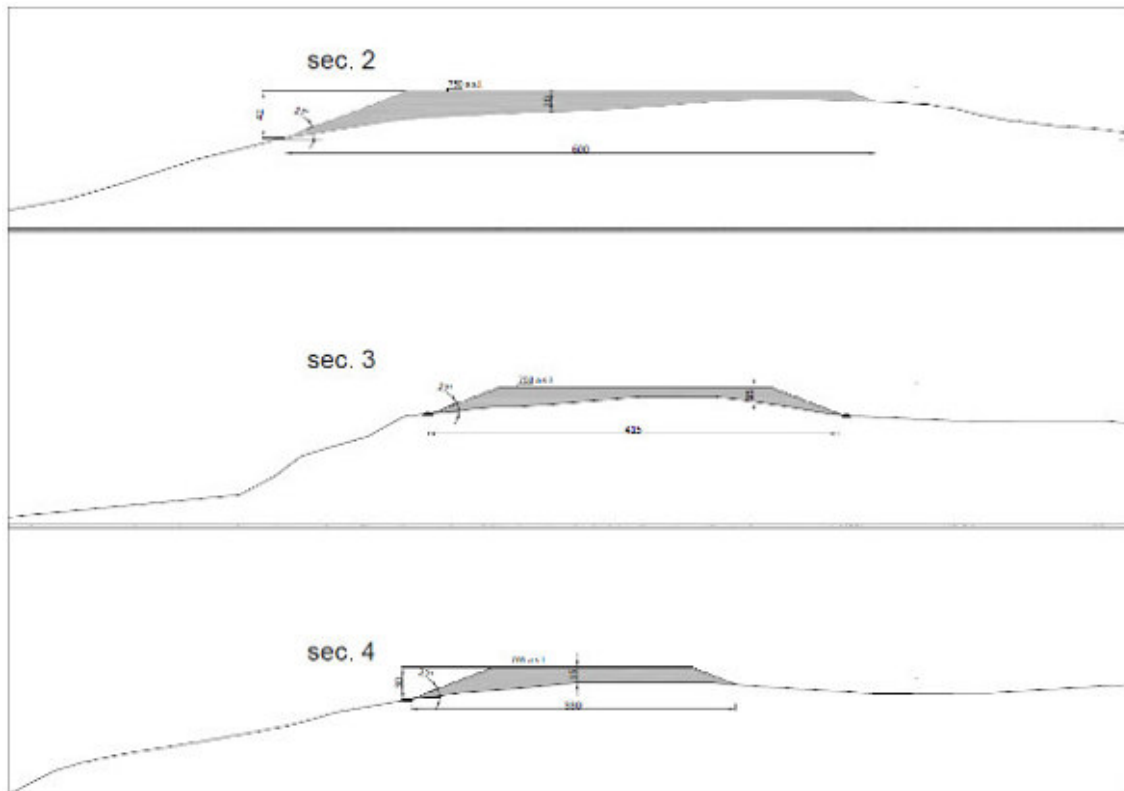


111. If the issues relating to access can be resolved, and the relevant permits obtained from MoEPA, this site would provide a suitable option for the spoil disposal site. The Detailed Design team have prepared the following maps and cross sections for the site.

**Figure 43: Spoil Site Area**



**Figure 44: Spoil Site Cross Sections**



112. Notwithstanding the above, the final selection of spoil locations rests with the Contractor, who may wish to choose alternative locations for cost reasons. There are a number of critical actions that the Contractor must complete before using this, or any other area as a spoil location, including the development of a EIA to meet national requirements. These measures are outlined in **Section G.7.3** below.

### **C.8 Alternative Construction Camps and Laydown Areas.**

113. The locations of these facilities is not currently known. The Contractor will choose the sites which will need to follow the guidelines for siting and permitting as outlined in this EIA (**Section G.7.4 - Construction Camps, Asphalt Plants, Batching Plants & Temporary Storage Sites**)



## D. Environmental Laws, Standards and Regulations

### D.1 General

114. This section of the EIA provides a summary of:

- (i) Environmental Legislation of Georgia;
- (ii) The Administrative Framework;
- (iii) Environmental Regulations and Standards of Georgia;
- (iv) National Technical Regulations Relevant to the Project;
- (v) Environmental Permitting Procedure;
- (vi) Permit and Licences Required for Off-site Works During Construction;
- (vii) International Conventions Relevant to the Project Ratified by Georgia;
- (viii) An overview of the ADB safeguard policies.

### D.2 General

115. Georgian legislation comprises the Constitution, environmental laws, international agreements, subordinate legislation, normative acts, presidential orders and governmental decrees, ministerial orders, instructions and regulations. Along with the national regulations, Georgia is signatory to a number of international conventions, including those related to environmental protection.

116. The Ministry of Environmental Protection and Agriculture (MoEPA) of the Government of Georgia is responsible for regulating the activities that affect the natural environment.

### D.3 Environmental Legislation of Georgia

117. A list of Georgia's environmental legislation as it pertains to the proposed project is given in Table 12.

**Table 12: List of environmental laws and regulations relevant to the project**

Year	Law / Regulation	Consolidated version -Last revision	Code
1994	Law on soil protection	07/12/2017	370.010.000.05.001.000.080
1995	Constitution of Georgia	13/10/2017	010.010.000.01.001.000.116
1996	Law on subsoil	07/12/2017	380.000.000.05.001.000.140
1996	Law on environmental protection	07/12/2017	360.000.000.05.001.000.184
1996	On the system of protected areas	07/12/2017	360.050.000.05.001.000.127
1997	Law on wildlife	07/12/2017	410.000.000.05.001.000.186
1997	Law on water	07/12/2017	400.000.000.05.001.000.253
1999	Law on protection of atmospheric air	07/12/2017	420.000.000.05.001.000.595
1999	Forestry code of Georgia	07/12/2017	390.000.000.05.001.000.599
1999	Law on compensation of damage from hazardous substances	07/12/2017	040.160.050.05.001.000.671
2000	Law on regulation and engineering protection of the sea and river banks	05/05/2011	400.010.010.05.001.000.830
2003	Law on Red List and Red Book of Georgia	07/12/2017	360.060.000.05.001.001.297
2005	Law on licences and permits	23/12/2017	300.310.000.05.001.001.914

Year	Law / Regulation	Consolidated version -Last revision	Code
2003	Law of Georgia on conservation of soil and restoration-amelioration of soil fertility	07/12/2017	370.010.000.05.001.001.274
2014	Waste code	07/12/2017	360160000.05.001.017608
2017	Environmental Assessment Code	07/12/2017	360160000.05.001.018492

118. Brief summaries of the listed documents are given below:

119. **Constitution of Georgia** states the basic rights of people to live in a healthy environment and obligation to protect it. According to constitution everyone has the right to obtain complete, objective, and timely information about environmental conditions (Article 37 Part 3). It assures that the state shall protect environment and foster sustainable development (Article 37 Part 4). It establishes a legal framework that guarantees public access to information about the condition of the environment (Article 37 Part 5, Article 41 Part 1).

120. **Environmental Assessment Code (EAC)**. The Code establishes a legal basis for regulating issues related to projects and strategic documents, which implementation may have significant impact on the environment, human life and health. It regulates the procedures related to environmental impact assessment, strategic environmental assessment, public participation in decision-making, trans boundary environmental impact assessment; defines rights and obligations of the developer, the planning authority, the public and the competent authorities in the course of decision-making envisaged by this Code; describes procedures of issuing Environmental Decision; exemption rules. The law includes two annexes. Annex I lists activities subject to EIA, Annex II - lists activities/projects that require screening procedure. Screening is responsibility of MoEPA. Under the EAC construction of international and interstate roads; construction and operation of tunnels and/or bridges on the international and interstate roads belongs to activities subject to EIA. According to the document, the main stages of environmental impact assessment include:

- (i) Screening;
- (ii) Scoping procedure;
- (iii) Preparation of the EIA Report by the developer or the consultant;
- (iv) Ensuring public participation;
- (v) Examination of the information presented in the EIA Report and any supplementary information provided by the developer to the Ministry as well as assessment of the information received through the public participation and consultation processes;
- (vi) Expertise procedure;
- (vii) Implementation of transboundary environmental impact assessment procedure (weather appropriate);
- (viii) Issuance of Environmental Decision or the decision on refusal to implement the project by the Minister.

121. **Law on Licenses and Permits** regulates legally organized activities posing certain threats to human life/health, and addresses specific state/public interests, including usage of resources, regulates activities requiring licenses/permits, determines types of licenses/permits required, and defines the procedures for issuing, revising and cancelling of licenses and permits. The law is generic and refers to the Environmental Assessment Code for details of environmental permitting (Environmental Decision) procedures.

122. **Law on Environmental Protection** regulates the legal relationship between the bodies of the state authority and the physical persons or legal entities (without distinction-legal

form) in the field of environmental protection and in the use of nature on all Georgia's territory including its territorial waters, airspace, continental shelf and special economic zone. The law defines the principles and norms of legal relations, rights and obligations and responsibilities, awareness raising, education and scientific research in the field of environment, key players and principles of environmental management; describes economical mechanisms and levers; ecological insurance; basics of environmental audit; environmental requirements during privatization; justifies needs of environmental standards and limits (air, water, soil, noise, vibration, fields, radiation) and ecological requirements for production, transportation and storage of goods and food products; ecological requirements applicable to waste; states necessity of environmental impact assessment and related issues (strategic environmental protection and transboundary environment assessment) referring to Environmental Assessment Code; defines general principles of environmental protection; considers different aspects on protection of ecosystems, protected areas, issues of global and regional management, protection of ozone layer, biodiversity, protection of Black Sea and international cooperation aspects. As stated in the law, in order to protect the climate against the global changes, the subject of the business activity is obliged to observe the limits to green-house gas emissions as well as to take measures for mitigating this emission. The emission of the green-house gases is regulated on the basis of integrated control of pollution of environment (Article 51). Besides, the subject of the business activity is obliged to reduce or stop production and use of such chemicals, which are likely to have effects on the ozone, layer of the earth and cause depletion of it (Article 52).

123. The status, of natural resources, study and usage of mineral resources is regulated by the **Law of Georgia on Subsoil**. The law describes rights and obligations of the users (Including re-cultivation after expiration of the license term), duration of the licenses (for energy resources – up to 45 years; for metal ores – up to 40 years; up to 30 years for construction materials and other non-ore mineral resources; ground water and gas (except for the natural gas) – up to 25 years); protection of natural resources and safety requirements; termination of license; state supervision and control over the use of mineral resources; general requirements during mining. With regards to the issues related to the licenses for use of the natural resources the law gives reference to the law on Licenses and Permits, Law on Oil and Gas and related regulations. The law states the need for protection of environment and OHS during operation (mining), including requirements for waste (including waste water) management. According to the law extraction and treatment of mineral resources from deposits both of natural and technogenic origin (soil disposal areas) are subject to state supervision and control.

124. The **Waste Management Code** (2015) provides the legal conditions for implementation of measures aiming at prevention of generation of waste and increased re-use, environmentally-sound treatment of waste (including recycling and extraction of secondary raw materials, energy recovery from waste, as well as safe disposal). The following summarizes the key points of the code.

- (i) **Article 7 - General waste management requirements**
  - (a) Waste, depending on its type, properties and composition, shall be collected, transported and treated in a manner not impeding its further recovery.
  - (b) Waste shall be collected, transported and treated in a manner which excludes, to the maximum extent possible, pollution of the environment and risks for human health.
  - (c) In case of waste pollution caused by waste transport activities, the waste transporter shall be responsible for taking clean up measures.
  - (d) The producer and holder of waste is obliged to treat their waste
  - (e) on their own or hand it over for collection, transport and treatment to persons entitled to carry out such operations in accordance with this

- (f) Law and legislation of Georgia.
- (f) Where waste has been submitted for recovery or disposal, the original producer's and/or holder's responsibility shall remain until recovery or disposal is completed.
- (g) Persons who collect and transport waste shall hand it over for treatment to appropriate facilities, holding the relevant permit or registration.
- (h) The burning of waste outside permitted incinerators shall be prohibited.
- (ii) Article 14 - Company waste management plan**
- (a) Legal and natural persons that produce more than 200 tonnes of non-hazardous waste or 1000 tonnes of inert waste or any amount of hazardous waste annually, shall prepare a company waste management plan.
- (iii) Article 15 – Environmental Manager**
- (a) The persons under Article 14 of this Law shall nominate a suitable person as a company environmental manager.
- (iv) Article 17 - General obligations for hazardous waste management**
- (a) The production, collection and transportation of hazardous waste, as well as its storage and treatment, shall be carried out in conditions providing protection for the environment and human health. It shall be prohibited to
- discard hazardous waste outside waste collection containers;
  - discharge it into the sewerage systems or underground or surface waters, including the sea;
  - burn it outside waste incinerators permitted for that purpose;
  - treat it outside waste treatment facilities permitted to treat such type of waste
- (v) Article 18 - Special obligations for hazardous waste management**
- (a) Waste producers that produce more than 2 tons of hazardous waste per year shall
- create and implement a suitable separation and collection system for such waste;
  - designate an environmental manager, pursuant to Article 15 of this Law, responsible to make arrangements for the safe management of said waste;
  - make arrangements for briefing and training for staff handling hazardous waste.
- (b) Until the exact content of waste is unknown, the waste shall be regarded as hazardous.
- (c) Hazardous waste for which no appropriate treatment techniques and/or technologies are available in accordance with the requirements of this Law within the territory of Georgia shall be exported for treatment. Until the export is carried out, the waste shall be safely stored at temporary storage facilities.
- (d) The Ministry may exceptionally once allow for an extended storage period of up to one year if this is justified and does not harm human health or the environment.
- (e) Hazardous waste may only be collected and transported by a natural or legal person after its registration pursuant to this Law.
- (vi) Article 29 - Obligations for keeping records and reporting on waste**
- (a) Records on waste shall be kept and waste reports shall be submitted to

the Ministry by natural and legal persons:

- dealing professionally with collection, transport and/or treatment of waste;
- which produced more than more than 2 tones non-hazardous (excluding municipal waste) waste or any amount of hazardous waste per year.

125. **Law on Protection of Atmospheric Air.** The law regulates protection of atmospheric air from man-caused impact. Pollution of atmospheric air is emission of hazardous substances originating from activities which are able to have negative impact on human health and environment. Four types of pollution are considered (Part II, Chapter IV, Article II.2): Pollution of environment with hazardous matter, Radiation pollution of atmospheric air. Pollution with microorganisms and biologically active matter of microbial origin, Noise, vibration, electromagnetic fields and other physical impact. Maximum permitted limits for concentration of hazardous substances into the atmospheric air are defined for each contaminants and represent maximum concentration of hazardous pollutants, in averaged time span, recurring action of which has not have negative impact on human health and environment. Maximum permitted levels of emission of hazardous matters into the atmospheric air are defined with allowance of prospective of development of the enterprise, physical. geographical and climatic conditions, dispersion of emitted substances, background concentration of pollutants emitted from other neighboring enterprises, taking into account inter-location of existing or planned dwellings, sanatoria and recreation zones. In compliance with the law (Clause 28), in order to restrict pollution from the stationary sources<sup>5</sup> of hazardous emissions the limits of emissions are to be set. The limit of pollution from the stationary source of emission is permitted quantity (mass) of emitted hazardous matters (Clause 29). Maximum annual emission level means the maximum permitted limit of discharge. This is annual permitted quantity of emission predetermined by technology in conditions of standard permitted capacity of discharge. Annual maximum capacity is defined for each hazardous substance and is calculated so that for each stationary source of emission cumulative emission from all registered sources of discharge does not exceed relevant maximum permitted value. Discharge of hazardous emissions from the stationary sources of emission without approved limits of discharge is forbidden. The standards of emissions (Clause 30) are to be worked out by the enterprise itself. According to the law (Clause 38) the enterprise is responsible for conducting self-monitoring which includes measurement of emission (evaluation), recording/registration and accounting. Emission which has not been recorded in self-monitoring record is considered illegal. As mentioned in the Clause 51 results of the monitoring and information on pollution of the air with hazardous substances is transparent and accessible for the public.

126. **Law on Water** regulates water use, defines rights and obligations of water users, sets out the types of licenses for the use of water, the rules and conditions of their issuance, considers conditions of suspension, withdrawal and deprivation of license, regulates water flows. The law states liability of all natural and legal persons to prevent pollution of catchment basins, water reservoirs, snow and ice covers, glaciers, permanent snow cover with industrial, household and other wastes and emissions which may cause deterioration of the underground water quality; prohibits piling of industrial and household wastes near the public water headwork's and in their sanitation zones, bans construction of facilities and implementation of any other activity which may cause water pollution; sets requirements for forest use within water protection zones. The state management of water protection and use is exercised through accounting, monitoring, licensing, control and supervision.

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<sup>5</sup> Stationary source of pollution of the atmospheric air is stationary device or construction with a special emission unit. Any stationary device or construction which, proceeded from its technological peculiarities, is not fitted with sputtering device is also considered as a stationary source of emission.

- (i) State monitoring of water is implemented by the Legal Entity under Public Law - the National Environmental Agency under MoEPA. By virtue of the law when locating/designing/constructing/commissioning of a new or reconstructed enterprise, or other facility, as well as in introducing of new technological process capable to affect the state of water, the rational water use is to be secured. At the same time, attention is to be paid to the measures ensuring due accounting of water abstracted from and returned to water bodies; protection of water from contamination, pollution-and depletion; avoidance of the unfavorable water impact; restriction of land flooding up to minimum necessary level, protection of land from silting, swamping or drying up; as well as environmental protection and landscape preservation.
- (ii) Under the law required is purification, up to the fixed standard, of the waste water discharged in a water body. In order to protect the quality of water resources, the law requests creation of sanitary protection zone that consists of three belts, each having a special regime. The procedure fixing the water quality standards, the maximum permissible rates of emission of harmful substances (including microorganisms) into ambience, the water abstraction quotas and the temporary rates (limits) of emission of harmful substances (including microorganisms) into water is defined by the Law of Georgia on the Environmental Protection.
- (iii) Georgian legislation may provide liability for other violations of law in the water protection and use sphere. Water users shall compensate for damages caused by violation of the law on Water in the amount and under procedure established by legislation of Georgia. Under the Article 17 (Protection of natural resources of the Black Sea) anadromous fish species (fish species seasonally migrating upstream of a river against the current) within the rivers of Georgia shall be protected by creation of conditions necessary for their reproduction, through conservation of the habitat, determination of procedures for regulating the fishing industry, determination of a total permissible amount of catching these species within the territorial waters, and within and outside special economic zones of Georgia, also through implementation of other measures defined by the legislation of Georgia. Article 20 (River water protection zone) defines protection zone of a river shall be its adjacent territory, where a special regime is established to protect water resources from pollution, littering, fouling, and depletion. This zone may include its dry bed, adjacent terraces, natural elevated and steep riversides, as well as gullies directly adjacent to riversides. The width of a river water protection zone shall be measured in meters from the edge of a riverbed to both sides under the following procedure:
  - (a) 10 meters - in the case of a river up to 25 kilometers long,
  - (b) 20 meters - in the case of a river up to 50 kilometers long,
  - (c) 30 meters - in the case of a river up to 75 kilometers long,
  - (d) 50 meters - in the case of a river over 75 kilometers long.
- (iv) Within this zone, prohibited activities are to: a) construct, expand or reconstruct functioning enterprises, except for cases directly determined by law; b) spray, by air atomisation, perennial plants, sown crops and forest lands with toxic chemicals; c) keep, collect or place toxic chemicals and mineral fertilizers, as well as any other wastes as defined in the legislation of Georgia. It is requested that hydraulic structures located within a water protection zone shall be normally equipped with appropriate technical facilities to completely exclude the possibility of river pollution and littering.

127. **Law on Wildlife.** The law regulates wildlife protection and use including hunting and fishing. The main goal of the law is to ensure protection and restoration of wildlife, its habitats, preservation and sustainability of species diversity and genetic resources, creation of conditions for sustainable development, taking into account the interests of present and future generation; legal ensuring of wildlife protection (including in-situ and ex-situ conservation, translocation and reproduction of wildlife) and state-based provision of use of wildlife objects. In addition to this law, Georgian legislation on the wildlife is based on the Constitution of Georgia, Georgia's international agreements and treaties, laws on Environmental Protection and on the System of Protected Areas, law of Georgia on Wildlife and law of Georgia on the "Red List" and "Red Book". It is one of the main goals of the Environmental Protection Law to support the preservation of biodiversity of the country, the preservation of rare, endemic and endangered species, the protection of the marine environment, and the maintenance of the ecological balance (Art. 3.1 (d)). The Law contains regulations on both wild animals and plants which are threatened by extinction and those which are not. Two main legal acts regulating the issues of species protection in Georgia.

128. **Law on Red List and Red Book** which gives the legal definitions of Red List and Red Book (relevant recommendations and methodological issues) of endangered species of Georgia. The Red List structure was also legally defined, as well as the relevant procedures for including species in the Red List, procedures for revising, and updating of it. The Law also regulates issues related to planning and financial matters connected with the protection, taking of, rehabilitation and conservation of endangered species. The Red List of Georgia was approved by Order of President of Georgia No. 303 (2006), later - by the Resolution of the Georgian Government No. 190, dated 20-Feb-14. The law defines special cases when removal of individuals of the Georgian Red List species from their habitats is allowed. Decisions are made by the Government of Georgia.

129. **Forestry Code** regulates relations and state policy in the area of forestry management, use and protection. The code specifies all activities, which may be carried out in Forestry Fund. It allows only those activities, which are related to forest resource protection or use such as timber logging, collection of non-timber resources, use of area for agriculture or recreation, establishment of hunting farms, etc. State forestry fund may be used for a special purpose in urgent cases. Decisions are made by the Government of Georgia.

130. **Law on Soil Protection.** The law provides the policy requirements and principles of the protection and preservation of fertility soil resources against negative impacts. Soil protection is the state problem since correct and rational use of all types of soil, including barren soil, saline soils, swamped soil, alkali soil and aqueous soil are the main reserve of dynamic development of agriculture and of the national economy as a whole. The purpose of the present Law is to establish the rights and the duties of landholders, landowners and the state in the field of soil protect. The law defines soil protection measures and methods and prohibits certain activities, e.g. use of fertile soil for non-agricultural purposes; implementation of non-agricultural activity without topsoil removal and conservation; any activity, which results in deterioration of soil properties, etc. In addition to this law soil protection issues are regulated by order #2-277 (25.11.2005) of the Minister of Agriculture on approving Recommendations for Complex Measures for Soil Protection from the Erosion.

131. **Law of on Conservation of Soil and Restoration-Amelioration of Soil Fertility** is to ensure conservation and improvement of soil in the territory of Georgia, define the legal principles, measures, limitations and prohibitions to that end; soil conservation and fertility restoration improvement measures. It prohibits unregulated grazing, removal of windbreaks, application of non-registered fertilizers or other substances, soil contamination and any activity, which results in deterioration of soil properties and facilitates desertification, swamping, salinization, etc. Businesses that use soil or conduct activities upon soil that have the potential to negatively impact soil conservation are required to follow the Law and related

normative documents and regulations, including Order #113 (27.05.2005) of the Minister of Environment and Natural Resources' Protection on affirming regulation on "Removal, Storage, Use and Re-cultivation of the Fertile Soil Layer" and 2) Resolution of the GoG #424 (31.12.2013) on affirming technical regulations on "Removal, Storage, Use and Re-cultivation of the Fertile Soil Layer". These documents consider issues of land resources protection and rational use and issues related to removal, storage, use and re-cultivation of the fertile soil layer during different activates. According to the regulation, restoration of degraded soil fertility must be implemented using re-cultivation (technical and biological) methods.

132. **Law on System of Protected Areas.** Forms a legal basis for planning, establishment and maintenance and assignment of categories of protected areas, described funding issues for each category. It specifies ownership forms of land and other natural resources in protected areas, allowed and prohibited activities.

133. **Law on Regulation and Engineering Protection of Seacoast and Riverbanks of Georgia** provides general principles and requirements for protection of coastal areas and riverbanks from negative environmental impacts.

134. **Law on Compensation for Damage Caused By Hazardous Substances** Includes principles and procedures for compensating the negative impacts caused by discharge of hazardous substances into environment.

135. Laws and regulations related to social aspects and land ownership applicable to the project are presented in Table 13.

**Table 13: List of social and land ownership related laws relevant to the project**

Year	Law / Regulation	Last revision	Code
1996	Law on agricultural land ownership	16/06/2017	370.030.000.05.001.000.132
1997	Civil code of Georgia	23/12/2017	040.000.000.05.001.000.223
1997	Law on compensation of land substitute costs and damages due to allocating agricultural land for non-agricultural purposes	25/12/2014	370.020.000.05.001.000.244
1999	Law on rules for expropriation of property for public needs	06/09/2013	020.060.040.05.001.000.670
2007	Law on cultural heritage	07/12/2017	450.030.000.05.001.002.815
2007	Law on public health	07/12/2017	470.000.000.05.001.002.920
2010	Law on state property	07/12/2017	040.110.030.05.01.004.174
2010	Labour Code	04/05/2017	270000000.04.001.016012

136. Brief summaries of the listed documents are given below.

137. **Civil Code** regulates contractual relations, describes the rights and responsibilities of natural and legal persons, defines the penalties in the case of violations of the requirements set out in the document. The Civil Code differentiates between movable and immovable property and provides rules for acquiring title over property, as well as any proprietary or obligatory rights thereto. This piece of legislation must be taken into account when entering into contracts in Georgia.

138. **Labour Code** regulates employment relations, unless such relations are otherwise regulated by international treaties that have been implemented in Georgia. Employers are obliged to comply with requirements and clauses of the document for the purpose of ensuring that the rights of employees are protected.



139. **Law on Public Health** regulates legal relations for ensuring a safe environment for human health. It indicates quality norms of for air, soil and water pollution and restrictions related to ionized radiation, noise and vibration. The limits must be complied with. Section 7 of the law is dedicated to safety of technological processes.

140. **Law on Compensation of Land Substitute Costs and Damages due to Allocating Agricultural Land for Non-agricultural Purposes** defines compensation amounts, required at the time of allocation, use or disposal of agricultural land parcel for non-agricultural purpose; the payment procedure and the procedure for changing the agricultural land category, including payment of losses to landowners or land users, as a result of restricting their rights or reducing the quality of their land.

141. **Law on agricultural land ownership.** Objective of the law is to ensure improvement of the structure of agricultural land based on rational use of resources, avoidance of splitting and unsustainable use of the land plots. The law defined the rules for acquisition and selling the land, participation of the state in agricultural land related relations. The law deals with land ownership issues, restrictions of land alienation in case of co-ownership, sets priority of the state in buying out the agricultural land plots.

142. **Law on rules for expropriation of property for public needs** outlines respective procedures and conditions for expropriation of private property as well as procedures for compensation payment for expropriated property or the transfer of other property with the same market value.

143. **Law on State Property** regulates relationships on state property management and transfer for use by others, defines special requirements and procedures for transfers. The Ministry of Economy and Sustainable Development is the state authority in charge of the property.

144. **Law on cultural heritage** sets out procedures for protection of cultural heritage and permitting arrangements for archaeological investigations.

#### **D.4 Administrative Framework**

145. **Ministry of Environment Protection and Agriculture (MoEPA)** - In December 2017, MoEPA had its responsibilities split between the ministries of agriculture and economy, with the latter also taking over the Ministry of Energy.

146. MoEPA is responsible for all environmental protection issues and agriculture in Georgia. The responsibilities of the Ministry as the competent authority are: a) to intermit, limit, or stop any activity having or likely to have adverse impact on the environment, b) to carry out screening of planned development, c) to implement scoping, d) to issue environmental decision for project subject to EIA procedure (ref. Environmental Assessment Code), e) to control the execution of mitigation measures by the developer, f) to organize public meetings and discussion of an estimation of influence on environment and prepares the documentation (the project of the order of the minister) to let out the permission to influence to environment.

147. **Ministry of Economy and Sustainable Development (MoESD)** - MoESD is responsible for carrying out the review of technical documentation (including conclusion of independent experts) and issuing Permits on Construction for projects, as well as for supervision over constructing activities and for arranging Acceptance Commission after completion of construction. State supervision of construction and compliance monitoring is provided by the Main Architecture and Construction Inspection (MACI), which is operating under the Ministry of Economy and Sustainable Development of Georgia. Following to

reorganization of MoEPA and the Ministry of Energy the MoESD took over the functions of the latter, as well as part of the main functions of MoEPA (viz. licencing activity).

148. **The Roads Department** - The Roads Department of the Ministry of Regional Development and Infrastructure (RD) is responsible for elaboration of policy and strategic plans related to developing motor roads, management of road and traffic related issues and construction, rehabilitation, reconstruction and maintenance of the roads of public use of international and national significance, utilizing funds from the state budget, lawns, grants and other financial sources. Thus, the RD is responsible for the procurement of design and EIA studies, as well as works on construction and rehabilitation of roads and is responsible for ensuring compliance with the Georgian legislation and environmental and social requirements of the relevant donor organizations. Control of implementation of the Environmental Management Plan (EMP) is direct responsibility of the Roads Department. Within the RD there is Environmental Division dealing with the environmental issues. This division is supposed to review the EIAs and EMPs related to the Roads Department projects and perform monitoring of compliance of the contractor's performance with the approved EMPs, EIAs, environmental standards and other environmental commitments of the contractor.

149. **The Ministry of Culture, Monument Protection and Sports** - responsible on supervision of the construction activities in order to protect archaeological heritage. In case if construction is to be carried out in a historic sites or zones of cultural heritage, consent of the Ministry of Culture, Monument Protection and Sport is also required for issuing construction permit.

150. **The “National Service for the Foodstuffs Safety, Veterinary and Plant Protection” of the Ministry of Environmental Protection and Agriculture** - responsible for implementation of complex sanitary protection measures in case of identification burial sites during earthworks. Information about suspicious burial sites should be delivered to the “National Service for the Foodstuffs Safety, Veterinary and Plant Protection” of MoEPA by the Construction Contactor (field environmental officer) and RD field officer.

## D.5 Environmental Regulations and Standards

151. Georgia has a large set of specific standards that refer to emission, effluent, and noise standards, as well as standard to handle and dispose specific wastes ranging from sewage to hazardous wastes. The following summarizes these laws and standards along with IFC and EU standards.

### D.5.1 Ambient Air Quality Standards

152. Maximum permissible concentrations (MPC) for air born pollutants are set by the hygienic standards on Maximum Permissible Concentrations of Air Born Pollutants for Settlements (HN 2.1.6. 002-01), see Table 14. This project will also ensure compliance with IFC guideline values (not interim targets) as these values are, in some instances, more stringent than the national standards, the most stringent standards are highlighted in green.

**Table 14: Ambient Air Quality Standards**

Parameter	Averaging Period	Limit (µg/m <sup>3</sup> )		
		Maximum Permissible Concentration (MAC) for Air Quality	IFC Guideline Value	EU Ambient Air Quality Guidelines
Nitrogen Dioxide (NO <sub>2</sub> )	30 minutes	200	-	-
	1 Hour	-	200	200
	24 Hours	40	-	-

Parameter	Averaging Period	Limit ( $\mu\text{g}/\text{m}^3$ )		
		Maximum Permissible Concentration (MAC) for Air Quality	IFC Guideline Value	EU Ambient Air Quality Guidelines
	1 Year	-	40	40
Sulphur Dioxide ( $\text{SO}_2$ )	10 minutes	-	500	-
	30 minutes	500	-	-
	1 Hour	-	-	350
	24 Hours	50	20	125
Carbon Monoxide (CO)	30 minutes	5000	-	-
	24 Hours	3000	-	-
Total Suspended Particulates (TSP) / Dust	24 Hours	150	-	-
	30 minutes	500	-	-
PM10	1 year		20	40
	24 hour		50	50
PM2.5	1 year		10	25
	24 hour		25	-
Ozone	8-hour daily maximum		100	120

#### D.5.2. Surface Water Quality Standards

153. The values of Maximum Admissible Concentrations of the harmful substances in surface are provided in the Environmental Quality Norms approved by the Order #297N (16.08.2001) of the Ministry of Labour, Health and Social Protection (as amended by the Order No 38/n of the same Ministry of 24.02.2003). The admissible level of pollutants in surface water is given in Table 15. All effluents shall comply with the Georgian National Standards. However certain parameters are not specified in the national standards for these IFC Guidelines are being used as shown in the Table.

**Table 15: Applicable Standards for Surface Water Quality**

Parameter	Maximum Permissible concentration	Source
pH	6.5-8.5	National
Diluted Oxygen, mg/l	4-6	National
BOD5, mg/l	30	IFC
COD, mg/l	125	IFC
Total Nitrogen, N, mg/l	10	IFC
Total Phosphate, mg/l	2	IFC
Chlorides, mg/l	350	National
Oil Products, mg/l	0.3	National
Zinc ( $\text{Zn}^{2+}$ )	1g/kg	National
Lead (Pb total)	23.0	National
Chrome ( $\text{Cr}^{6+}$ )	32.0	National
Cadmium (Cd, total)	6.0	National
Total Suspended Solids, mg/l	50	IFC

154. Quality requirements depend on category of water body (ref. Technical regulations of protection of surface water from pollution, approved by decree #425 of the government of Georgia, 31/12/2013). The categories are: a) household water use, b) domestic water use and c) fisheries. The latter, in its turn, splits in highest, first and second categories.

**Table 16: Water quality requirements by water use category**

	Water use category			
	Household water use	Domestic water use	Fisheries	
			Highest first	and Second
	Increase not higher that listed below is allowed			
Suspended solids	0.25mg/l	0.75 mg/l	0.25mg/l	0.75 mg/l
	For rivers with natural content of suspended solids 30mg/l, around 5% increase is allowed			
	If waste water contains suspended particles with deposition rate above 0.2mm/sec discharge in water reservoirs is not allowed. Discharge of effluents containing suspended particles with deposition rate above 0.4mm/sec is prohibited.			
Floating matter	Patches and films of oil, petroleum products, fats must not be detectable			
Colour	Must not be visible in water column		Water must not have unusual colour	
	20cm	10cm	-	
Odour, taste	Water must not have odour and taste of higher than 1 unit intensity		Water must not result in unusual odour and taste in fish	
	After chlorination of other treatment	Without treatment	-	
Temperature	After discharge of waste water, temperature in water reservoir must not exceed by more than 5% compared to the natural value		For water bodies where cold water lowing fish is found ( <i>Acipenseridae</i> , <i>Coregonidae</i> ) maximum allowable temperatures in summer and winter are 20C and 5C respectively, for other water bodies 28C (in summer), 8C (in winter)	
pH	Must be in 6.5-8.5 interval			
Water mineralisation	<1000mg/l, Incl. chlorides – 350mg/l; sulphates - 500mg/l	To comply with requirement given in section related to taste (see above)	In accordance with taxation	
Dissolved oxygen	Must not be lower than			
	4mg/l	4mg/l	6mg/l	6mg/l
Biological oxygen demand	At 20C must not exceed			
	3mg/l	6mg/l	3mg/l	6mg/l
Chemical oxygen demand	Must not exceed			
	15 mg/l	30 mg/l	-	-
Chemical substances	Must not exceed maximum permissible limits			
Pathogens	Must be free for pathogens, including viable helmint eggs, tenia oncosperes and viable cysts of pathogen organisms			
Toxicity	-	-	At the point of discharge and control section of the river toxic impact must not be observed.	

### D.5.3 Groundwater Quality Standards

155. Groundwater quality standards are not set under Georgian law. Drinking water quality standards are commonly used instead as assessment criteria for groundwater. Quality of drinking water is determined by the Technical Regulations for Drinking Water (approved by order №58 of the government of Georgia, (15.01.2014).

**Table 17: Drinking water quality criteria**

Parameter	Units	Value
Odour	Unit	2
Taste	Unit	2
Colour	Grad	15
Turbidity	Turbidity units (formazine) or mg/l (kaolin)	3.5 or 2
<b>Metals and Miscellaneous</b>		
Boron, B	mg/kg	0.5
Arsenic, As	mg/kg	0.01
Cadmium, Cd	mg/kg	0.003
Copper, Cu	mg/kg	2
Mercury, Hg	mg/kg	0.006
Nickel, Ni	mg/kg	0.07
Lead, Pb	mg/kg	0.01
Selenium, Se	mg/kg	0.01
Zinc, Zn	mg/kg	3
Total Petroleum Hydrocarbons, TPH	mg/kg	0.1
Cyanide	mg/kg	0.07
Sulphate	mg/kg	250
Chloride	mg/kg	250
pH	pH value	6-9
Sodium, Na	mg/kg	200
<b>Microbiological characteristics</b>		
Thermotolerant coliforms	Bacteria in 100cm <sup>3</sup>	not allowed
Total coliforms	Bacteria in 100cm <sup>3</sup>	not allowed
Mesophylic aerobes and facultative anaerobes	Colony forming units in 1cm <sup>3</sup>	< 50
Colifagues	Negative colonies in 100m <sup>3</sup>	not allowed
Sulphitereducing clostridia	Spores in 20cm <sup>3</sup>	not allowed
Lamblias and cysts	Cysts in 50dm	not allowed

#### D.5.4 Noise Standards

156. Admissible noise standards of the IFC and Georgian national standards for residential areas are similar. The national standards for noise are set according to the Technical regulation – Acoustic noise limits for rooms/premises in residential houses and public establishments (Document #300160070.10.003.020107, Date 15/08/2017) see Table 18.

157. For IFC noise impacts should not exceed the levels presented in Table 19 or result in a maximum increase in background levels of 3 dB at the nearest receptor location off site. This project will comply with both IFC Guidelines and Georgian Standards. Note that Georgian standards refer to the allowable limits indoors, not at the building façade.

**Table 18: Georgian Standards for Noise Levels**

Purpose/use of area and premises	Allowable limits (dBA)		
	L <sub>day</sub>		23:00 – 08:00
	08:00 - 19:00, Day	Evening 19:00-23:00	L <sub>night</sub> , Night
Educational facilities and library halls	35	35	35
Medical facilities/chambers of medical institutions	40	40	40
Living quarters and dormitories	35	30	30
Hospital chambers	35	30	30
Hotel/motel rooms	40	35	35
Trading halls and reception facilities	55	55	55
Restaurant, bar, cafe halls	50	50	50
Theatre/concert halls and sacred premises	30	30	30
Sport halls and pools	55	55	55
Small offices ( $\leq 100\text{m}^3$ ) – working rooms and premises without office equipment	40	40	40
Small offices ( $\leq 100\text{m}^3$ ) – working rooms and premises without office equipment	40	40	40
Conference halls /meeting rooms	35	35	35
Areas bordering with houses residential, medical establishments, social service and children facilities (<6 storey buildings)	50	45	40
Areas bordering with houses residential, medical establishments, social service and children facilities (>6 storey buildings)	55	50	45
The areas bordering with hotels, trade, service, sport and public organizations	60	55	50

Note:

1. in case noise generated by indoor or outdoor sources is impulse or tonal, the limit must be 5dBA less than indicated in the table.
2. Acoustic noise limits given above are set for routine operation conditions of the 'space', i.e. windows and door are closed (exception – built-in ventilation canals), ventilation, air conditioning, lighting (in case available) are on; functional (baseline) noise (such as music, speech) not considered.

**Table 19: IFC Noise Level Guidelines**

Receptor	One hour L <sub>aeq</sub> (dBA)	
	Daytime 07.00-22.00	Night-time 22.00 – 07.00
Residential; institutional; educational	55	45
Industrial; commercial	70	70

158. For workplace noise the following IFC standards are applicable.

**Table 20: IFC Work Environment Noise limits**

Type of Work, workplace	IFC General EHS Guidelines
Heavy Industry (no demand for oral communication)	85 Equivalent level L <sub>aeq</sub> ,8h
Light industry (decreasing demand for oral communication)	50-65 Equivalent level L <sub>aeq</sub> ,8h

### D.5.5 Vibration Standards

159. The Georgian Standards for vibration are designed for human comfort. These are shown in Table 21. Note that no standards for building damage exist.

**Table 21: Georgian General Admissible Vibration Values in Residential Houses, Hospitals and Rest Houses, Sanitary Norms 2001**

Average Geometric Frequencies of Octave Zones (Hz)	Allowable Values X0,Y0, Z0			
	Vibro-acceleration		Vibro-speed	
	m/sec <sup>2</sup>	dB	m/sec 10 <sup>-4</sup>	dB
2	4.0	72	3.2	76
4	4.5	73	1.8	71
8	5.6	75	1.1	67
16	11.0	81	1.1	67
31.5	22.0	87	1.1	67
63	45.0	93	1.1	67
Corrected and equivalent corrected values and their levels	4.0	72	1.1	67

Note: It is allowable to exceed vibration normative values during daytime by 5 dB during daytime. In this table of inconstant vibrations, a correction for the allowable level values is 10dB, while the absolute values are multiplied by 0.32. The allowable levels of vibration for hospitals and rest houses have to be reduced by 3dB.

160. The American Association of State Highway and Transportation Officials (AASHTO) (1990) identifies maximum vibration levels for preventing damage to structures. Table 22 summarizes the maximum levels.

**Table 22: AASHTO Maximum Vibration Levels for Preventing Damage**

Type of Situation	Limiting Velocity (in/sec)
Historic sites or other critical locations	0.1
Residential buildings, plastered walls	0.2-0.3
Residential buildings in good repair with gypsum board walls	0.4-0.5
Engineered structures, without plaster	1.0-1.5

### D.5.6 Soil Quality

161. Soil quality is currently assessed by Methodological Guides on Assessment of Level of Chemical Pollution of Soil (MG 2.1.7.004-02). However, these limits will soon be replaced as Georgia harmonizes its regulations with the EU and moves away from the outdated standards prepared while part of the Soviet Union. The national standards for soil quality are given in Table 23 along with the limits proposed by MoEPA and the Ministry of Labour, Health and Social Affairs.

**Table 23: Soil screening values**

Compound	Units	Current Limit	Proposed Limit
Metals and Miscellaneous			
Arsenic, As	mg/kg	2	30
Cadmium, Cd	mg/kg	2*	0.5** – 1.0***
Copper, Cu	mg/kg	3-132*	60**-100***
Mercury, Hg	mg/kg	2.1	

Compound	Units	Current Limit	Proposed Limit
Nickel, Ni	mg/kg	4-80*	60** - 80***
Lead, Pb	mg/kg	32-130*	100** - 140***
Zinc, Zn	mg/kg	23-220*	130** - 200***
Total Petroleum Hydrocarbons	mg/kg	1000	-
Cyanide	mg/kg	0,2	-
Volatile Organic Compounds			
Benzene	mg/kg	0.3	0.05
Toluene	mg/kg	0.3	-
Total xylenes	mg/kg	0.3	0.05
Semi Volatile Compounds			
Benzo(a)pyrene	mg/kg	0.02-0.2	0.1
Isopropylbenzene	mg/kg	0.5	-
Pesticides			
Atrazine	mg/kg	0.01-0.5	-
Lindane	mg/kg	0.1	-
DDT (and its metabolite)	mg/kg	0.1	0.075

\* Note: Sodium and neutral (clay and clayey) pH >5.5 - No screening value available, \*\* Light Soils, \*\*\*Other Soils

## D.6 National Technical Regulations Relevant to the Project

162. Technical (national) regulations applicable to the road project in Georgia include:
- Law on Roads (310.090.000.05.001.000.089, last amended in 2013);
  - Construction norms and regulations 2.05.03-84 - Design of bridges, viaducts, overpasses and pipes;
  - Construction norms and regulations 2.05.02-85 - Motor roads (regulate traffic safety, environmental issues, set forth main technical and traffic operation norms, crossings and intersections, paving aspects, etc.)
163. According to these documents:
- International and national importance roads should be built bypassing the settlements. Access roads to the settlements should be provided. To allow modernisation, the distance between the residential area (settlement) and the edge of the carriageway must be not less than 200m, distance to agricultural land - 50m. If because of technical or economical purposes the road is to cross the settlement, minimum distance to the residential area must be 50m, in case noise barriers are provided – 25m. For local roads minimum distance to residential area must be 50m, distance from agricultural land – 25m.
  - To protect residential area from noise and emission impact, 10m wide green barrier must be arranged;
  - Along with technical and economic aspects environmental impacts must be taken into account during design and construction;
  - Prior to arrangement of temporary infrastructure and preparation of road embankment, topsoil must be removed and stockpiled until subsequent use for re-cultivation after completion of construction and removal of all temporary facilities;
  - Roads along the rivers, lakes and reservoirs must be built with consideration of protection zone boundaries for the surface water bodies.

## D.7 Environmental Permitting Procedures

164. Since the draft of the EIA report for the planned development was disclosed before the entry into force of the new Environmental Assessment Code, permit application/issuance



procedure follows the steps defined in the law on Environmental Impact Permit described below:

**Table 24: Environmental impact permit issuance procedure (valid for the projects disclosed before January 1, 2018)**

Step	Action	Comment	Timeframe
1	Publication of information on the project in central and regional newspapers.	The advertisement has to include the project title, location, place and the date, time and venue of public disclosure meeting(s). It will also identify locations where the EIA can be reviewed and where comments may be submitted.	Day 0
2	<ul style="list-style-type: none"> <li>Submission of the draft ESIA report to the Ministry of Environment Protection and Agriculture (MoEPA)</li> </ul>	Hard copy and electronic version of the report delivered to MoEPA	within 3 days after announcement in the newspapers
	<ul style="list-style-type: none"> <li>Feedback</li> </ul>	Receiving public comments on the disclosed EIA	45 days from announcement in the newspapers
	<ul style="list-style-type: none"> <li>Meetings with stakeholders including local community, NGOs, local authorities, etc.</li> </ul>	All comments and questions must be documented and answers, minutes of the meeting(s) written up.	Between 50 and 60 days after publication of the advert
3	Development of final version of the ESIA and submission to MoEPA (together with Non-technical Summary, Technical Summary, reports on emissions and allowable limits) for the state ecological examination.	Comments received from the stakeholders considered in the report. Minutes of meeting(s) enclosed to the document as attachment. .	After arranging a public review of the EIA report and development of final version of the EIA, the developers is authorised to submit, within one year, an application to the permit issuing administrative body for a permit
4	Consideration of the documents by MoEPA and issuance of conclusion		20 days after registration of an application for a permit and submission of the EIA package to the MoEPA.

Note: According to the national regulations (Law on Licenses and Permits and in compliance with Resolution of the GoG on rules and conditions for issuance of construction permit (N57, 24 March 2009, with amendments) construction/ modernization of highways requires Construction Permit.

165. After January 1, 2018, the procedure including screening, scoping and EIA stages is has been introduced. According to the Code, 'construction of international and interstate roads' and 'construction and operation of tunnels and/or bridges on the international and interstate roads' belong to the Annex 1 projects that require EIA. This does not differ from the statement given in the law on Environmental Impact permit replaced by the new Code. The differences between the old and the new procedures are in scoping stage, which was not required before and increase role of the MoEPA is the public consultations process.

166. The procedure described below will be applicable to all international/interstate road and construction and operation of tunnels and/or bridges on the international and interstate roads disclosed after January 2018 (Note, this project was started prior to January 2018 so is not subject to the new rules).

**Table 25: Environmental Decision (formerly environmental impact permit) issuance procedure (after January 1, 2018)**

Step	Action	Comment	Timeframe
1	Written application to the Ministry submitted by developer.	The application submitted by the developer shall be accompanied with the following documents and/or data: a. EIA report; b. Projects on estimation of the limits for emission of harmful substances into the atmospheric air and for the injection of polluting substances into the surface waters together with the waste waters. c. Notification about a confidential part of a submitted application, if applicable; d. Copy of the document evidencing payment of the fee (500 GEL) in accordance with the existing legislation. e. Electronic copy of above mentioned documents.	Day 0
2	Ministry ensures publication of submitted application and attached documents on its official website as well as on the notice board of the relevant local authorities and/or representative bodies and upon request, provides paper copies of abovementioned documentation.	The Developer is entitled to request the Environmental Decision on several activities through a single application, if the activities are significantly interconnected.	within 3 days after submission of the application
3	Minister sets up the Expert Commission		within 5 days after registration of the application
4	Expert commission prepares and submits the expertise conclusion on the EIA report to the Ministry		within 40 days
5	Ministry takes decision on the finding of a deficiency in application		within 15 days after registration of the application
6	Feedback from stakeholders		within 40 days after the publication of the application
7	Publication of announcement on the public hearing	The announcement on public hearing shall include the information on: a. The content and brief description of the issue to be discussed, format of the discussion; b. The time, place and rules of the public hearing; c. The web address where the respective	no less than 20 days prior to organizing the public hearing

Step	Action	Comment	Timeframe
		application, the EIA report and any other information relevant to decision-making will be available as well as indication about the opportunity of accessing the paper copies of these documents during the public hearing.	
8	Public hearing	The Ministry is responsible for organizing and conducting the public hearing. It is chaired and protocoled by a representative of the Ministry. The public hearing is organized in the closest appropriate administrative building to the site of the planned project or within its vicinity. If the project is planned to be implemented within the administrative borders of a self-governing community, the public hearing is organized in the closest appropriate administrative building to the site of the project or within its vicinity and if the project is planned to be implemented within the administrative borders of a self-governing city, the public hearing is organized in the appropriate administrative building determined by the Ministry, or within its vicinity. The public hearing is open to the public and any person has a right to participate in it.	no earlier than 25th day and no later than 30th day after the publication of the application
9	Prior to issuance of the Environmental Decision or the decision on the refusal to implement the project, the Ministry ensures involvement of the Ministry of Culture and Monument Protection of Georgia, within its competence, in the administrative procedures as other public authority, under the rule envisaged by Article 84 of General Administrative Code of Georgia.		
10	The Minister issues individual administrative legal act on issuance of the Environmental Decision or the decision on the refusal to implement the project		no less than 51 and no more than 55 days after registration of the application
11	Ministry ensures publication of the EIA report, the Expertise Conclusion, the Environmental Decision or the legal act on the refusal to implement the project and the results of public participation on its official website as well as on the notice board of the relevant local authorities and/or representative bodies and upon request, provides paper copies of abovementioned documentation		within 5 days after issuing the Environmental Decision or the legal act on the refusal to implement the project

Note: The table does not include description of the scoping stage procedures.

## D.8 Licenses, Permits, and Approvals

167. The Project will also be required to obtain a number of permits and consents, of which the main permits and the implementing national legislation are described in Table 26. The Law

on Licences and Permits governs the issue of all permits and consents. Subject to satisfaction of application requirements, all the permits are issued within 30 days from application submission.

**Table 26: Permits Register**

<b>Permit Required Activity</b>	<b>Permit Title</b>	<b>Issuing Authority</b>	<b>Implementing Law</b>	<b>Responsible Party for Obtaining License</b>
<b>Pre-construction</b>				
Construction activities	Construction Permit	Ministry of Economy and Sustainable Development	Law No.1775 on Licenses and Permits; Government Resolution N57 "On Terms and Conditions of issuance of Construction Permit"	RD
Construction activities	Environmental Decision	MoEPA	Law No.519 on Environmental Protection  Law No 890-II Environmental Assessment Code	RD
Construction activities	Cultural Heritage Clearance	National Agency of Cultural Heritage	Law No 4708 "On Cultural Heritage" Law No.1775 on Licenses and Permits; Government Resolution N57 "On Terms and Conditions of issuance of Construction Permit"	RD
Construction activities	Visual geological-engineering conclusion	National Environmental Agency	Government Resolution N57 "On Terms and Conditions of issuance of Construction Permit"; Order N7 of the Minister of Environment Protection	RD
<b>Construction Phase</b>				
Tree felling in state forest lands for ROW and permanent facilities	Forest use agreement	MoEPA	Law No.2124 on Forestry Code of Georgia; Resolution No.242 of Government of Georgia on Approval of Rules for Forest Use  Resolution No.132 of Government of Georgia on Approval of Regulations on Rules and Conditions of Issuance of Forest Usage License	Contractor
Tree felling in state forest lands for Temporary Facilities	Forest Use Agreement	MoEPA	Resolution No.242 of Government of Georgia on Approval of Rules for Forest Use; Order N10/61 of the Chairman of	Contractor

			State Department of Forestry	
Underground water abstraction	Mineral extraction licence	Ministry of Economy and Sustainable Development	Decree of the Government of Georgia N136 of August 11, 2005; Law N 946 "On Fees for Use of Natural Resources"	Contractor
Construction or upgrade of access roads	Approval of construction or upgrade activities	Ministry of Infrastructure and Regional Development; local municipalities	Government Resolution N57 "On Terms and Conditions of issuance of Construction Permit"	Contractor
Transportation of oversized and overweight cargo	Transportation permit	Ministry of Internal Affairs	Joint Order N956/1-1/746 of the Minister of Internal Affairs and Minister of Economic Development; Law N 700 "On Road Transport"; Law "On Road Traffic"	Contractor
Spoil disposal	Spoil disposal approval	MoEPA	Law "On Subsoils", May 8, 2012	Contractor
Import of explosives	Permit to import explosives	Ministry of Internal Affairs	Tax Code of Georgia; Decree of the Government of Georgia N420; Law N2911 "On Control of Technical Hazard"; Order N 1-1/2502 of the Minister of Economy and Sustainable Development	Contractor
Use of explosives	Permit to use explosives	Ministry of Economy and Sustainable Development	Tax Code of Georgia; Decree of the Government of Georgia N420; Law N2911 "On Control of Technical Hazard"; Order N 1-1/2502 of the Minister of Economy and Sustainable Development	Contractor

## D.9 Construction Permits

168. The Law on Licences and Permits defines protocols for the issue, amendment and withdrawal of permits. For projects such as this, a construction permit is needed.

169. Construction permit – a different hierarchical permit which, proceeding from the economic interests of permit seekers, is divided into three mutually-dependent but in terms of administrative procedure independent stages: I stage – establishment of urban planning conditions; II stage - endorsement of architectural-construction design; III stage – issuance of construction permit. The rules and principles defined by this law for permit issuance shall apply to these stages.

170. The responsible authority (the Road Department) must obtain the following approvals before it gets approval from the Ministry of Economy and Sustainable Development:

- (i) Geological conclusions to be issued by National Environmental Agency;
- (ii) Cultural heritage clearance to be issued by National Agency of Cultural Heritage;
- (iii) Environmental Decision issued by MoEPA;
- (iv) Project design approval to be issued by MoESD; and
- (v) Project's registered rights to land.

#### D.10 State Forest Fund

171. According to The Resolution No.242 of Government of Georgia on Approval of Rules for Forest Use, Article 27<sup>1</sup> State forest land (or State Forest Fund (SFF)) may be used for the purposes of construction of motorways, as well as for other activities which are deemed as special use of forest lands. Article 27 states that if the activity that is deemed as special use of forest land and is subject to Ecological Expertise then the Client (in this case the RD) is obliged to apply to remove all trees identified in the affected SFF area from the SFF register or "de-list" them before they can be cut. The decision to de-list trees and plants from the State Forest Fund of Georgia is issued by the National Forest Agency excepting the vegetation species protected by the Red List of Georgia. A decision to de-list trees and plants from the Red List of Georgia is made by MoEPA. The client must apply to the MoEPA in writing regarding the presence of the Red-Listed species in the project area.

#### D.11 International Conventions and Agreements

172. Important international environmental treaties that have been signed by Georgia and may have relevance to the Project are listed in Table 27.

**Table 27: International Agreements and Treaties**

Date	Title	Status in Georgia	Date
<b>Natural environment</b>			
1961	International Convention for The Protection of New Varieties of Plants	Entry into force	2008
1971	Ramsar Convention on Wetlands of International Importance Especially as Wildfowl Habitat	Entry into force	1997
1973	Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	Entry into force	1996
1991	Agreement on The Conservation of Populations of European Bats	Entry into force	2002
1995	Agreement on The Conservation of African-Eurasian Migratory Waterbirds	Entry into force	2001
1997	International Plant Protection Convention (1997 Revised Text)	Entry into force	2007
1983	Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) (CMS)	Entry into force	2000
1992	Rio Convention on Biological Diversity	Entry into force	1994
2000	Cartagena Protocol on Biosafety to the Convention on Biological Diversity	Entry into force	2009
2000	European Landscape Convention	Entry into force	2011
2008	Convention on the Conservation of European Wildlife and Natural Habitats (Bern)	Entry into force	2010
2010	European Landscape Convention	Entry into force	2011
<b>Environmental pollution, waste</b>			
1997	Joint Convention on the Safety of Spent Fuel Management and on	Entry into force	2009

Date	Title	Status in Georgia	Date
	the Safety of Radioactive Waste Management	force	
1998	Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade	Entry into force	2007
1989	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal	Entry into force	1995
2001	Stockholm Convention on Persistent Organic Pollutants	Entry into force	2007
<b>Climate</b>			
1994	UN Framework Convention on Climate Change (UNFCCC)	Entry into force	1994
1985	Vienna Convention for the Protection of the Ozone Layer	Entry into force	1996
1987	Montreal Protocol on Substances that Deplete the Ozone Layer, (and its London, Copenhagen, Montreal and Beijing Amendments 2000 and 2011)	Entry into force	1996
1997	Kyoto Protocol to UNFCCC	Entry into force	2005
1999	Geneva Convention on Long-Range Transboundary Air Pollution	Entry into force	1999
<b>Cultural heritage</b>			
1954	European Cultural Convention	Entry into force	1997
1972	Paris Convention Concerning the Protection of the World Cultural and Natural Heritage	Entry into force	1992
1982	European Convention on the Protection of the Archaeological Heritage	Entry into force	2000
1985	Convention for the Protection of the Architectural Heritage of Europe	Entry into force	2000
2005	Council of Europe Framework Convention on the Value of Cultural Heritage for Society (Faro convention)	Entry into force	2011
<b>Public participation and information accessibility</b>			
1998	Aarhus Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters	Ratified	2000
<b>Labour issues</b>			
1930	Forced Labour Convention	Entry into force	1993
1936	Holidays with Pay Convention	Entry into force	1993
1949	Freedom of Association and Protection of the Right to Organise Convention	Entry into force	1999
1948	Right to Organise and Collective Bargaining Convention	Entry into force	1993
1950	European Convention for the Protection of Human Rights and Fundamental Freedoms	Entry into force	1999
1951	Equal Remuneration Convention	Entry into force	1993
1957	Abolition of Forced Labour Convention	Entry into force	1996
1958	Discrimination (Employment and Occupation) Convention	Entry into force	1993
1962	ILO Social Policy (Basic Aims and Standards) Convention	Entry into force	1997
1964	Employment Policy Convention (Geneva)	Entry into force	1993
1973	Geneva Convention concerning Minimum Age for Admission to	Entry into force	1996

Date	Title	Status in Georgia	Date
	Employment	force	
1975	Human Resources Development Convention	Entry into force	1993
1978	Labour Relations (Public Service) Convention	Entry into force	2003
1997	Employment Service Convention	Entry into force	2002
1997	Private Employment Agencies Convention	Entry into force	2002
1999	Worst Forms of Child Labour Convention	Entry into force	2002

## D.12 Asian Development Bank Safeguard Policies 2009

173. The ADB has three safeguard policies that seek to avoid, minimize or mitigate adverse environmental impacts and social costs to third parties, or vulnerable groups as a result of development projects<sup>6</sup>.

174. **Safeguard Requirements 1: Environment** – The objectives are to ensure the environmental soundness and sustainability of projects, and to support the integration of environmental considerations into the project decision-making process. Environmental safeguards are triggered if a project is likely to have potential environmental risks and impacts. Eleven ‘Policy Principles’ have been adopted as part of the SPS, including:

- (i) Use a screening process for each proposed project, as early as possible, to determine the appropriate extent and type of environmental assessment so that appropriate studies are undertaken commensurate with the significance of potential impacts and risks. (The Project is classified as a Category A project).
- (ii) Conduct an environmental assessment for each proposed project to identify potential direct, indirect, cumulative, and induced impacts and risks to physical, biological, socioeconomic (including impacts on livelihood through environmental media, health and safety, vulnerable groups, and gender issues), and physical cultural resources in the context of the project’s area of influence. Assess potential transboundary and global impacts, including climate change. Use strategic environmental assessment where appropriate. (The EIA herewith provides the environmental assessment for the Project, including an assessment of climate change. Transboundary impacts are not applicable).
- (iii) Examine alternatives to the project’s location, design, technology, and components and their potential environmental and social impacts and document the rationale for selecting the particular alternative proposed. Also consider the no project alternative. (Alternatives have been considered, including the ‘no project’ alternative in **Section C – Alternatives**).
- (iv) Avoid, and where avoidance is not possible, minimize, mitigate, and/or offset adverse impacts and enhance positive impacts by means of environmental planning and management. Prepare an environmental management plan (EMP) that includes the proposed mitigation measures, environmental monitoring and reporting requirements, related institutional or organizational arrangements, capacity development and training measures, implementation schedule, cost estimates, and performance indicators. Key considerations for EMP preparation include mitigation of potential adverse impacts to the level of

<sup>6</sup> ADB. 2009. Safeguard Policy Statement, Manila



- no significant harm to third parties, and the polluter pays principle. (An EMP has been prepared for the Project and is outlined in detail in **Section G – Environmental Management Plans and Institutional Requirements**).
- (v) Carry out meaningful consultation with affected people and facilitate their informed participation. Ensure women's participation in consultation. Involve stakeholders, including affected people and concerned nongovernment organizations, early in the project preparation process and ensure that their views and concerns are made known to and understood by decision makers and taken into account. Continue consultations with stakeholders throughout project implementation as necessary to address issues related to environmental assessment. Establish a grievance redress mechanism to receive and facilitate resolution of the affected people's concerns and grievances regarding the project's environmental performance. (Consultations were held to discuss environmental issues, the findings of the consultations (and a description of the Project grievance redress mechanism) are presented in **Section H – Public Consultation, Information Disclosure & Grievance Mechanism**).
  - (vi) Disclose a draft environmental assessment (including the EMP) in a timely manner, before project appraisal, in an accessible place and in a form and language(s) understandable to affected people and other stakeholders. Disclose the final environmental assessment, and its updates if any, to affected people and other stakeholders. (This EIA and its EMP will be disclosed on the ADB and RD web-sites).
  - (vii) Implement the EMP and monitor its effectiveness. Document monitoring results, including the development and implementation of corrective actions, and disclose monitoring reports. (The EIA and its EMP outline a plan to monitor the implementation of the EMP and the institutional responsibilities for monitoring and reporting throughout the Project lifecycle: **Section G – EMP Institutional Responsibilities**).
  - (viii) Do not implement project activities in areas of critical habitats, unless (i) there are no measurable adverse impacts on the critical habitat that could impair its ability to function, (ii) there is no reduction in the population of any recognized endangered or critically endangered species, and (iii) any lesser impacts are mitigated. If a project is located within a legally protected area, implement additional programs to promote and enhance the conservation aims of the protected area. In an area of natural habitats, there must be no significant conversion or degradation, unless (i) alternatives are not available, (ii) the overall benefits from the project substantially outweigh the environmental costs, and (iii) any conversion or degradation is appropriately mitigated. Use a precautionary approach to the use, development, and management of renewable natural resources. (No critical habitats have been identified that would be significantly impacted by the Project).
  - (ix) Apply pollution prevention and control technologies and practices consistent with international good practices as reflected in internationally recognized standards such as the World Bank Group's Environmental, Health and Safety Guidelines. Adopt cleaner production processes and good energy efficiency practices. Avoid pollution, or, when avoidance is not possible, minimize or control the intensity or load of pollutant emissions and discharges, including direct and indirect greenhouse gases emissions, waste generation, and release of hazardous materials from their production, transportation, handling, and storage. Avoid the use of hazardous materials subject to international bans or phase-outs. Purchase, use, and manage pesticides based on integrated pest management approaches and reduce reliance on synthetic chemical pesticides. When host country regulations differ from these levels and measures, the borrower/client will achieve whichever is more stringent. (The

EIA and its EMP outline specific mitigation and management measures to prevent and control pollution: **Section G – Environmental Management Plans and Institutional Requirements. Section D – Legal Framework**, identifies the most stringent regulations. No pesticides will be used during the lifecycle of the Project).

- (x) Provide workers with safe and healthy working conditions and prevent accidents, injuries, and disease. Establish preventive and emergency preparedness and response measures to avoid, and where avoidance is not possible, to minimize, adverse impacts and risks to the health and safety of local communities. (The EIA and its EMP outline the requirement for specific health and safety plans and emergency response plans: **Section G – Environmental Management Plans and Institutional Requirements**).
- (xi) Conserve physical cultural resources and avoid destroying or damaging them by using field-based surveys that employ qualified and experienced experts during environmental assessment. Provide for the use of “chance find” procedures that include a pre-approved management and conservation approach for materials that may be discovered during project implementation. (No physical and cultural resources have been identified that would be significantly impacted by the Project. Chance finds are discussed in **Section G – Physical and Cultural Resources**) and a sample chance finds procedure is provided in **Appendix E**.

### **Safeguard Requirements 2: Involuntary Resettlement.**

175. The objectives are to avoid involuntary resettlement wherever possible; to minimize involuntary resettlement by exploring project and design alternatives; to enhance, or at least restore, the livelihoods of all displaced persons in real terms relative to pre-project levels; and to improve the standards of living of the displaced poor and other vulnerable groups. The safeguard requirements underscores the requirements for undertaking the social impact assessment and resettlement planning process, preparing social impact assessment reports and resettlement planning documents, exploring negotiated land acquisition, disclosing information and engaging in consultations, establishing a grievance mechanism, and resettlement monitoring and reporting.

176. The involuntary resettlement requirements apply to full or partial, permanent or temporary physical displacement (relocation, loss of residential land, or loss of shelter) and economic displacement (loss of land, assets, access to assets, income sources, or means of livelihoods) resulting from (i) involuntary acquisition of land, or (ii) involuntary restrictions on land use or on access to legally designated parks and protected areas. Resettlement is considered involuntary when displaced individuals or communities do not have the right to refuse land acquisition that results in displacement. A land acquisition and resettlement plan (LARP) has been prepared for the Project to ensure compliance with the safeguard on Involuntary Resettlement.

### **Safeguard Requirements 3: Indigenous Peoples.**

177. The objective is to design and implement projects in a way that fosters full respect for Indigenous Peoples’ identity, dignity, human rights, livelihood systems, and cultural uniqueness as defined by the Indigenous Peoples themselves so that they (i) receive culturally appropriate social and economic benefits, (ii) do not suffer adverse impacts as a result of projects, and (iii) can participate actively in projects that affect them.

178. The Project does not involve impacts to Indigenous Peoples and therefore no further actions relating to this safeguard are required.

### **D.13 Comparison of ADB and National Requirements**

179. The environmental assessment of the Project will need to satisfy the requirement of both the GoG and ADB. A harmonized safeguard framework is developed for conducting EIA study of the Project. The framework is given below.

**Table 28: Comparison of ADB and GoG Legislation Requirements**

<b>Aspect</b>	<b>ADB</b>	<b>GoG</b>	<b>Harmonized Framework</b>
Environmental Policy and Regulations	ADB's SPS (2009) sets out the policy objectives, scope and triggers, and principles for three key safeguard areas: <ul style="list-style-type: none"> <li>• Environmental safeguards, □</li> <li>• Involuntary resettlement safeguards, and □</li> <li>• Indigenous peoples safeguards □</li> </ul>	Environmental assessment and permitting procedure in Georgia is set out in the Environmental Assessment Code.	The Project shall comply with both requirements.
Screening	ADB carry out project screening and categorization at the earliest stage of project preparation when sufficient information is available for this purpose using REA checklist Categorization into Category A, B, C, FI.	Project Proponent in consultation with MOENRP.	The Project is Categorized as Category A.
Alternatives	Examination of financially and technically feasible alternatives to the project location, design, technology and components, their potential environmental and social impacts. Consider no project alternative.	Alternative assessments are to be carried out for the project location and design.	Assessment of alternatives will include the location and design, and also no project alternative.
EIA Report	Guidelines and Table of Contents are provided for EIA report in SPS (2009). EMP will include proposed mitigation measures, monitoring and reporting requirements, institutional arrangements, schedules and cost estimates.	No Table of Contents are available for EIA reports. Only guidelines (Regulation) on EIA is available, which includes required content of the EIA.	The EIA and EMP reports will follow the table of contents proposed by ADB SPS (2009)
Public Consultations	Carry out meaningful consultation with affected people and facilitate their informed participation. Involving stakeholders, project- affected people and concerned NGOs early in the project preparation and ensure that their views and concerns are made known and understood by decision makers and taken into account. Continue consultations with stakeholders throughout project implementation as necessary to address environmental assessment- related issues.	Publication of information in national and regional mass-media. Arrange consultation not later than 60 days from the date of publication. All stakeholders are to be invited for the meetings.	Consultations will be carried out with the stakeholders, affected people, NGOs throughout the project cycle and consider their views in project design and safeguard plan. Questions and concerns raised during public consultations held will be considered and addressed in the EIA.
Public Disclosure	Draft EIA will be published in ADB website for 120 days before Project approval by the Board.	The draft EIA should be available for public review for 45 days before public consultations.	Draft EIA report (English and Georgian) will be published in ADB and Roads Department Websites. The copies of the draft EIA report will be made available with the municipal offices.

## **E. Baseline Data Collection Methodology**

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### **E.1 General**

180. Background data and information was obtained from reputable published and unpublished sources, e.g., on: climate, topography, geology and soils, natural resources, flora and fauna, agriculture, and socio-economic data.

181. Several site inspections were conducted by the International Environmental Specialist during 2017 and 2018. The project area was reviewed and areas of potential environmental significance assessed carefully.

182. In addition, several surveys were undertaken to collect additional baseline data by a Local Consulting Firm (LCF) specializing in environmental and social studies. They include:

- (i) Instrumental Noise and Vibration Monitoring.
- (ii) Instrumental Air Quality Monitoring.
- (iii) Instrumental Water Quality Surveys.
- (iv) Flora and Fauna Surveys.
- (v) Physical and Cultural Resources Surveys.
- (vi) Socio-economic Surveys.

183. Formal discussions were held with a number of stakeholders (see **Section I**) in order to identify any specific areas of interest, or concern that needed to be surveyed or identified as part of the baseline collection phase.

### **E.2 Detailed Methodology**

184. The following section outlines the detailed methodology followed for the collection of data.

#### **E.2.1 Geology**

185. Methodology for collection of baseline data – Geological maps were collected and geological information from the FS reviewed and incorporated into the report. Discussions with the Detailed Design Consultants Geotechnical specialist were also undertaken to discuss the geological conditions within the Project area based on information collected during the detailed design phase.

186. Sources of Data:

- (i) Detailed Design Consultant.

#### **E.2.2 Topography**

187. Methodology for collection of baseline data – The topography of the project area was assessed using Google Earth and Topographical maps.

188. Sources of Data:

- (i) Detailed Design Consultant – Site plans and profiles.
- (ii) Google Earth.

### **E.2.3 Soils**

189. Methodology for collection of baseline data – Soils maps were collected and soils information from the FS reviewed. Other relevant EIAs were reviewed to determine the status of roadside contamination on the E-60.

190. Sources of Data:

- (i) Detailed Design Consultant.
- (ii) Feasibility Study for E-60 Highway Section from Zemo Osiarui to Argveta.
- (iii) Environmental and Social Impact Assessment of Works for the Improvement of Chumateleti-Khevi Section of E-60 Highway (Section F1).

### **E.2.4 Climate and Climate Change**

191. Methodology for collection of baseline data – Meteorological data, including atmospheric pressure, air temperature, relative humidity, precipitation, wind speed and direction, were collected from secondary sources. Recently completed climate change reports were collected and reviewed.

192. Sources of Data:

- (i) Climate Risk and Vulnerability Assessment and Independent Proof Check. ADB April 2018.
- (ii) Second Regional Development Project, Imereti Regional Development Program, Imereti Tourism Development Strategy. Strategic Environmental, Cultural, Historical and Social Assessment. World Bank, 2014.
- (iii) Office of the Deputy Prime Minister (2005). Planning Minerals Policy Statement 2: Controlling and Mitigating the Environmental Effects of Minerals Extraction in England. Annex1: Dust.
- (iv) Meteoblue: <https://www.meteoblue.com>.

### **E.2.5 Air Quality**

193. Methodology for collection of baseline data – Instrumental air quality monitoring was undertaken at six locations within the Project area during March 2018 to determine baseline conditions. NO<sub>2</sub>, SO<sub>2</sub>, CO, PM<sub>10</sub>, PM<sub>2.5</sub> and Total Dust were monitored four times (30 minute averaging period) over a 24 hour period. The following equipment was used:

- (i) Carbon monoxide meter (China), range 0-100ppm
- (ii) Dust measuring unit CW-HAT 200, range 0-500 µg/m<sup>3</sup>
- (iii) Air analyser, TESTO-350 (Germany), range: CO (0-10 000 ppm); NO (0-4 000 ppm); NO<sub>2</sub> (0-500 ppm); SO<sub>2</sub> (0-5 000 ppm).

194. Site visits were also undertaken to assess if there were any other point sources of air pollution within the Project corridor.

195. Reference Documents:

- (i) IFC (2007). Environmental, Health and Safety Guidelines. General EHS Guidelines: Environmental. Air Emissions and Ambient Air. April 2007.

### **E.2.6 Hydrology**

196. Methodology for collection of baseline data – Maps and locations of surface water courses were reviewed and discussions with the Detailed Design Consultant undertaken.

197. Instrumental monitoring of surface water quality was undertaken at thirteen locations in March 2018 to determine baseline conditions in the Project area, specifically in the areas close to the bridge sites. Parameters monitored included pH, electrical conductivity (EC), turbidity, BOD, COD, dissolved oxygen (DO), Temperature, Total suspended solids (TSS), Total Coliform Bacteria, Oil and Grease, Total Phosphorus, Total Nitrogen, Total Ammonium, Petroleum Hydrocarbons, Total Residual Chlorine, Total Zinc, Magnesium, Dissolved Copper. Groundwater samples were also taken from two sites in March 2018.

198. The protocol for the surface water monitoring was as follows:

- (i) Water sampling for chemical analysis was done in line with requirements of the technical regulation of the Sanitary rules on water sampling, approved by the Governmental decree #26 (dated January 3, 2014).
- (ii) Sampling protocol was filled in on the sampling site. Samples marked.
- (iii) The samples were stored in secure location to preclude conditions which could alter the properties of the sample or lead to its contamination/loss.
- (iv) Samples were in custody sealed during storage and/or transportation and kept in the custody of the sampler until the samples were relinquished to another party.
- (v) The samples were delivered to the lab within 24 hours from sampling. Prior to delivery to the lab the samples were kept in portable refrigerator.

199. Containers:

- (i) Samples were collected in 1 litre PET bottles.
- (ii) For TPH amber glass bottles were used.
- (iii) BOD samples were collected in 300ml bottles.
- (iv) 1 litre sterile bottle was used for the sample intended for microbiological examination.

200. In addition to the samples for offsite analysis, parameters such as temperature, dissolved oxygen, pH, important for fish wellbeing were measured on the spot.

201. Sources of Baseline Data:

- (i) Second Regional Development Project, Imereti Regional Development Program, Imereti Tourism Development Strategy. Strategic Environmental, Cultural, Historical and Social Assessment. World Bank, 2014

## **E.2.7 Natural Hazards**

202. Methodology for collection of baseline data – The FS was reviewed to determine areas where flood events occur. In addition, consultations with the Detailed Design Consultants geotechnical specialist was undertaken to determine areas where natural hazards exist, such as landslides.

## **E.2.8 Biodiversity**

203. Methodology for collection of baseline data – Works included desk top data gathering and field works for verification of available information and additional data gathering. Field surveys were carried out on August 8-9, 2017; September 22-23, 2017 and 1-2 March 2018. In addition to that results of the field survey in the area of interest implemented for feasibility stage of the project (April 2015).

204. **Flora** - Following to desk top data gathering and analysis site 4 site visit have been carried out. Collection of the floristic data on the study area included covered two components: 1) collection of the data on the vegetation diversity in the study area and 2) field sampling of

the vegetation of the study corridor(s) for obtaining precise empirical data. For identification of the plant species was used determinants and checklists of the flora of Georgia (Ketzkhoveli & Gagnidze, 1971-2011; Czerepanov, 1995; Gagnidze, 2005). Information on the species distribution in the local habitats was obtained from the primary and secondary sources of information (Ketzkhoveli, 1960; Doluchanov, 2010, Akhalkatsi, Tarkhnishvili, 2012; Nakhutsrishvili, 2013, survey reports carried out by the team in the region under other assignments). Validity of the taxonomic statuses of the identified plant taxa was verified using the widely accessible plant taxonomic database "The Plant List" (The Plant List Vers. 1, 2010). Threat categories for the identified plant taxa were determined according to the categories and criteria of International Union for Conservation of Nature (IUCN) guidelines (IUCN, 2003) and The Red List of Georgia (2006). Particular attention was paid to identification of any protected species in the project impact area. (Note: inventory of the trees diameter >8cm and <8cm is in process)

205. For the vegetation study 1x1m, 5x5m, 10x10m, 25x25m sampling plots were selected depending on the type of vegetation (forest, shrubs, wetland area, meadow) and the size of the area.

206. Plots were sampled in every type of existing habitat. Along with identification of diversity individual coverage scale in the total projecting coverage was determined. Braun-Blanquet cover-abundance scale was used for assessment.

207. **Biodiversity** - Following desk top data gathering and analysis four site visits have been carried out. The surveys were carried out in August 8-9, 2017; September 22-23, 2017; March 1-2, 2018 and April 22-23, 2018. The aim of the study was to identify of animal species within the study area; to reveal significant habitats for inhabitant species; to determine possible impact on animal biodiversity on construction and operation phases and to develop impact mitigation measures. Species, protected under Georgian legislation and international treaties (included in the Red List and species having other conservation status), species bearing special significance for local population have been paid particular attention to.

208. Walkover method has been used during the survey, along the species on transect, all observed species were visually recorded and identified. In addition with registration of the physical presence - traces, excrements, holes, burrows, feathers, fur, etc. were registered.

209. The surveyed corridor width was ranging from 50 to 2500m depending on location and potential species available. The surveys were carried out in different periods of the day. The peak activity periods (such as April for squirrels; end of March (peak of activity, reproduction period, from mid March until mid June) - for herps) were taken into account while survey planning.

210. The species composition of birds was determined by voice if it was not possible to observe them visually.

211. Reptiles and amphibians were studied in transects, shelters and water bodies – checked. The fact that activity of the reptiles depends on weather was taken into account. Keeping in mind that the species start to 'appear' end of March (Peak of activity is from mid March until mid June which is the reproduction period. In July and August they can be registered only in the morning and late evening when it is not too hot. )

212. Recording of adult phase of large invertebrates (butterflies, bugs, dragonflies, bees, grasshoppers, spiders, mollusks) was visually carried out on transects. Research methodology comprises the following activities: catching and identification of insects; turning over the stones and soil layer; checking of plants and plant residues; photographing; shaking off the insects on an awning and checking pond bottom - sieving.



213. **Aquatic fauna** - In addition to the desk top work the ichthyofauna study, undertaken in April 2018 included:

- (i) Visual audits for identification of habitats suitable for fish species expected to be found in the stream (geomorphology of the substrate, general hydrological data, hypsometry, landform, landscape-visual features);
- (ii) Field surveys:
  - (a) Control catches with cast net, trammel net and kick net,
  - (b) Determination of length, weight, gender, maturity stage, fattening coefficient, meristic and plastic characteristics, digestive tract content;
  - (c) Collection of scales for identification of age, growth and growth rate;
  - (d) Study of food base - hydroflora and hydrofauna; identification of macroinvertebrates and insects used for feeding, assessment of periphyton composition. Registration of periphyton and invertebrates within the wetted perimeter of the stream. Examination of stoned in the riverbed/wetted perimeter;
  - (e) On-site measurements - determination of suspended solids; dissolved oxygen (using filed tester Oxi 330i); water and air temperature; pH;
- (iii) Interview of the local population and amateur fishermen with at least 5-10 years of fishing experience); and
- (iv) Laboratory processing of the obtained material (identification of age, growth and growth rate based on scales collected during the field survey (Note catch and release principle was complied with).

214. A survey of state forest fund areas was also undertaken and an inventory of species prepared along with a shape file of the state forest fund within the Project corridor.

215. Sources of Baseline Data:

- (i) See **Appendix M**.

### **E.2.9 Protected Areas and IBAs**

216. Methodology for collection of baseline data – Maps and data relating to Important Bird Areas (IBAs) and protected areas were collected and reviewed.

217. Sources of Data:

- (i) Birdlife International - <http://datazone.birdlife.org/site/mapsearch>)
- (ii) Protected Plant - <https://www.protectedplanet.net/borjomi-strict-nature-reserve>
- (iii) Agency of Protected Areas of Georgia - <http://apa.gov.ge/en/>

### **E.2.10 Socio-economic conditions**

218. Methodology for collection of baseline data – A review of existing data, including information provided by GEOSTAT as well as the information collected as part of the social surveys provided by the Detailed Design Consultants social specialists. Data on traffic accidents was also reviewed.

219. Sources of Data:

- (i) <http://www.geostat.ge/>
- (ii) Draft Land Acquisition and Resettlement Plan, Section F2 of Khevi-Ubisa-Shorapani-Argveta section (E60 Highway), April 2018
- (iii) Feasibility Study for E-60 Highway Section from Zemo Osarui to Argveta
- (iv) Environmental and Social Impact Assessment of Works for the Improvement of Chumateleti-Khevi Section of E-60 Highway (Section F1).

### **E.2.11 Infrastructure**

220. Methodology for collection of baseline data – The existing infrastructure in the Project area was identified during site visits and in consultation with the Detailed Design Consultant.

### **E.2.12 Land Use**

221. Methodology for collection of baseline data – A review of the land uses was undertaken based on existing maps of the project area, satellite images, aerial photos and site visits.

### **E.2.13 Waste Management**

222. Methodology for collection of baseline data – A review of the existing waste management situation in the region was undertaken and local waste management facilities were identified.

### **E.2.14 Health and Educational Facilities**

223. Methodology for collection of baseline data – Site visits identified the health and educational facilities within the Project area. This was confirmed by a web-based search.

224. Sources of Data:

- (i) Ministry of Education and Sciences Georgia - <http://www.mes.gov.ge/>
- (ii) Ministry of Health Georgia - <http://cloud.moh.gov.ge>

### **E.2.15 Cultural Resources**

225. Methodology for collection of baseline data – Existing data was reviewed and a site walkover was undertaken during March 2018 to determine what PCR was present within the Project area.

226. Sources of Data:

- (i) Second Regional Development Project, Imereti Regional Development Program, Imereti Tourism Development Strategy. Strategic Environmental, Cultural, Historical and Social Assessment. World Bank, 2014

### **E.2.16 Noise and Vibration**

227. Methodology for collection of baseline data – Baseline noise monitoring has been undertaken at 13 residential properties within the Project corridor. The monitoring activities were undertaken over a period of two weeks during April and May 2018. Hourly logging of data over a 24 hour period was undertaken 3m from the façade of each residential property facing the existing road alignment. Monitors were placed 1.5m from the ground. Weather conditions were recorded, including wind speed.

228. Sources and Reference Documents:

- (i) IFC (2007). Environmental, Health and Safety Guidelines. General EHS Guidelines: Environmental. Noise. April 2007.

## **E.3 EIA Project Area**

229. The potential impacts of the Project on its surrounding physical and biological environments include air and water quality impacts, noise generation, land transformation and changes to soil. These are expected to reduce with the increased distance from the Project

facilities, affecting more the areas located closer, up to one kilometer, to the Project alignment. For this, a study area of one kilometer around the site was delineated, to assess the baseline conditions in the areas likely to be affected by the Project due to its proximity to the Project site. This is referred to as the Study Area in this report. The Study Area selected for the EIA includes sensitive receptors<sup>7</sup> that are most likely to be impacted by the Project's development activities.

## F. Description of the Environment

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230. This section of the report discusses the existing environmental and social conditions within the Project area under the following headings:

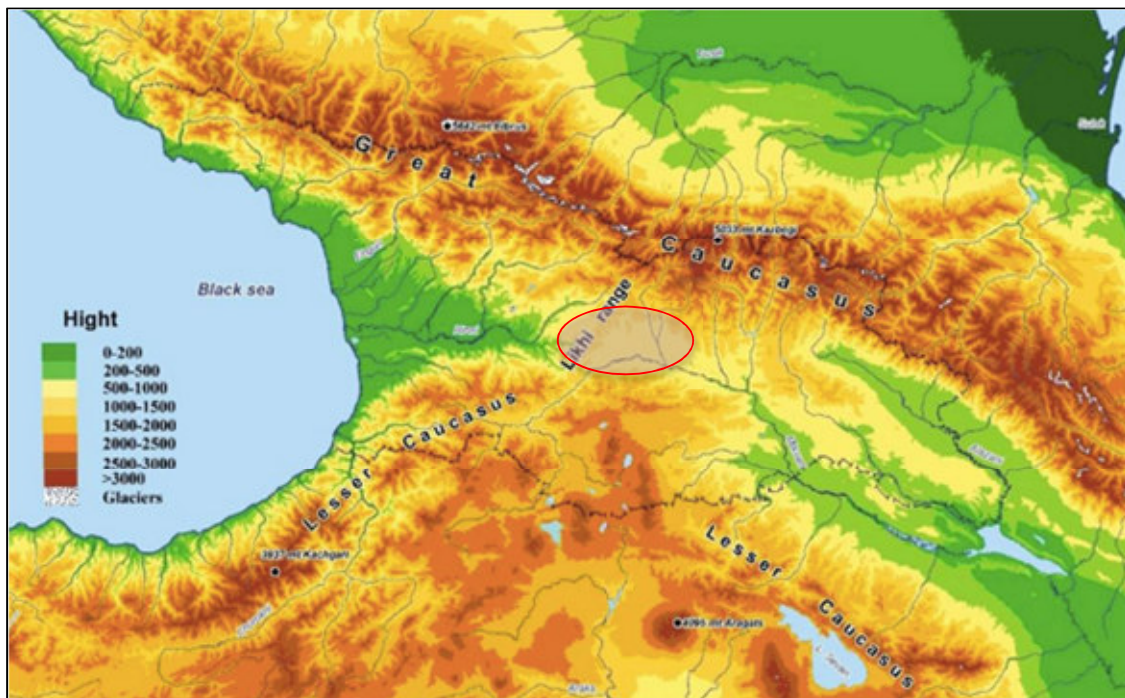
- (i) Physical Resources (air quality, hydrology, topography, etc.);
- (ii) Ecological Resources (flora, fauna, protected areas);
- (iii) Economic Resources (infrastructure, land use, etc.);
- (iv) Social and Cultural Resources (health, education, noise, cultural resources, etc.)

### F.1 Physical Resources

#### F.1.1 Topography

231. The Project area is located to the west of the Likhi Range which connects the Greater and Lesser Caucasus Mountains (see Figure 45).

Figure 45: Regional Topography



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<sup>7</sup> Sensitive receptors include, but are not limited to, residential areas, schools, places of worship, wetlands, and habitats. These are areas which are more susceptible to the adverse effects of an anthropogenic activity such as noise, air emissions, traffic influx, and privacy issues

232. The Project corridor is set within a landscape of mountains, and rolling hills. The existing road is located within the bottom of the river valley and elevations vary from around 480 above sea level at the start of the road to 305 meters above sea level at the end of the road section in Boriti. Figure 46 illustrates the mountainous / rolling landscape looking east from Boriti (end point of the Project road).

**Figure 46: Topography of the Project Area**



## **F.1.2 Geology & Soils**

### **F.1.2.1 Geology**

233. In the Project area, along the highway alignment, several major geological units can be identified:

- (i) Quaternary soils, covering both the volcanic and the sedimentary rocky units, represented by:
  - (a) mQ<sup>8</sup> - Railway, motor road and other soil embankments. Mainly coarse.
  - (b) aaQ - Current alluvial deposits.
  - (c) aQ - Recent alluvial and terraced deposits. Coarse.
  - (d) cdQ - Colluvial deposits in the valley floors and debris at the slope bases. Coarse and/or fine.
  - (e) eQ - Eluvial cover deposits on the upper plains. Coarse and/or fine.
- (ii) Sedimentary rocks covering the crystalline basement, dated Middle Miocene. They are represented by the following formation:
  - (a) K1 - Flyschoid alternation of argillites, arenaceous limestones and marls, from very hard to weak, thinly bedded.
- (iii) Intrusive and metamorphic rocks constituting the Proterozoic crystalline basement. They are represented by the following geological formations:

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<sup>8</sup> mQ is anthropogenic in source

- (a) PzGr - Pink and grey granites, meta-granites and grano-diorites, from mildly to heavily weathered, from massive to heavily fractured; locally, metamorphic facies and gabbros in rock mass are observed;
- (b) PzQgn - Grey quartz gneiss, from lightly to mildly weathered, from massive to heavily fractured;
- (c) PzGa – Dark gray gabbros, from massive to heavily fractured.

234. From a geo-lithological point of view, along the alignment, three main homogeneous sections can be identified, depending on similar lithological conditions:

- (i) From km 0+000 to 3+250 – In the first tract, from km 0+000 to around km 0+700, under alluvial, colluvial and anthropic deposits (aaQ, cdQ and mQ formations), pink and grey granites (PzGr) lie. From km 0+700 to km 3+250, the outcropping rocks are represented by gabbros belonging to the PzGa formation. Above, quaternary deposits (aaQ, aQ, cdQ and mQ) of variable thickness are present. In this section, along the route, tunnels are expected to be excavated in PzGa formation; bridges are expected to have their abutments and piers on quaternary overlying PzGr and PzGa rocky formations.
- (ii) From km 3+250 to 10+300 – Outcropping formations are represented by granites of the PzGr formation. Along the route, tunnels are expected to be excavated in this rocky formation and bridges are expected to have their abutments and piers on quaternary deposits (aaQ, aQ, cdQ and mQ with a variable thick) covering the crystalline basement.
- (iii) From km 10+300 to 12+494 – In this section, the main outcropping rocks are granites belonging to the PzGr formation and, above them, the flyschoid unit K1 is present with a stratigraphic sub-horizontal contact. Quaternary soils cover the intrusive and sedimentary units, where the tunnels are expected to be excavated. Bridges are expected to have their abutments and piers on quaternary deposits covering the granites.

#### **F.1.2.2 Soils**

235. Within the eastern part of the Dzirula Gorge, three types of soils are observed: grey soils, yellow-grey soils, and humus-grey soils.

236. Pozdolic grey soils mainly appear on the intensively exhausted clay soils and clays. Their profiles are characterized with thin underlying formation followed by 3-5-cm humus horizon and 15-20-cm obviously faded podzolic horizon. The profiles end with alluvial-metamorphic hardened straw-colored and yellow or reddish-yellow horizon turning into the main rock. The humus content is low and the reaction is the acid one. Yellow soils are mainly spread on terrace formations and piedmont plains. The humus soil is represented by a granular soil layer (19-15 cm). Deeper there is an alluvial-metamorphic horizon that gradually turns into the main soil-forming rock. The content of the humus horizon in this type of soil makes 6-10%, and the level of acids prevails higher than the level of base materials.

237. Humus-calcareous soils are limestones, dolomites and their fission products. Their upper part has dark grey color that fades lower. In the upper part of the profile the reaction is neutral, in the lower part - alkaline. The lower part of the profile is enriched with carbonate. Concentration of humus in the upper part of the horizon is 6-10%. This soil type is met in the limestone rock zones characteristic for Cretaceous rocks along the Caucasus. Topsoil thicknesses along the road alignment are shown in Table 29.

**Table 29: Topsoil Thickness in the Project Corridor**

Chainage (km)	Topsoil Thickness (m)
0+000 - 0+279	0,3
0+279 - 0+517	0,2
0+517 - 0+777	0,4
0+777 - 0+830	0,3
0+830 - 0+909	0,1
0+909 - 0+990	0,1
0+990 - 1+095	0,1
1+095 - 1+312	0,15
1+312 - 1+384	0,2
1+384 - 2+009	0,1
2+009 - 2+451	0,1
2+451 - 2+846	0,3
2+846 - 3+210	0,1
3+210 - 3+406	0,3
3+406 - 3+678	0,3
3+678 - 4+019	0,2
4+019 - 4+370	0,1
4+370 - 4+791	0,2
4+791 - 5+572	0,3
5+572 - 6+121	0,1
6+121 - 6+590	0,4
6+590 - 6+814	0,2
6+814 - 7+802	0,3
7+802 - 8+634	0,2
8+634 - 9+181	0,2
9+181 - 9+980	0,15
9+980 - 10+168	0,1
10+168 - 10+480	0,2
10+480 - 11+804	0,2
11+804 - 12+097	0,25
12+097 - 12+198	0,15

238. Soil sampling was undertaken in Section F1 along the roadside verges as part of the EIB funded EIA for the construction of this section of the E-60. Section F1 ends at the start point of F2 in Khevi village. Although the samples were above the current national limit for lead, they are below EU standards and also below the new proposed soil standards for Georgia (which are planned to enter into force sometime in 2018 and are based around EU standards). In addition, the Project is a new alignment, with only minor areas following the existing road so there will be little excavation of roadside soils. No other sources of potential soil contamination were noted within the Project corridor and as such no soil samples were analyzed for potential contamination.

### E.1.3 Geomorphology

239. The area is drained by the river Dzirula which, in the initial part of F2, presents sub-angular pattern, an index of considerable tectonic influence. The river Dzirula has higher relative heights. The erosion of the river bank is present in the correspondence of meanders. Along the river Dzirula, in correspondence of the change of slope, where the alluvial plain appears wider, some alluvial fans have been detected. A secondary fluvial system, consisting mainly of temporary flows, is widespread throughout the study area. The small valley is narrow, mainly V-shaped when the water is on the rocks. Also the gravity-related soil forms are widespread, represented mainly by the edges of the natural slopes.

240. A detailed description of the alignment of the project road along Lot F2, in terms of geomorphology, is given below.

- (i) km 0+000 – 1+400. On this segment of the alignment, the valley of the river Dzirula/Rikotula, is affected by banks of erosion and alluvial fans. There are changes of direction of the water flow in correspondence with the observed fault and in correspondence with the meanders the erosion of the river bank is deeply present. The river is linear till km 0+800, after this point there are some meanders; in correspondence with the meanders the erosion of the river bank is present. There is a tectonic contact between the meta-granites (PzGr formation) and Gabbros (PzGa formation) regulated by a fault oriented NNE-SSW. In this case the small V shaped valleys and the secondary fluvial system, consisting mainly of temporary flows, are set on the correspondence with the fault. The Meta-Granites (PzGr formation), the Gabbros (PzGa formation) and the colluvial deposits (cdQ formation) are the predominant lithology; edges of natural escarpment are present at the change of the lithology. In this segment of the alignment there are some superficial creeps on the northern slope on the meta-granites (PzGr formation) but they do not involve the alignment.
- (ii) km 1+400 - 3+200. On this segment of the alignment, the valley of the river Dzirula, is affected by banks of erosion and alluvial fans. There are changes of direction of the water flow in correspondence with the observed faults and in correspondence of the meanders the erosion of the river bank is heavily present. Differently from the previous described segment there is a minor presence of the secondary fluvial system; also in this case the small V shaped valleys and the secondary fluvial system, consisting mainly of temporary flows, are set in correspondence of the faults.
- (iii) km 3+200 – 4+800. On this segment of the alignment, the river Dzirula evidences some meanders, as in the previous ones with meanders of erosion of the river bank is present; in this segment of the stream there is a considerable tectonic influence. In this segment the secondary fluvial system composed by temporary rivers is highly developed on the meta-granites (PzGr formation). In the same context there are some alluvial fans, on the colluvial deposits (cdQ formation), increased by temporary rivers. The meta-granites (PzGr formation) and the colluvial deposits (cdQ formation) are the predominant lithology but it is evident a geological contact between the meta-granites (PzGr formation) and the Gabbros (PzGa formation).
- (iv) km 4+800 - 6+500. On this segment of the alignment, the valley of the river Dzirula, is affected by banks of erosion and alluvial fans. There are changes of direction of the water flow in correspondence with the observed faults and in correspondence with the meanders the erosion of the river bank is present. In this segment there is a minor presence of the secondary fluvial system developed on the meta-granites (PzGr formation); also in this case the small V shaped valleys and the secondary fluvial system, consisting mainly of temporary flows, are set in correspondence of the faults. In the same context there are some alluvial fans, on the colluvial deposits (cdQ formation), increased by temporary rivers.
- (v) km 6+500 – 9+200. Along this segment of the alignment, the river Dzirula its subjected to a considerable tectonic influence; there are changes of direction of the water flow in correspondence with the observed faults and in correspondence with the meanders the erosion of the river banks are presents. In this case the small V shaped valley and the secondary fluvial system, consisting mainly of temporary flows, are set on the correspondence of the fault.
- (vi) km 9+200 – 11+100. On this segment of the alignment, the valley of the river Dzirula, is affected by banks of erosion and alluvial fans. There are changes of direction of the water flow in correspondence of the observed fault and in

correspondence of the meanders the erosion of the river bank is present. In this segment the secondary fluvial system composed by temporary rivers is developed on the meta-granites (PzGr formation) and on the flyshoid alteration of argillites (K1 formation) on the southern slope. On the northern slope the secondary fluvial system develops on the quartz-gneiss (PzQGn formation) presenting the same erosion structures of the southern slide: small V shapes. This segment is affected by many faults on the quartz-gneiss (PzQGn formation) and on the meta-granites (PzGr formation), with a prevalent orientation towards NNE-SSW; in this case also the small V shaped valleys and the secondary fluvial system are set on the correspondence of the faults. In the same context there are some alluvial fans, on the colluvial deposits (cdQ formation), increased by the temporary rivers.

- (vii) km 11+100 – 12+198. On this segment of the alignment, the river Dzirula its subjected to a considerable tectonic influence; there are changes of direction of the water flow in correspondence with the observed faults and in correspondence with the meanders the erosion of the river bank are present. In this segment the secondary fluvial system composed by temporary rivers is developed on the meta-granites (PzGr formation) and on the flyshoid alteration of argillites (K1 formation). In the same context there are some alluvial fans, on the colluvial deposits (cdQ formation), increased by the temporary rivers. There are two tectonic contacts; one of them is between the meta-granites (PzGr formation) and on the flyshoid alteration of argillites (K1 formation) regulated by faults oriented NNE-SSW in on the southern slope. The other tectonic contact is between the quartz-gneiss (PzQGn formation) and the meta-granites (PzGr formation) regulated by faults orientated NNE-SSW on the northern slope. In this case also the small V shaped valleys and temporary flows, are set on the correspondence of the faults.

#### **F.1.4 Natural Hazards**

241. Regional Context - Georgia is one of the more complex mountainous regions living through the development of natural disasters, in which multi-spectral natural hazards are distinguished by their high recurrence rates and negative consequences for the population and infrastructure, as well as high rates of land resource losses and economic damage. Among the different types of natural disasters that periodically cause significant damage to the country's economy and often cause human casualties, the most relevant to the Project are landslides.

242. Almost all morphological-climatic zones in Georgia, starting with the sea coastline up to the high altitude mountain alpine-nival zone, have experienced damage to different extents. Over 50,000 landslides of different sizes and over 3,000 mudflow-transforming watercourses (rivers, canyons) have been identified in the country, as well as hundreds of kilometers of eroded riverbanks and coastline. Up to 70% of the territory and around 63% of the population are permanently at risk of natural disasters of different intensities.

243. Local Context - Landslides – An assessment of landslide areas has been undertaken as part of the detailed design. The following areas were identified:

- (i) Superficial creeps
  - (a) Around KM2.0 involving the alignment, on bridge (BRI-2.1.07-TA) above the Gabbros (PzGa formation); - Detailed Design Consultants consider this insignificant.
  - (b) Around KM5.0 involving the western abutments of bridge BR-2.1.12-AT; - Detailed Design Consultants consider this insignificant.
  - (c) Around KM5.5 involving the eastern portals of tunnels TUN 2.0.08-TA and TUN-2.0.08-AT.; - The Detailed Design Consultants have

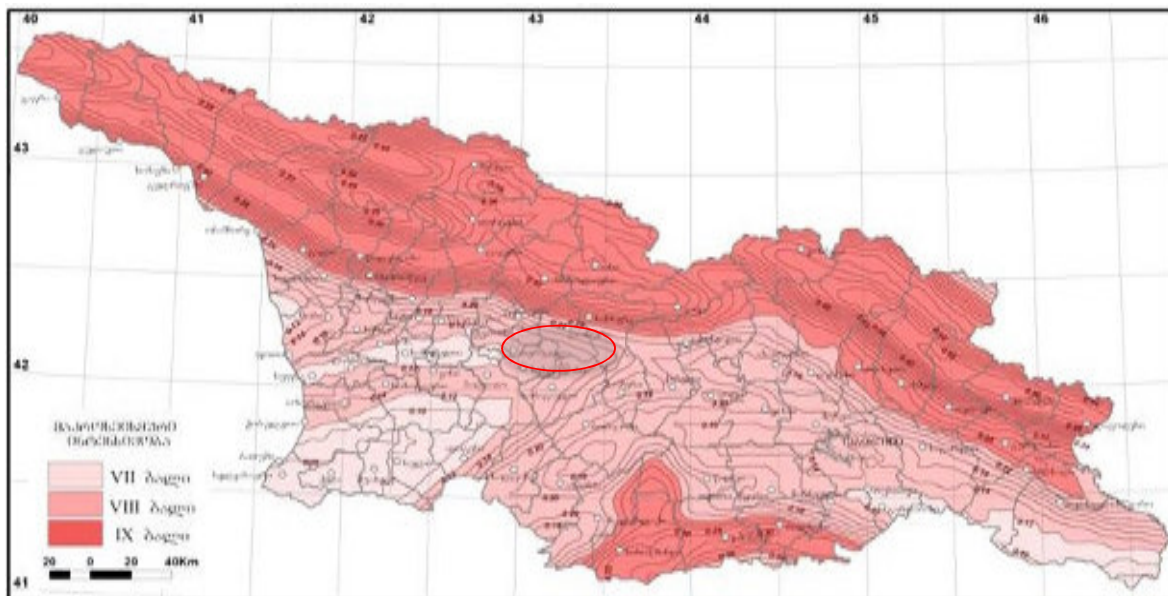


indicated that this area will be stabilized with the construction of the tunnel portals.

- (ii) Diffuse superficial instability
  - (a) Between KM2.8 and KM2.9, involving colluvial deposits (cdQ formation) and Gabbros (PzGa formation), in correspondence of the eastern portals of tunnels TUN-2.0.05-TA and TUN-2.0.05-TA and western abutments of bridges BRI-2.1.09-TA and 2.1.09-AT. – The Detailed Design Consultants have indicated that this area will be stabilized with the construction of the portals and will not affect the bridge abutments.
- (iii) Active landslide
  - (a) Between KM10.3 and KM10.4 involving the flyshoid alteration of argillites and limestones (K1 formation). The thicknesses of these active landslide are only a few meters); - The Detailed Design Consultants have indicated that these landslide areas can be managed with the construction of the eastern portal of TUN-2.0.10-AT.
  - (b) Between KM11.0 and KM11.2, on granite (PzGr formation), close to the contact with the flysch (K1 formation), involving the eastern portals of tunnels TUN-2.0.11-TA and TUN-2.0.11-AT. - The Detailed Design Consultants have indicated that this area will be stabilized with the construction of the portals.

244. **Seismicity** - According to the Seismic Hazard Map of Building Norms and Rules effective in Georgia “Earthquake-resisting construction (SSM III, 21.10.2009 N 128, article 1477) PN 01.01-09”, the study area is located in the 8-point earthquake zone (MSK 64 scale<sup>9</sup>) with the dimensionless coefficient of seismicity (A) equaling 0.14 (Boriti village) under the same document. Figure 47 illustrates the seismic conditions in Georgia.

**Figure 47: Seismicity Map of Georgia (MSK Scale)**



<sup>9</sup> MSK-64, is a macroseismic intensity scale used to evaluate the severity of ground shaking on the basis of observed effects in an area of the earthquake occurrence. The MSK scale has 12 intensity degrees. Magnitude VIII can be compared to 6 – 7 on the richter scale.

**Table 30: Seismicity in the Region**

Settlement	Region	Municipality	Seismicity coefficient	Magnitude (MSK64 scale)
Khunevi	Imereti	Kharagauli	0.15	8
Vertkvichala	Imereti	Kharagauli	0.14	8
Boriti	Imereti	Kharagauli	0.14	8
Makatubani	Imereti	Kharagauli	0.14	8

## F.1.5 Air quality

### F.1.5.1 Site Observations

245. The Project road is located within a rural setting with no point sources of industrial emissions noted within the Project area. Apart from rural household emissions from wood burning stoves and heating the only other source of air emissions are from road transport, including vehicles on the existing E-60.

### F.1.5.2 Sensitive Receptors

246. The Project road passes close to a number of residential properties and sensitive receptors. Those within 200 meters have been mapped and are included as part of the air quality and noise assessment provided in **Section G** of this EIA.

### F.1.5.3 Baseline Ambient Air Quality

247. Air quality monitoring was carried out at nine different locations during March, 2018 to characterize the current air quality within the Study Area. The pollutants selected for evaluation are based on the expected emissions from the Project activities and the level of risk to human health posed by these pollutants. They include:

- (i) Total Suspended Particulates (TSP), or Dust;
- (ii) Carbon Monoxide (CO);
- (iii) Nitrogen Dioxide (NO<sub>2</sub>);
- (iv) Sulfur Dioxide (SO<sub>2</sub>); and
- (v) Particulate Matter (PM<sub>10</sub> and PM<sub>2.5</sub>)

248. A description of sampling locations and the rationale of selection is given in Table 31. The locations are also provided by

249.  
250.

251. Figure 48. The ambient air quality data was compared against applicable IFC, EU and Georgian Standards.

**Table 31: Ambient Air Quality Monitoring Locations**

Sample ID	Approximate Location	Coordinates	Rationale for Site Selection
F2-A1	KM0.6	42°05'50.77"N / 43°24'05.16"E	Khevi Village
F2-A2	KM3.3	42°06'14.04"N / 43°22'01.28"E	Close to Khunevi School
F2-A3	KM4.1	42°06'20.77"N / 43°21'43.70"E	Khunevi village
F2-A4	KM6.4	42°06'31.95"N / 43°20'06.21"E	Vertkvichala Village
F2-A5	KM8.6	42°06'18.78"N / 43°18'34.61"E	Close to School in Vertkvichala
F2-A6	KM12.1	42°06'30.41"N / 43°16'03.18"E	End of Project road in Boriti

Figure 48: Ambient Air Quality Monitoring Locations



252. The results of the ambient air quality monitoring are provided in Table 32. The results, which provide a 'snapshot' of the air quality in the Project area on this particular day of the year show that ambient air quality meets the national standards for CO, TSP, NO<sub>2</sub> and SO<sub>2</sub>. It is noted that air quality can vary due to a range of parameters that are different on given days and periods of the year. Even following IFC averaging periods we would still only reveal a 'snapshot' of one day during the year which would not give a clear understanding of air quality in the Project area throughout the year. Accordingly, national standards were followed for baseline data collection.

253. As noted above, there are no major point sources of air emissions within the Project corridor and the only major emissions of air quality result from vehicle traffic on the E-60. **Section G** of this report provides an air quality model for the new alignment, and this model clearly shows that the Project will not have significant impacts on air quality.

**Table 32: Ambient Air Quality Monitoring Result**

#	Time*	Wind speed, m/s	Wind direction	CO, µg/m3	NO <sub>2</sub> , µg/m3	SO <sub>2</sub> , µg/m3	PM10, µg/m3	PM 2.5, µg/m3	Total dust, µg/m3
<b>F2-A1</b>									
1	8:00	0.8	W	2000	<200	<500	42	34	<100
2	13:00	1.2	W	1000	<200	<500	38	30	<100
3	18:10	<0,1		<1000	<200	<500	28	25	<100
4	23:10	<0,1		<1000	<200	<500	25	23	<100
<b>F2-A2</b>									
1	8:40	1	W	1000	<200	<500	23	21	<100
2	13:50	1.1	W	1000	<200	<500	35	28	<100
3	19:00	<0,1		<1000	<200	<500	25	23	<100
4	0:05	<0,1		<1000	<200	<500	20	18	<100
<b>F2-A3</b>									
1	9:25	0.9	W	<1000	<200	<500	44	34	<100
2	14:35	1.2	W	1000	<200	<500	45	37	<100
3	19:50	<0,1		<1000	<200	<500	30	21	<100
4	0:50	<0,1		<1000	<200	<500	20	18	<100
<b>F2-A4</b>									
1	10:10	1.1	W	1000	<200	<500	32	25	<100
2	15:20	1.1	W	1000	<200	<500	42	35	<100
3	20:30	<0,1		<1000	<200	<500	28	24	<100
4	1:40	<0,1		<1000	<200	<500	25	23	<100
<b>F2-A5</b>									
1	11:00	1.1	W	1000	<200	<500	17	15	<100
2	16:00	1.1	W	1000	<200	<500	23	21	<100
3	21:20	<0,1		<1000	<200	<500	9	7	<100
4	2:20	<0,1		<1000	<200	<500	5	3	<100
<b>F2-A6</b>									

Section F2 of the Khevi-Ubisa-Shorapani-Argveta Road (E60 Highway)  
Environmental Impact Assessment

#	Time*	Wind speed, m/s	Wind direction	CO, µg/m <sup>3</sup>	NO <sub>2</sub> , µg/m <sup>3</sup>	SO <sub>2</sub> , µg/m <sup>3</sup>	PM10, µg/m <sup>3</sup>	PM 2.5, µg/m <sup>3</sup>	Total dust, µg/m <sup>3</sup>
1	11:45	1.5	W	<1000	<200	<500	25	23	<100
2	16:50	1.2	W	<1000	<200	<500	30	27	<100
3	22:20	<0,1		<1000	<200	<500	15	11	<100
4	3:20	<0,1		<1000	<200	<500	5	4	<100
MPC/guideline values/limits		Aver. period	CO, µg/m <sup>3</sup>	NO <sub>2</sub> , µg/m <sup>3</sup>	SO <sub>2</sub> , µg/m <sup>3</sup>	PM10, µg/m <sup>3</sup>	PM 2.5, µg/m <sup>3</sup>	TSP, µg/m <sup>3</sup>	
1	National limit – max. permissible one time (volley) concentration (MPC), µg/m <sup>3</sup> *	24 h	3000	40	50	n/a	n/a	150	
		30 min	5000	200	500	n/a	n/a	500	
2	IFC/WHO (updated 2016) –guideline value, µg/m <sup>3</sup>	1 year	n/a	40	50	20	10	n/a	
		8h	10000	n/a	n/a	n/a	n/a	n/a	
		24 h	n/a	n/a	20	50	25	120	
		1h	30000	200	n/a	n/a	n/a	n/a	
		30 min	60000	n/a	n/a	n/a	n/a	n/a	
		10 min	100000	n/a	500	n/a	n/a	n/a	
3	EU limit, µg/m <sup>3</sup>	1 year	n/a	40	n/a	40	25	n/a	
		8h	10000	n/a	n/a	n/a	n/a	n/a	
		24 h	n/a	n/a	125	n/a	n/a	n/a	
		1h	n/a	200	350	n/a	n/a	n/a	

\*Averaging Period - 30 mins

**Equipment**

Carbon monoxide meter (China), diapason 0-100ppm

Dust measuring unit CW-HAT 200, diapason 0-500 µg/m<sup>3</sup>

Air analyser, TESTO-350 (Germany),

Diapason: CO (0-10 000 ppm); NO (0-4 000 ppm); NO<sub>2</sub> (0-500 ppm); SO<sub>2</sub> (0-5 000 ppm)

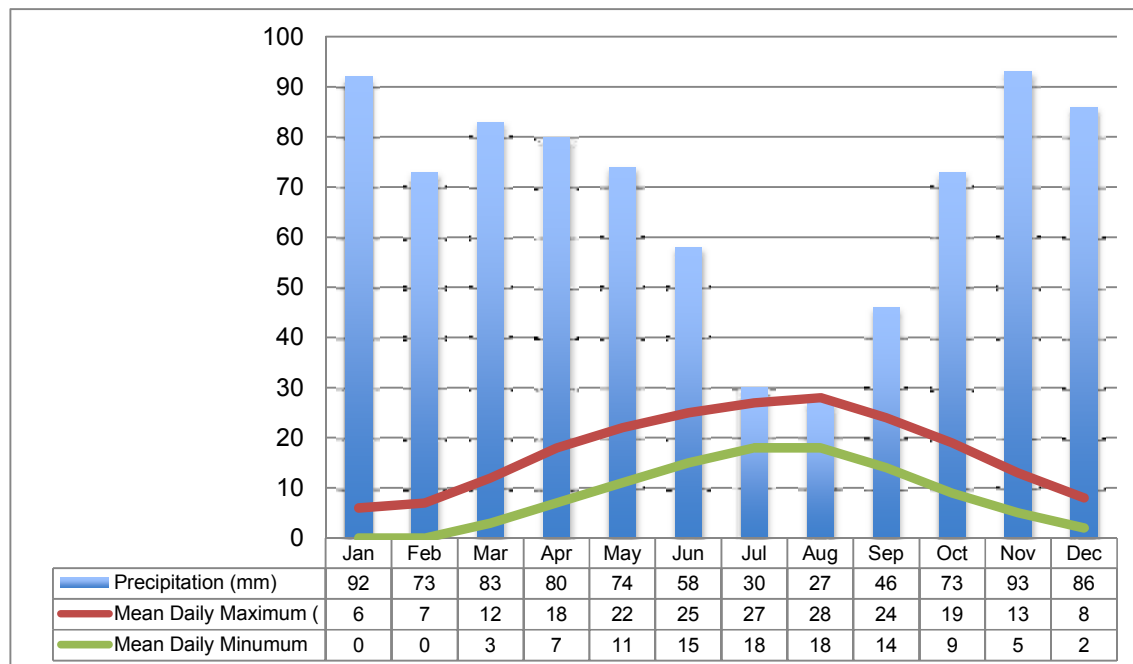
## F.1.6 Climate

254. Due to the peculiar geographical position of Georgia between the Black and Caspian seas and the presence of powerful natural climatologic in the North of the Main Caucasus Range, and also owing to the large range of elevations above sea level, the climate of Georgia is varies quite widely for a small country. According to technical document GOST 16350-80 the Project road is located in district II9, which is characterized by a temperate warm climate with mild winters.

### F.1.6.1 Precipitation & Temperature

255. Annual precipitation in Boriti (end point of the Project Road) is around 800 mm. Rainfall is highest in the Winter, Autumn and Spring, although rainfall can still be observed during the hotter summer months.

**Figure 49: Precipitation (mm) and Temperature (°C), Boriti**



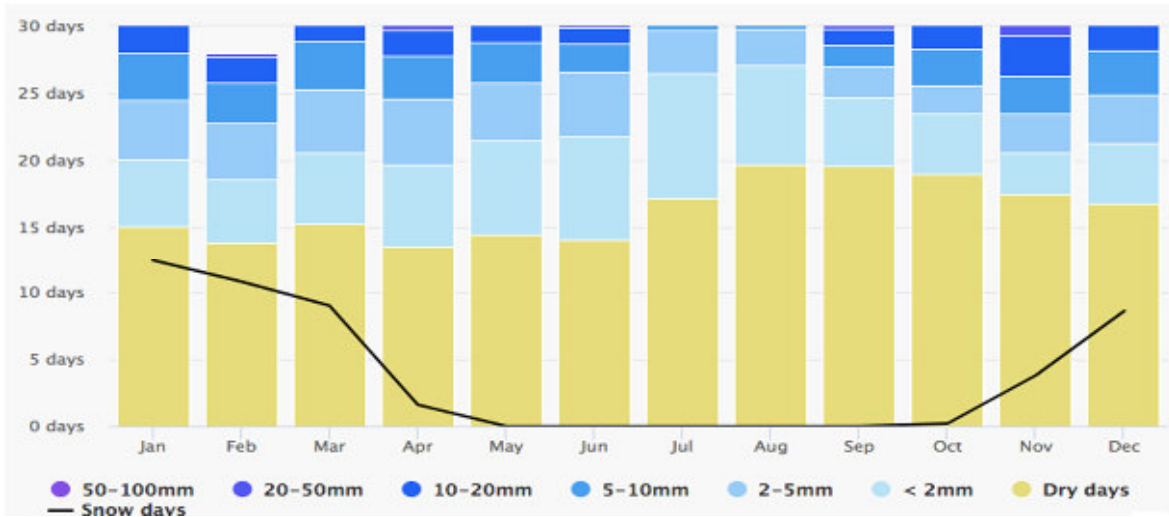
Source: Meteoblue

256. Less than 0.2 mm/day are considered sufficient to effectively suppress wind-blown dust emissions<sup>10 11</sup>. Figure 50 details the number of days showing >0.2 mm/day rainfall. On average each year, around ten such days occur between November and June and rarely in the months of July to August.

<sup>10</sup> IFC (2007). Environmental, Health and Safety Guidelines. General EHS Guidelines: Environmental. Air Emissions and Ambient Air. April 2007.

<sup>11</sup> Office of the Deputy Prime Minister (2005). *Planning Minerals Policy Statement 2: Controlling and Mitigating the Environmental Effects of Minerals Extraction in England. Annex1: Dust.*

**Figure 50: Precipitation Levels (mm), Boriti**

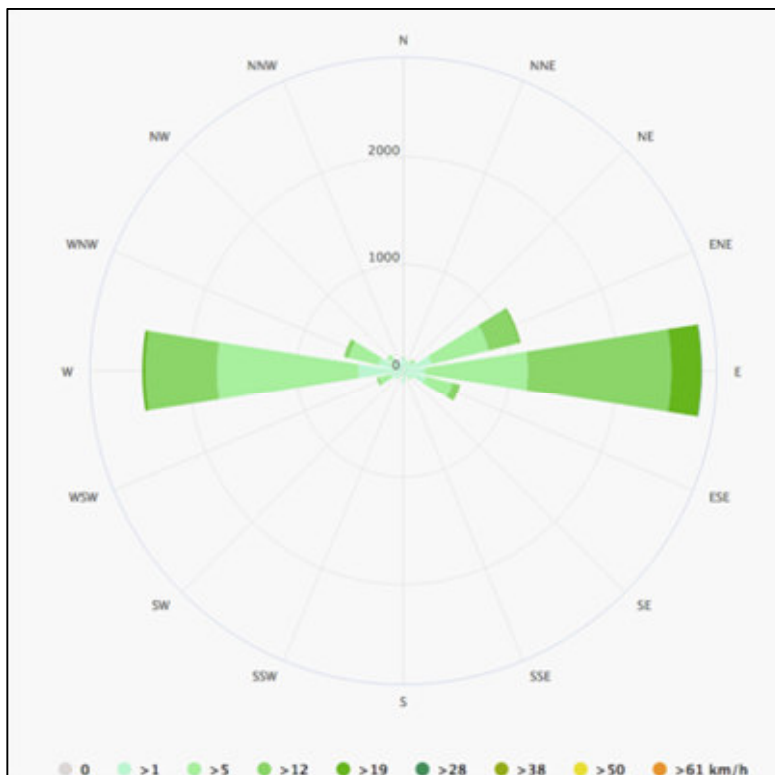


Source: Meteoblue

### F.1.6.2 Prevailing Winds

257. Wind strength, direction and frequency is shown in Figure 51. The wind rose illustrates that the dominant wind direction is from the east. However, strong winds from the west are also experienced quite frequently.

**Figure 51: Wind Rose, Boriti**



Source: Meteoblue

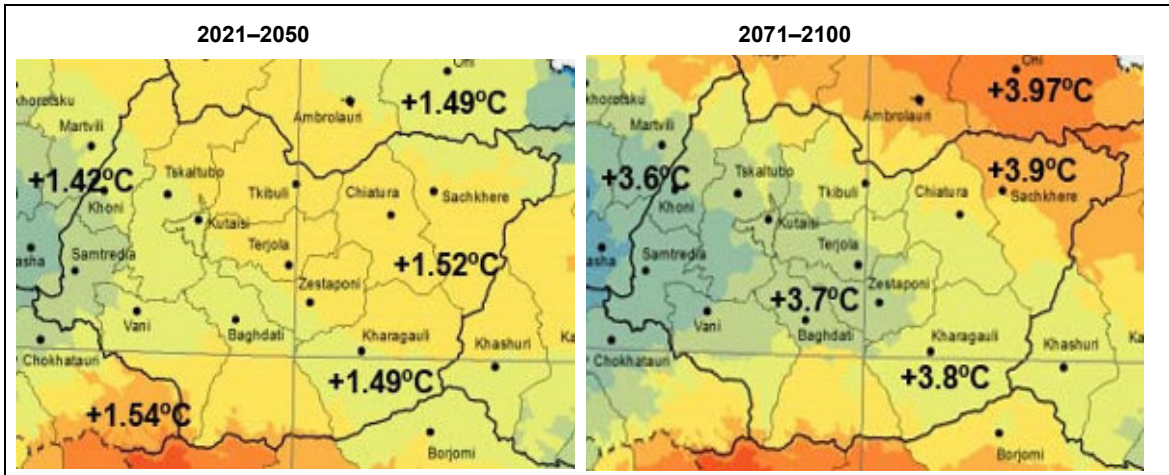
**F.1.6.3 Climate Change**

258. General – The following section is reproduced from the Climate Risk and Vulnerability Assessment & Independent Proof Check prepared for the Project by the ADB in April, 2018.

259. Projected Climate Changes in Georgia - Projected climate changes in Georgia are outlined below.

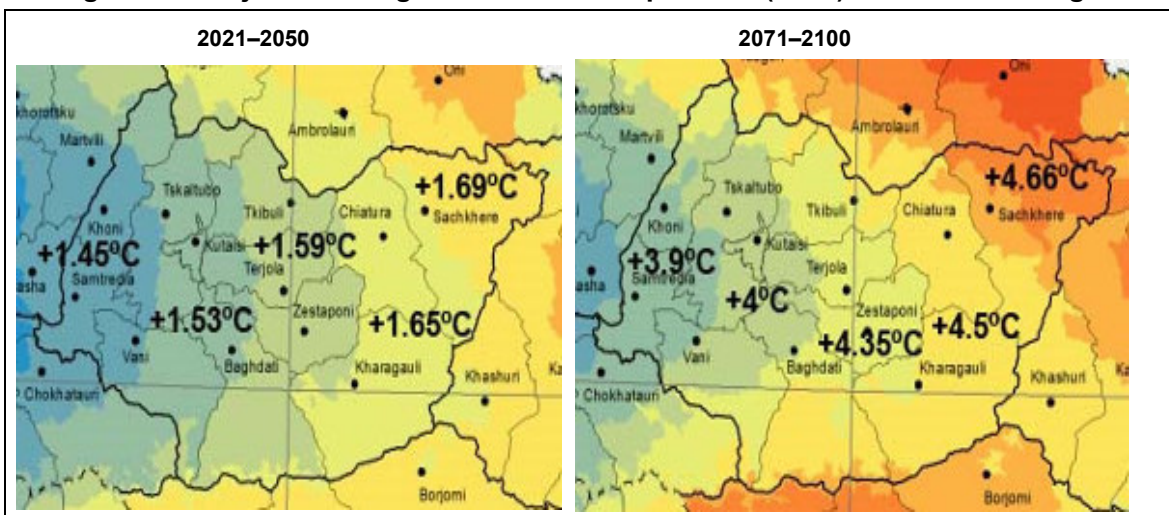
260. Average annual temperatures are expected to increase by 1.3°–1.6°C by 2050 and 3°–4°C toward 2100 (Figure 52).

**Figure 52: Projected changes in annual mean temperature (in °C) in the Imereti Region**



261. The increases are highest in September, when temperatures are already at their highest. The greatest overall increase is expected in northwest Georgia, especially in the Kakheti region (Sagarejo, Signaghi and Dedoplistskaro municipalities). The least warming is expected in the Black Sea coastal area and Kolkhети Lowland of Georgia. In the project area, by 2100, summer temperatures may be higher by 4.5°C (Figure 53).

**Figure 53: Projected changes in summer temperature (in °C) in the Imereti Region**



262. The increase in temperatures will be accompanied by an increase in the number of hot days (days where the average daily temperature is higher than 25°C). In some mountain areas, the number of hot days may double. In the project area, by 2050, the number of hot



days will increase to 38 days p.a., and by 2100 the number of hot days will increase to 66 days p.a.

263. In addition, more frequent heat waves will occur during June–August. The population in the project area is considered to be highly vulnerable to heat waves (80% vulnerability). Concurrent with the increase in temperatures, and the increase in droughty conditions, a decrease in overall humidity (with some exceptions, such as Mestia, Khaishi and Keda) is expected.

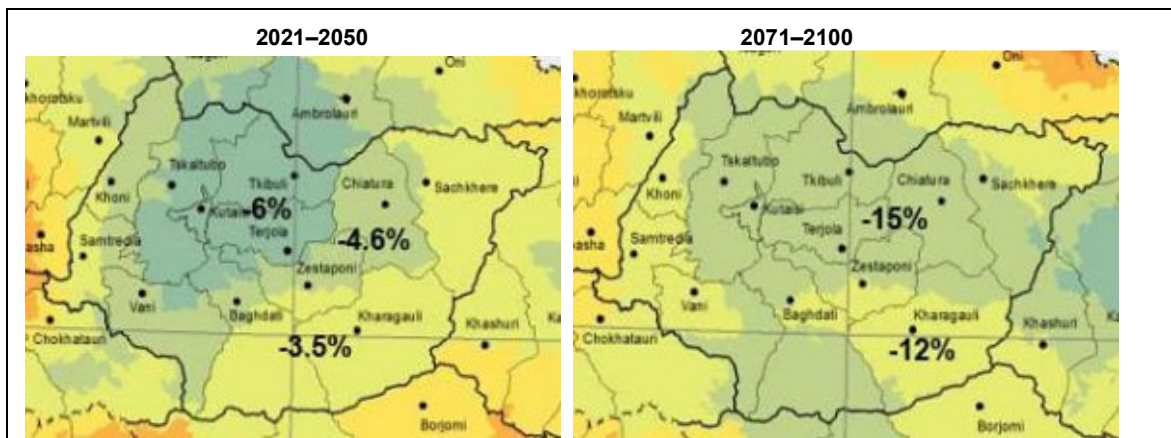
264. A decrease in the number of days and nights with frost (i.e., number of days when daily minimum temperature is less than 0°C) is also expected. The current range of frost days in Georgia is 80–120 days. In the project area, by 2050, the number of frost days will decrease by 21 days p.a., and by 2100 the number of frost days will decrease by 55 days p.a.

265. Wind speeds are not expected to strengthen, and wind direction will remain variable across the four road segments.

266. By 2160, due to higher temperatures a complete loss of Georgia's 637 glaciers is expected, leading to a decrease in the annual glacial runoff. By 2100, glacial runoff is predicted to decrease by up to 40%, and as a result, annual river runoff will decrease by about 13%.

267. Precipitation projections include a general increase of 5% up to 2050, followed by a drastic decline of up to 24% by 2100. The exception is the central part of the Likhi Range (in Mta-Sabueti) where precipitation is predicted to increase by 93%. In the project area, however, precipitation decreases will occur much faster. By 2050, annual mean precipitation will decrease by 4.5%, and by 2100 it will decrease by close to 13% (Figure 54).

**Figure 54: Projected changes in annual mean precipitation (in %) in the Imereti Region**



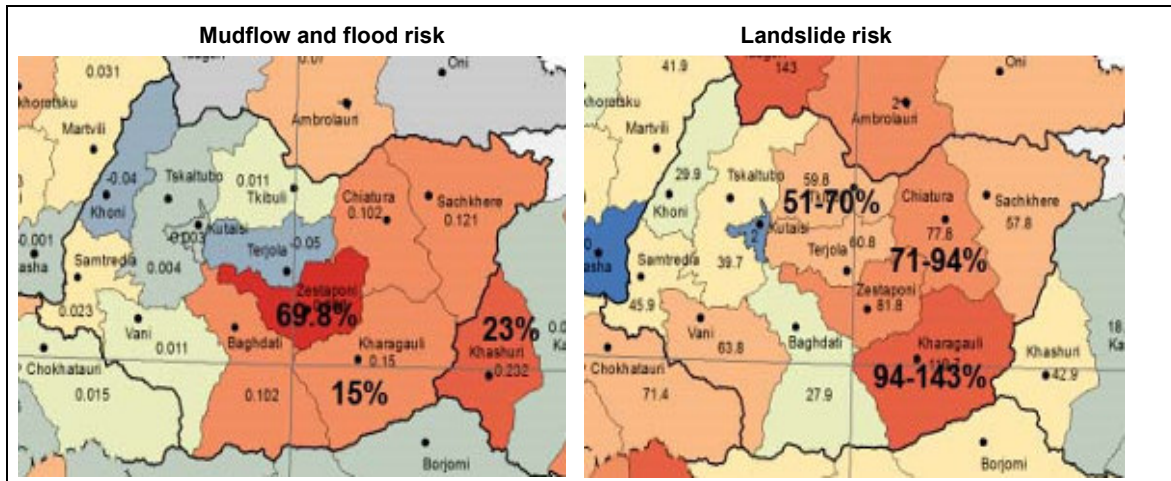
268. The seasonal variability of precipitation will increase in the project area. By 2050, precipitation decreases of -3.5%, -15%, -4%, and -3% are expected during the winter, spring, summer and autumn months, respectively. By 2100, the expected decrease in precipitation will be -4.5%, -23%, -32%, -10%, respectively, for the winter, spring, summer and autumn months.

269. Despite the long-term decrease in precipitation, an increase in the amount and intensity of daily and multi-day rainfall events is expected. In the project area, the number of days with heavy rain, when total daily precipitation exceeds 20 mm, will increase by 2050 to 44 days p.a.

270. These changes will lead to increased risk of flash floods, mudflows and landslides. In the project area, the risk of erosion processes, floods and landslides is expected to increase. For landslides, the project corridor has a high-risk range (94%–143%).

271. For mudflows and floods, the projected risk range for F2 is between 15% and 70% (Figure 55).

**Figure 55: Projected mudflow, landslide and flood risk (in %) in the Imereti Region (2021–2050)**



#### F.1.6.4 Greenhouse Gases (GHGs)

272. General - According to the World Resources Institute Climate Analysis Indicators Tool (WRI CAIT), Georgia's 2011 GHG profile was dominated by emissions from the energy sector, which accounted for 71% (7.5 MtCO<sub>2</sub>e) of Georgia's total emissions. Land-use change and forestry (LUCF) was the second most significant sector. Of the 7.5 MtCO<sub>2</sub>e % of emissions from the energy sector approximately 2 of the 7.5 MtCO<sub>2</sub>e was attributable to the transport sector (resulting from purchases of large, inefficient, aging used cars, as well as economic growth and improved living conditions overall. From 2001-2009, the number of vehicles doubled, and the number of buses and minibuses tripled.<sup>12</sup> In 2013 emissions data compiled by the World Resources Institute (WRI) indicated that Georgia produced around 14 MtCO<sub>2</sub>e or 0.0003% of global GHG emissions. 2 MtCO<sub>2</sub>e represents 0.00004% of global GHG emissions.

### F.1.7 Hydrology

#### F.1.7.1 Surface Water

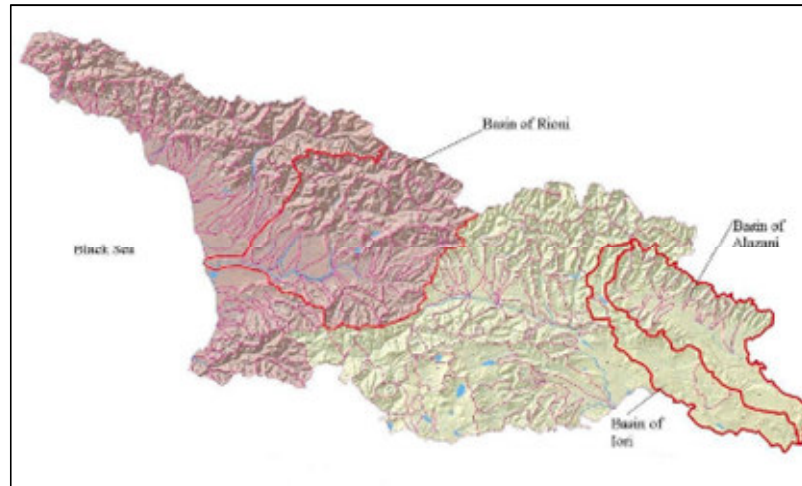
273. Regional Context – In Georgia there are 26,060 rivers and stream with a total length of 60,000 km. They belong both to the Caspian and Black Sea basins. 25,075 (99.4%) of the rivers are small (less than 25km length), with total length of 54,768 km. More than 18,109 (70%) of the rivers belong to the Black Sea basin, and 7,951 (30%) belong to the Caspian Sea basin. Figure 52 illustrates the division on the Caspian and Black Sea basins.

274. The Project road is located within the Black Sea basin in the Rioni sub-basin. The Rioni sub-basin dominates western Georgia and has a total catchment area of 13,400 km<sup>2</sup>, which is approximately 20% of the whole Georgian territory.

<sup>12</sup> Greenhouse Gas Emissions in Georgia. USAID, July, 2016

275. Local Context –

The main rivers in the Project area include the Dzirula, Rikotula and the Dumala. The Project road flows parallel with the Rikotula from KM0.0 until it merges with the Dzirula adjacent to KM1.3 beneath bridge BRI 2.1.04 TA/AT. The Dzirula is the main river flowing through the valley in which the Project road is located. The Dumala is a major tributary of the Dzirula, but is located more than 300 m north of the new alignment in Boriti, almost at the end point of the Project road.



**Figure 56: Rioni Sub-basin**

276. **Dzirula River** - The river heads at 1,252 m above sea level where several brooks merge on the western slopes of Likhi Range and flows into the river Kvirila from its left bank. The length of the river is 89 km, its total fall is 1,052 m and the area of its catchment basin is 1,270 km<sup>2</sup>. The river comprises 1,386 tributaries with the total length of 1,677 km.

277. The river basin is located on Imereti Plateau and is bordered by Likhi Range from east and south-east and by the river Kvirila basin from north and north-west. The relief of the river basin within the limits of the Likhi Range is strongly dissected with deep gorges of the river tributaries. The geology of the river basin is represented by granites, gneisses, limestones and sandstones. The soil cover of the basin is represented by loamy soils, and the vegetation cover in almost all basin is presented as a dense hardwood forest.

278. The river gorge is winding and mostly V-shaped. The width of the gorge bed varies from 20-25 m to 300-350 m. The slopes of the river gorge merge with the slopes of the adjacent ridges. The river has terraces only in its middle and lower reaches. The width of the terraces varies from 50 to 400 m; their height is from 2-3 m to 7-8 m. The river floodplain is weakly developed.

279. The river bed is moderately winding and mostly non-branched. The bed in the upper reaches is stony giving the current a mountainous character. The width of the current varies from 10 to 30 m, its depth is 0.5-1.8 m, and its speed is within the limits of 0.8 and 1.5 m/sec.

280. The river is mostly fed with snow and rain waters. Its water regime is characterized by spring flood often accelerated by freshets caused by rains, non-stable low-water periods in summer and freshets in autumn and winter caused by rains and rapid air warming. The yearly distribution of the river flow is extremely uneven. On average, 48% of the annual flow flows in spring, 9-12% flows in summer and autumn and 30% flows in winter. Short icy events mostly as icy edges are fixed only at the river mouths.

**Figure 57: Dzirula River (Approximately KM8.0)**



**Table 33: Average monthly discharges of the Dzirula River (million m<sup>3</sup>)**

River	Station	Catchment (km <sup>2</sup> )	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Dzirula	Tseva	1190	21.6	33.5	54.0	58.2	29.8	19.4	13.5	9.59	8.93	16.0	20.1	25.9

**Table 34: Peak Discharges of the Dzirula River (million m<sup>3</sup>)**

River	Station	Catchment (km <sup>2</sup> )	Reoccurrence □ Year					
			1000	100	50	20	10	5
Dzirula	Tseva	1190	965	670	575	455	380	315

281. **Rikotula River** - The Rikotula heads on the north-eastern slope of the western fork of Surami Ridge, at the altitude of 1,100 m and merges with the river Dzirula from its left side, in 33 km from its estuary. The length of the river is 10,1 km, its total fall is 643 m, its mean slope is 64,3 ‰, and the area of the catch basin is 70.4 km<sup>2</sup>. The total length of the first-range tributaries of the river is 45 km. The river basin is located on the western slopes of Surami Ridge. Its geology is mainly presented as crystal rocks of Dzirula massif, mostly granites. Mostly mountain and forest soils are common in the basin.

282. The vegetation cover of the basin is presented as dense hardwood forest occupying 65% of the basin. The entire river gorge is a V-shaped, with its slopes having high gradients and merging with the slopes of the adjacent slopes. The riverbed is moderately winding and mostly non-branched. The river is alimented with snow, rain and ground waters. The water regime of the river is characterized by spring floods caused by snow-melt, freshets caused by autumn and winter rains and non-stable summer low water periods. It should be noted that the levels of the freshets caused by rains exceed those caused by snow- melt. In the low water periods, the water in the river is clean, transparent and drinkable. The river is used to run the village mills.

283. **Dumala** - The river Dumala heads at the altitude of 960 m, from the spring outflowing on the northern slope of mountain Dzira, at Surami ridge and flows into the river Dzirula from its right side, at village Boriti. The length of the river is 34 km, its total fall is 676 m, its mean slope is 19,9‰, the area of its catch basin is 124 km<sup>2</sup>, the mean altitude of the river basin is 730 m. The river is flown by 157 tributaries of different ranges, with the total length of 189 km.

284. The river basin is located over the western slopes of Surami ridge, between the catch basins of the rivers Dzirula and Kvirila. In a geomorphological respect, the river basin is divided into two zones - the upper hilly zone and the lower mountainous zone. The upper hilly zone, which is located between the river mouth and village Mandaeti, is characterized by relatively smoother relief forms, while the relief in the lower mountainous zone has high slopes and clear contours. The geology of the basin is presented by granites, limestones and sandstones, which are covered with loamy soils. Hardwood forest grows all along the river.

285. The river gorge from its mouth to village Mandaeti is a box-like. Below, to the confluence, it is V- shaped. The width of the gorge bed varies from 10-15 m to 70-80 m. The gorge slopes are dissected with the gorges of tributaries and gullies. The river bed is winding and mostly non- branched. The width of the current is from 2 to 16 m, its depth is 0,2-0,7 m and its velocity changes from 0,4 m/sec to 1,0-1,5 m/sec. The river is fed with rain and ground waters. Its water regime is characterized by spring floods, autumn freshets and summer and winter unstable low-water periods. A relatively more stable low-water period is fixed in august and September. Icy events as an 0,2-0,3-metre-thick icy cover from the river mouth to village Karbouli is fixed from December through February. The river is used to run the village mills.

286. Surface Water Quality – Monitoring of surface water was undertaken in March 2018 to assess the status of surface water quality. Monitoring was undertaken at all of the locations where the new alignment crosses the river. Figure 58 illustrates the monitoring locations and Table 35 provides a table of the monitoring locations. The results of the water quality monitoring are presented in Table 36 below.

**Figure 58: Surface Water Monitoring Locations**



**Table 35: Surface Water Monitoring Locations**

	Point #	Coordinates	
		X	Y
1	F2-SW1	368146	4661766
2	F2-SW2	367382	4661970
3	F2-SW3	366938	4661965
4	F2-SW4	366988	4662191
5	F2-SW5	366387	4662036
6	F2-SW6	365630	4662379
7	F2-SW7	365035	4662638
8	F2-SW8	363771	4662783
9	F2-SW9	362662	4663152
10	F2-SW10	362151	4663368
11	F2-SW11	360165	4662943
12	F2-SW12	358256	4663908
13	F2-SW13	356936	4663265

287. The results of the monitoring show that all parameters are below the Georgian MACs.

**Table 36: Surface Water Quality Monitoring Results**

#	Parameter	Units	F2-SW1	F2-SW2	F2-SW3	F2-SW4	F2-SW5	F2-SW6	F2-SW7	F2-SW8	F2-SW9	F2-SW10	F2-SW11	F2-SW12	F2-SW13	National, maximum allowable concentration
1	pH	-	7.0	7.0	7.15	7.05	7.0	7.1	7.1	7.05	7.1	7.1	7.1	7.25	7.2	6.5-8.5
2	Electrical conductivity (EC)	S/m	0.0059	0.0062	0.0063	0.0064	0.0066	0.0069	0.0068	0.0066	0.0068	0.0066	0.0065	0.0070	0.0066	n/a
3	Turbidity	FTU	167.0	133.0	328.0	338.0	182.0	242.0	185.0	219.0	135.0	105.0	228.0	125.0	213.0	n/a
4	BOD <sub>5</sub>	mg/l O <sub>2</sub>	1.1	0.8	0.6	0.9	0.9	1.5	1.4	1.9	1.5	1.1	0.4	0.4	0.6	6
5	COD	mg/l O <sub>2</sub>	18.0	<15.0	<15.0	<15.0	<15.0	<15.0	<15.0	18.0	<15.0	<15.0	<15.0	<15.0	18.0	30
6	Dissolved oxygen (DO)	mg/l	11.6	12.1	11.2	11.9	10.9	11.5	10.2	11.8	10.3	9.9	10.5	10.1	10.6	≥4
7	Total suspended solids(TSS)	mg/l	40.4	41.8	41.6	39.4	45.3	42.1	44.8	43.2	42.1	45.0	44.8	44.0	43.0	increase by ≤ 0.75
8	Oil and grease	mg/l	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	n/a
9	Total Phosphorus	mg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	2
10	Total Nitrogen	mg/l	0.44	0.63	0.54	0.54	0.58	0.51	0.49	0.60	0.53	0.57	0.51	0.48	0.56	n/a
11	Total Ammonium	mg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.5 mg/l NH4
12	TPH	mg/l	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.3
13	Total residual chlorine	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	n/a
14	Total Zinc	mg/l	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	1
15	Dissolved Copper	mg/l	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	1
16	Manganese	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	1
17	Total Coliform Bacteria	1000ml	3200	2800	4600	1430	2700	3400	4700	9000	4800	5100	5300	5100	5360	≤10 000
18	Temperature	°C	7.7	7.4	8.0	7.0	7.9	7.7	8.1	10.4	10.5	10.8	10.8	10.9	11.0	

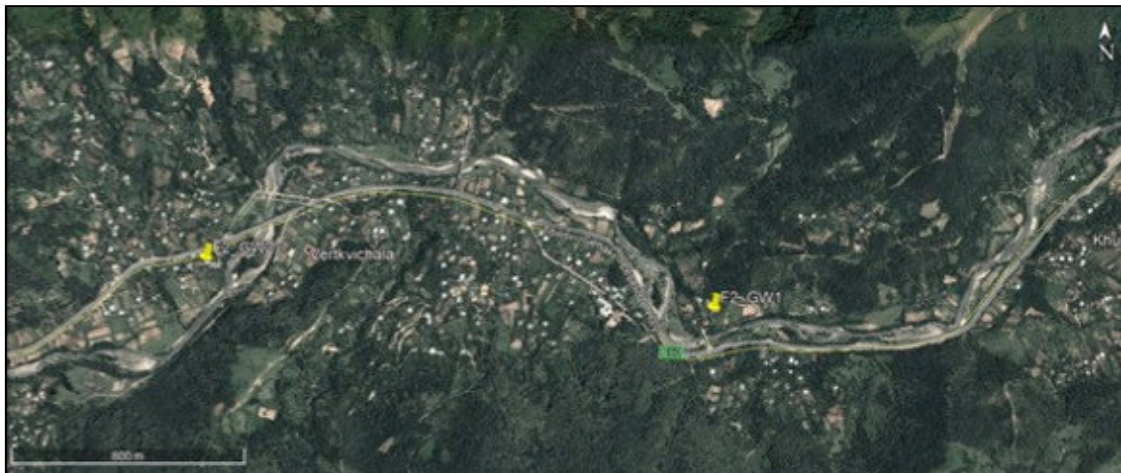
### F.1.7.2 Groundwater Water

288. Local Context – The water bearing strata is of contemporary alluvial deposits characterized by a free groundwater table declining along the general flow of the rivers. The shallow ground water level is 1.5m – 1.8m below ground and anticipated amplitude of groundwater level fluctuation is below 1m. At some locations near the riverbeds, groundwater is very shallow depths (0.3m). Aquifers are mainly fed from rivers and precipitation.

289. As part of the Projects Geological study a number of boreholes were excavated within the Project area. Groundwater levels between generally ranged between 0.3 and 8.8 meters in depth. A number of groundwater wells and natural springs are present within the Project area and according to a recent World Bank study groundwater and springs are main sources of water supply for the Imereti population although the study did not indicate if these sources were owned by the water users or if the water was piped.<sup>13</sup>

290. Groundwater Quality - Two groundwater samples were collected from ground water wells within the Project area. Figure 59 illustrates the monitoring locations and Table 37 provides a table of the monitoring locations. In addition, a water sample was taken from a spring in Vertkvichala. The results of the monitoring are presented in Table 38 below.

**Figure 59: Groundwater Monitoring Locations**



**Table 37: Groundwater Monitoring Locations**

#	Point #	Coordinates		Description
		X	Y	
1	F2-GW1	362968	4662843	Location vil.Vertkvichala. Well depth approximately 11 m. Water level (from the top of the well to water table) 3.42m. Note: distance from ground level till the top of the well is 0.65cm. According to the owner (Makhaz Lomidze) water level changes seasonally (drops in dry season).
2	F2-GW2	361270	4663041	Location vil.Vertkvichala. Well depth approximately 6.4m. Water level (from the top of the well) 3.81m. Note: distance from ground level till the top of the well is

<sup>13</sup> Second Regional Development Project, Imereti Regional Development Program, Imereti Tourism Development Strategy. Strategic Environmental, Cultural, Historical and Social Assessment. World Bank, 2014



#	Point #	Coordinates		Description
		X	Y	
				0.71 cm. According to the owner (Ilo Lursmanashvili) water level does not change.
3	F2-Sp1	363026	4662763	Location vil.Vertkvichala.

**Table 38: Groundwater Monitoring Results**

#	Parameter	Units	F2_GW1	F2_GW2	F2_Sp1	Method/standard	National limit, maximum allowable concentration	WHO, guidance values, mg/l
1	pH	-	7.50	7.65	7.35	ISO 10523-08	6.5-8.5	n/a
2	Dissolved oxygen (DO)	mg/l	10.1	9.40	10.3	ISO 5815-03	n/a	n/a
3	Electrical conductivity (EC)	S/m	0.0159	0.0344	0.0074	ISO 7888-85	n/a	n/a
4	Alkalinity	mg-eq/l	1.32	3.36	0.6	Gost 23268.3-78	n/a	n/a
5	Hardness	mg-eq/l	1.49	3.80	0.8	Gost 23268.5-78	7-10	n/a
6	Total suspended solids (TSS)	mg/l	16.4	24.4	37.6	ISO 11923-97	n/a	n/a
7	Total dissolved solids	mg/l	136.7	334.0	75.6	Calculated	1000-1500	n/a
8	Arsenic, As	mg/l	<0.005	<0.005	<0.005	Gost 4152-89	<0.01	0.01
9	Chlorides	mg/l	7.10	15.6	7.1	Gost 23268,17-78	<250	n/a
10	Iron, Fe	mg/l	1.27	0.05	0.07	EPA 3005 A-92	<0.3	n/a
11	Nitrates	mg/l	6.64	8.84	6.2	Gost 18823-73	<50	50
12	Sodium, Na	mg/l	5.28	11.55	2.64	ISO 9964-3-93	<200	n/a
13	Potassium, K	mg/l	1.10	3.47	0.33	ISO 9964-3-93	n/a	n/a
14	Calcium, Ca	mg/l	16.0	56.0	12.0	Gost 23268,5-78	<140	n/a
15	Magnesium, Mg	mg/l	8.4	12.2	2.4	Gost 23268,5-78	<85	n/a
16	Lead, Pb	mg/l	<0.01	<0.01	<0.01	ISO 8288-A-86	<0.01	0.01
17	Sulphates	mg/l	10.4	20.0	4.0	Gost 23268,3-78	<250	n/a
18	Manganese, Mn	mg/l	<0.02	<0.02	<0.02	EPA 3005 A-92	<0.4	0.4*

291. The results of the groundwater monitoring show that all measured parameters are below national MACs and WHO guideline values.

## F.2 Ecological Resources

292. The project road crosses forest areas, agricultural land plots, residential areas and riparian ecosystems. Due to human activity in the main part of the Project area natural vegetation has been lost. In these areas arable lands and pastures have developed. This change from natural habitats to agricultural production and urban landscape has therefore changed the assemblage of fauna within the area. Animals currently found in the area of interest are mainly presented by those species that live in forested areas and/or can tolerate presence of humans.

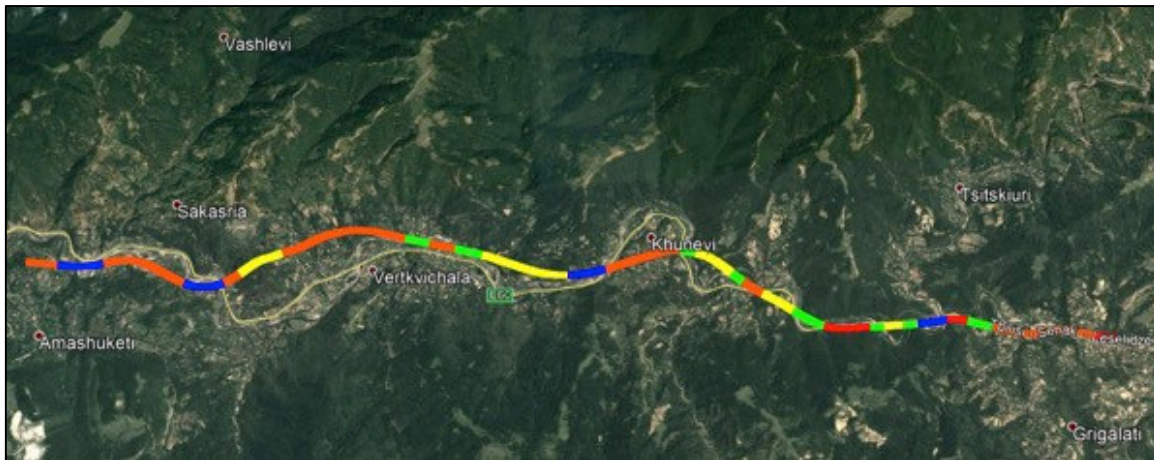
293. The natural forest massifs have significant value from biodiversity protection viewpoint, because of their importance as wildlife corridors for the local animal species.

294. To fully understand the biodiversity in the Project area a biodiversity study was carried out by the LCF. The study was based on two aspects, firstly existing data was collected and analyzed in the form of a 'desk-top' study'. This was then followed up with field surveys. The aim of the study was to identify of animal species within the study area; to reveal significant habitats for inhabitant species; to determine possible impact on animal biodiversity on construction and operation phases and to develop impact mitigation measures.

### F.2.1 Habitat

295. Main Habitats in the Project Area - The study area has been divided in 5 sections according to the habitats types (see Figure 60).

**Figure 60: Main Habitats in the Project Area**



1	Code of Georgia 62GE04 Vegetation of agricultural-economic settlements and cultivable land
2	Code of Georgia 91EO Alluvial forest with Adler trees - <i>Alnus glutinosa</i> and ash tree - <i>Fraxinus excelsior</i>
3	Code of Georgia 323GE Clayey and rock riverine vegetation with duckweed/Alpine rivers and their ligneous vegetation
4	Code of Georgia 9160GE Oak or oak-hornbeam forests ( <i>Quercitum</i> - <i>Carpinion betuli</i> )
5	Code of Georgia 918 0 GE Tilio-Acerion forests of slopes, screes and ravines

296. **Habitat 1. Code of Georgia 62GE04 vegetation of urban and rural areas** - General description Vegetation of village settlements and cultivable land is extremely interesting from the point of view of plants of economic importance. In this habitat there are various species of aborigine, invasive and adventive cosmopolitan plants related to wild relatives of cultural plants and those used in traditional (people's) and scientific medicine, including, Chicory - *Cichorium intybus*, meliot - *Melilotus officinalis*, yarrow - *Achillea millefolium*, agrimony – *Agrimonia eupatoria*, creeping couch-grass - *Agropyron repens*, shepherd's purse - *Capsella bursa-pastoris*, henbane - *Hyoscyamus niger*, mother of nettle - *Lamium album*, forest mallow - *Malva sylvestris*, great plantain - *Plantago major*, coltsfoot - *Tussilago farfara*, etc.

297. These plants are distributed on the territories of the city and village settlements, roadsides and transformed habitats. Most of them create primary successions on eroded slopes as a result of industrial activities and construction works. Within this habitat, in residential and homestead plots cereals and fruits are cultivated (see Figure 61).

**Figure 61: View of the village area**



298. **Habitat 2 - Code of Georgia 91EO - Alluvial forest with Alder trees and Ash<sup>14</sup>** - Riverside forests are developed both in the forest zone and places without the forest, where it grows as a narrow line along the river-bed. In the forest zone the riparian forest is less distinguished from the structure of the bordering forest. Besides wing-nut and alder trees there is an Ash (*Fraxinus oxycarpa*), Aspen (*Populus tremula*); from lianas - Smilax (*Smilax excelsa*) is met. In the forest zone, riparian forest does not differ from adjacent forest structure. In the riverside areas species like Common alder (*Alnus barbata*) are met, however less often than in wetland forests. Near the river Date-plum (*Diospyrus lotus*) and Black locust (*Robinia pseudoacacia*) are registered (see Figure 62).

299. **Habitat 3 - Code of Georgia 323 GE Clayey and rock riverine vegetation with duckweed** - On river banks covered with silt or mud thin scrub can be found - hawthorn (*Crataegus kyrtostyla*), oriental hornbeam (*Carpinus orientalis*) and Jerusalem thorn (*Paliurus spina-christi*). Riverside vegetation is under the influence of floods during which it can completely disappear and then revive again. Mainly annual plants *Carex capillaris*, *Agrostis verticillata*, *Chamaenerion hirsutum*, *Verbascum gnaphalode*, cereals and perennial dicotyledons can be found (see Figure 63).

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<sup>14</sup> Corresponding categories:

1. United Kingdom classification: "W5 *Alnus glutinosa*-*Carex paniculata* woodland", "W6 *Alnus glutinosa*-*Urtica dioica* woodland)" and "W7 *Alnus glutinosa*-*Fraxinus excelsior*-*Lysimachia nemorum* woodland".  
2. German classification: "43040401 Weichholzaunenwald mit weitgehend ungetörter Überflutungsdynamik", "43040402 Weichholzaunenwald ohne Überflutung", "430403 Schwarzerlenwald (an Fließgewässern)", "430402 Eschenwald (an Fließgewässern)", "430401 Grauerlenauenwald (montan, Alpenvorland, Alpen).  
3. Nordic classification: "2234 *Fraxinus excelsior*-typ" and "224 Alskog". 4) Associated habitat Forests of this type border with moist meadows and flood plane forests

**Figure 62: Secondary mixed forest of Dzirula River with dominance of Alder Black locust**



**Figure 63: View of Riverside Vegetation**



300. Habitat 4 - Code of Georgia: 9160GE- Oak or oak-hornbeam forests (*Quercitum - Carpinion betuli*)<sup>15</sup> - The study corridor and next to it two types of Oak are met: the Georgian oak (*Quercus iberica*) and the nationally red listed Imeretian oak (*Quercus imeretina*). The following species can be found together with the oak: Oriental hornbeam (*Carpinus orientalis*), Maple (*Acer sp.*), Black locust (*Robinia pseudoacacia*), European ash (*Fraxinus excelsior*). In such forest massives oak forms mono-dominant groups and mixes with abovementioned plant

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<sup>15</sup> Corresponding categories:

1. 91G0 \* Pannonic woods with *Quercus petraea* and *Carpinus betulus*
2. PAL.CLASS.: 41.2B, 41.266, 41.267
3. German classification: "430703 Stieleichen-Hainbuchenwald feuchter bis frischer Standorte".
4. Nordic classification: "2223 *Fagus sylvatica*-*Mercurialis perennis*-*Allium ursinum*-typ".

species. In sub-communities Oak-Hornbeam with Ruscus bushes is worth to mention (see Figure 64).

**Figure 64: Oak-Hornbeam with Ruscus Bushes**



301. **Habitat 5 - Code of Georgia: 9180 GE Tilio-Acerion forests of slopes, screes and ravines**<sup>16</sup> - Mixed forests (Tilio-Acerion) are created by secondary species Field maple (*Acer campestre*), European ash (*Fraxinus excelsior*), Elm (*Alnus foliacea*), lime (*Tilia begonifolia*), and are located on steep rocky slopes, mainly on limestone, sometimes on siliceous ground material at various elevations. In some areas different type mixed forest with dominance of lime (*Tilia begonifolia*), with Common hornbeam (*Carpinus betulus*), Oriental hornbeam (*Carpinus orientalis*), Field elm (*Alnus foliacea*), European alder (*Alnus barbata*), Common hazel (*Corylus avellana*). In early spring flowering herbaceous plants blooming early - *Scilla sibirica*, *Primula woronowii*, *Helleborus caucasicus*, *Viola alba*, *V. odorata* etc. are often met. In summer the following replace them - *Poa nemoralis*, *Piptatherum virescens*, *Polygonatum glaberrimum*, *Tamus communis*, *Laser trilobum*.

302. A description of the habitats by sections of the new alignment is given below and followed by more detailed maps of the habitat along the alignment.

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<sup>16</sup> Corresponding categories:



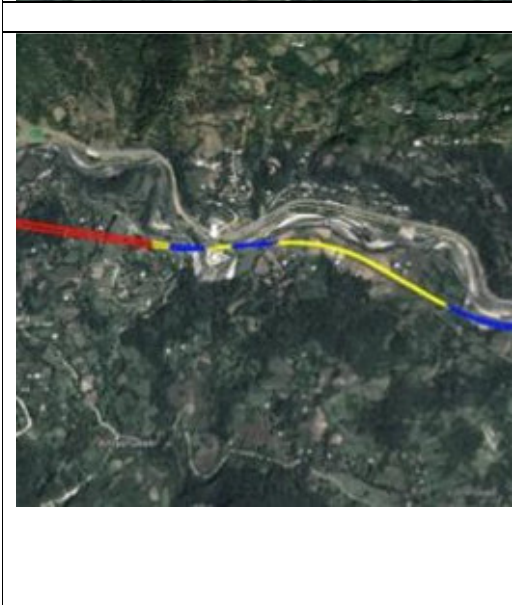
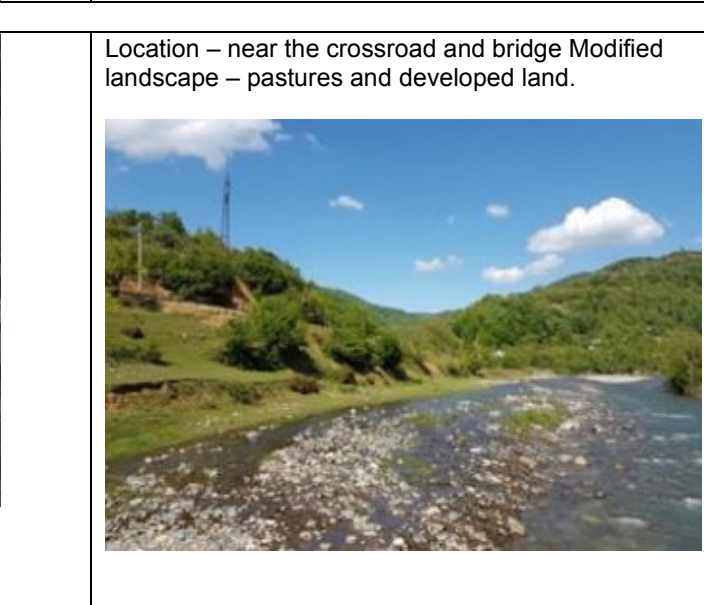
1. United Kingdom classification: "W8 Fraxinus excelsior-Acer campestre-Mercurialis perennis woodland" and "W9 Fraxinus excelsior-Sorbus aucuparia-Mercurialis perennis woodland".

2. German classification: "430604 Sommerlinden-Begulmen-Blockschuttwald", "430603 Ahorn-Linden-Hangschuttwald (wärmere Standorte)", "430602 Eschen-Ahorn-Schluchtbzw. -Hangwald (fleucht-kühle Standorte)", "430601 Sommerlinden-HainbuchenSchuttwald".

3. Nordic classification: "2233 Ulmus glabra -typ", "2235 Tilia cordata -typ" and "2236 Quercus robur-Ulmus glabra-Tilia cordata-typ". In Boreal region corresponding species-poor communities often with *Anemone nemorosa*, *Corydalis* spp., *Primula veris*.

4) Associated habitat 1. Hornbeam forest

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		<p><b>Unit 1</b>                  UTM T38: 0356876E Y 4663234N                  Habitat 91EO - Alluvial forest with Adler trees and Ash                  Projection vegetation coverage 50%</p> <table border="1"> <tr><td><i>Alnus barbata</i></td><td>3</td></tr> <tr><td><i>Carpinus orientalis</i></td><td>2</td></tr> <tr><td><i>Fraxinus excelsior</i></td><td>2</td></tr> <tr><td><i>Gleditsia triacanthos</i></td><td>2</td></tr> <tr><td><i>Rosa canina</i></td><td>1</td></tr> <tr><td><i>Ficus carica</i></td><td>1</td></tr> <tr><td><i>Rubus sp.</i></td><td>1</td></tr> <tr><td><i>Sambucus ebulus</i></td><td>1</td></tr> <tr><td colspan="2">Low sensitivity habitat</td></tr> </table>	<i>Alnus barbata</i>	3	<i>Carpinus orientalis</i>	2	<i>Fraxinus excelsior</i>	2	<i>Gleditsia triacanthos</i>	2	<i>Rosa canina</i>	1	<i>Ficus carica</i>	1	<i>Rubus sp.</i>	1	<i>Sambucus ebulus</i>	1	Low sensitivity habitat					
<i>Alnus barbata</i>	3																							
<i>Carpinus orientalis</i>	2																							
<i>Fraxinus excelsior</i>	2																							
<i>Gleditsia triacanthos</i>	2																							
<i>Rosa canina</i>	1																							
<i>Ficus carica</i>	1																							
<i>Rubus sp.</i>	1																							
<i>Sambucus ebulus</i>	1																							
Low sensitivity habitat																								
	<p>Location – near the crossroad and bridge Modified landscape – pastures and developed land.</p> 	<p><b>Unit 2</b>                  UTM T38: 0358967E, 4663848N                  Habitat: 62GE04 Vegetation of urban and rural areas                  Projection vegetation coverage: 30 %                  Species list/ Species cover%</p> <table border="1"> <tr><td><i>Alnus barbata</i></td><td>1</td></tr> <tr><td><i>Carpinus orientalis</i></td><td>1</td></tr> <tr><td><i>Prunus divaricata</i></td><td>1</td></tr> <tr><td><i>Ranunculus sp.</i></td><td>2</td></tr> <tr><td><i>Geranium sp.</i></td><td>1</td></tr> <tr><td><i>Rosa canina</i></td><td>1</td></tr> <tr><td><i>Ficus carica</i></td><td>1</td></tr> <tr><td><i>Rubus sp.</i></td><td>1</td></tr> <tr><td><i>Sambucus ebulus</i></td><td>1</td></tr> <tr><td><i>Anagallis arvensis</i></td><td>1</td></tr> <tr><td colspan="2">Low sensitivity area area.</td></tr> </table>	<i>Alnus barbata</i>	1	<i>Carpinus orientalis</i>	1	<i>Prunus divaricata</i>	1	<i>Ranunculus sp.</i>	2	<i>Geranium sp.</i>	1	<i>Rosa canina</i>	1	<i>Ficus carica</i>	1	<i>Rubus sp.</i>	1	<i>Sambucus ebulus</i>	1	<i>Anagallis arvensis</i>	1	Low sensitivity area area.	
<i>Alnus barbata</i>	1																							
<i>Carpinus orientalis</i>	1																							
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<i>Ranunculus sp.</i>	2																							
<i>Geranium sp.</i>	1																							
<i>Rosa canina</i>	1																							
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Low sensitivity area area.																								



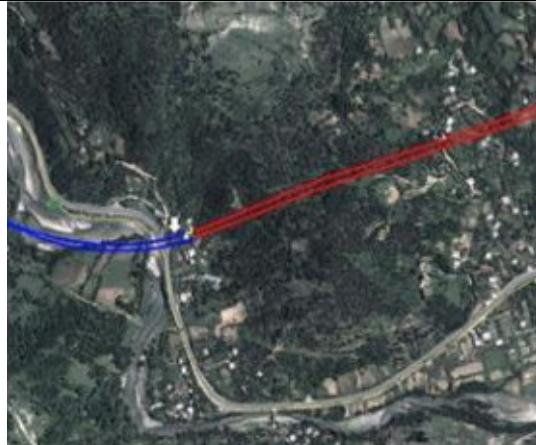
Blue-scarlet pimpernel (*Anagallis arvensis*)



*Geranium* sp.

After that point alignment runs through developed area (pastures, agricultural land plots). Vegetation is similar to that of unit 1, but in this section a number of trees reduces leaving space to shrubs and grasses (see some samples on the left).

**Unit 3.** Closer to the section where construction of a bridge and tunnel (indicative coordinates UTM T38 03659178E, 4663147N) is planned vegetation coverage is less. Plant species are not diverse. In the area the species listed under the unit 2 section are sometimes met.



In this section in oak-hornbeam forest area above the tunnel, protected oak species (*Quercus imeretina*, *vulnerable species*) is met – however, the species are not found in the project impact zone. They are present in the area above the tunnel. Another protected species –Walnut (*Juglans regia*) is found to be present in the residential zone, close to the houses.

<b>Unit 4</b>	
UTM T38: 0360269E, 4663170N	
Habitat: 9160GE-02 Oak or oak-hornbeam forests ( <i>Quercitum</i> - <i>Carpinion betuli</i> )	
Projection vegetation coverage: 60 %	
Species list/ Species cover%	
<i>Carpinus caucasica</i>	1
<i>Carpinus orientalis</i>	2
<i>Prunus divaricata</i>	1
<i>Ranunculus sp.</i>	1
<i>Pinus sosnowskyi</i>	1
<i>Juglans regia</i>	1
<i>Rosa canina</i>	1
<i>Ficus carica</i>	1
<i>Rubus sp.</i>	1
<i>Quercus iberica</i>	2
<i>Quercus imeretina</i>	1
<i>Populus alba</i>	1



**Unit 5.** In the tunnel exit and the bridge construction area (indicative coordinates UTM T38 03616226E; 4663465N) the plants here are represented by alder and hornbeam with projection coverage 50%.

Species composition of the plants in this section of alignment are similar to this described under unit 1, viz:

- European alder (*Alnus barbata*),
- Oriental hornbeam (*Carpinus orientalis*),
- Common ash (*Fraxinus excelsior*),
- Honey locust (*Gleditsia triacanthos*),
- Dogrose (*Rosa canina*),
- Common fig (*Ficus carica*),
- Blackberry (*Rubus* sp.),
- Danewort (*Sambucus ebulus*).





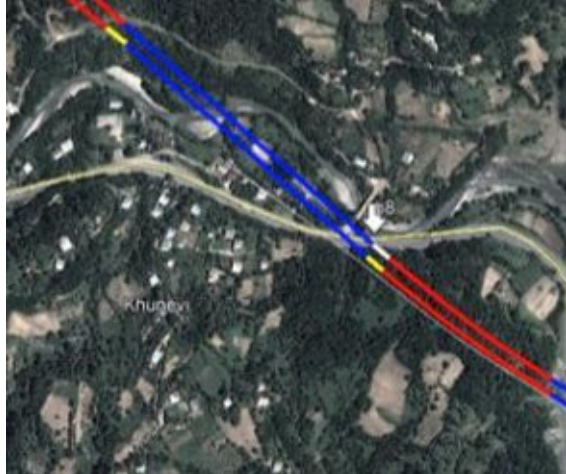

**Unit 6.** The section where construction of the road is planned (area west to Khunevi) represents developed agricultural area with pastures and small forest massif. The landscape is agricultural. Forest – secondary. Indicative coordinates of the unit are UTM T38 0363342E, 4662891N.

Species composition found in the area is similar to that of the Unit 2:

- European alder (*Alnus barbata*),
- Oriental hornbeam (*Carpinus orientalis*),
- Cherry plum (*Prunus divaricata*),
- Dogrose (*Rosa canina*),
- Blackberry (*Rubus* sp.),
- Common fig (*Ficus carica*),
- Buttercup (*Ranunculus* sp.),
- Geranium (*Geranium* sp.),
- Danewort (*Sambucus ebulus*),
- Blue-scarlet pimpernel (*Anagallis arvensis*).



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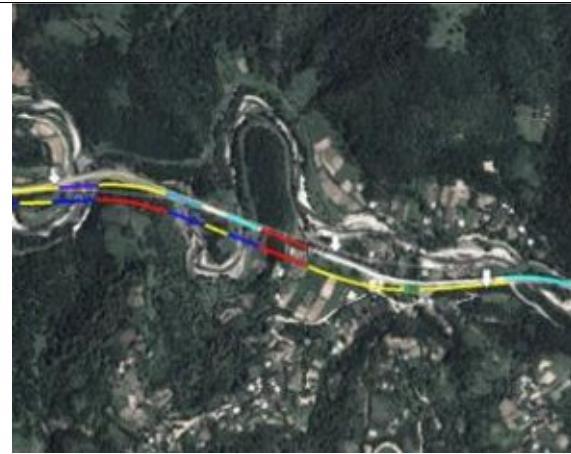
	<p>The following section – bridge, crossing existing road and the river. In this section riverine forest is crossed.</p> 	<p><b>Unit 7</b>                  UTM T38: 0364629E, 4662944N                  Habitat: 91E0* Alluvial forest with Adler trees -                  Alnus glutinosa and ash tree -Fraxinus excelsior                  Projection vegetation coverage: 70 %                  Species list/ Species cover%</p> <table border="1"> <tr><td><i>Alnus barbata</i></td><td>1</td></tr> <tr><td><i>Carpinus orientalis</i></td><td>2</td></tr> <tr><td><i>Prunus divaricata</i></td><td>1</td></tr> <tr><td><i>Ranunculus sp.</i></td><td>1</td></tr> <tr><td><i>Salix alba</i></td><td>1</td></tr> <tr><td><i>Robinia pseudoacacia</i></td><td>2</td></tr> <tr><td><i>Fraxinus excelsior</i></td><td>1</td></tr> <tr><td><i>Ficus carica</i></td><td>1</td></tr> <tr><td><i>Rubus sp.</i></td><td>1</td></tr> <tr><td><i>Quercus iberica</i></td><td>2</td></tr> <tr><td><i>Populus alba</i></td><td>1</td></tr> </table>	<i>Alnus barbata</i>	1	<i>Carpinus orientalis</i>	2	<i>Prunus divaricata</i>	1	<i>Ranunculus sp.</i>	1	<i>Salix alba</i>	1	<i>Robinia pseudoacacia</i>	2	<i>Fraxinus excelsior</i>	1	<i>Ficus carica</i>	1	<i>Rubus sp.</i>	1	<i>Quercus iberica</i>	2	<i>Populus alba</i>	1
<i>Alnus barbata</i>	1																							
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<i>Rubus sp.</i>	1																							
<i>Quercus iberica</i>	2																							
<i>Populus alba</i>	1																							
	<p>Within this section oak-hornbeam forest is registered. Neither protected species nor mature trees are registered in the impact area.</p> 	<p><b>Unit 8</b>                  UTM T38: 0365336E; 4662486N                  Habitat: 9160GE-02 Oak or oak-hornbeam forests                  (Quercitum -Carpinion betuli)                  Projection vegetation coverage: 70 %                  Species list/ Species cover%</p> <table border="1"> <tr><td><i>Carpinus caucasica</i></td><td>2</td></tr> <tr><td><i>Carpinus orientalis</i></td><td>3</td></tr> <tr><td><i>Acer platanoides</i></td><td>1</td></tr> <tr><td><i>Pinus sosnowskyi</i></td><td>2</td></tr> <tr><td><i>Quercus iberica</i></td><td>2</td></tr> <tr><td><i>Ficus carica</i></td><td>1</td></tr> <tr><td><i>Rubus sp.</i></td><td>1</td></tr> <tr><td><i>Gleditsia triacanthos</i></td><td>1</td></tr> </table>	<i>Carpinus caucasica</i>	2	<i>Carpinus orientalis</i>	3	<i>Acer platanoides</i>	1	<i>Pinus sosnowskyi</i>	2	<i>Quercus iberica</i>	2	<i>Ficus carica</i>	1	<i>Rubus sp.</i>	1	<i>Gleditsia triacanthos</i>	1						
<i>Carpinus caucasica</i>	2																							
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<i>Acer platanoides</i>	1																							
<i>Pinus sosnowskyi</i>	2																							
<i>Quercus iberica</i>	2																							
<i>Ficus carica</i>	1																							
<i>Rubus sp.</i>	1																							
<i>Gleditsia triacanthos</i>	1																							

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**Unit 9.** UTM from T38 0365620E, 4662275N – till unit 10 (UTM coordinates T38 0366928E, 4662046N) - alignment crosses the road and the river, partly coinciding with existing road.

Forested areas are bypassed via tunnels.



**Unit 11.** Up to UTM T38 0367601E, 4661882N pine plantations, agricultural land and populated areas where such species as Cherry plum (*Prunus divaricate*), Mulberry (*Morus alba*), Common fig (*Ficus carica*) are present.

Section F2 of the Khevi-Ubisa-Shorapani-Argveta Road (E60 Highway)  
 Environmental Impact Assessment

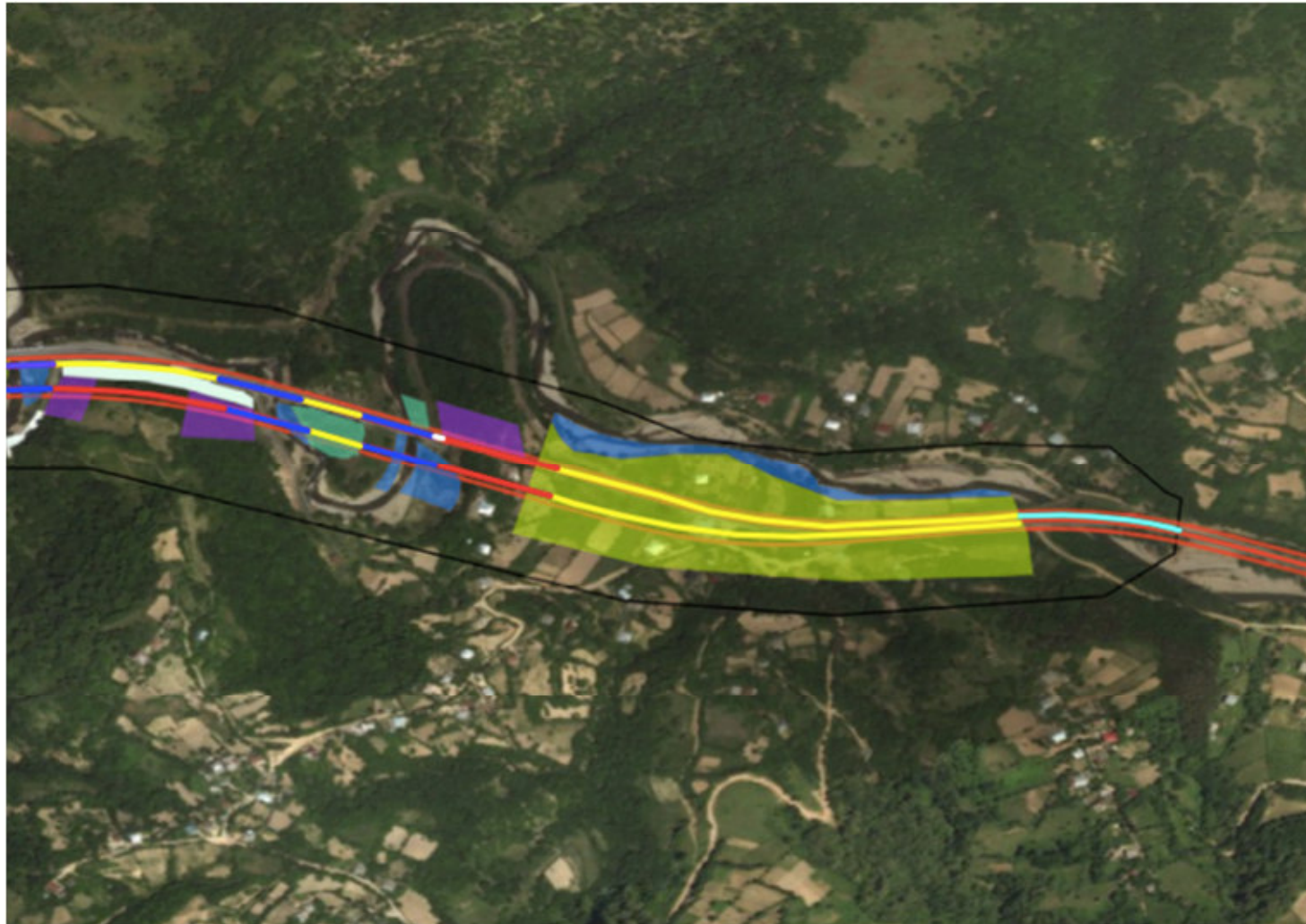


In some sections alignment follows existing road. In this section acacia, black locust and 'artificial' plantations (cyprus, cedar) are registered.



<b>Unit 12</b>	
UTM T38 0368480E, 46616679N	
Habitat: 9160GE-02 Oak or oak-hornbeam forests (Quercitum -Carpinion betuli)	
Projection vegetation coverage: 35 %	
Species list/ Species cover%	
<i>Carpinus caucasica</i>	1
<i>Carpinus orientalis</i>	1
<i>Acer laetum</i>	1
<i>Robinia pseudoacacia</i>	2
<i>Tilia begonifolia</i>	1
<i>Quercus iberica</i>	1
<i>Ficus carica</i>	1
<i>Cupressaceae sp.</i>	1
<i>Cedrus sp.</i>	1

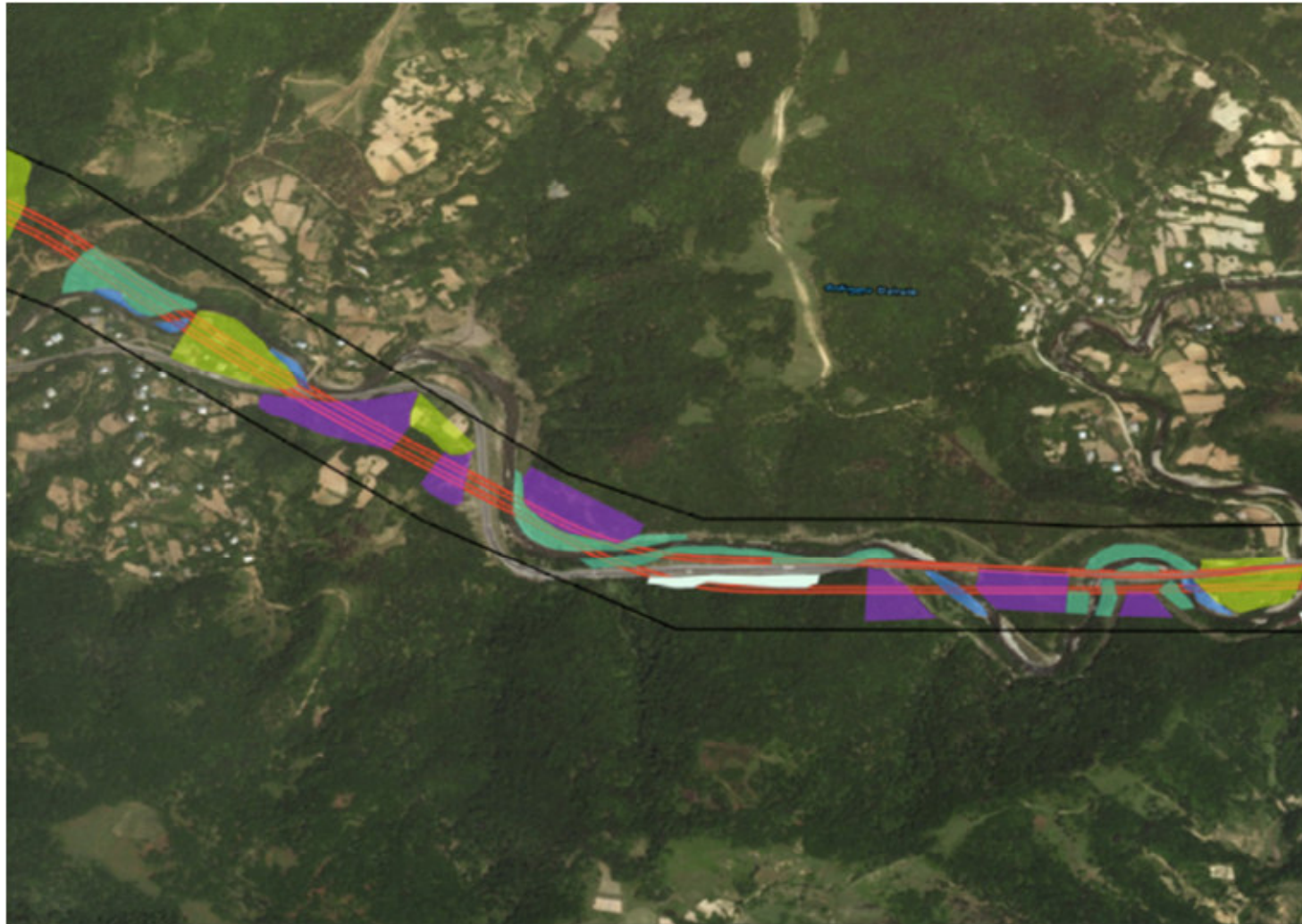
Figure 65: Corridor Habitat (KM0.0 – KM1.4)



Colour	Code
Green	Vegetation of urban and rural areas (62GE04)
Purple	Oak or oak-hornbeam forests (Quercitum - Carpinion betuli) (9160GE)
Blue	Alluvial forest with Alder trees and Ash (910EO)
Dark blue	Clayey and rock riverine vegetation with duckweed (323GE)
White	Tilio-Acerion forests of slopes, screes and ravines (9180GE)

Note: Areas of no habitat mapping are tunnel locations.

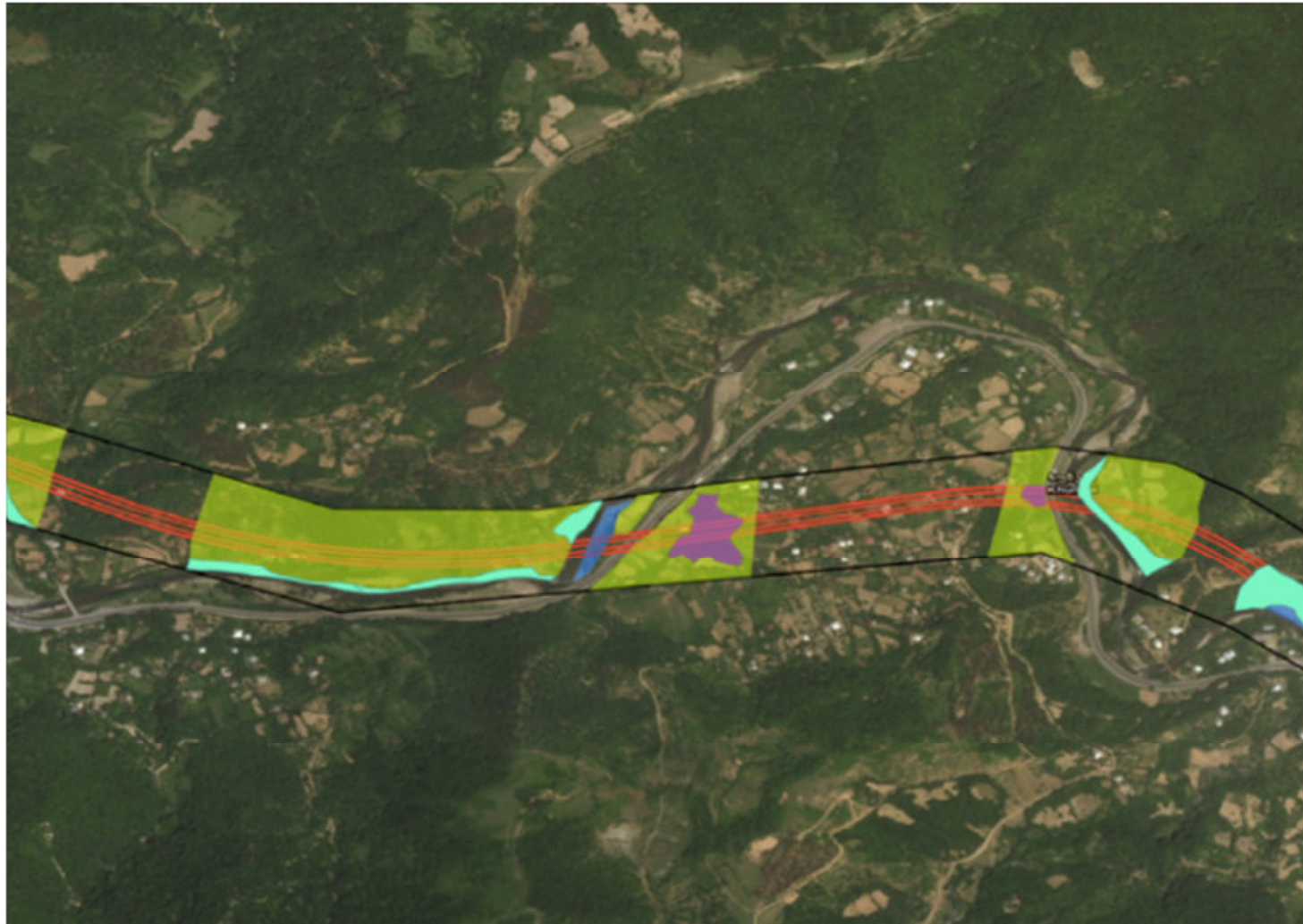
Figure 66: Corridor Habitat (KM1.4 – 3.3)



Colour	Code
Green	Vegetation of urban and rural areas (62GE04)
Purple	Oak or oak-hornbeam forests (Quercitum - Carpinion betuli) (9160GE)
Blue	Alluvial forest with Adler trees and Ash (910EO)
Dark blue	Clayey and rock riverine vegetation with duckweed (323GE)
White	Tilio-Acerion forests of slopes, screes and ravines (9180GE)

Note: Areas of no habitat mapping are tunnel locations.

Figure 67: Corridor Habitat (KM3.3 – KM5.3)



Colour	Code
Green	Vegetation of urban and rural areas (62GE04)
Purple	Oak or oak-hornbeam forests (Quercitum - Carpinion betuli) (9160GE)
Blue	Alluvial forest with Adler trees and Ash (910EO)
Dark blue	Clayey and rock riverine vegetation with duckweed (323GE)
White	Tilio-Acerion forests of slopes, screes and ravines (9180GE)

Note: Areas of no habitat mapping are tunnel locations.

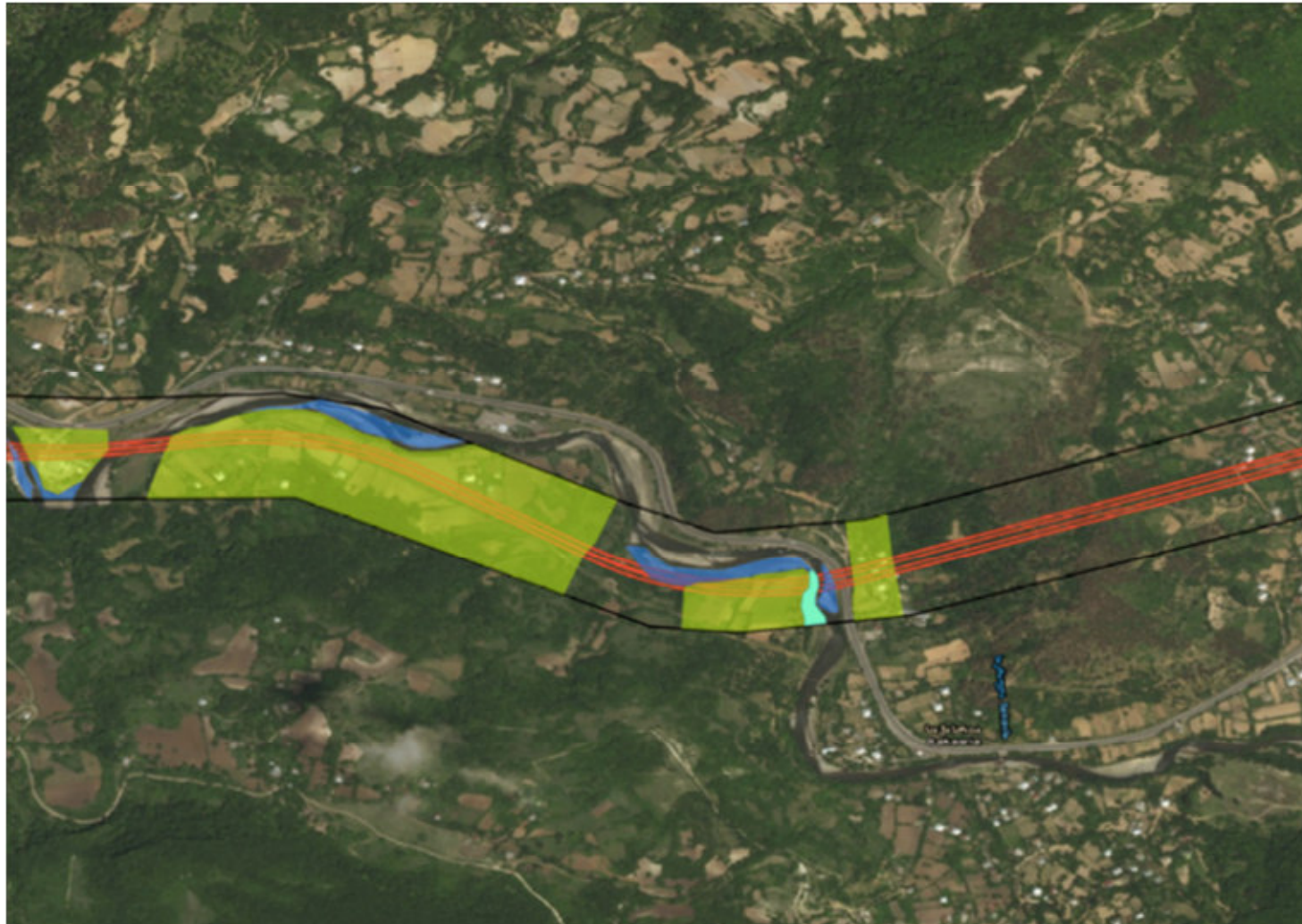
Figure 68: Corridor Habitat (KM5.3 – KM8.0)



Colour	Code
Green	Vegetation of urban and rural areas (62GE04)
Purple	Oak or oak-hornbeam forests (Quercitum - Carpinion betuli) (9160GE)
Blue	Alluvial forest with Adler trees and Ash (910EO)
Dark blue	Clayey and rock riverine vegetation with duckweed (323GE)
White	Tilio-Acerion forests of slopes, screes and ravines (9180GE)

Note: Areas of no habitat mapping are tunnel locations.

Figure 69: Corridor Habitat (KM8.0 – KM10.0)

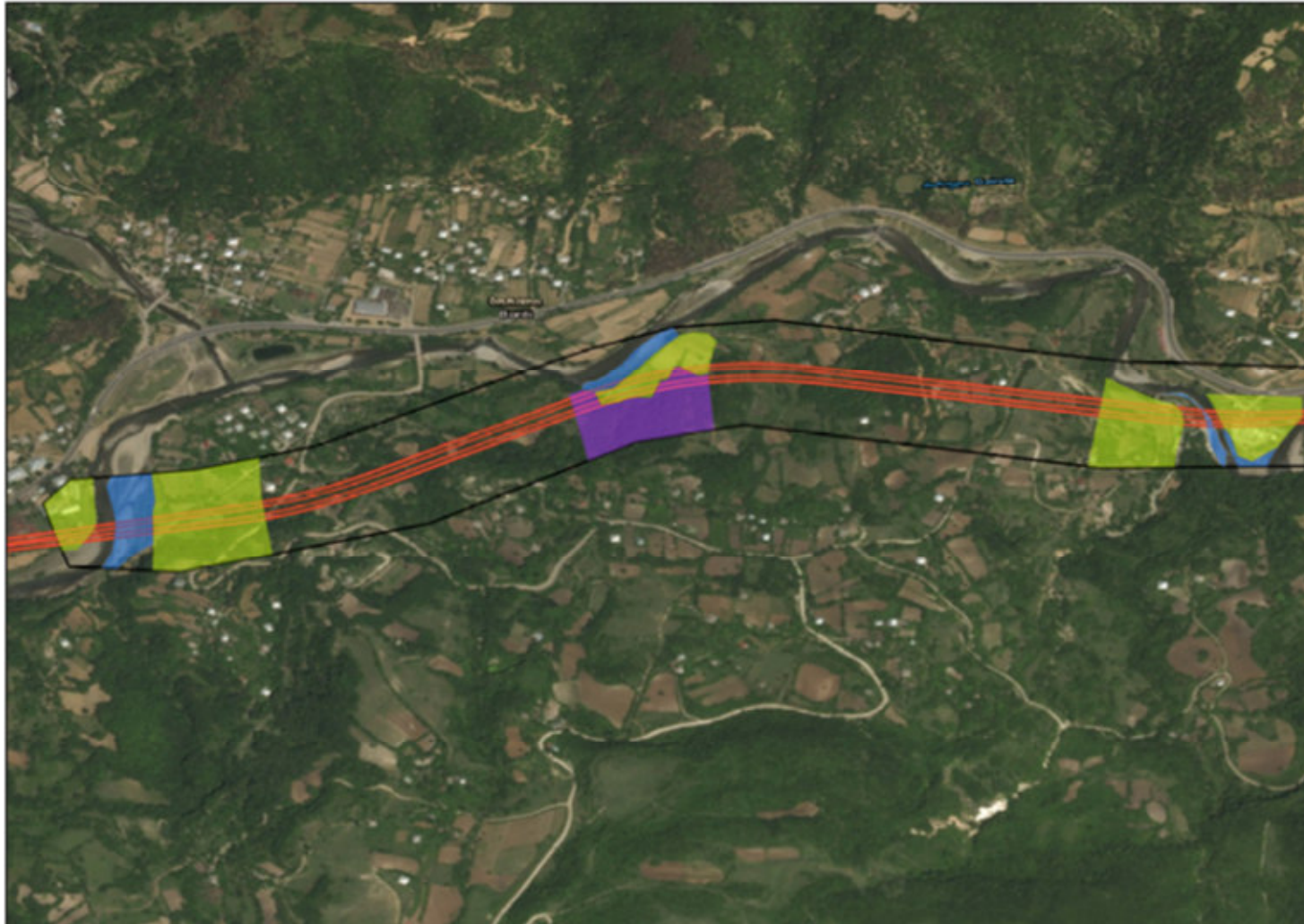


Colour	Code
Green	Vegetation of urban and rural areas (62GE04)
Purple	Oak or oak-hornbeam forests (Quercitum - Carpinion betuli) (9160GE)
Blue	Alluvial forest with Adler trees and Ash (910EO)
Dark blue	Clayey and rock riverine vegetation with duckweed (323GE)
White	Tilio-Acerion forests of slopes, screes and ravines (9180GE)

Note: Areas of no habitat mapping are tunnel locations.



Figure 70: Corridor Habitat (KM10 – End)



Colour	Code
Green	Vegetation of urban and rural areas (62GE04)
Purple	Oak or oak-hornbeam forests (Quercitum - Carpinion betuli) (9160GE)
Blue	Alluvial forest with Adler trees and Ash (910EO)
Dark blue	Clayey and rock riverine vegetation with duckweed (323GE)
White	Tilio-Acerion forests of slopes, screes and ravines (9180GE)

Note: Areas of no habitat mapping are tunnel locations.

303. The Study Area does not meet the criteria for Critical Habitat because based on field survey, literature review and consultation it does not have high biodiversity value and does not support any of the qualifying interests as outlined in the table below. It is not located in a legally protected area or an area officially proposed for protection.

**Critical, Natural and Modified Habitat**

**Critical habitats** are areas with high biodiversity value, including (i) habitat of significant importance to Critically Endangered and/or Endangered species; (ii) habitat of significant importance to endemic and/or restricted-range species; (iii) habitat supporting globally significant concentrations of migratory species and/or congregatory species; (iv) highly threatened and/or unique ecosystems; and/or (v) areas associated with key evolutionary processes.

**Natural habitats** are areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition.

**Modified habitats** are areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition. Modified habitats may include areas managed for agriculture, forest plantations, reclaimed coastal zones, and reclaimed wetlands.<sup>17</sup>

304. Further, large portions of the Project road are located within tunnels (approximately 4km) which eliminates impacts to habitat in the areas above the tunnels (but not at the portals). Other portions of the road are located within agricultural and urban areas, classified as modified habitat.

305. However, there are numerous areas within the Project buffer zone which can be classified as natural habitat (If the habitat still largely contains the principal characteristics and key elements of its native ecosystem(s), such as complexity, structure and diversity, than it should be considered a natural habitat regardless of the presence of some invasive species, secondary forest, human habitation or other human-induced alteration<sup>18</sup>), these areas are shown below and include the State Forest Fund (SFF) areas identified as part of the SFF inventory.

**Table 39: Area of Habitat Affected**

Code	ha affected	% of total area in 100m corridor	Note
Vegetation of urban and rural areas (62GE04)	76.8	71.0	Agricultural / Modified
Oak or oak-hornbeam forests (Quercitum -Carpinion betuli) (9160GE)	12.14	11.2	Natural
Alluvial forest with Adler trees and Ash (910EO)	9.45	8.7	Natural

<sup>17</sup> IFC Performance Standard 6 Biodiversity Conservation and Sustainable Management of Living Natural Resources. January, 2012

<sup>18</sup> Guidance Note 6 - Biodiversity Conservation and Sustainable Management of Living Natural Resources. IFC 2012