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ACTIVITY 4

PREPARATION OF ENVIRONMENTAL IMPACT ASSESSMENT FOR THE KVESHETI-KOBI ROAD SECTION – LOT 1 TUNNEL SOUTH PORTAL KOBI AND LOT 2 – KVESHETI – TUNNEL SOUTH PORTAL

FINAL REPORT

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Activity 4 – Preparation of environmental impact assessment for the Kvesheti - Kobi road section – lot 1 tunnel south portal Kobi and lot 2 - Kvesheti - tunnel south portal

FINAL REPORT

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Final Report, March 2019

Environmental Impact Assessment for the Kvesheti – Kobi Road Section

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Abbreviations and Acronyms

AADT	Annual Average Daily Traffic
AASHTO	American Association of State Highway and Transportation Officials
AM	Accountability Mechanism
ADB	Asian Development Bank
AST	Above Ground Storage Tank
AT	Argveta - Tbilisi
AQP	Air Quality Plan
BAP	Biodiversity Action Plan
BPAP	Borrow Pit Action Plan
BAT	Best Available Technology
BGL	Below ground level
BMP	Biodiversity Management Plan
BMEP	Biodiversity Monitoring and Evaluation Plan
BoQ	Bill of Quantities
BOD	Biological Oxygen Demand
BRI	Bridge
CAREC	Central Asia Regional Economic Cooperation
CAP	Corrective action plan
ccTV	Closed Circuit TV
CFC	Chlorofluorocarbon
CHM	Cultural Heritage Monitor
CIS	Commonwealth of Independent States
CO	Carbon monoxide
COD	Chemical Oxygen Demand
CO_2	Carbon Dioxide
Cr	Chromium
dBA	decibel
DD	Detailed Design
EA	Executing Agency
EAC	Environmental Assessment Code
EBRD	European Bank for Reconstruction and Development
EC	Electrical conductivity
EcoW	Ecological Clerk of Works
EIA	Environmental Impact Assessment
EIB	European Investment Bank
EHS	Environmental Health and Safety
EMP	Environmental Management Plan
EM	Environment Manager
ERP	Emergency Response Plan
ES	Executive Summary
ESIA	Environmental and Social Impact Assessment
EU	European Union
EWH	East West Highway
EWHIPs	East West Highway Improvement Projects
FE	Iron
FS	Feasibility Study
GAA	Georgian American Alloys
GDP	Gross Domestic Product
GEOSTAT	National Statistics Office of Georgia
GEL	Georgian Lari
GHG	Greenhouse Gases
GoG	Government of Georgia
GOST	Technical Standard

GRM	Grievance Redress Mechanism
GRCE	Grievance Redress Committee
ha	Hectare
H&S	Health and Safety
HC	Hydrocarbon
HP	Horse Power
HZ	Hertz
IBA	Important Bird Area
IBC	Intermediate bulk storage containers
IFC	International Finance Corporation
IFI	International Finance Institutions
IEE	Initial Environmental Examination
IES	International Environmental Specialist
in/sec	Inch per second (25.4mm/sec)
IUCN	International Union for Conservation of Nature
km	Kilometer
km/h	Kilometers per Hour
Km^2	Square kilometer
LARP	Land Acquisition and Resettlement Plan
LC	Least Concern
LCF	Local Consulting Firm
L_{eaq}	Equivalent Continuous Level
MELT	Modified Eccentric Loader Terminal
mg/l	Milligram per liter
mg/m^3	Milligram per cubic meter
mg/kg	Milligram per kilogram
m^3/s	Cubic meters per second
m^3/h	Cubic meters per hour
m^3/d	Cubic meter per day
m	Meter
m^2	Square meter
m^3	Cubic Meter
m^3/s	Cubic meter per second
MAC	Maximum Allowable Concentrations
MCA	Multi-criteria analysis
MoEPA	Ministry of Environment Protection and Agriculture
MoESD	Ministry of Economy and Sustainable Development
MPE	Maximum Permissible Emission
MPC	Maximum permissible concentrations
MPD	Maximum Permissible Discharges
MSDS	Material Safety Data Sheet
$MtCO_2e$	Million tons of CO_2 equivalent
NES	National Environmental Specialist
NGO	Non-Governmental Organization
NH_4+	Ammonium
Nm^3	Normal cubic meter
NO_X	Nitrogen oxides
NO_2	Nitrogen Dioxide
NO_3	Nitrate
Ni	Nickel
NT	Near Threatened
OCHS	Occupational and Community Health and Safety
OHS	Occupational Health and Safety
PA	Per Annum
PAP	Project Affected Person

PAH	Polycyclic aromatic hydrocarbons
PCR	Physical and cultural resources
PPV	Peak Particle Velocity
Pb	Lead
PM	Particulate matter
POPs	Persistent organic pollutants
PO_4	Phosphate
PMU	Project Managing Unit
PPE	Personal Protective Clothing
PPTA	Project Preparatory Technical Assistance
PPM	Parts per million
PSC	Pre-stressed concrete
SPM	Suspended Particulate Matter
RD	Road Department
RoW	Right of Way
SFF	State Forest Fund
SniP	Construction Standards
STD	Sexually transmitted diseases (such as HIV/AIDS)
SEMP	Specific Management Plan
SO_2	Sulfur Dioxide
SPS	Safeguard Policy Statement
TA	Tbilisi - Argveta
TEM	Trans-European North-South Motorway
TMP	Traffic Management Plan
TOR	Terms of Reference
TSP	Total Suspended Particulates
TSS	Total suspended solids
TUN	Tunnel
UNEP	United Nations Environment Program
USAID	United States Agency for International Development
USD	United States Dollar
UST	Underground Ground Storage Tank
VU	Vulnerable
WB	World Bank
WHO	World Health Organization
WMP	Waste Management Plan
°C	Degrees Celsius
$\mu g/m^3$	Micrograms per cubic meter

Currency Exchange Rates as of 30 November 2018
1 US$ = 2.66 (GEL)
($ refers in this report to US-Dollars)

Executive Summary

1. Introduction

1. This Environmental Impact Assessment (EIA) is part of the process of compliance with the Asian Development Bank (ADB) Safeguard Policy Statement (2009) and the European Bank for Reconstruction and Development (EBRDs) Environmental and Social Policy (2014) in relation to the construction of the Kvesheti – Kobi Road Section or more simply, the "Project".

2. The EIA provides a road map to the environmental measures needed to prevent and/or mitigate negative environmental effects associated with the project. More specifically, the EIA:

- Describes the existing socio-environmental conditions within the Project area;
- Describes the project design, construction activities and operational parameters;
- Describes the extent, duration and severity of potential impacts;
- Analyzes all significant impacts; and
- Formulates the mitigation actions and presents it all in the form of an Environmental Management Plan (EMP).

3. Based on the existing ADB Environmental Safeguards Policy (2009), this Project falls under ADB's project Category A as the project is considered to have significant diverse impacts over a wide area, such as noise impacts, significant quantities of spoil disposal, road safety impacts, and vibration.[1] The Project is also classified as a Category A Project according to EBRD Environmental and Social Policy, Appendix 2 which classified construction, realignment or widening of motorways as Category A projects.

2. Project Background

4. Due to its geographic location Georgia's role as a major transit country is significant. Transport of goods into and through Georgia has increased over the past 10-15 years. Almost two-thirds of goods in Georgia are transported by road, and haulage by domestic and international truck companies is very evident on the country's highways. Many of the roads are however poorly equipped to cope with the volume of traffic and the proportion of heavy vehicles, and factors such as insufficient dual carriageways, routing through inhabited areas and inadequate maintenance and repair, hinder throughputs and increase transit times. This creates difficulties for haulage companies and their clients, truck drivers, Georgian motorists and local residents.

5. The Government of Georgia (GoG) has launched a program to upgrade the major roads of the country. The program is managed by the Roads Department of the Ministry of Regional Development and Infrastructure (RD) and aims to improve transportation and transit of goods in Georgia and to surrounding countries. The World Bank, Japanese International Cooperation Agency (JICA), European Investment Bank (EIB), EBRD and ADB have already provided a series of loans to the state for construction/rehabilitation of the road infrastructure.

6. As a part of the program, upgrading Jinvali-Larsi section of the Mtskheta-Stephantsminda-Larsi Road is planned which connects Georgia to Russian Federation. The road starts from Mtskheta, follows the E-60 highway before heading north bypassing Jinvali

[1] According to ADB "*A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment is required."*

reservoir from the west, crossing Gudauri winter resort via the Jvari Pass located at 2,400 meters above sea level (masl) and ending at the border to Russian Federation.

7. Various portions of the road are currently being rehabilitated or are in the process of feasibility study or detailed design. The Project, which is the subject of this EIA, focuses on the portion of road between Kvesheti and Kobi.

3. Project Description

8. The project is located in Dusheti and Kazbegi municipalities, Mtskheta-Mtianeti region in the central northern portion of Georgia (see Figure 1). The Project comprises the Kvesheti – Kobi section of the Mtskheta – Stephantsminda – Larsi Road.

Figure 1: Road Location Map

9. The length of the new alignment is 22.7 km and will be divided into two construction packages, or 'Lots' as follows (and shown by Figure 2):

- Lot 1: Tskere – Kobi: Chainage KM 12.7 – KM 22.7 (10 km)
- Lot 2: Kvesheti – Tskere: Chainage KM 0.0 – KM 12.7 (12.7 km)

Lot 1 Summary

10. The Tskere-Kobi portion of the Project road, also referred to as 'Lot 1', includes a 8.86 km long tunnel with two cut and cover sections and a junction connecting to the existing road near Kobi. More specifically Lot 1 includes:

- 178m long section of road from Tskere to the south portal of Tunnel 5;
- Tunnel 5 - 8.86 km long bidirectional, 2 lane tunnel (max. gradient 2.35%);

- Two cut and cover (C&C) [2] sections of Tunnel 5 (200m –south portal and 8m – north portal) to protect from avalanches and move entrance portal farther from the Tskere;
- 9.062 km emergency gallery parallel to Tunnel 5 and 17 connections to the main tunnel (6.4 meters wide);
- Technical buildings next to the north and south portals – the buildings include facilities building, pumping station and ventilation room;
- 0.8km long section of road connecting the north portal of the tunnel with existing road. The alignment has been adapted to the current road with a maximum gradient of 4.2 % to keep on using the existing bridge (bridge length 42m, height 6m); and
- 214m long local road diversion.

Lot 2 Summary

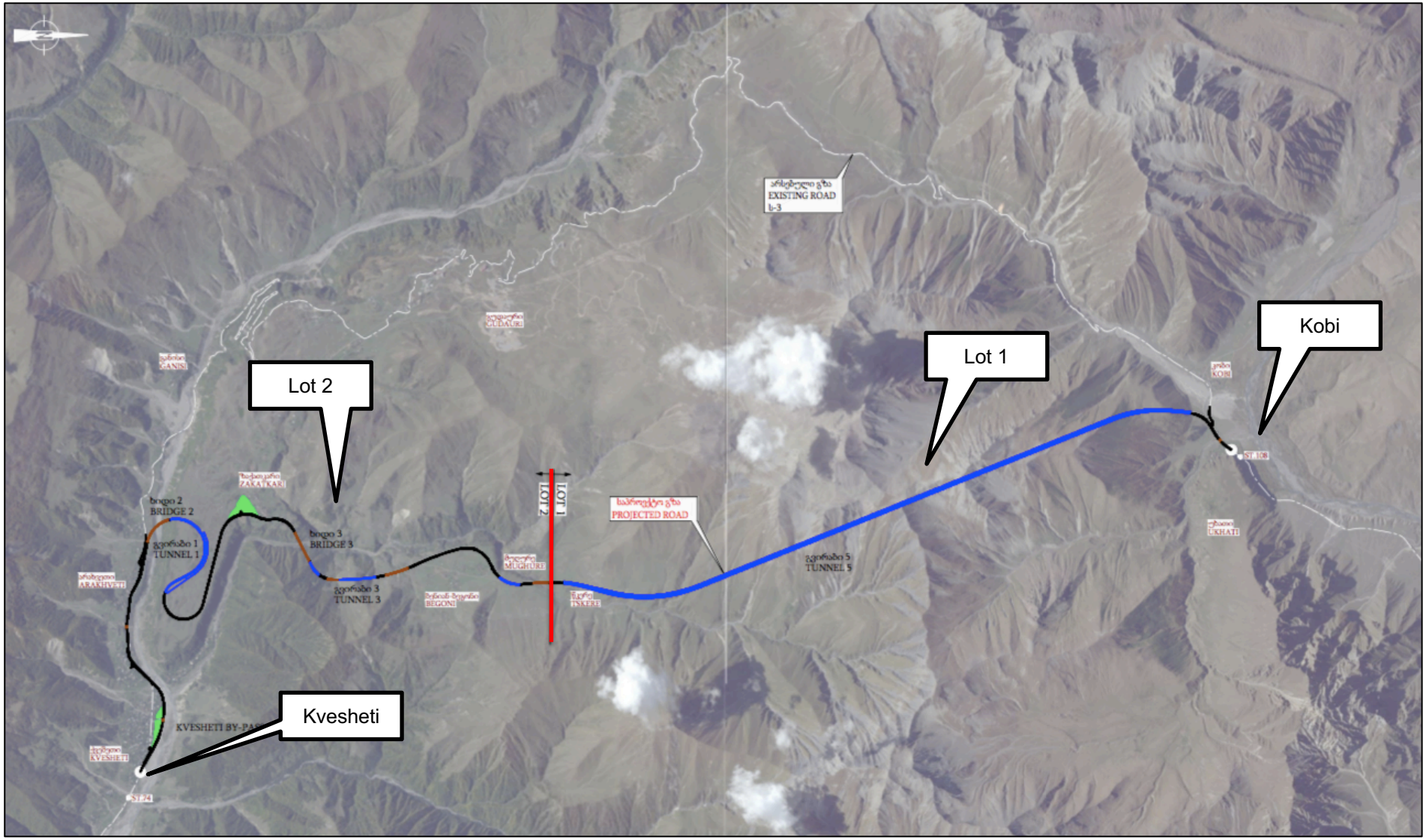
11. The Kvesheti – Tskere section, or 'Lot 2' includes 2.5 km of tunnels and 1.5 km of bridges. The main elements of this section are:

- Kvesheti bypass road (length 3.2 km),
- Bridge 1 (length 27.8m, height 14m, 2 lane)
- Bridge 2 over the Aragvi river (length 435.28m, height 62m, 3 lanes)
- Tunnel 1 (length 1540.64m, 2 lanes) with gallery (1092m) (New Austrian tunneling method-NATM [3])
- Bridge 3 - Arch bridge over the River Khadistskali (length 426m, height 164m, 3 lane)
- Tunnel 2 (length 193.42m, C&C, 3 lane)
- Bridge 4 over the left tributary of River Khadistskali river (length 147.80m, height 26m, 3 lane)
- Tunnel 3 (length 388.38m)
- Bridge 5 (length 322m, height 55m, 3 lane)
- Tunnel 4 (length 299m, C&C, 3 lane)
- Bridge 6 (length 218m, height 48m, 3 lane)
- Five grade junctions are planned (KM0.3, KM1.7, KM3.1, KM7.7, KM10,5) and 3 service roads.

[2] Cut and cover: the basic concept involves the digging of a trench, the construction of a tunnel, and then returning the surface to its original state.

[3] The NATM integrates the principles of the behaviour of rock masses under load and monitoring the performance of underground construction during construction. The NATM has often been referred to as a "design as you go" approach, by providing an optimized support based on observed ground conditions. More correctly it can be described as a "design as you monitor" approach, based on observed convergence and divergence in the lining and mapping of prevailing rock conditions. It is not a set of specific excavation and support techniques.

Figure 2: Lot 1 and Lot 2



4. Alternatives

No Action Alternative

12. The "No Action" Alternative in this instance is defined as a decision not to undertake the proposed construction of the Project Road meaning road users would continue using the existing road without any additional upgrades (above and beyond typical maintenance works). The existing road is 35 km long. Between Kvesheti and Kobi it runs through Gudauri ski resort and Jvari Pass (2,400 masl). However, the existing road suffers from a number of technical and safety issues as follows:

- Alignment: the parameters are out of the National standard requirements (minimum radiuses, gradient, super-elevation, junctions, accesses, no population by-passes) and because of it, safety of road users and the local community is jeopardized.
- Cross-section: the minimum width of the carriageway/lane or shoulders is not enough at some stretches.
- Pavement: bad/very bad condition of the structural section of the pavement and/or the pavement itself.
- Drainage: lack of longitudinal/transversal drainage at some stretches. Rain water and debris running onto the road surface which can result in accidents.
- Cut slopes, retaining walls and protection structures: Currently in bad condition and do not fully prevent mudflows, rockfalls and/or landslides.
- Avalanches: Inadequate technical parameters of avalanche protection tunnels and galleries.
- Lack of visibility and/or lighting.
- Lack of signalling and/or safety barriers, for traffic flow and pedestrians.

The "No Action" Alternative would see the continued deterioration of the existing road pavement and its drainage structures and a continuation of the high ratio of accidents.

13. In addition to the technical and safety aspects the following significant issues are associated with the existing road:

- The road is often closed due to snow fall during the winter months. From the strategic point of view, this road section has become a key traffic hub in the Caucasus region, the traffic discontinuity is a major impediment to meet the increasing transport demand on the North-South Corridor and harnessing the economical and tourism potential of the region.
- There can be significant congestion on the road especially during the tourist season which leads to degradation of air quality in and around Gudauri which is one of Georgia's prime tourist destinations during the winter.
- Difficulties maneuvering HGVs, especially in the areas highlighted in **Figure 62** below, which leads to a high level of delays and demand affected.

14. Given all of the above, the 'No Action' alternative is not recommended.

Upgrading of the Existing Road (Alternative Zero)

15. There are a range of technical and safety issues relating to the existing road. Technically, it is possible to upgrade the existing road, but it will not resolve the key issues described below.

16. It is possible to upgrade the pavement, add safety barriers, slightly upgrade the alignment at some curves (small enhancements at some points) and provide a few galleries.

These actions would not have a significant impact to the landscape/local communities along the existing alignment. But functionality and safety of the road would remain at the same levels. It is possible to accommodate drainage, safety barriers, pavement within the existing road; but not a relevant change avoiding high gradient, U-turns or going through Gudauri.

17. In order to significantly upgrade the safety and functionality of the existing road the current alignment would need to be significantly changed, enhancing the gradient, minimum radius, cross section (enough space), visibility, etc. This would result in a completely different scenario to what is currently seen. Deep cut-slopes, junctions, tunnels, and bridges would all be required which would have a significant impact on the landscape and the local communities.

18. Further, to ensure no road closures because of adverse weather conditions in the winter (snow) something similar to a continuous gallery would be required for a long stretch (several kilometres, with a combination of tunnel and gallery). The end result would be very similar to a long tunnel after completion of the construction, but there would be significant construction impacts during this period, even more significant than constructing a tunnel on its own.

19. Given the fact that there is no alternative route to Kobi from Kvesheti (and no detour route) the construction period, of several years, would have huge impacts on road users and the local community as portions of the road are closed to allow for construction works. This could have significant impacts on the local economy for a number of years, including the Gudauri tourist area.

20. In this scenario the impact on the landscape and environment is also significant as well as the required investment. Even with these works completed, the functionality would still be lower than the proposed Project (as the alignment must still go up and down from the Jvari pass). Alternative Zero was also assessed from a geological perspective. The alignment of the existing road is located in areas of medium and significant geological risk.

21. Around 8 km of Alternative Zero is in the limits of the SPA/IBA area. This area of the existing road suffers from a significant waste management issue as road users empty literally tonnes of garbage every year along the portion of the road in the SPA/IBA area. Continued use of the existing road would see this situation endure and degradation of the SPA/IBA environment continue. Crucially, the proposed Project avoids this area by tunnelling under the SPA/IBA for much of its extent in its northern portion and the resulting footprint within the SPA/IBA is much smaller than for the Alternative Zero.

22. The existing road is also located along a bird migration corridor, that goes along the Tetri Aragvi river close to portions of the fragmented Kazbegi National Park. The proposed Project follows the Tetri Aragvi river for a much shorter portion thereby reducing potential impacts to this area and the newly extended Kazbegi National Park.

23. Alternative Zero would also involve many of the environmental impacts identified with the ‘do nothing’ scenario above, e.g. noise levels and air emissions would increase in the built-up areas of Kvesheti and Gudauri.

24. Given all of the above constraints Alternative Zero was ruled out for further consideration.

Alternative Alignments

25. At the outset of the project study, based on initial map assessments, it was generally understood that there would be two possible broadly defined locations for the proposed project road: (i) close to the existing road alignment through the Gudauri valley; and (ii) along a new alignment to the east, through the Khada valley.

26. The studies commenced with a pre-feasibility study that assessed several alignments in specific corridors within both valleys. The output of this study was refined during the pre-

feasibility study down to 4 potentially possible alignments, 2 generally in each valley. These alignments were further assessed via a comprehensive multicriteria analysis approach that took into account 3 groups of criteria, briefly (i) functionality from terrain and geological, traffic, local population access, and operational perspectives; (ii) economic and financial considerations for both construction and long term operations and maintenance considerations; and (iii) environmental and social aspects from biodiversity, surface water, protected areas, and other related perspectives.

27. The outcome of the process was a rational and evidence-based decision that the proposed road alignment should be in the Khada valley, between Kvesheti and Kobi, and that it should include an 8 km long tunnel through the mountain range between Tskere and Kobi.

28. The Feasibility study further assessed three potential alignments in the Khada valley. The chosen alternative which broadly resembles the current alignment was selected for detailed design.

29. Some changes to the alignment were made during the detailed design in order to; a) reflect new environmental legislation (Since 2014 environmental legislation has changed. Some of laws, regulations and policy documents in the area of biodiversity (listed in Annex II to the referred strategy document) have been updated, revised. As example – Environmental Assessment Code was adopted.), b) reduce risks and impacts, and c) improve the safety of the alignment. The main changes were made in Kobi-Tskere (Lot 2) section.

30. In addition, during the detailed design phase the geometry of the road was improved in some sections, residential areas were bypassed, cut and cover sections increased to reduce noise impacts and underpasses were included.

Alternative Pavement

31. Asphalt and concrete pavement were considered by the Detailed Design team. Priority was given to asphalt. This type of pavement was selected for the following reasons:

- less noise during operation – compared to concrete;
- less vibration compared to the concrete;
- better visibility of horizontal marking on asphalt surface;
- better efficiency in snow/ice melt conditions;
- recyclability of material.

Alternative Tunneling Methods

32. Various tunneling option have been compared by the Detailed Design team. The list includes:

- Cut and cover.
- Drill and blast (D&B).
- Boring (using Tunnel Boring Machine (TBM)).
- NATM (sequential excavation – New Austrian Tunneling Method).

33. With consideration of the length of the main tunnel (> 8 km), advancement rates of D&B and TBM and the geotechnical characteristics of the rocks – the use of a TBM for the main tunnel is considered the most appropriate.

34. In some sections, selection between mechanical and drill and blast excavation technique (in NATM tunnels) will be made on case by case basis depending upon locations that may be particularly sensitive to vibration.

Alternative Transport Modes

35. For the north - South Corridor there is currently no rail network, so building an entirely new route would be vastly more expensive than upgrading the existing road network and furthermore, given the lack of existing network, the construction of the railway north to Russia would likely have much great environmental impacts than upgrading of the existing road, as it would have to be constructed all the way practically from Tbilisi.

5. Summary Description of the Environment

36. For this Project, a general 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. This is referred to as the Project Area in this report. The Project Area selected for the EIA includes sensitive receptors [4] that are most likely to be impacted by the Project's development activities. The social area of influence also includes villages that may lie outside the 1km zone due to potential impacts and benefits, such as economic contributions (supply of a local workforce or goods and services) or social effects of in-migration. For biodiversity the EIA has addressed a project zone of direct influence which is considered to be a 300m working corridor (150m either side of the proposed route) plus additional elements such as access roads, working areas and spoil disposal sites.

Physical Environment

37. Topography - The Project area is mountainous. The relief is mainly hilly, dissected by gorges/gullies and difficult access. Elevation in the Project area ranges from 1,320m to 1,975m. The Project road broadly follows the alignment of two valleys, firstly along Tetri Aragvi river valley, and secondly turning north along the Khada (Khadistskali river) valley before entering the main long tunnel in Lot 1, Tunnel 5.

38. Geology - Kazbegi region is characterized by a complex geological structure. The geological development history of the region started in the early and middle and upper Jurassic periods. In the Kvesheti-Kobi zone upper Jurassic – lower Cretaceos (Valanginian) flysch formation and Pliocene Quaternary lava flows and volcanic strata are present. The area belongs to Shaori-Pasanauri carbonate flysch of the Mestia-Tianeti zone, Greater Caucasus area.

39. Soils - The soil types present in the region differ by elevation. Grey and brown forest soils are present in lowlands. In hilly areas, medium and small thickness forest grey soils - humus and calcareous soils are found. At higher elevations forest zone soils are replaced by caespitose and caespitose- turfy soils. Most parts of the Kazbegi territory are covered with mountain and meadow caespitose (up to 1,100 – 2,600 m above sea level) and primitive soils. The forest light grey soils are found in the gorges of river Tergi and its several tributaries. Alluvial soil is present along the bottoms of the river gorges. In the highland areas soil is devoid of forest cover. Testing of soil quality in Kvesheti and Kobi did not reveal the presence of any levels of contamination in roadside soils elevated above national standards.

40. Natural Hazards - Due to geological compositions, landforms and steep slopes large amounts of weathered and talus material accumulate at the top of the gorges. Combined with the climatic conditions in the Project area hazardous processes – floods, flash floods, landslides, mudflows and snow avalanches – can occur. These events occur spontaneously and can be rather strong. Floods and flash floods are typical in the region. These events put communities living in floodplain areas at risk. The tributaries of the Tetri Aragvi are notable for mudflows.

[4] 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

41. Air Quality - Air quality in the Khada valley is good. No significant sources of air pollution are present. Vehicle emissions are low because of low traffic volumes, and air pollution is rapidly dispersed due to winds. The situation in Kobi and Kvesheti, Arakveti areas is different since the settlements are located along the main road where higher levels of vehicle emissions occur.

42. Climatic Conditions – The Project area comprises medium and high mountain areas. Elevation ranges from 870m to 4,000m above sea level, therefore the climate conditions are rather diverse. In the lower areas the climate is moderately humid with mild winter and warm lengthy summer. Average annual temperature in the low-sited areas (870-899 masl) is 9.7 °C. Precipitation level is around 750mm. In the higher-sited areas the climate is more humid, precipitation level increases and ranges from 1,200 till 1,600mm. The climate in Kazbegi municipality is moderately humid. At comparatively low elevation (around 1,700m, up to 2,000m) winter is cold and dry, summer – cool. Steady snow cover persists for 3-4 months. In the 2,000-2,600m zone winter is comparatively dry, summer – cool and short. Average temperature of around 10 °C lasts 1-3 months. For 4-5 months temperature is below 5 °C. Temperature of the warmest month is 10-14 °C. In the upper zone, west winds dominate. Precipitation level is 1,000-1,200mm.

43. Hydrology - The Project road crosses several rivers in the Project area. Initially it runs adjacent to the Tetri Aragvi river in Kvesheti and Arakveti before crossing the river via Bridge 2 to the Zakatkari plateau. After leaving the plateau the road crosses the Khadistskali river gorge via Bridge 3, a 164m high arch bridge. After the bridge, the road continues up the Khada valley crossing the Khadistskali river again via Bridge 6 just before Tskere. After leaving the main Tunnel 5 close to Kobi the road crosses Narvani river via an existing bridge. The Narvani is a tributary to Tergi river. The Baidara river also runs west to the site in this area and a connection to the existing road will be provided over this river. The proposed spoil disposal sites for Lot 1 are partly located along Tergi and Baidara rivers, close to Narvani riverbed. Surface water sampling in the Project area indicates that water quality in the rivers is within the national limits set for surface water bodies.

Biodiversity and Nature Conservation

44. The proposed Project lies within the Greater Caucasus Corridor[5] biodiversity hotspot, an area of some 4.68 million hectares that cover most of the middle and high mountain areas of the Greater Caucasus Range.

45. The northern end of the project and northern portal lie within (or under) the proposed Kazbegi Key Biodiversity Area (KBA) and Kazbegi Important Bird Area (IBA) which is designated for notable species including breeding populations of Caucasian Black Grouse, Snowcock, Corncrake and several species of birds of prey. The project corridor itself does not appear to be of particular importance for IBA and KBA trigger species, with the exception of a pair of Egyptian vultures which are reported to nest in some years near the proposed Kvesheti tunnel. The area is also part of a broad migratory flightpath with over 30,000 raptors a day recorded at peak migration times in the vicinity of the Jvari pass. The high mountains at the back of the Khada valley itself mean, however, that this valley is considered to be of lesser importance, as shown by recent survey results.

46. The project also runs (at a depth of over 200m) under a small portion of the fragmented Kazbegi National Park (which has recently been expanded in area) and proposed Emerald Network site. Whilst this a legally protected area administered by the Kazbegi National Park Administration it will not be affected by the project and the National Parks Authority have confirmed that no specific study is required for this site. None of the proposed spoil disposal sites are within the existing or proposed expanded National Park.

5 https://www.cepf.net/sites/default/files/final.caucasus.ep_.pdf

47. Georgia has identified 27 priority habitats considered both sensitive and under threat, of which two habitats have been potentially identified within the Project area. These are grass marshes potentially present on the Zakatkari plateau and areas of sub-alpine birch krummholz near the northern portal of Tunnel 5. Three others "natural" habitats are also present within the Project area, but all other habitats are considered heavily modified, by a combination of severe over- grazing and agricultural activity around the local villages.

48. Forested areas within the Project area are generally patchy and partly modified and of only low-medium conservation value. Limited areas of natural forest are present (e.g. in the Khadistskali gorge) and these are considered to be of medium to high local conservation value. These are typically mixed-species deciduous forests, with oak and hornbeam although at the higher elevations of the northern portal more conifer trees are found. Narrow strips of riparian woodland dominated by *Alnus barbata* are present alongside rivers and streams.

49. All of the valleys within the Project area support "braided" rivers with seasonal flows that are heavily dependent upon the time of year (with greatest flow after snowmelt). Of these the three most important for the project are the:

- Tetri (or "White") Aragvi which runs past Kvesheti (where the road will cross it) and ultimately provides much of the drinking water for Tbilisi
- Khadistskali River which runs through the Tskere valley (the project route) to join the Aragvi at Kvesheti
- Tergi River which runs adjacent to the northern portal of Tunnel 5 before ultimately draining via Russia to the Caspian Sea.

50. No critically endangered or endangered flora species (either IUCN RL or Georgian RL) have been recorded from the Project area and species recorded or considered potentially present are generally common across the region. Four endemic species of flora were identified in site surveys, mostly around the northern portal of Tunnel 5, however, they are all common in the region.

51. Three species of birds within the broader Project area qualify as unique or endemic populations namely Caucasian Black Grouse, Caucasian Snowcock and Corncrake. All three have the potential to be located within the Project area, although the snowcock is typically found at higher elevations and key local populations for the grouse are found deeper within the National Park. A wide range of important birds of prey are either resident in, or migrate through the Project area, including Georgian Red List (GRL) and IUCN 'vulnerable and 'endangered'' species.

52. 19 large mammals are recorded from the broader study area, of which six species are considered both notable and potentially present within the broader area (Brown Bear, Eurasian Lynx, Eurasian Otter, Chamois, Tur and Grey Wolf). Of these only otter, bear and wolf have been confirmed within the road corridor, with the former restricted to river habitats and latter two common across the region. Several other species of small mammals, reptiles and amphibians are also recorded as potentially present in the Project area, of which the Kazbegi Birch Mouse and Dinniks Viper are considered notable.

53. Around 30 bat species are found in Georgia, all of which are legally protected. Of these four "notable" species and a further 14 non-notable species may be present in the Project Corridor. Of the notable species one, the Giant Noctule, is considered "Vulnerable" by IUCN, whilst the others are considered "Least Concern".

54. Whilst the Project AoI itself is not considered to represent especially important habitat for most species of fauna or flora present, for some species such areas are present within the broader National Park. Indeed, for Black vulture, this broader area is considered to represent "Critical Habitat" (in the context of IFC Performance Standard 6 and EBRD Performance Requirement 6) as over half of the national breeding pairs are found within the Park. These birds are not, however, expected to be affected by the Project.

55. For a number of other "notable" species, habitats in the Park may be considered to represent "Priority Biodiversity Features" (as outlined in EBRD Performance Requirement 6). These include birds such as Egyptian, Bearded, and Griffon vultures, Golden Eagle, Great Rosefinch, Güldenstädt's Redstart, Corncrake, and Caucasian Black Grouse. The Kazbegi National Park also represents important habitat for several mammal species including chamois, brown bear, lynx, otter and the Kazbegi birch mouse, as well as the endemic Dinniks viper. Certain fish (e.g. trout) in the rivers are also considered nationally at risk. Most of these species will not be materially affected by the project, although Egyptian vulture are believed to breed in the crags near Kvesheti. For these, and other species at greater risk of impact, a precautionary approach has been taken and species-specific action plans have been developed as discussed under the "key impacts identified" section below.

Economic Environment

56. The socio-economic household survey (HHS) undertaken as part of the Land Acquisition and Resettlement Plan (LARP) interviewed 136 households in total in the Project area with 425 members; of these, 52% were male and 48% female. Of the 425 interviewed individuals, 36 were identified as vulnerable, 35 of them are below poverty line and one is an internally displaced person.

57. According to the HHS results on employment status, 26% of surveyed people are employed, almost 24% are unemployed, 13% are housewives, 10% are students or pupils, and 19% are pensioners. 70% of HHS respondents receive less than 600 GEL per month. Higher classes of income greater than 1000 GEL per month are received only in Kvesheti and Arakveti (6% of survey respondents), rather than in the Khada Valley (none of the survey respondents).

58. Households engaged in the Project area indicated that agriculture, livestock and apiary are all activities in which they are engaged. Focus group discussions (FGDs) also indicated that livestock is the primary financial source for households, while agricultural and apiary activities are generally undertaken for subsistence with excess produce sold for profit. It was reported during stakeholder engagement that roadside markets provide some economic opportunities for local people, for example through selling handcrafts, wild produce and honey.

Social and Cultural Resources

59. The population by settlements in the Project area and the change from 2002 to 2014 census years shows a strong outflow of individuals in both locations over the 12-year period. Migration is a serious issue. The high number of elderly residents was reported in engagement meetings; this is driven by youth leaving the area to receive their higher education, while young parents often move to larger villages in the area (e.g. from the Khada Valley to Kvesheti) or to Tbilisi in order to provide better health care and education for their children.

60. In many villages remain a number of temporarily occupied, or abandoned, houses. In the Kobi area, 4 of 18 villages have permanent occupants (i.e. 78% are abandoned or have semi-permanent occupancy), while in Kvesheti region, 7 of 31 villages are permanently occupied (i.e. 77% are abandoned or have semi-permanent occupancy). This status limits investment in accommodation improvements and social infrastructure support to smaller villages.

61. In Kvesheti, it was reported during stakeholder interviews that access to emergency services is limited and is heavily dependent on availability of resources, for example, ambulances. Further, it was described that road accidents happen regularly, but that their severity and wait time for services will determine whether accident victims are transported by road to a nearby health facility, or by helicopter to Tbilisi.

62. Villages in the Project area are on the central power supply; for the Khada Valley, villages are connected by a power line from Kvesheti, while in Kobi this connection is from Kazbegi municipality. All villages in the Project Area and all surveyed households have access

to electricity. A spring located north to Tskere supplies water to Tskere and the villages located at lower elevations within the Project area. A simple water supply system consisting of small tank and metal pipes was built in former soviet times. Since then more pipes have been added. The flow is stable throughout the Project Area and only slight seasonal variation can be observed. The quality of water is not controlled.

63. People in the Khada Valley report that they travel by foot along the road down the valley to get to Kvesheti or try to take the journey with others who may be travelling the route by car (i.e. up to 9km journey from Tskere), however not all vehicles suitable to travel to the higher elevations in the Valley, particularly in winter, on steep and rough terrain.

64. Within the gorge area only small tracks are present allowing limited movement of local vehicles to and from the small villages doted around the valley. Accordingly, noise levels in this area are very low, with only wind and birdsong generating any kind of noise. Accordingly, no baseline noise monitoring has been undertaken in these areas.

65. Elevated noise in the Project area are only a result of vehicle movements along existing main roads in Kvesheti and Kobi. There are no elevated noise levels in Khada valley. Baseline noise monitoring undertaken as part of the EIA indicated that noise levels at the monitored locations are generally above IFC nightime limits and within IFC daytime limits. Noise levels are quite constant throughout the day. This is caused by the fact that the major noise sources, the heavy goods vehicles, move along the given road section both, during the day and at night (many of them prefer traveling at night along the less loaded road).

66. A wide range of physical cultural heritage can be found in the Project area. The Khadistskali Gorge itself is often referred to as the Gorge of 60 Towers. Accordingly, most of the physical cultural resources (PCR) identified in the Project area are towers, in addition to a few churches, some memorials and three cemeteries. Nearly all of the identified PCR is set back from the proposed alignment more than 50 meters. The exceptions are a religious cross located close to Kvesheti, the cemetery in Tkesere, a cemetery in Kobi, a tower on the plateau close to Zakatkari, the remains of a tower close to the interchange on the Begoni plateau and a war memorial in Kobi.

6. Key Impacts Identified

67. The EIA has identified a range of environmental and social impacts that will arise during all phases of the Project. The key impacts are summarized below.

Design / Pre-Construction Phase

68. Air Quality – lack of foresight in the siting of construction camps, rock crushing plants, concrete batching plants in the pre-construction phase could lead to significant air quality impacts in the construction phase, especially to sensitive receptors.

69. Soils – Productive soils can also be impacted without due consideration of their value when locating access roads, camps, plant, etc. Soil erosion can also occur on embankments and around structures if adequate consideration of this issue is not considered in the design phase.

70. Health safety – Failure to incorporate a full range of safety measures into the road design may result in accidents and even deaths on the road, especially close to residential areas.

Construction Phase

71. Air Quality - During construction of the road, air quality may be degraded by a range of operational activities including; exhaust emissions from construction machinery; open burning of waste materials; and dust generated from haul roads, unpaved roads, exposed

soils, material stock-piles, etc. This can lead to health impacts to locals and impacts to ecology and crops.

72. Soils - Potential soil contamination is a possibility in the construction phase resulting from poorly managed fuels, oils and other hazardous liquids used during the project works. It is also possible, that without adequate protection measures soil erosion could occur on road embankments, areas of cut and at material stockpiles.

73. Surface Water – Impacts to surface water and groundwater could occur through improper operation of construction camps, asphalt plants, etc. Poor construction management around bridges and close to surface watercourses could also lead to pollution incidents. Without due care temporary drainage structures may also fail, or get obstructed with construction debris, leading to flooding of property and access roads. Technical water may be sourced from rivers in the Project area. The required amounts, potentially 200 m^3 per day (0.002 m^3/s) are insignificant especially if excess water from tunnel dewatering can be re-used.

74. Groundwater – Impacts to groundwater include spills and leaks of hazardous liquids used at construction sites and camps and potential impacts to groundwater resources during tunnel construction (discussed in more detail below).

75. Bridge Construction - Bridge construction activities may increase silt load in the river during construction at bridge sites and may result in accidental spillage of concrete and liquid waste into rivers. This may impact upon the ecology of rivers and aquatic wildlife. However, the bridges have been designed to limit the amount of bridge piers in rivers and as such impacts to rivers from bridge construction are not likely to be as significant.

76. Habitat and General Ecological Impacts – A range of Project related activities may have negative impacts upon biodiversity in the Project area, including; 1) Direct Habitat Loss from Vegetation Clearance (Road corridor & compounds and Spoil disposal sites), 2) Impacts from vehicle movements (including transport of people and equipment) and use of machinery and equipment, 3) Impacts from working compounds and camps (including production of wastes and indirect worker pressure), 4) Water crossing construction, 5) Water abstraction e.g. for cement production, dust control, and 6) Access Roads. However, the route has largely been selected to avoid impacts to notable habitats (as noted in the section on Alternatives), although small areas of sub-alpine birch will be affected along with other small areas of natural woodland habitat.

77. Notable Species - The project has the potential to impact on notable species in a number of ways, including; 1) Habitat loss, conversion, degradation and simplification, 2) Fragmentation, 3) Changes in water conditions (hydrological impacts), 4) Habitat pollution including deposition and runoff, 5) Direct mortality, 6) Disturbance to species including visual and noise disturbance, and 7) Spread of non-native or invasive species.

78. The project has sought to avoid impacts to notable species from the outset through design of the route to avoid sensitive habitats. Wherever practical already degraded habitats (e.g. existing roads and tracks) are used or habitats of low biodiversity value (e.g. overgrazed pasture), and the use of tunnels will also avoid many impacts. Additional mitigation will be managed throughout the construction works by the use of an on-site Ecological Clerk of Works (one per Lot). This will involve a combination of both Good International Industry Practice and species/activity specific mitigation during construction. Additional conservation measures will be delivered through a series of species-specific actions as outlined in the specific action plans which are included in the Project **Biodiversity Action Plan (BAP)**. The Engineer will have the overall responsibility for the implementation of the BAP with support from the Contractor.

79. Designated Sites - The northern end of the route involves a slight overlap with the designated Kazbegi National Park (this also takes into account the newly expanded portion of the park), IBA and KBA. Direct impacts in these areas have been limited through appropriate route selection and tunneling. The small areas that will be affected by the project are not

considered to be important for the specific species for which the sites are designated. Impacts will be further reduced as described above as well as by sensitive timings of works, and appropriate working methodologies (including noise reduction and pollution control) as well as habitat restoration.

80. State Forest Fund – A number of trees will need to be cut within State Forest Fund areas. The trees cut in these areas will need to follow the procedures for de-listing, cutting and removal as described in the EIA.

81. Land Use - As the road involves construction of an almost entirely new alignment through mostly uninhabited land and the fact that large portions of the road are located on bridges or in tunnels the level of resettlement and compensation is lower than would otherwise be expected if the existing alignment was being upgraded.

82. Road Infrastructure and Access - Impacts resulting from Project works to infrastructure will include some minor road diversions and temporary blocking of access routes. The road will only follow the exiting road for a few kilometers between Kvesheti and Arakveti and after that will be a completely new alignment. As such there will only be short term localized impacts to the existing traffic flow in these areas as the road is constructed. During the construction phase pedestrians may also have to use alternative routes between Kvesheti and Arakveti.

83. It is possible that local roads (and tracks in the Khada valley), which may be used as temporary site access roads, could be damaged by the Contractors vehicles transporting materials to and from the various work sites along the alignment. Use of these access roads may also have negative impacts, in terms of issues such as noise and dust, on the local community who live close to these roads (e.g. the proposed Path 1).

84. Utilities - Gas pipes, electricity transmission and distribution lines and other utilities are located throughout the Project corridor. It is possible that these utilities will need to be temporarily removed, or supply temporarily disrupted, during construction.

85. Waste - Road construction will inevitably generate solid and liquid waste products including inert waste (e.g. concrete, wood, plastics, etc.) and hazardous waste (e.g. waste oils, batteries, etc.). In addition, uncontrolled discharges of sewage and 'grey water' (e.g. from washrooms and canteens) from construction sites and worker's camps may also cause odors and pollute local water resources.

86. Spoil Material - A large volume of spoil material will be generated from the tunneling works. Estimates provided by the Detailed Design Consultant indicate that after use of material as fill (for embankments, etc.) around 3.6 million m^3 of spoil material will remain from Project works including tunnels. Some of the material may be suitable for construction works, e.g. rip-rap, temporary roads, etc. (around 350,000 m^3). However, the remaining material will need to be disposed of in spoil disposal sites. Some of the sites identified for use have environmental and social constraints, e.g. some areas are classified as notable habitat, or habitat for otters, and as such measures need to be put in place to limit the impacts to these areas.

87. Construction Camps - Construction camps constitute a temporary land use change and raise issues related to activities such as impacts to air quality; poor sanitation arrangement and improper methods used for disposal of solid wastes and effluent; and transmission of communicable diseases to the local people by the construction workers due to inappropriate health monitoring facilities. The Contractor is responsible for choosing the location of his camp, and as such it is not possible at this stage of the Project to make specific assessment of the camps impacts, e.g. on biodiversity.

88. Tunnel Construction - The main typical environmental problems linked to the construction of underground works are; a) Triggering of surface settlements, structures collapse and slope instabilities, b) Drying up of springs and groundwater alterations, c) Storage and use of excavated materials, d) Noise, e) Vibrations, f) Pollution of groundwater, mainly after the realization of stabilization works by injections. Items c, d and e are discussed

in other sections, Spoil, Noise and Vibration. Triggering if surface settlements, if it does occur, is unlikely to have significant impacts as there are no settlements above the tunnels. However, Aqua Geo, a water bottling company, operate several boreholes in Kobi and it is possible that construction of Tunnel 5 could affect the quality and quantity of water available in these boreholes.

89. Community Health and Safety – Construction activities may result in road traffic accidents between vehicles, pedestrians and vehicles and livestock and vehicles. There will also be short term impacts to noise and air quality, which may impact upon the health of the local population. Migrant workers may also increase community health and safety risks, for example, through the spread of sexually transmitted diseases.

90. Landscape - The construction phase visual impact will be local and temporary. The activities during construction that will affect the aesthetics of the area include land clearing, excavation, storing of material in stockpiles and dumping at the spoil disposal areas.

91. Lighting – Light from construction sites and camps may result in light spill and glare. These issues can impact upon residential areas as well as biodiversity in the Project area.

92. Occupational Health and Safety - Workers' rights including occupational health and safety need to be considered to avoid accidents and injuries, loss of man-hours, labor abuses and to ensure fair treatment, remuneration and working and living conditions.

93. Physical and Cultural Resources – Most of the physical cultural resources within the Project area are set back more than 100 meters from the Project road and are unlikely to be impacted during construction. However, some cemeteries, churches, towers, war monuments and religious crosses have been identified throughout the Project corridor that are within 50 meters of the alignment and could be impacted during construction works, e.g. damaged by construction equipment or vibration. It is also possible, given the rich cultural heritage of Georgia, that chance finds could occur during excavation works.

94. Noise - The potential noise related issue during construction of the project is disturbance to sensitive receptors in the Project area. The main sources of noise and vibration during construction of the project include; a) Construction machinery, b) Drilling activities, c) Haulage and general vehicle movements, d) Concrete mixing and aggregate production systems; and e) Construction Camps / Ancillary Facilities. A noise model prepared for the Project has indicated that many of the villages within the Project corridor will be impacted by high levels of construction noise. Elevated noise levels also have the potential to disturb wildlife in the Project area, such as bats.

95. Vibration – A vibration assessment prepared for this EIA has indicated that no residential properties are likely to be impacted as a result of general road construction works or by bridge pilling and tunnel excavation works. However, several cultural resources, including religious sites and towers are located close to areas where bridge piling and tunnel excavation works could potential impact upon them.

Operational Phase

96. Air Quality – The main source of air pollution during the operational phase will be vehicles moving on the highway. The main pollutants from vehicles are: CO; NO_2; SO_2; carbon dioxide (CO_2); and particulate matter (PM). An air dispersion model was prepared for this EIA to assess the potential operational impacts of the road on air quality in the future. The analysis of the impact on operational phase air quality determined by the traffic on the new road suggests that there are no significant negative impacts on the environment with the exception of an area in Kobi which may, by 2043, have NO2 values above the national standard (but will be within IFC limits). The model did not identify any specific issues around the tunnel portals.

97. Hydrology – In rare circumstances there could be a major spill of oil / fuel from tanker trucks. Such spills could impact significantly on the rivers in the Project area given the proximity of the road to these surface water courses in many locations along the alignment.

Drainage of run-off from bridge decks could flow directly to the rivers if correct drainage is not installed on the bridges. This could be a problem if the bridges have accumulated oils and grease during dry periods and they are suddenly washed out during heavy rainfall.

98. Biodiversity - Impacts to notable habitats during operation of the road will result from disturbance, potential pollution and increased access to habitats. Given the proposed mitigation impacts to habitats per se are expected to be of only low/medium significance. The operation of the road will result in direct impacts to notable species from road traffic accidents as well as indirect impacts associated with disturbance, habitat fragmentation, pollution and increased access to habitats. Given the proposed mitigation, including the use of species-specific BAPs, such impacts are expected to be reduced to an acceptable level.

99. Noise – A noise model was developed for this EIA to determine the noise levels on the Project road in the years 2024 and 2028. The results of the model showed that without any noise mitigation measures by 2028 around 88 receptors in the Project area would be impacted by noise levels above IFC guideline limits, notably for the nighttime period. The only exceptions are Tskere, where the extension of the cut and cover section of Tunnel 5 appears to be extremely beneficial from a noise mitigation perspective and Benian-Begoni where the road is located in an area of cut thereby providing a natural sound barrier to the village.

100. Access – The inclusion of bridges and tunnels in the design means that there are few areas where access is blocked due to the new road. In various locations underpasses have been provided (some as a result of stakeholder consultations) or local roads diverted under bridges to allow free movement of people and cattle around the valley. Fencing has been only adopted for tunnel portals and operational areas and will therefore not impact upon access.

101. Vibration - Highway traffic is not likely to have any measurable impact on the structures or on comfort.

102. Lighting – In terms of impacts on the landscape large portions of the road would need to be lit for safety reasons and to meet design specifications, e.g. lighting of junctions and bridges. As such, lighting of the remaining portions of the road is unlikely to add significantly to the effects of the light on the landscape although it will still have a negative impact to a certain degree. Street lighting can also impact upon the local community and residential areas if the light is not shielded correctly and light 'spill' occurs. In these terms light spill only has the potential to impact upon the residential areas of Kvesheti and Arakveti, all other villages and properties are too far away from the road to be significantly impacted.

103. Health and safety – Rehabilitation of the road will result in numerous beneficial health and safety impacts, including; reduced dust levels, faster emergency response times; improved pedestrian crossing facilities and improved road geometry.

104. Visual Impact - Cut slopes, embankments, concrete bridges and tunnel portals will have an impact on the landscape within the Project area throughout the Project lifecycle. The mitigation measures outlined below may go some way to enhancing the aesthetic value of the Project especially as vegetation grows back around construction zones.

Cumulative and Induced Impacts

105. The EIA has identified a number of potential cumulative and induced impacts that may result from construction and operation of the road, such as increased legal and illegal tree felling, poaching, illegal development and introduction of invasive alien species. Cumulative impacts associated with other plans for the area have been discussed as part of the EIA including the Gudauri Recreational Area which is deemed to have a beneficial impact in the Project Area. The induced benefits of the Project relate to economic benefits associated with increased accessibility of households in the area to market opportunities (e.g. tourism), and greater efficiencies of local, regional and international movement of goods along the new alignment.

7. Mitigation and Management Actions

106. Initially the Contractor, RD and Engineer will be responsible for setting up a range of pre-construction plans and stakeholder consultation / engagement procedures. The following table provides a summary of those requirements. These requirements are applicable to both Project Lots.

Table 1: Pre-construction Management Measures

#	Issue	Proposed Management Measures
1	Disclosure of project information	Implementation of the **Stakeholder Engagement Plan** (SEP) – Section 6.2.2.3, EIA Disclosure Phase
2	Development and implementation of the mechanism to resolve environmental complaints due to the project implementation	During Construction, the Contractor shall implement the **Stakeholder Engagement Plan** (SEP) – Section 6.2.3, Construction Phase.
3	Lack of Consultation	Prior to the establishment of areas, such as construction camps the Contractor shall undertake consultations with local stakeholders to ensure that the sites selected are agreeable from an environmental and social perspective. In addition, throughout the construction phase the Contractor will be responsible for regular community meeting to consult with local residents regarding issues that arise through construction, e.g. dust on local roads.
4	Development of sub-plans	Prior to start of site works, the Contractor shall prepare his **Specific Environmental Management Plan** (SEMP) which will include the following topic specific and site-specific plans: **Topic Specific** • Waste Management Plan • Topsoil Management Plan • Waste Water Management Plan • Noise Control Plan. • Construction Vibration Management Plan. • Spill Management Plan. • Air Quality Management Plan. • Occupational and Community Health and Safety Plan • Labor and Working Conditions Management Plan • Traffic Management Plan • Emergency Response Plan • Ground Water Management Plan • Recultivation/Land Restoration Plan • Biodiversity Management Plan • Tunnel Blasting Plan • Method Statement for the Safe Management of Asbestos • Cultural Heritage Management Plan • Local Content Management **Site Specific** • Spoil Disposal Plan • Asphalt Plant Management Plan • Concrete Batching Plant Management Plan • Bridge Construction Plan • Construction camp layout plan. • Construction Camp Management Plan • Method Statements for temporary storage areas • Method Statements for temporary River Crossings • Method Statements for temporary Access Roads • OHS Plans for Tunnels • Accommodation Option Risk Assessment • Code of Conduct (for workers) • Tunnel Transition Plan

#	Issue	Proposed Management Measures
		Plan.
5	*Other Plans*	*Prior to the start of construction, the Engineer shall prepare a **Biodiversity Monitoring and Evaluation Plan** (BMEP to monitor and report on the Project **Biodiversity Action Plan**. This BMEP will contribute directly and significantly to the achievement of the National Biodiversity Strategy and Action Plan (NBSAP) for Georgia including its objectives of developing a biodiversity monitoring system and an active and integrated biodiversity database to ensure sustainable use and conservation of biological resources.*
6	*Obtaining licenses, permits and agreement*	*The Contractor will be responsible for obtaining permits and licenses for: a) the operation of any asphalt plant, b) spoil disposal area, c) discharge to water bodies, d) abstraction of water, e) operation of borrow pits or quarries (although this is considered unlikely), and f) waste disposal, both hazardous and non-hazardous.*

107. In addition to the above a range of impacts and mitigation and management measures have been prepared as part of this EIA to be implemented by the Contractor during the Construction phase and the RD during the operational phase. The following tables provides a summary of the key potential impacts and the mitigation associated with the Project and notes the residual impacts.

Table 2: Summary of Pre-construction and Construction Phase Key Mitigation

#	Aspect	Impact Mitigation	Residual Impacts
1	***Air quality***	*The Contractor shall strictly implement approved **Air Quality Management Plan**. In addition, he shall follow all of the mitigation and management measures included the EIA for **Air Quality, Section F.5.1** including for example, routine watering of access roads and using construction equipment and vehicles that meet national emission standards.*	*If the mitigation measures suggested are implemented as per the EMP, the residual impacts of the Project will be **minor**.*
2	***Soils***	*Soil Erosion and Contamination – The Contractor will strictly implement approved **Spill Management Plan and Spoil Management Plan**. He will also follow all of the mitigation and management measures included the EIA for **Soils, Section F.5.3** including for example; locating stockpiles away from any watercourse or wetlands to avoid sedimentation of these areas, protecting stockpiles from erosion and storing fuels, oils and hazardous substances in paved areas with secondary impermeable enclosure capable to hold 110% of the stored volume.*	*If the mitigation measures suggested are implemented as per the EMP, the residual impacts of the Project will be **minor**.*
		*Soil Stability – The Contractor shall follow all of the mitigation and management measures included the EIA for **Soils, Section F.5.3** and the general measures such as avoiding removal of vegetation outside the boundaries of the RoW and areas temporarily used for the project and stabilizing the slopes in a shortest feasible time after completion of works on the site.*	
3	***Hydrology***	*Impact on surface water quality – The Contractor will strictly implement approved **Spill Management Plan**, **Waste Water Management Plan, Bridge Construction Plans and Spoil Management Plan**. He will also follow all of the mitigation and management measures included the EIA for **Hydrology Section F.5.4** including for example; Arrange settling basins to manage tunnel drainage water; check quality of drainage water (including pH) from settling basins prior to discharge into environment and prohibit untreated discharge of any potentially contaminated effluents. The Contractor will also be responsible for preparing and following method statements for temporary roads, river crossings and storage areas. All of these plans will make specific reference to the measures to protect soils and water from pollution and degradation.*	*If the mitigation measures suggested are implemented as per the EMP, the residual impacts of the Project will be **minor**. However, impacts to the boreholes maybe more significant and this is addressed below under the item on tunnels.*
		*Stream blockage, drainage obstruction – The Contractor shall strictly implement the **Spoil Disposal Plan** approved by Engineer, RD, ADB and EBRD. Since some of potential sites selected for spoil disposal are located in the riverbed, in case the use of these site is authorized by the MoEPA, provide adequate protection measures to ensure stability of the stockpile and minimize the risk of stream blockage during high water.*	

#	Aspect	Impact Mitigation	Residual Impacts
		*Bridges – The Contractor shall implement the Bridge Construction Plans. He shall also follow the general mitigation measures for bridges as outlined in **Section F.5.4 Hydrology**.*	
		*Ground water availability – The Contractor shall strictly implement approved **Ground Water Management Plan**. He will also monitor ground water levels and quality in pre-selected locations near the tunnel excavation areas (the springs/sources used by the local community and specifically the boreholes used by Aqua Geo).*	
		*Potential contamination of groundwater due to tunneling – The Contractor shall strictly implement approved **Ground Water Management Plan**. In addition, he will apply measures such as using non-toxic slurry and additives and minimize impact of these materials to reduce risk of impact on ground water quality. Monitoring of the Aqua Geo boreholes shall also be undertaken to determine the impacts of Tunnel 5 works on these boreholes.*	
4	***Habitat and General Ecological Impacts and Designated Sites***	*The Contractor shall ensure that he employs, for the duration of the Project, suitably qualified **Ecological Clerks of Works (ECoW)**, to be supervised by the Project Developer Biodiversity Specialist.* *The Contractor shall strictly implement his **Biodiversity Management Plan (BMP)** and apply the mitigation measures proposed in **Table 108 – Generic Habitat Impacts and Mitigation.** He shall also apply Offsetting as outlined in **– Areas of Offset required for Notable and Natural Habitats.*** *The Contractor, through his Ecological Clerk of Works (ECoW) will undertake a range of pre-work surveys to inform and update the **BMP.** Specific surveys shall be undertaken for breeding birds, bats, otters and large carnivores.* *The Engineer / Contractor, through the support of contracted third parties, will implement the Project **Biodiversity Action Plan (BAP)** as additional mitigation. To track the performance of the BAP a **Biodiversity Monitoring and Evaluation Program (BMEP)** shall be implemented by the Engineers International Environmental and Biodiversity Specialist.*	*Residual impacts on notable habits are expected to be **minor / moderate**. Whilst some non-notable habitats will be lost, use of Ecological Clerks of Works (ECoW) to avoid notable habitats, aligned with sensitive routing, use of TBM, habitat restoration and offsets will reduce such impacts to acceptable levels. In addition, implementation and monitoring of the BAP will improve the long-term biodiversity management in the Project area.*
5	***Notable Species***	*Impacts to notable species will be minimized by the use of the ECoW and the application by the Contractor of the mitigation proposed in **Table 112 – Generic Construction Mitigation (GIP)** to Minimize Impacts to Notable Species and the*	*Residual impacts on notable species are expected to be **moderate**. Direct impacts will be associated with habitat loss, disturbance and accidental mortality. Indirect impacts*

#	Aspect	Impact Mitigation	Residual Impacts
		*mitigation measures for notable species as outlined in **Section F.6.2 – Notable Species.*** *Further mitigation will be delivered through the Contractors **Biodiversity Management Plan (BMP)** and the above mentioned **Biodiversity Action Plan (BAP**) and its associated species specific plans.*	*could also arise from fragmentation and introduction of people to the valley. The implementation of the proposed mitigation, including the proactive use of the ECoW, and the implementation of Biodiversity BAPs for key species, means that such impacts are, however, expected to be reduced to an acceptable level.*
6	***Infrastructure and Utilities***	*Community Facilities – The Contractor shall a) Immediately repair any damage caused by the Project to community facilities such as water supply, power supply, communication facilities and the like, b) Provide temporary alternative options if appropriate, c) Repair any accidental damage to third party's property caused by the project activities, d) Communicate grievance mechanism to communities and e) Implement 24-hour community complaints hotline.*	*Only **minor** residual impacts are anticipated if the TMP and the other mitigation measures outlined above are implemented correctly.*
		*Roads – The Contractor shall strictly implement approved **Traffic Management Plan** (TMP) and ensure the following mitigation measures are followed; a) Post traffic advisory signs (to minimize traffic build-up) in coordination with local authorities, b) Regularly monitor traffic conditions along access roads to ensure that project vehicles are not causing congestion, or are causing traffic hazards, c) Ensure alternative access whether appropriate, d) Implement 24 hour community complaints hotline.*	
7	***Waste***	*The Contractor will strictly implement approved **Waste Management Plan**. He will also follow all of the mitigation and management measures included the EIA for **Waste Management, Section F.7.6** including general measures such as providing garbage bins and facilities within the project site for temporary storage of domestic solid waste and construction waste and training staff in best practice.*	*In general, if the mitigation measures suggested are implemented residual impacts will be **minor**.*
8	***Spoil Material***	*Recommended to avoid the use of SDL-22.7 and SDR-22.3 spoil sites. Alternatively portions of these sites can potentially be utilized if the Contractor provides suitable mitigation measures as part of his **Spoil Disposal Plan** and any required national EIA.* *Under no circumstances shall the following habitats be used for spoil disposal sites:* • *Located within any national park (as per the updated park boundaries of January 2019).* • *Low Grass Marshes*	*Restoration of any spoil disposal area will take a number of years and as such the residual impacts for the spoil disposal areas are considered **minor/moderate**.*

#	Aspect	Impact Mitigation	Residual Impacts
		• *Sub-alpine Birch Krummholz*	
		Include a 50-meter buffer zone around the river Narvana for the protection of otters. The buffer zone shall also be fenced and signposted to prevent machines and workers entering this site. The site will also be inspected weekly by the ECoW to ensure no impacts to this buffer zone.	
		All ephemeral wetlands on the Plateau shall be demarcated and fenced. The spoil disposal site shall not encroach on the wetlands.	
		*Regarding construction of the spoil sites, they shall be graded to fit in with the surrounding landscape (as proposed by the drawings in **Appendix O** of this EIA). The design documents also propose specifications for side slopes of the spoil disposal areas and they shall be strictly followed to prevent collapse and soil erosion. All spoil sites will be reinstated as per the Contractors **Re-cultivation/Land Restoration Plan**.*	
		• *The Contractor shall strictly implement his **Spoil Disposal Plan**. A template for this plan is provided by **Appendix F**.* • *Spoil disposal sites will be located outside of sensitive sites. No spoil disposal Area shall be located within a national park. In addition, the Contractor will be required to prepare an EIA (or other E&S document requested by the national regulation) for any spoil disposal site to meet national requirements and be approved by MoEPA.* • *Spoil disposal site selection will require additional consultation with stakeholders, including those who may be directly affected through loss of land or access to resources.*	
9	***Land use impacts***	*A **Land Acquisition and Resettlement Plan** has been prepared for the Project to resettle or compensate affected people.*	*No significant residual impacts are anticipated if the LARP is implemented correctly. However, there will still be disruption to the local community during the LARP implementation process. A GRM has been prepared to manage complaints received during this process. Residual impacts are anticipated to be **minor** / **moderate**.*
10	***Tunnels***	*During the construction phase a key issue will be tunnel dewatering. To manage this issue The Contractor will pass all drainage water from the tunnel through a settlement tank. Weekly monitoring of the water quality from the tank will be*	*In general impacts will be minor during the construction phase. However, due to the potential impacts on the Aqua Geo boreholes*

#	Aspect	Impact Mitigation	Residual Impacts
		undertaken by the Contractor to assess for any pollution. If the drainage water meets drinking water standards it can be considered for re-use in any potentially depleted wells during the construction phase. In addition to ensure impacts to groundwater levels are not realized the Contractor shall implement his ***Groundwater Management Plan*** *for each tunnel. This will include monitoring of water quality and quantity in the Aqua Geo boreholes in Kobi.*	*the residual impacts are upgraded to* ***minor / moderate****.*
11	***Health and Safety***	*General Health and Safety – The Contractor shall strictly implement approved* ***Occupational and Community Health and Safety****,* ***Traffic Management, Waste Management, Emergency Response, Dust Management, Noise Management and Camp Management Plans****. He will also appoint a team of health and safety specialists to supervise implementation of mitigation measures, to ensure that environment, health and safety precautions are strictly implemented, evaluate efficiency of mitigation measures and identified new measures if required.*	*If the mitigation measures suggested are implemented residual impacts will be* ***minor****.*
12	***Landscape***	*The visual impact following to completion of works will be mitigated by clean up and re-cultivation of all sites temporarily disturbed for the needs of the project and re-vegetation of spoil disposal areas. Regarding physical works, the following measures shall be applied by the Contractor; 1) Reinstate all temporarily disturbed sites after completion of works, 2) Avoid using 'alien' plant species, 3) Choose colors of above ground sections of technical buildings at tunnel exits so to merge with environment, 4) Give priority to use of geotextile against shotcrete., 5) Use irregular shape stones for riprap, and 6) Avoid use of white concrete.*	*Construction works, including land clearing, cutting of slopes and developing tunnel portals will no doubt have a visual impact in the Project area. Realistically there is little that can be done about these temporary construction activities. Residual impacts will be* ***minor / moderate***
13	***Lighting***	*Impacts to Biodiversity – During the construction phase the work sites will not be lit except in exceptional circumstances. Where lighting is required it will be directional and the lighting strategy will be designed with the input of the ECoW. Only non-UV lighting sources will be employed. In addition, if lighting is used it should be shone away from the river during construction at dusk or in the morning. Or if needed in the river it should use shrouding to ensure that not all the river is lit up and passage along it is still possible in unlit locations.*	*If the proposed mitigation measures are employed the impacts will be* ***minor / moderate*** *due to the fact that in some instances lighting will be needed during works at night and they could impact upon biodiversity. However, oversight of such works by the Ecological Clerk of Works should reduce the incidences of impacts occurring.*
		Impacts to local community – All construction site lighting shall be turned off when construction activities have ceased for the day. In addition, the use low wattage lamps directing light downwards at work sites and camps shall be applied. Siting of construction camps away from residential areas will further reduce the impacts of lighting on residential areas.	
14	***PCR***	*The Contractor will a) Fence cultural monuments located in proximity to the project sites prior to commencement of works, b) Observe physical protection boundaries*	*Measures including demarcation and fencing of sites and the inclusion of a CHM on the*

#	Aspect	Impact Mitigation	Residual Impacts
		*for monuments (min 50m), c) Monitoring vibration effects at cultural heritage sites, d) Use chance find procedure as provided in **Appendix E**, e) Ensure presence of the Engineers **Cultural Heritage Monitor** is on the site if any excavation is planned (in particular in those locations that have been identified as sensitive), and f) Ensure the staff is familiar with chance find procedures and monument protection requirements.* *In addition, it is noted that Site #23 is located within 2 meters of a slip road connecting to a local access road off the main intersection on Begoni Plateau. It is recommended that the design of the slip road be moved at least 20 meters to the north of its current location to avoid impacts to this site in both the construction and operational phases of the Project. The site shall also be fenced during the construction phase.*	*Contractors roster, reduces the potential for significant impacts to occur. However, residual impacts may still be **low / moderate**.*
15	***Noise***	*The Contractor shall strictly implement approved **Noise Management Plan**. In addition, he shall follow all of the mitigation and management measures included the EIA for **Noise, Section F.8.5** including for example; the use temporary noise barriers while working in sensitive locations; no noisy activities (e.g., transport of materials along residential areas and other sensitive receptors, piling, etc.) during the night, etc.*	*Despite the fact that comprehensive mitigation measures have been set to manage construction noise there may still be instances where construction works may result in unanticipated elevated noise levels. However, these will only be temporary and localized. Good oversight from the Contractors HSE team and the Engineers environmental manager should further limit the impact of these types of incidents. Residual impacts will be **minor**.*
16	***Vibration and Blasting***	*To manage impacts associated with vibration the Contractor shall implement his **Construction Vibration Management Plan**. He shall also follow all of the procedures outlined in **Section F.8.6** including any real time monitoring of vibration in potentially affected areas including the identified PCR sites, especially in the area around Tskere. Where the results of the vibration monitoring (including visual monitoring by the Projects Cultural Heritage Monitor) show that the specified construction vibration limit is reached at a particular location, the Contractor shall suspend the construction activities that generate the excessive vibration at such location, notify the Engineer and with the approval of the Engineer take mitigative actions necessary to keep the construction vibration within the specified limit. The Contractor will also implement the **Blasting Plan** for all activities requiring blasting.*	*No significant impacts from vibration are anticipated during the Construction phase. In addition, the procedures outlined above provide measures to review and change construction methods based on monitoring results during construction. Residual impacts are **minor**.*

#	Aspect	Impact Mitigation	Residual Impacts
17	***Livelihoods***	*Skilled, semi-skilled and unskilled workers are required for the Project, some of which may be accessed from within the local area. Identification of potential candidates and readiness for work will need to be assessed by the Contractor prior to appointment of workers with support from the Labor offices of Dusheti and Kazbegi municipalities. Procurement policies in the EMP will encourage the use of local suppliers. The Project will ensure that labor conditions for its workforce (including contractor personnel) comply with all relevant requirements of the Georgian Labor Law, the ILO Conventions ratified by the country, and labor management provisions of Project Lenders. Local business development opportunities associated with the use of the road, or in support of others using the road, include creation of market places. Particular examples include at Kobi, which also creates a beneficial use for spoil, and the interchange at the Begoni Plateau, where a flat marketplace area as a stopping point for tourists also has the potential attraction of creating a lookout point from which to view the main span bridge across the Khada Valley.*	*Indirect job generation and procurement opportunities related to Project construction will have a **beneficial** impact on employment in the Project Area. Opportunities for local and regional suppliers, businesses, and service providers will be created, thus contributing to the positive employment effect as well as indirect job generation and procurement opportunities associated with construction of the Project.*
18	***Access Roads***	*General construction measures outlined under previous sections, such as air quality, will reduce the potential impacts of access roads. In addition, consultation with stakeholders has led to changes in access road locations which further limits impacts. In addition, the Contractor will be responsible for preparing method statements for all access roads which will be reviewed and approved by RD and the Engineer before they can be used.*	*Residual impacts will be **minor**.*

108. In the demobilization phase of construction impacts are largely limited to rehabilitation of temporary construction facilities, such as camp sites, asphalt plant, etc. These issues are not significant as the contractor generally removes everything for use on other Projects.

109. In addition to the above, during the operational phase of the Project a range of good practice measures have been provided to ensure that the road operates with due consideration to the environment and local community. The key measures, which will be implemented by the RD, are summarized in the table below, with the residual impacts presented in the conclusions of this executive summary below.

Table 3: Operational Phase Mitigation

#	Environmental Aspect/ Concern	Key Mitigation Measures
1	Air pollution by transport emissions	• Keep roadside vegetation intact. • Ensure proper state of maintenance of tunnel ventilation system. • Apply construction phase mitigation to maintenance works.
2	Impact on soil quality	• Monitoring of slopes, in particular after strong rains and snowmelt for identification of possible traces of erosion. • Implementation of mitigation measures defined for pre-construction/construction works during road repair/maintenance works.
3	Hydrology	• Ensure clean up and waste removal from carriageway and roadsides. • Maintain integrity and permeability of storm water drainage system to avoid blockage, overflow and direct discharge of untreated runoff into the rivers. • Ensure firefighting water is managed according to the requirements of the technical specifications. • Ensure maintenance and timely clean-up/removal of sediments accumulated in bridge deck runoff treatment facility and tunnel water drainage systems. Disposal of these sediments following the same procedure as set for the management of sediments from treatment unit (settling basin). • Maintain contracts with hazardous waste removal companies to ensure timely and safe removal of skimmed oil, other hazardous waste generated at technical buildings. • Monitor water quality in waste water recipient stream quarterly (50m upstream and 250m downstream the point of discharge). • Make sure (training) that tunnel operator staff is aware of material and waste management requirements. • Perform maintenance paving of the road sections and bridge decks only in dry weather to prevent runoff contamination. • At drainage discharge points, including interceptor tanks, reinstatement with native wetland plant species in discharge locations to remediate the water and provide soil stability.
4	Impact to wildlife caused by presence of road infrastructure.	• Register and analyze road kills. Develop additional mitigation measures if found to be necessary. E.g. install reflectors /local fencing, warning signs, speed reduction etc.). • Register and analyze bird – potential noise barrier collision incidents. Develop additional mitigation measures if found to be necessary. Consultation with ornithologist will be required. • Use light-sensitive photocells that activate automatically when light is or is not needed to reduce light pollution in service areas. • Prohibit poaching (ensure that tunnel operator staff is aware of the ban).
5	Impact on vegetation	• Monitor the status of re-cultivated and re-instated areas, such as spoil disposal sites.
8	Waste generation	• Install sanitary facilities and waste bins in the rest areas along the road. • Install waste collection bins in technical buildings area. • Use garbage bins fitted with lids to avoid scattering around and attraction

#	Environmental Aspect/ Concern	Key Mitigation Measures
		of scavengers. • *Dispose garbage according to agreement with Kazbegi and/or Dusheti waste management utilities.*
9	*Lighting*	• *Full horizontal cut off glass lens luminaires are installed at 0° uplift. These luminaires, in addition to reducing sky glow, help to minimise visual intrusion within open landscape.* • *Where possible use lower lamp heights.* • *To prevent future pollution issues, prohibit the use of sodium light bulbs is prohibited and use LED lights with a "neutral" color temperature of 4000K.*
10	*Local Economy and Livelihoods*	• *Creation of market places for local businesses.*
		• *Development of a 'visitor center'. This facility will act as a potential hub for agri-business, development of eco-tourism and for sustainable community development within the project area. The visitor center has been included as a project component to ensure that residents of the Khada Valley, particularly women get some direct benefits from the project and it will also act to promote sustainable eco-tourism development in the region.*
11	*Noise*	• *Construction of noise barriers as recommended as part of the Project noise model or any further requirements resulting from the pre-construction modelling to refine the specification and location of the barriers.* • *For all properties still above IFC guideline limits for noise the following options will be implemented by the RD:* o *Expropriation of properties, or* o *Waiver agreement signed with property owners.* • *Prepare planning guidelines based on prevention of noise impacts from road projects.*
13	*Use of Spoil Sites*	• *Consultations with residents in Kobi indicated that they would like the chance to develop some of the spoil disposal areas for car parking/cafes/market stalls, etc. This aspect should be considered further by the RD as part of ongoing stakeholder engagement with the local residents.*
14	*Resolve environmental complaints due to the project implementation*	• *During Operation, the Contractor shall implement the* ***Stakeholder Engagement Plan*** *(SEP) – Section 6.2.4, Operational Phase.*

8. Monitoring Actions

110. To ensure that all of the above mitigation actions are completed according to the requirements of this EIA, monitoring shall be undertaken of Project works by the Contractor and the Engineer. Specifically, both observational monitoring and instrumental monitoring shall be undertaken as follows:

111. Instrumental Monitoring – This shall be completed by independent specialists hired by the Contractor and will include routine air quality, water quality and noise monitoring during the construction phase. Schedules, parameters, locations are indicated by the EMP. The Contractor shall be responsible for contracting independent monitoring specialists during the construction phase. The RD will be responsible for operational monitoring, e.g. hiring independent monitoring specialists.

112. Observational Monitoring – The Contractor will employ a team of environmental, social, labor and health and safety specialists to continually monitor the works on site. This will also

include an Ecological Clerk of Works who will be employed by the Contractor to specifically monitor the works to ensure correct application of all biodiversity management and mitigation measures. The Contractors actions shall be continually monitored and managed by the Engineer throughout the Projects Construction phase. This will be achieved through weekly inspections of the Contractors environmental performance and his SEMP by national and international environmental specialists engaged by the Engineer throughout the construction period. The Engineer shall have the right to suspend works or payments if the Contractor is in violation of any of his obligations under the EMP and this EIA. In addition to the above, the international environment specialist will also have a biodiversity focused component to their role and will be responsible for ensuring the Biodiversity Action Plan (BAP) is implemented with the support of the Contractor and a team of specialists directly employed to complete the required work. They will also be responsible in their general environment role for identifying when Cultural Heritage Monitors are required to monitor the Project works and assess potential impacts on physical and cultural resources in the Project area.

9. Stakeholder Engagement

113. Stakeholder engagement has been undertaken throughout the development of the Project, with the view to determining and responding to the views of interested and parties potentially affected by the Project throughout the life of the Project, and ensure open and transparent, two-way communication between Project proponent, the RD, and stakeholders. The approach to engagement seeks to meet both national and international requirements.

114. To date more than 41 formal stakeholder consultation sessions (all documented in this EIA) have been undertaken to discuss the EIA and LARP and several other informal meetings have been held with environmental NGOs such as the Georgian Centre for Biodiversity Conservation and Research (NACRES) and the Caucasus Nature Fund (CNF) in order to gain additional understanding of Project specific biodiversity issues.

115. Engagement activities have been designed and continue to be implemented in accordance with a stakeholder engagement action plan (SEP). This documents the engagement activities that seek: to outline a systematic approach to stakeholder engagement that will help the proponent to build and maintain a constructive relationship with stakeholders, in particular directly affected communities; to promote improved environmental and social performance of the project through effective engagement with the project's stakeholders; to promote and provide means for adequate engagement with affected communities throughout the project lifecycle on issues that could potentially affect them and to ensure that meaningful environmental and social information is disclosed to the project's stakeholders; and; to ensure that grievances from affected communities and other stakeholders are responded to and managed appropriately.

116. Consultation has been carried out in line with national requirements, and to date includes collection of environmental baseline data to inform the EIA and conducting the scoping consultation that was undertaken by the RD with support of national consultants.

117. Further, to inform Project design, formal and informal engagements have been held by the Detailed Design team which included following the proposed alignment for ground truthing. This was held concurrently with environmental baseline and resettlement and land acquisition data collection, as described in the LARP and EIA methodology, and was also supported by the national consultants. As noted in Section B of the EIA, several of the suggestions made by stakeholders to the Detailed Design team and RD have now been incorporated into the design (e.g. locations of underpasses) or are being considered as part of future economic development in the area (e.g. using spoil disposal sites in Kobi as market places)

118. Further, in line with Lender requirements, a range of both formal and informal information disclosure and stakeholder engagement meetings have been undertaken. These included the provision of project updates to participants as well as baseline data gathering for the preparation

of detailed design, environmental and social baseline data gathering and the preparation of this document.

119. It should be noted that consultations continue to be held as engagement is an ongoing activity throughout the life of a Project; the Project SEP will be further updated with the results of future engagement activities as these become available.

10. Conclusions

120. This EIA has established that, with the exception of the residual impacts mentioned below, there are no significant environmental issues that cannot be either totally prevented or adequately mitigated to levels acceptable to the GoG and international standards for Project activities.

121. The identified residual impacts during the **Construction Phase** include:

- Notable Habitats – residual impacts on notable habits are expected to be **MINOR/MODERATE.** Whilst some habitats will be lost, use of an ECoW to avoid notable habitats wherever possible, aligned with sensitive routing, use of TBM, habitat restoration and offsets will reduce such impacts to acceptable levels.
- Notable Species – residual impacts on notable species are expected to be **MODERATE**. Direct impacts will be associated with habitat loss, disturbance and accidental mortality. Indirect impacts could also arise from fragmentation and introduction of people to the valley. The implementation of the proposed mitigation, including the proactive use of the ECoW, and the preparation and implementation of appropriate Biodiversity Action Plans (BAPs) for key species, means that such impacts are, however, expected to be reduced to an acceptable level.
- State Forest Fund – Cutting of the trees during the construction phase will have a negative impact upon habitat and the species in these areas. Residual impacts will be **MINOR / MODERATE**.
- Land Use – No residual impacts are anticipated if the LARP is implemented correctly. However, there will still be disruption to the local community during the LARP implementation process. A GRM has been prepared to manage complaints received during this process. Residual impacts will be **MINOR / MODERATE.**
- Tunnels – In general impacts will be minor during the construction phase. However, due to the potential impacts on productive boreholes the residual impacts are upgraded to **MINOR / MODERATE**.
- Spoil / Landscape – If the proposed mitigation measures are implemented, including for example the buffer zones for Otter protection, impacts should be manageable. However, restoration of any spoil disposal area will take a number of years and as such the residual impacts for the spoil disposal areas are considered **MINOR / MODERATE**.
- Lighting – If the proposed mitigation measures are employed the impacts will be **MINOR/MODERATE** due to the fact that in some instances lighting will be needed during works at night and they could impact upon biodiversity. However, oversight of such works by the Ecological Clerk of Works should reduce the incidences of impacts occurring.
- PCR – The key potential impacts to PCR during the construction phase relate to vibration, potential encroachment on existing sites and the potential for impacts to unidentified PCR. However, measures outlined above, including demarcation and fencing of sites and the inclusion of a CHM on the Engineers roster, reduces the potential for significant impacts to occur and as such they are considered **MINOR / MODERATE**.

122. The identified residual impacts during the **Operational Phase** include:

- Air Quality – No significant degradation of air quality is anticipated in the operational phase of the Project in most of the Project area. However, as traffic levels increase levels of NO_2 are anticipated to rise in the Kobi area, potentially above allowable national limits in 20 years time (but below IFC limits). However, by 2043 it is fully expected that the vehicle emissions

will be lower than today's levels and as such these elevated levels of NO_2 may not be realized in the long term. However, based on the model results residual impacts are classified as **LOW / MEDIUM**.

- Greenhouse Gases – Residual impacts from the generation of GHGs will remain throughout the lifecycle of the Project. This is an unavoidable consequence of the Project, but as noted in other sections of this report, the growth of the electric car market and more fuel-efficient cars may, in the future lead to a decrease in the emissions generated on the Project road. Residual impacts will be **LOW/MEDIUM.**
- Notable Habitat – Impacts to notable habitats during operation of the road will result from disturbance, potential pollution and increased access to habitats. Given the proposed mitigation impacts to habitats per se are expected to be of only **LOW/MEDIUM** significance.
- Notable Species – The operation of the road will result in direct impacts to notable species from road traffic accidents as well as indirect impacts associated with disturbance, habitat fragmentation, pollution and increased access to habitats. Given the proposed mitigation, including the use of species-specific BAPs, such impacts are expected to be reduced to an acceptable level. Residual impacts will be **MEDIUM**.
- Spoil Disposal – Restoration of any spoil disposal area will take a number of years and as such the residual impacts for the spoil disposal areas are considered **LOW / MEDIUM**.
- Tunnels – It is possible that the construction of tunnels could depleted groundwater and affect groundwater users, including Aqua Geo. If this is the case affected villagers will be supplied with an alternative source of potable water and methods to compensate any businesses affected will be applied. Residual impacts in this case will be **LOW / MEDIUM**.
- Access and Access Roads – During the operational phase there will be some inconvenience for people using local roads who will have to make some minor detours to access the new road. Pedestrians will no longer be able to walk along the road between Kvesheti and Arakveti, and while alternative routes exist, they may not be as convenient, or as well maintained as the existing road. Residual impacts will be **LOW / MEDIUM**
- Landscape – Cut slopes, embankments, concrete bridges and tunnels will have an impact on the landscape within the valley throughout the Project lifecycle. The mitigation measures outlined above may go some way to enhancing the aesthetic value of the Project especially as vegetation grows back around construction zones, and in all likelihood any negative opinion of the new road in terms of visual impact will decrease over time as people get used to the altered landscape. Residual impacts will be **LOW/MEDIUM.**
- Lighting – Even with the proposed light shielding there will still be some level of impact of lighting to the Project area and the Khada valley. Residual impacts will be **LOW/MEDIUM.**
- Noise – Residual impacts will be minor for all of the identified receptors if the noise barriers are constructed and any remaining receptors are resettled. However, some property owners may choose to sign the waiver agreement and remain in their homes. These properties may be subject to elevated noise levels above IFC limits in the future, and for these receptors residual impacts will remain throughout the lifecycle of the Project, although in many instances limits will only be breached by 1-3 decibels which is considered to be of minor magnitude. Residual impacts will be **LOW/MEDIUM** due to the potential resettlement aspect.

123. In addition to the above, a number of beneficial impacts have been identified by this EIA, they include:

- Economic and Livelihood Impacts – Indirect job generation and procurement opportunities related to Project construction will have a beneficial impact on employment in the Project Area. Opportunities for local and regional suppliers, businesses, and service providers will be created, thus contributing to the positive employment effect as well as indirect job generation and procurement opportunities associated with construction of the Project. The decline in workforce numbers with the commencement of project operations phase will have a marginal detrimental effect on local and regional communities with regards to worker numbers and direct local livelihoods opportunities. Efforts will be made to maximize

Georgian work opportunities in the operations and maintenance positions, and establishment of the Project will enable improved transport links (access to market opportunities) thus the overall impact during operations is expected to be beneficial.

- Community Safety and Security – Provision of underpasses and safer driving conditions should result in reduced accident rates. This can also be enhanced by implementation by the RD of community road safety programs, e.g. in schools.

11. Implementation

124. The EMP, its mitigation and monitoring programs, contained herewith will be included within the Project Bidding documents for project works. This ensures that all potential bidders are aware of the environmental requirements of the Project and its associated environmental costs.

125. The Bid documents state that the Contractor will be responsible for the implementation of the requirements of the EMP through his own Specific Environmental Management Plan (SEMP) which will adopt all of the conditions of the EMP and add site specific elements that are not currently known, such as the Contractors construction camp locations.

126. The EMP and all its requirements will also be added to the Contractors Contract, thereby making implementation of the EMP a legal requirement according to the Contract. He will then prepare his SEMP which will be approved and monitored by the Engineer. Should the Engineer, through routine monitoring by his national and international environmental specialists, note any non-conformance with the SEMP the Contractor can be held liable for breach of the contractual obligations of the EMP. To ensure compliance with the SEMP the Contractor will employ a Environmental and Social Officer (ESO) and a team of specialists to monitor and report Project activities throughout the Project Construction phase.

127. A grievance redress mechanism (GRM) has also been prepared as part of the Project. The GRM provides a structure for stakeholders to make complaints and a mechanism for the complaints to be resolved both locally and centrally.

128. In addition to this report and the GRM a package of documents will be prepared to ensure compliance with EBRD ESP 2014: Performance Requirements, including a Non-technical Summary, a Stakeholder Engagement Plan (SEP) and a Land Acquisition and Resettlement Plan (LARP). These items, along with the EIA in hand, will be disclosed separately on the RD and EBRD websites. ADB will also disclose separately the LARP and the EIA on their website.

A. Introduction

A.1 General

129. This section of the report; a) provides an overview of the Project, b) outlines the purpose of the EIA; and c) describes the scope of the EIA.

A.2 Overview

130. Due to its geographic location Georgia's role as a major transit country is significant. Transport of goods into and through Georgia has increased over the past 10-15 years. Almost two-thirds of goods in Georgia are transported by road, and haulage by domestic and international truck companies is very evident on the country's highways. Many of the roads are however poorly equipped to cope with the volume of traffic and the proportion of heavy vehicles, and factors such as insufficient dual carriageways, routing through inhabited areas and inadequate maintenance and repair, hinder throughputs and increase transit times. This creates difficulties for haulage companies and their clients, truck drivers, Georgian motorists and local residents.

131. The Government of Georgia (GoG) has launched a program to upgrade the major roads of the country. The program is managed by the Roads Department (RD) of the Ministry of Regional Development and Infrastructure (MRDI) and aims to improve transportation and transit of goods in Georgia and to surrounding countries. The World Bank, Japanese International Cooperation Agency (JICA), European Investment Bank (EIB) and the Asian Development Bank (ADB) have already providing series of loans to the state for construction/rehabilitation of the road infrastructure.

132. As a part of the program, upgrading Jinvali-Larsi section of the Mtskheta-Stephantsminda-Larsi Road is planned which connects Georgia to Russian Federation. The road starts from Mtskheta, follows the E-60 highway before heading north bypassing Jinvali reservoir from the west, crossing Gudauri winter resort via the Jvari Pass located at 2,400 meters above sea level (masl) and ending at the border to Russian Federation.

133. Various portions of the road are currently being rehabilitated or are in the process of feasibility study or detailed design. The Project, which is the subject of this EIA, focuses on the portion of road between Kvesheti and Kobi which is shown by Figure 3.

134. The existing road between Kvesheti and Kobi (approximately 34 km) is characterized by difficult geographical and problematic winter maintenance conditions. During the winter, the height of snow at Jvari Pass (2,379 meters above sea level) is 3-5 meters in depth. Snow drifts due to high wind conditions compound the problems in the winter and often lead to closures of the Jvari Pass which can be anytime between November and April.

135. Avalanche protection tunnels are located in portions of the existing road however, they are not wide enough for safe bidirectional traffic. This results in queuing of trucks and passenger cars caused by regulation of the traffic flow by road police. In these areas vehicles have to wait until the snow is cleared or, in best case – until the traffic flow from opposite direction stops to allow the queue to move.

136. Based on the calculation of the average number of hours with prohibited movements the portion of annual demand affected by restriction of traffic by vehicle type has been estimated by the Projects Feasibility Study.

Figure 3: Project Road Location Map

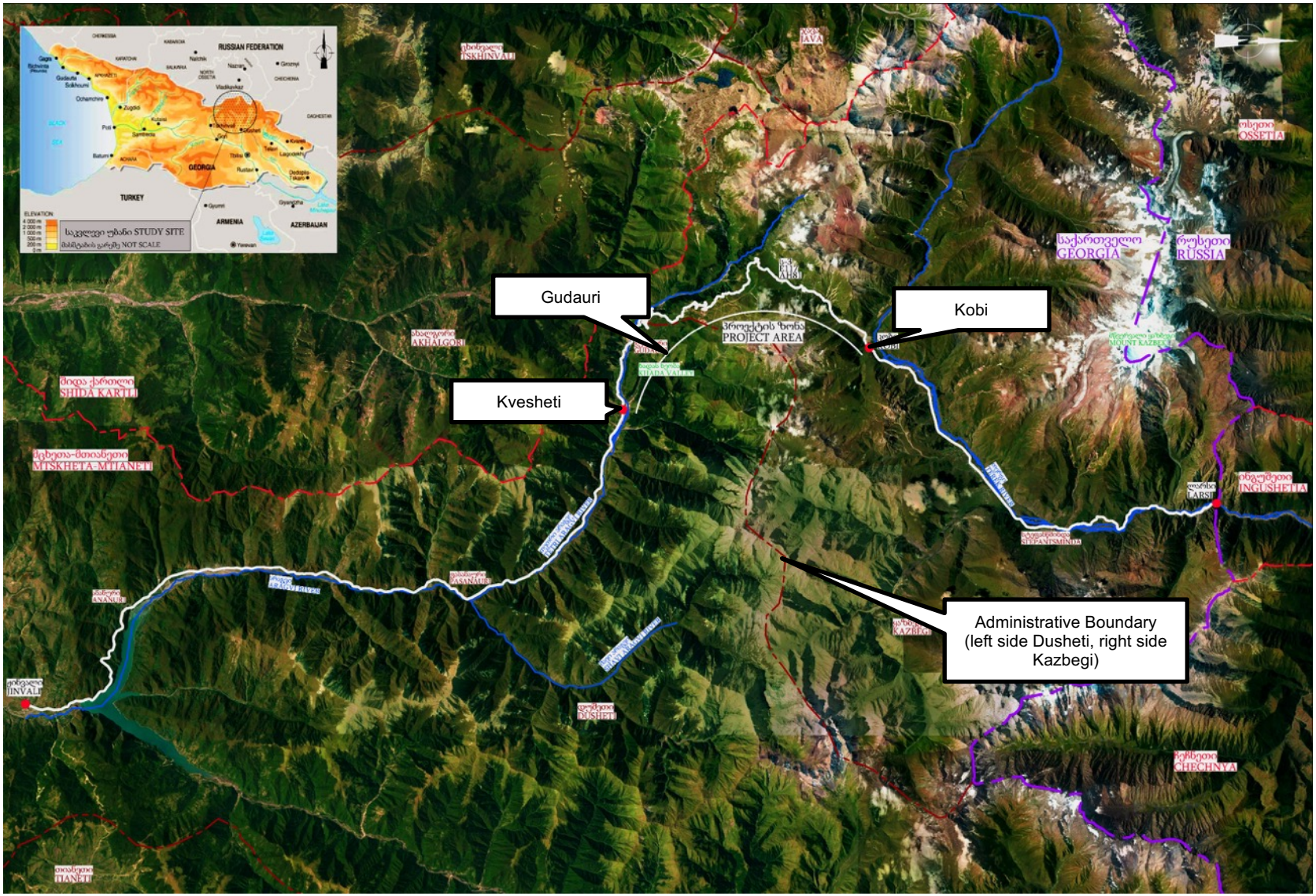


Table 4. Percentage of annual demand affected due to prohibition of traffic

	Kvesheti-Kobi		
	Bus	Heavy vehicles	Light vehicles
2012-2016 annual average delay (hours)	2,351	2,384	1,096
% of the annual demand affected	**34.6%**	**35.1%**	**16.1%**

137. Given the issues identified above a new alignment has been proposed that bypasses the problematic areas mainly through a 9km tunnel.

138. The importance of the project is conditioned by the fact that the road is a strategic project in the Government's effort of transforming Georgia into a transport and logistics hub for trade between Central Asia and the Far East on the one hand, and Turkey and Europe on the other. Connecting the East-West Highway to the main border crossing points via the Project road is becoming a critical part of Georgia to enhance its role as a transit country along the Silk Road.

139. The project will have multiple benefits including a) improving operational continuity of the road even during winter time, b) improving safety, including reduction in fatality, injury and accident rates especially in the winter when tourist traffic heading to Gudauri will be separated from vehicles in transit to Kobi and beyond, and c) travel time savings for passengers and freight transport. At the same time the existing road will be kept operational thereby acting almost exclusively as access to Gudauri.

A.3 Purpose of the EIA Report

140. This Environmental Impact Assessment (EIA) is part of the process of compliance with the ADB Safeguard Policy Statement (2009) and EBRDs Environmental and Social Policy (2014) in relation to the construction of the Kvesheti – Kobi Road Section or more simply, the "Project".

141. The EIA provides a road map to the environmental measures needed to prevent and/or mitigate negative environmental effects associated with the Project. The EIA provides a detailed description of the direct and indirect environmental effects associated with the proposed Project during key periods of work.

142. More specifically, the EIA:

(i) Describes the existing socio-environmental conditions within the Project area;
(ii) Describes the project design, construction activities and operational parameters;
(iii) Describes the extent, duration and severity of potential impacts;
(iv) Analyzes all significant impacts; and
(v) Formulates the mitigation actions and presents it all in the form of an Environmental Management Plan (EMP).

A.4 Category of Project

143. Based on the existing ADB Environmental Safeguards Policy (2009), this Project falls under ADB's project Category A as the project is considered to have significant diverse impacts over a wide area, such as noise impacts, significant quantities of spoil disposal, road safety impacts, and vibration.[6] The Project is also classified as a Category A Project according to EBRD E&S Policy, Appendix 2 which classified construction, realignment or widening of motorways as Category A projects.

[6] According to ADB "*A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment is required."*

A.5 Structure of the Report

Section A: Introduction – The section in hand provides the introductory information.

Section B: Description of the Project – Section B describes the Project need and its environmental setting. A scope of works is also provided indicating the type of engineering works required.

Section C: Analysis of Alternatives – This portion of the report provides an analysis of alternatives, including the 'no project' option.

Section D: Legal, Policy and Administrative Framework – This section presents an overview of the policy/legislative framework as well as the environmental assessment guidelines of Georgia that apply to the proposed project. The overview is based on recent EIA reports prepared for the previous East West Highway Improvement Projects (EWHIPs).

Section E: Description of the Environment – This section of the report discusses the regional and local environmental baseline conditions. This section is divided into subsections relating to:

(i) Physical: geology; topography; soils; climate; air quality; noise; surface water; groundwater; seismicity and natural hazards.
(ii) Biological: flora and fauna; rare and/or endangered species (Red List species); critical habitats and ecosystems; protected areas. Particular attention shall be given to the presence of land plots registered as the State Forest Fund.
(iii) Human: population; communities; demographics; employment and socio-economics; land use; infrastructure (including local access roads); transport; public health; cultural heritage; archaeology; waste management; tourism.

Surveys have been conducted to address important gaps in the existing data and to collect up-to-date information on topics and areas where significant negative impacts are expected, specifically, flora, fauna, noise, air quality and water quality.

Section F: Environmental Impacts and Mitigation Measures – Section F outlines the potential environmental impacts and proposes mitigation measures to manage the impacts. This has included numerical modeling of noise, vibration and air quality to assist in predicting impacts and planning mitigation in these fields.

Section G: Environmental Management Plan – This section comprises an Environmental Mitigation Plan and an Environmental Monitoring Plan.

The Environmental Mitigation Plan:

(i) Clearly identifies what specific potential impacts various types of works may have on the sensitive receptors;
(ii) Provides concrete actions prescribed for managing these impacts, including location and timing of these actions;
(iii) Provides cost estimates for the main discrete mitigation measures (those that are unlikely to be part of a construction company' corporate policy and will not necessarily be included into general pricing of the contract); and
(iv) Specifies responsibility for the implementation of each mitigation activity.

The Environmental Monitoring Plan:

(i) Lists all prescribed mitigation measures by types of construction activities;
(ii) Provides selected criteria of monitoring implementation of mitigation measures;
(iii) Specifies methods for measuring outcomes of applied mitigation measures (visual, instrumental, survey, etc.);

(iv) Identifies location and timing/frequency of monitoring mitigation measures by the prescribed criteria;
(v) Gives cost estimates of monitoring mitigation measures by the prescribed criteria; and
(vi) Specifies responsibility for tracking each monitoring criterion.

Section H: Public Consultation, Information Disclosure & Grievance Mechanism – Section H provides a summary of all of the stakeholder consultation activities undertaken. The section also describes the grievance redress mechanism, setting out the mechanisms for resolving complaints about environmental performance.

Section I: Conclusions and Recommendations – The final section of the report provides the report conclusions and recommendations, including a description of any residual impacts.

B. Project Description

B.1 Section Layout

144. This section of the EIA provides the Project description. More specifically it provides; a) Summary of the type and location of the Project, including detailed site location maps, b) summary of each of the two lots including maps of each lot, c) overview of the road design, including all structures, d) summary of the construction process and activities, and e) and overview of road safety issues.

B.2 Type and Location of project

145. The Project is a road construction project. The project is located in Dusheti and Kazbegi municipalities, Mtskheta-Mtianeti region. The Project comprises the Kvesheti – Kobi section of Mtskheta-Stephantsminda-Larsi Road. The length of the new alignment is 22.7 km and will be divided into two construction packages, or 'Lots' as follows:

- Lot 1: Tskere – Kobi: Chainage KM 12.7 – KM 22.7 (10 km)
- Lot 2: Kvesheti – Tskere: Chainage KM 0.0 – KM 12.7 (12.7 km)

146. Figure 4 provides a map of the entire Project road and Figure 5 to Figure 19 provides a set of fifteen detailed maps of both Lots including locations of tunnels and bridges.

B.3 Summary of Lots

B.3.1 Lot 1 Summary

147. The Tskere-Kobi portion of the Project road, also referred to as 'Lot 1', includes a 8.86 km long tunnel with two cut and cover sections and a junction connecting to the existing road near Kobi. More specifically Lot 1 includes:

- 178m long section of road from Tskere to the south portal of Tunnel 5;
- Tunnel 5 – 8.86 km long bidirectional, 2 lane tunnel (max. gradient 2.35%);
- Two cut and cover (C&C) [7] sections of Tunnel 5 (200m –south portal and 8m – north portal) to protect from avalanches and move entrance portal farther from the Tskere;
- 9.062 km emergency gallery parallel to Tunnel 5 and 17 connections to the main tunnel (6.4 meters wide);
- Technical buildings next to the north and south portals – the buildings include facilities building, pumping station and ventilation room;
- 0.8km long section of road connecting the north portal of the tunnel with existing road. The alignment has been adapted to the current road with a maximum gradient of 4.2 % to keep on using the existing bridge (bridge length 42m, height 6m); and
- 214m long local road diversion.

[7] Cut and cover: the basic concept involves the digging of a trench, the construction of a tunnel, and then returning the surface to its original state.

Figure 4: Project Road (KM 0 – KM 22.7)

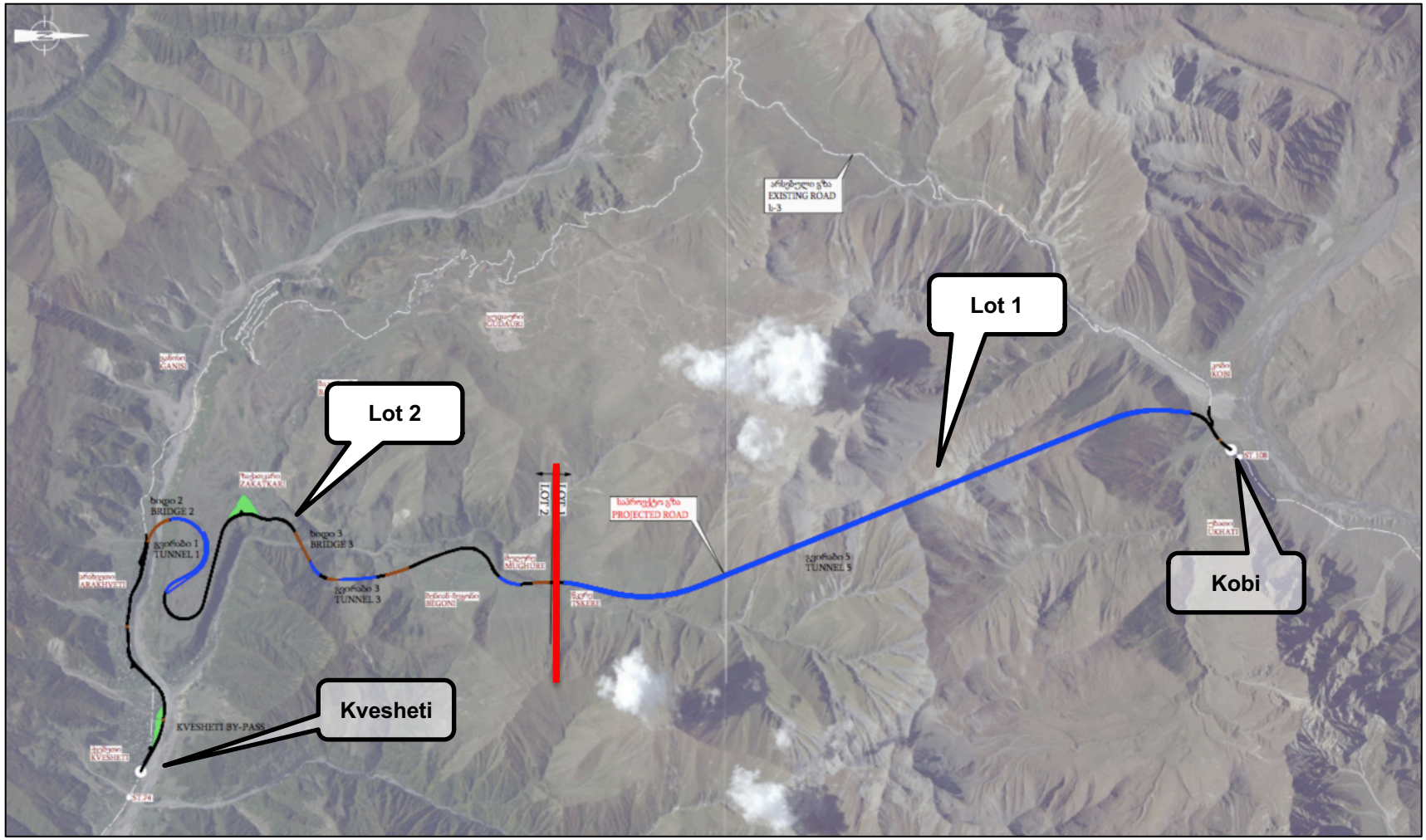


Figure 5: LOT 2 Plans (KM 0.0 – KM 1.7)

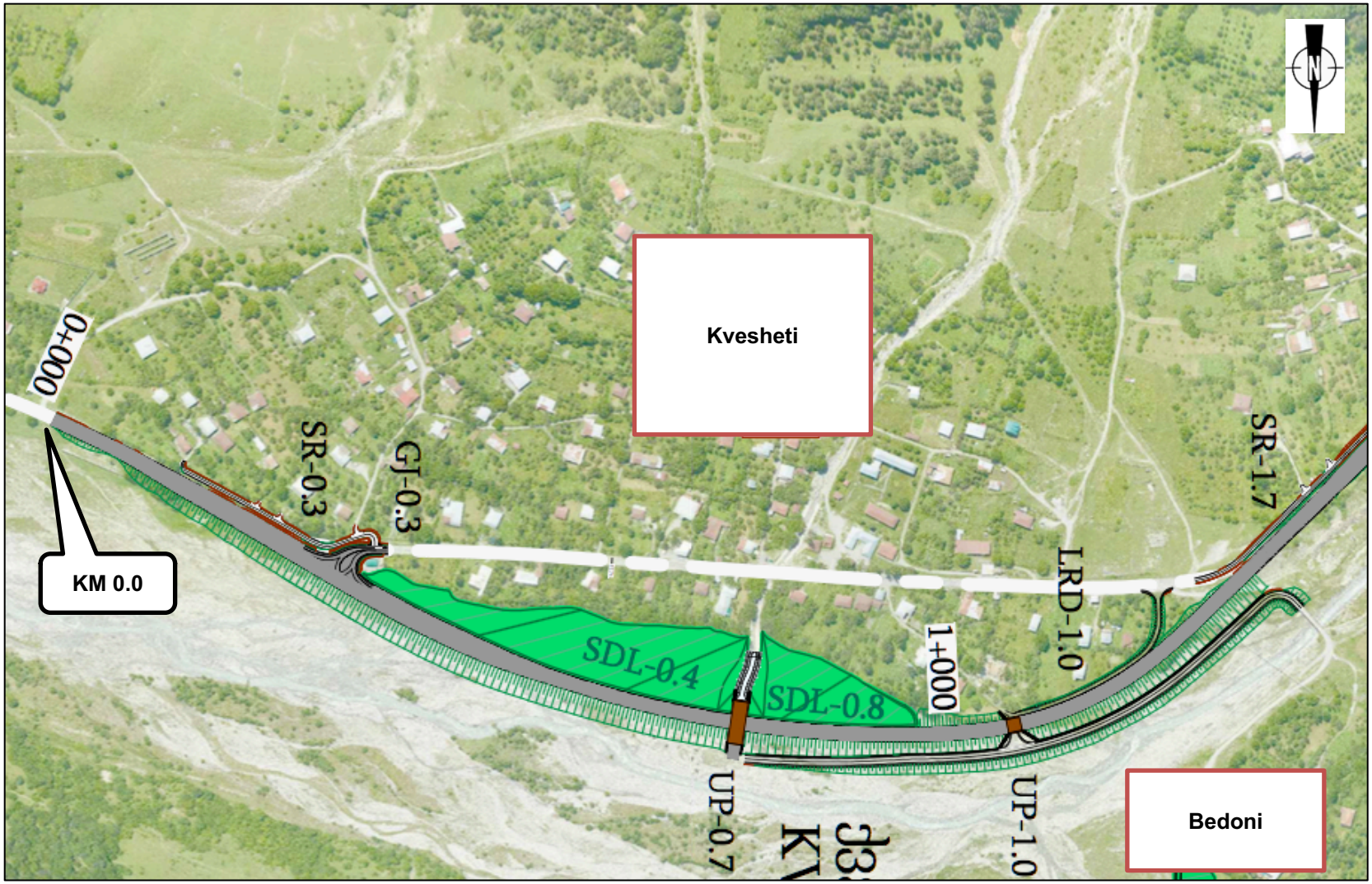


Figure 6: LOT 2 Plans (KM 1.5 – KM 2.5)

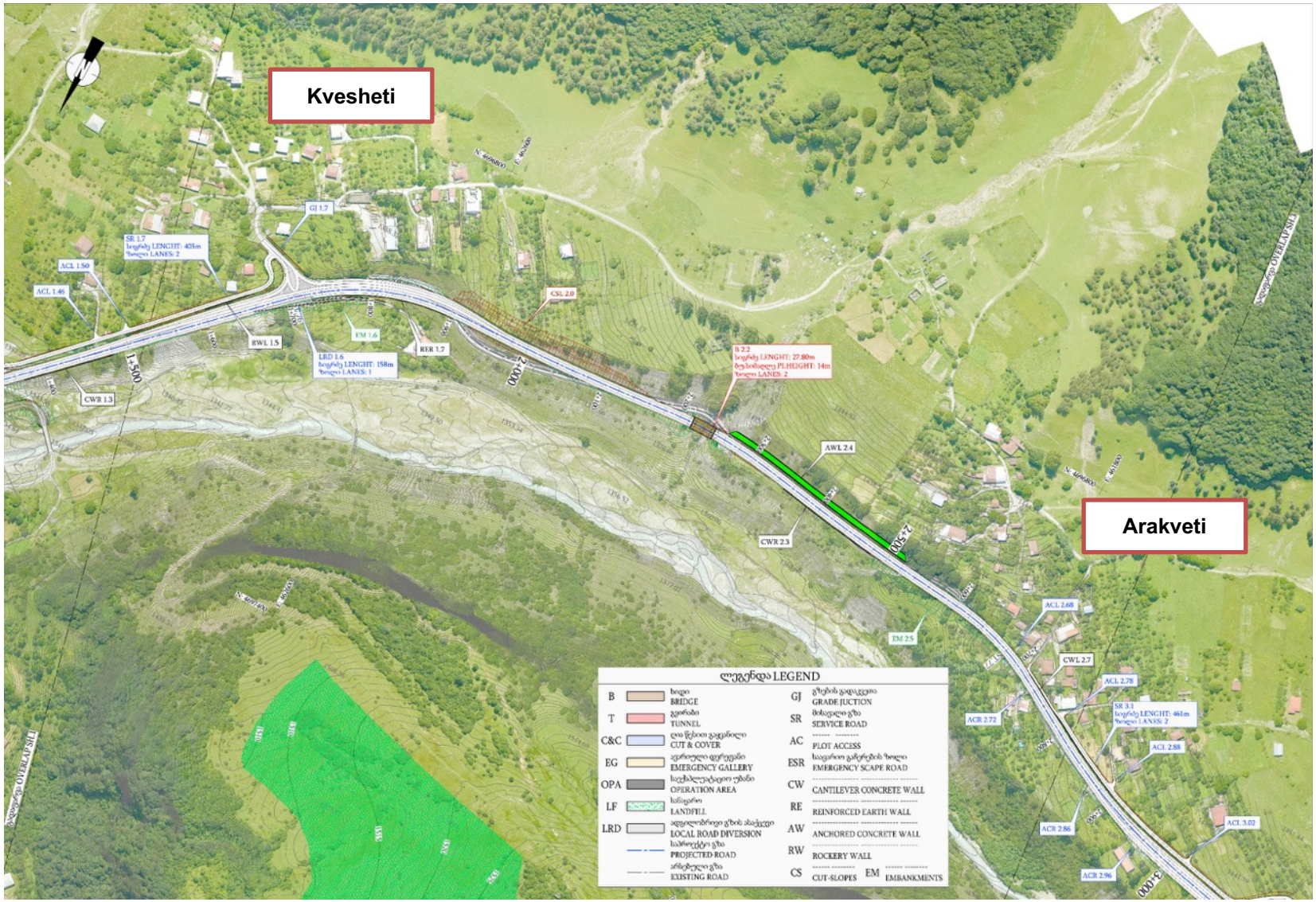


Figure 7: LOT 2 Plans (KM 2.5 – KM 4.0)

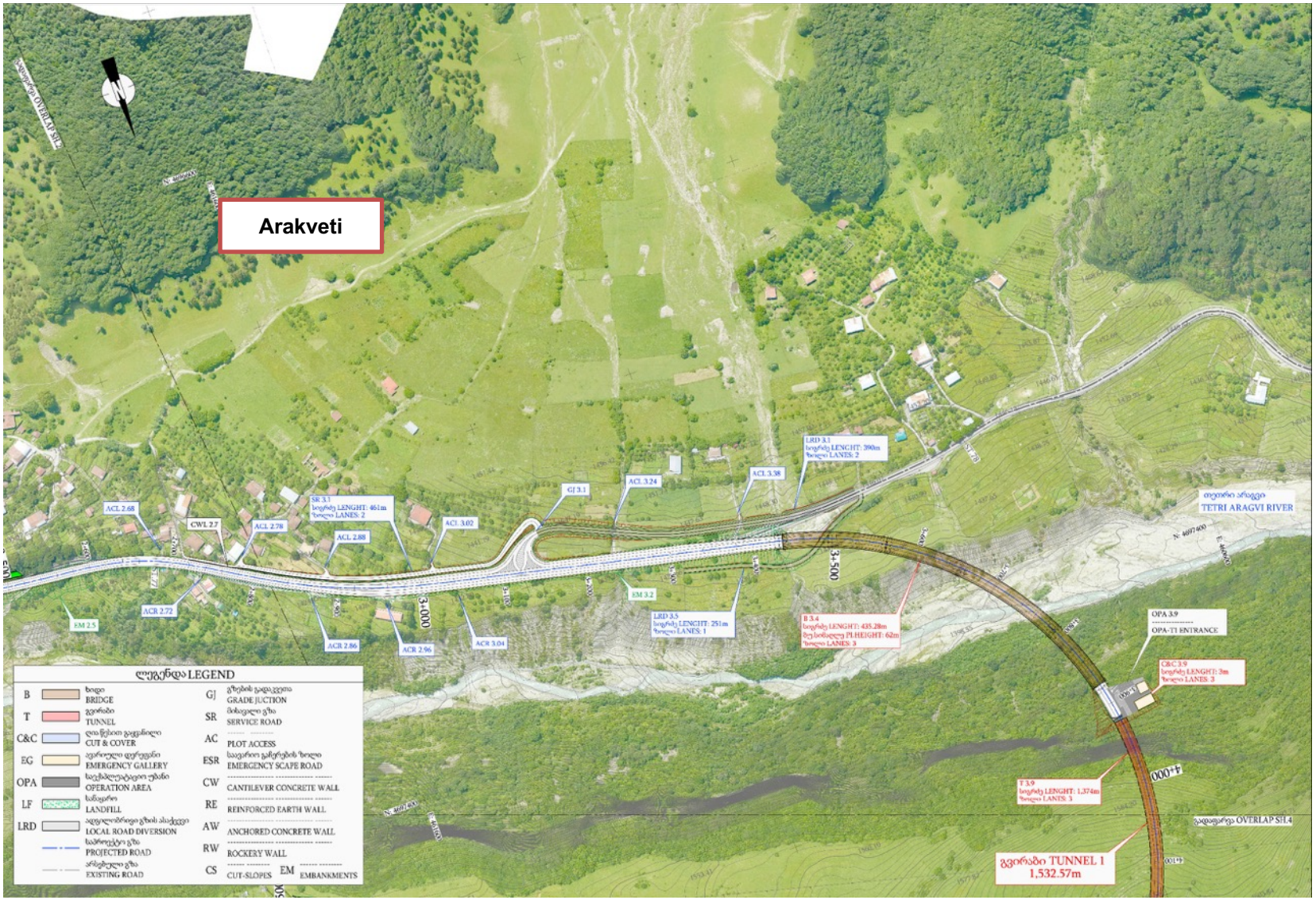


Figure 8: LOT 2 Plans (KM 4.0 – KM7.0)

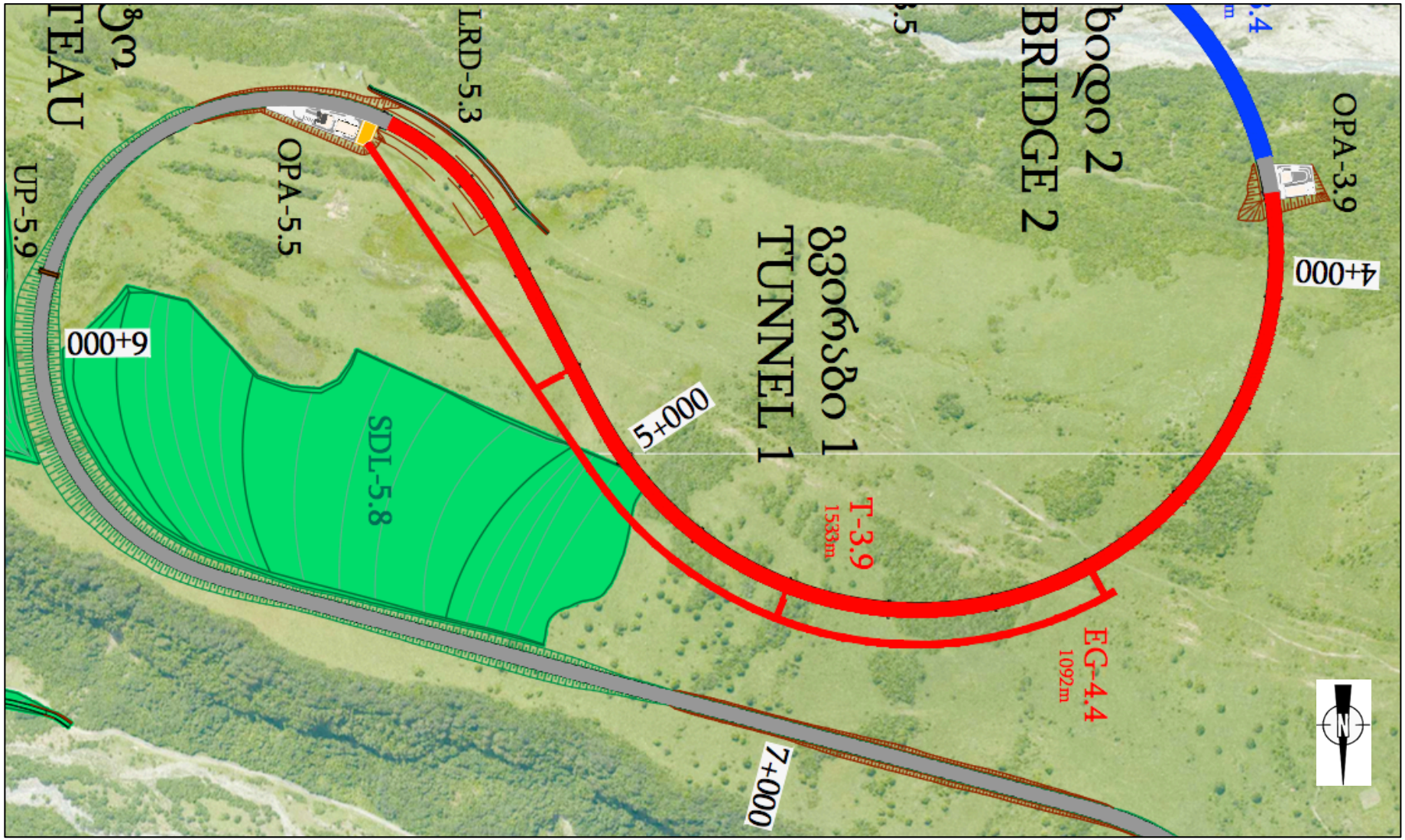


Figure 9: LOT 2 Plans (KM 7.0 – KM 8.9)

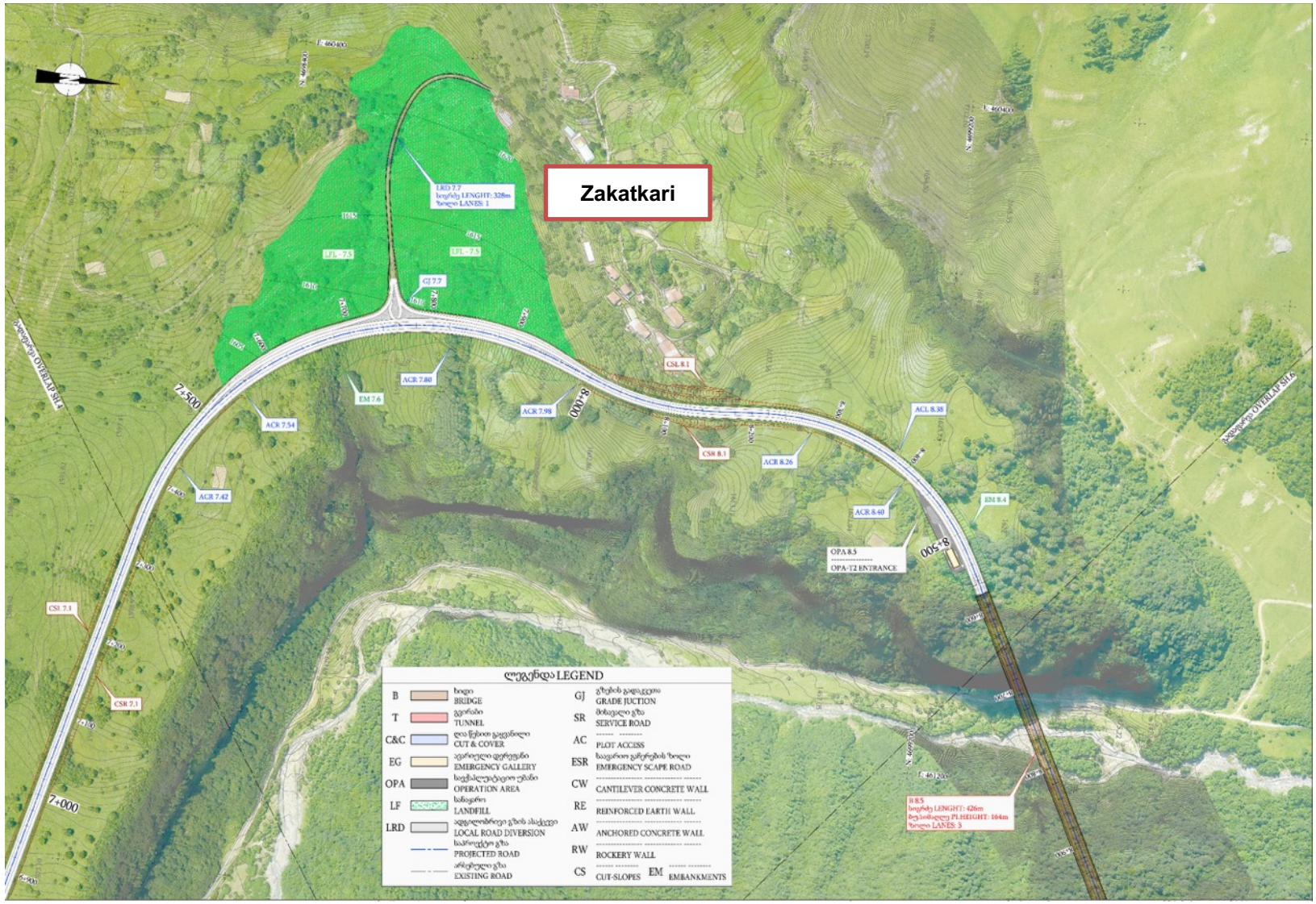


Figure 10: LOT 2 Plans (KM 8.5 – KM 10.2)

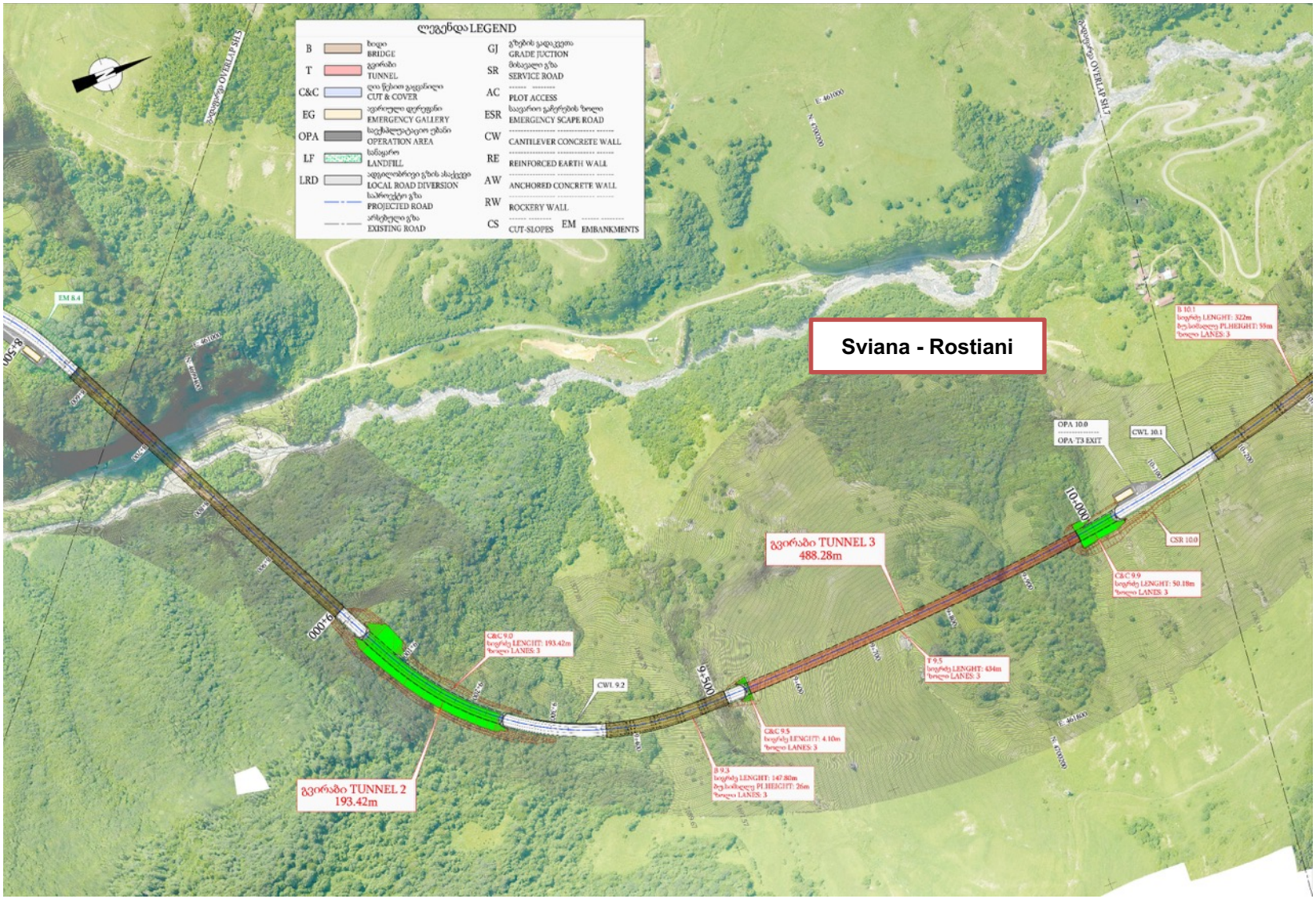


Figure 11: LOT 2 Plans (KM 10.1 – KM 11.5)

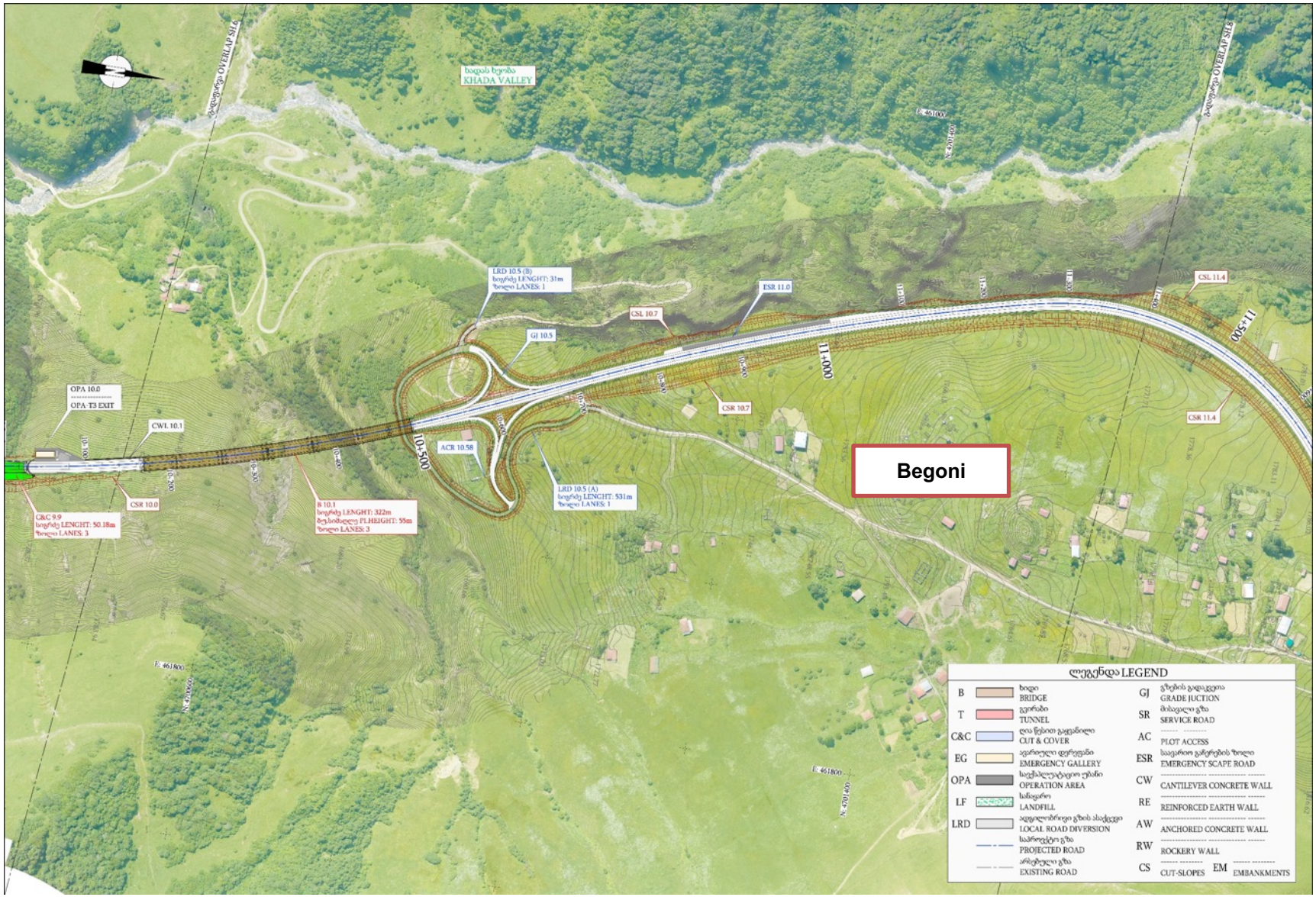


Figure 12: LOT 2 Plans (KM 11.5 – KM 12.7)

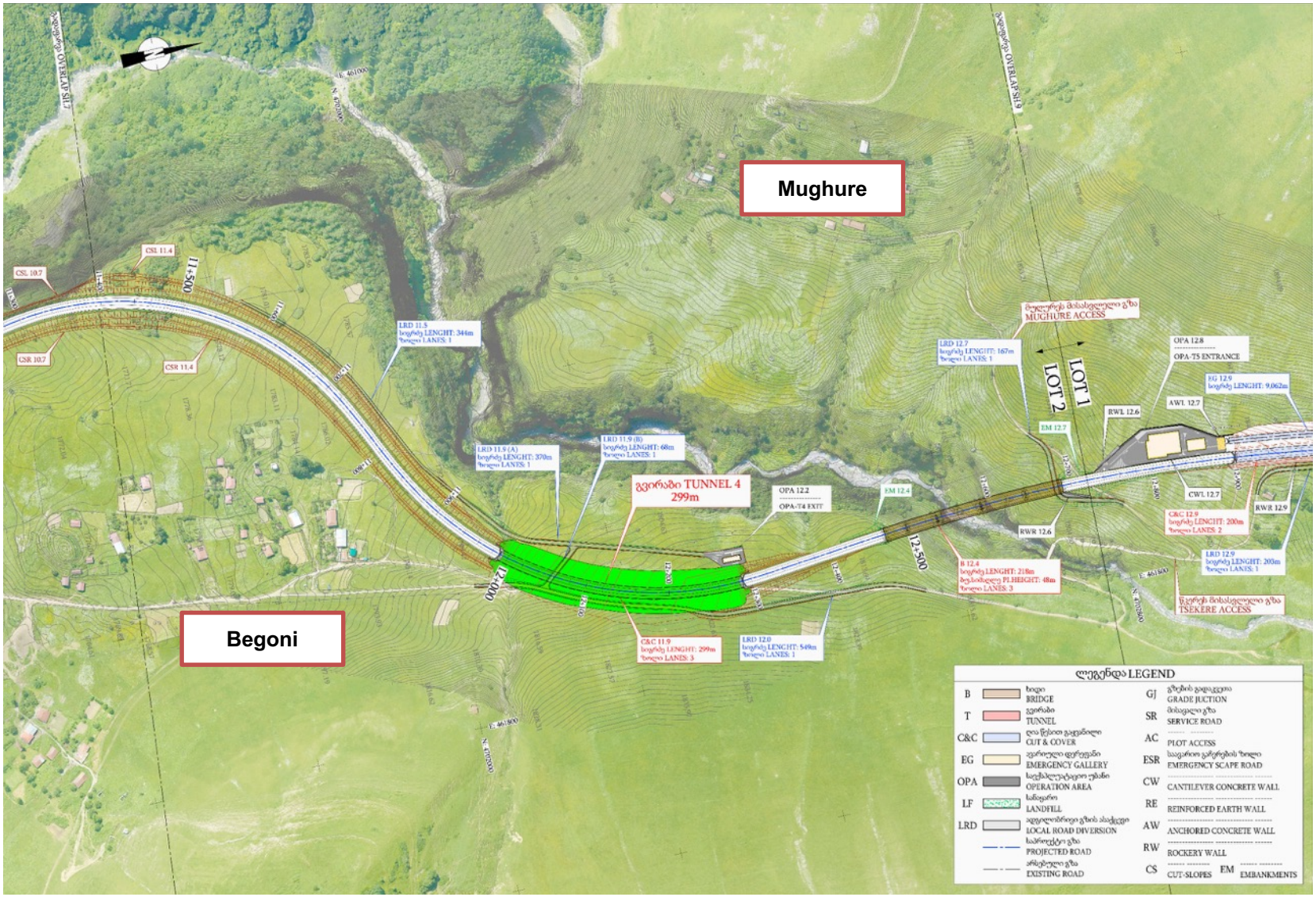


Figure 13: LOT 1 Plans (KM 12.7 – KM 14.0)

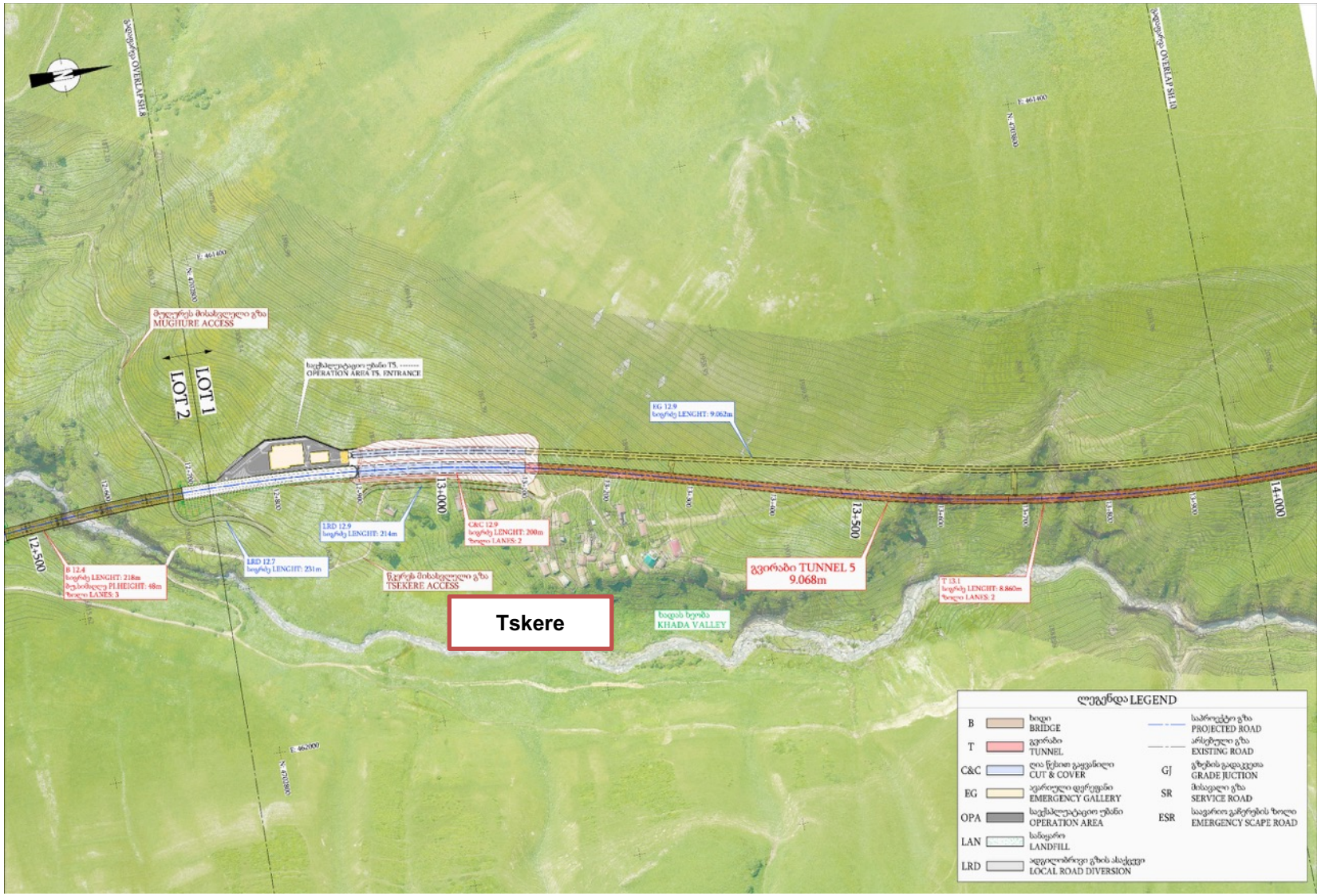


Figure 14: LOT 1 Plans (KM 14.0 – KM 15.4)

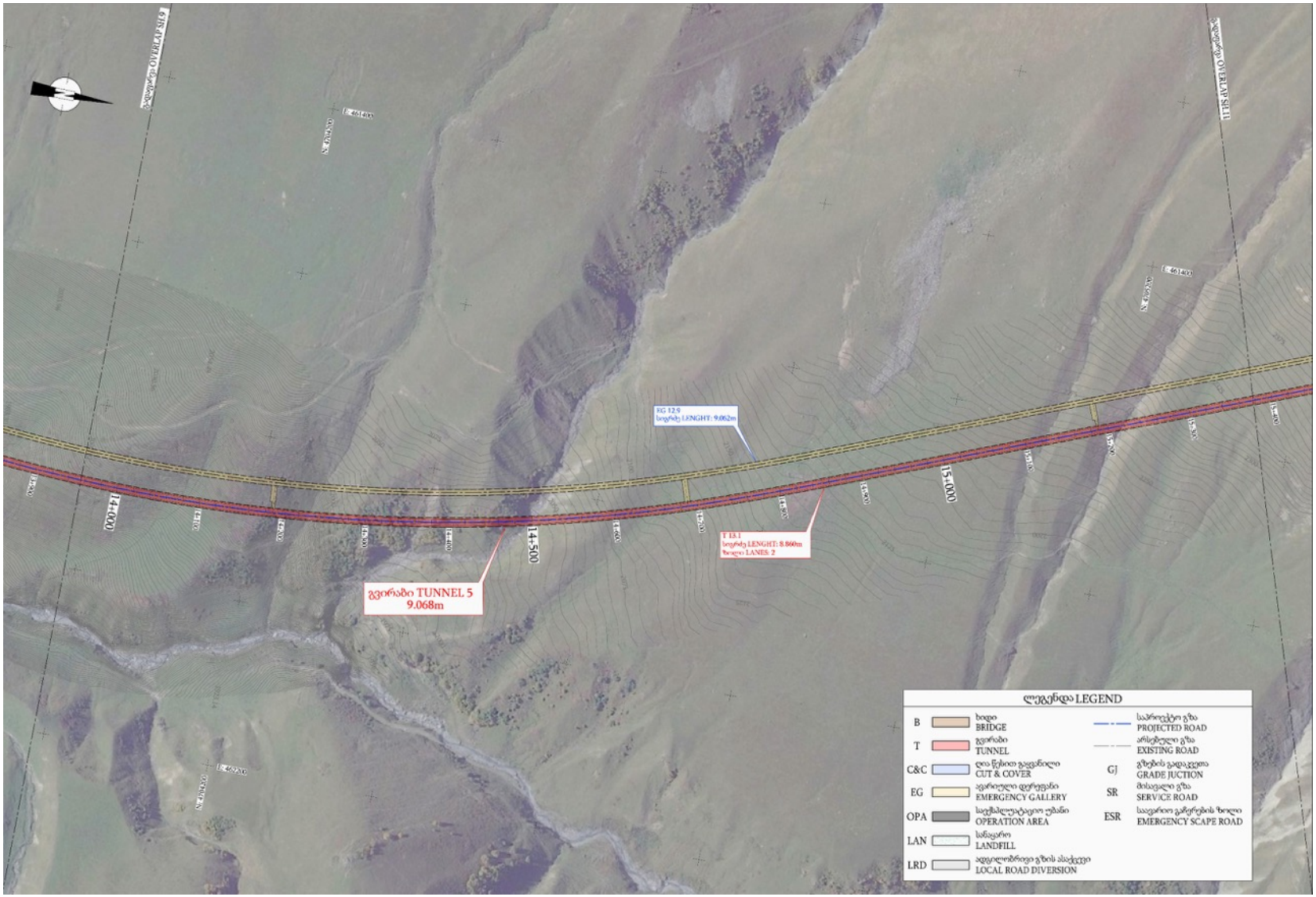


Figure 15: LOT 1 Plans (KM 15.4 – KM 16.8)

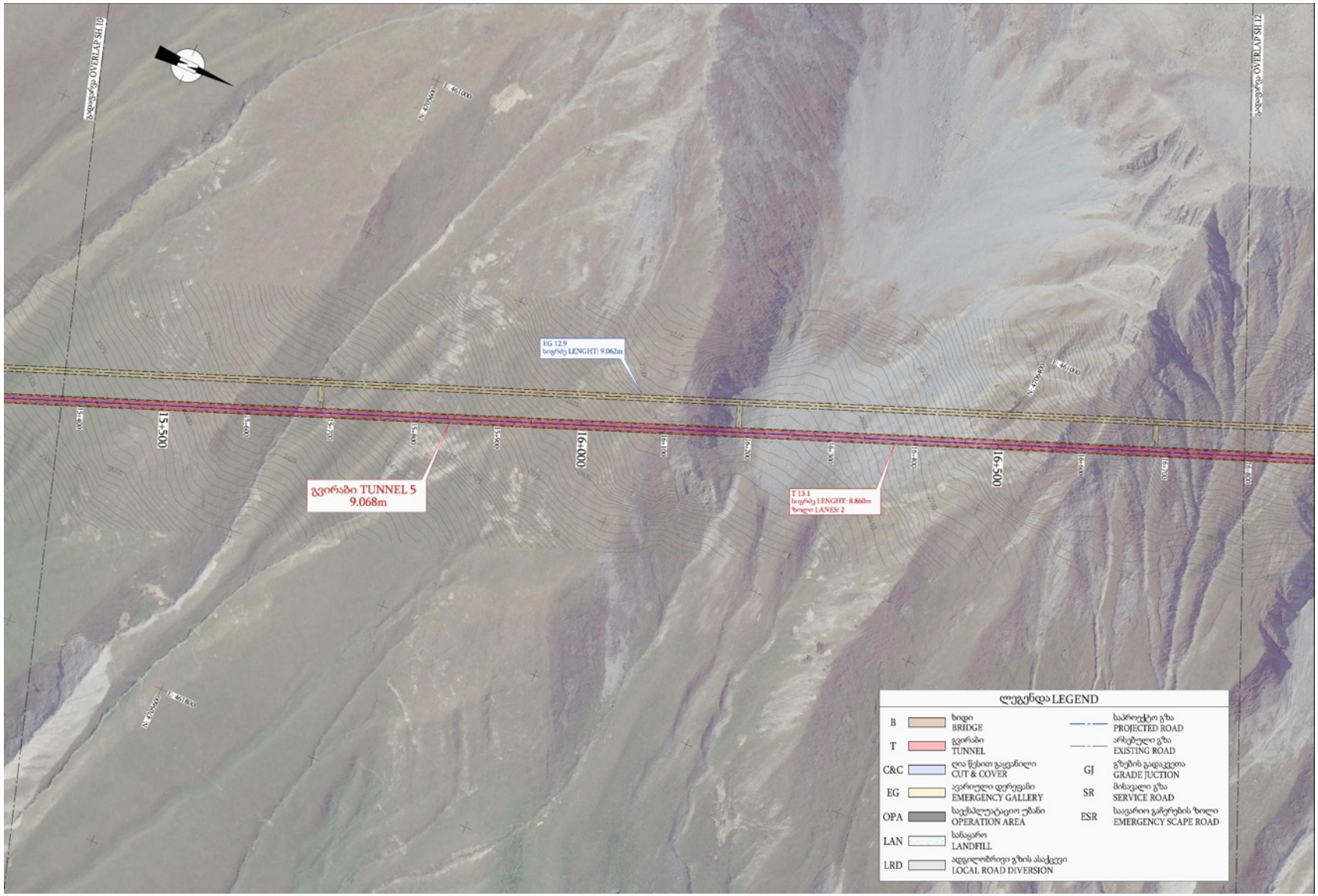


Figure 16: LOT 1 Plans (KM 16.8 – KM18.2)

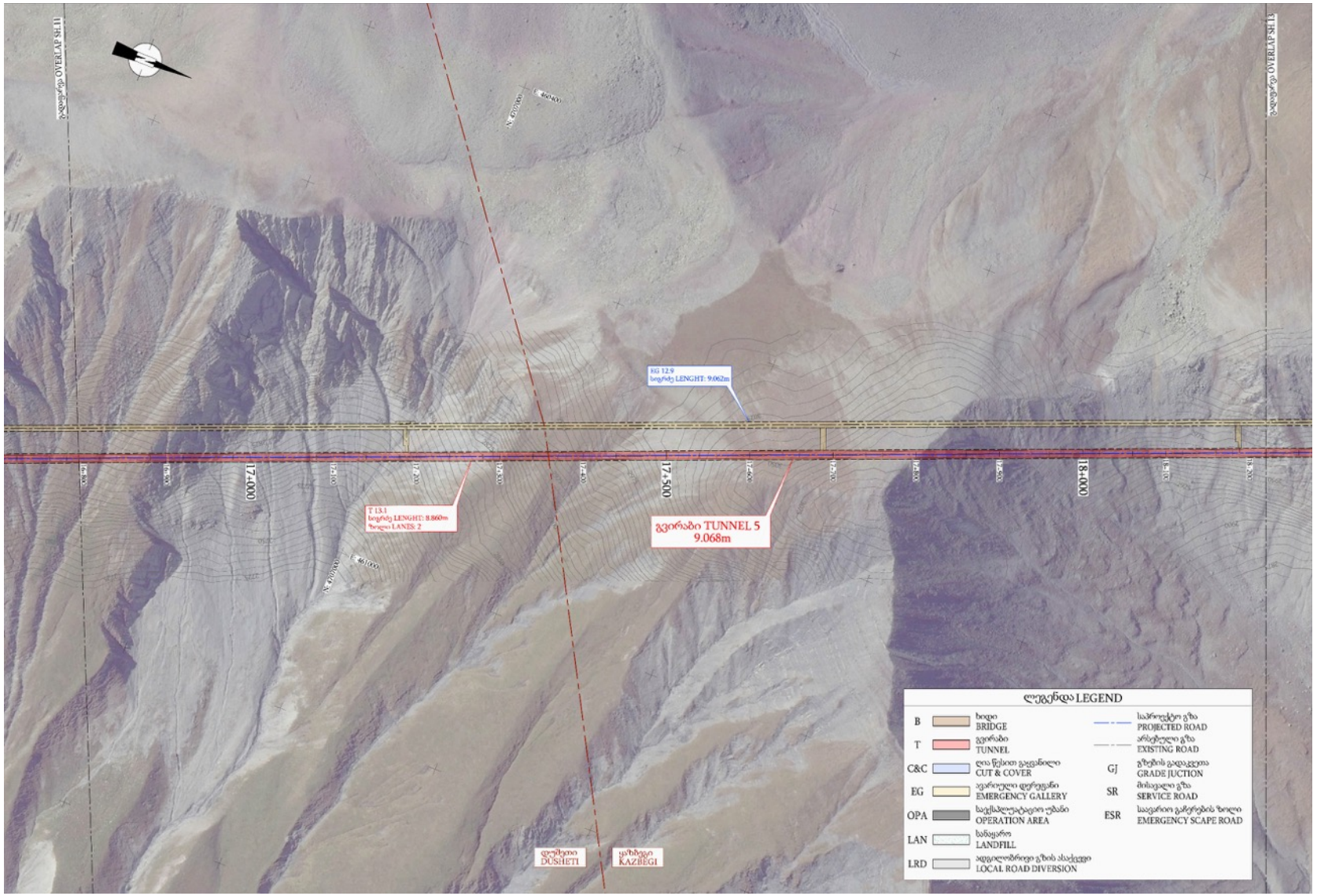


Figure 17: LOT 1 Plans (KM18.2 – KM 19.7)

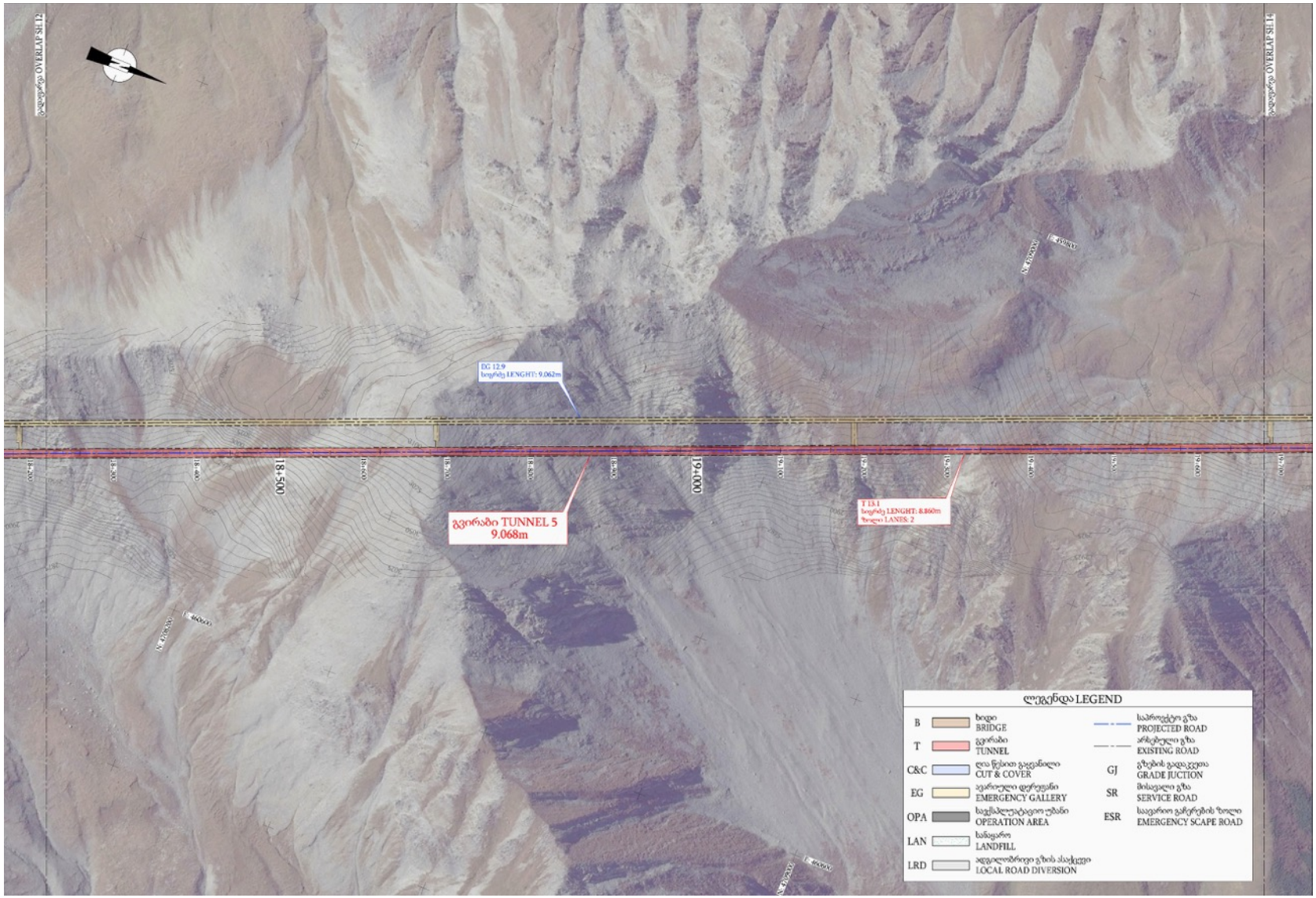
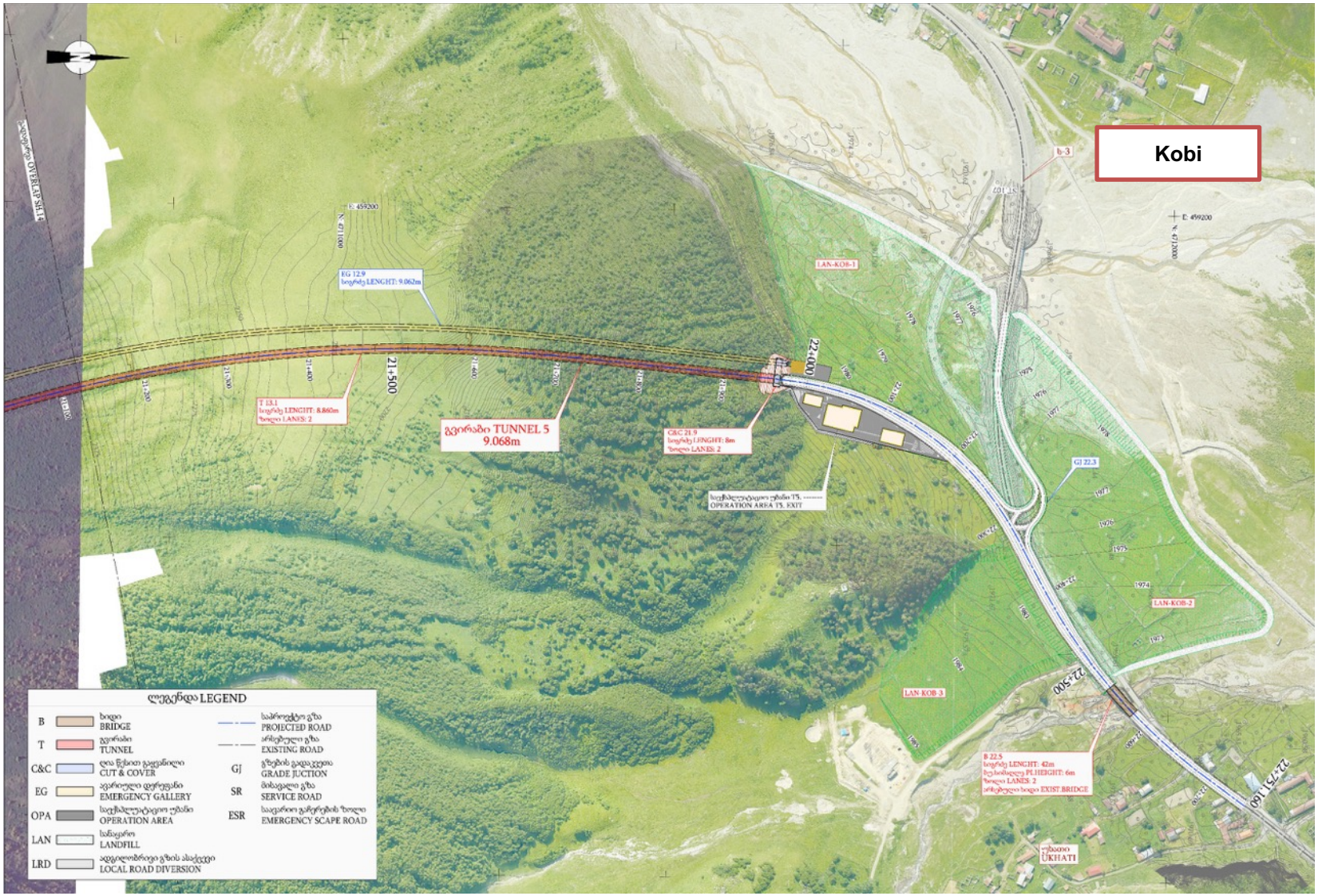


Figure 18: LOT 1 Plans (KM 19.7 – KM 21.1)

Figure 19: LOT 1 Plans (KM 21.0 – KM21.7)



1. Lot 1, which is located predominantly within Tunnel 5, starts around 200m south of Tskere. Figure 20 provides and aerial image of the start section of Lot 1 and Figure 21 depicts Tskere village. There will be a minor realignment of the existing road approaching Tskere and prior to the tunnel's technical buildings. Access from the north to the south will also be provided via an access road under the bridge over the Khadistskali river just before the immediate start of Lot 1 as shown on the figure below (access road is located in Lot 2). This will enable villagers to access the cemetery located to the north of the cut and cover portion of Tunnel 5.

Figure 20: Start section of the design alignment

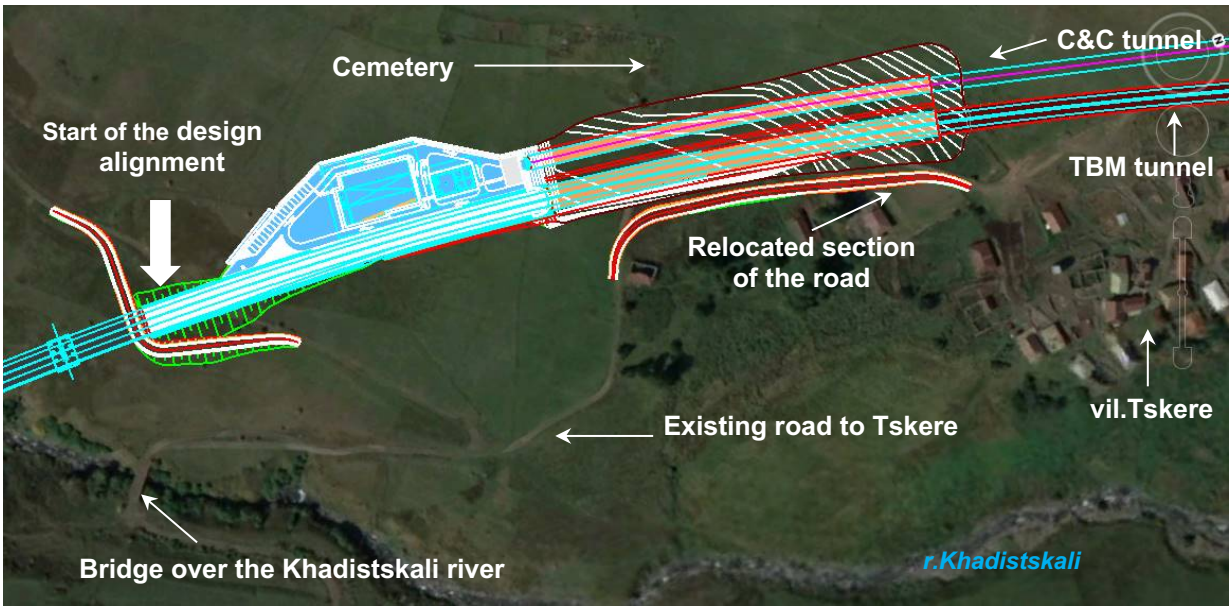


Figure 21: Tskere Village

2. Lot 1 ends near Kobi, about 176m from the existing bridge over the Narvani river. This area is illustrated by Figure 22 and Figure 23. No new access roads are required in this area.

Figure 22. End section of the design alignment

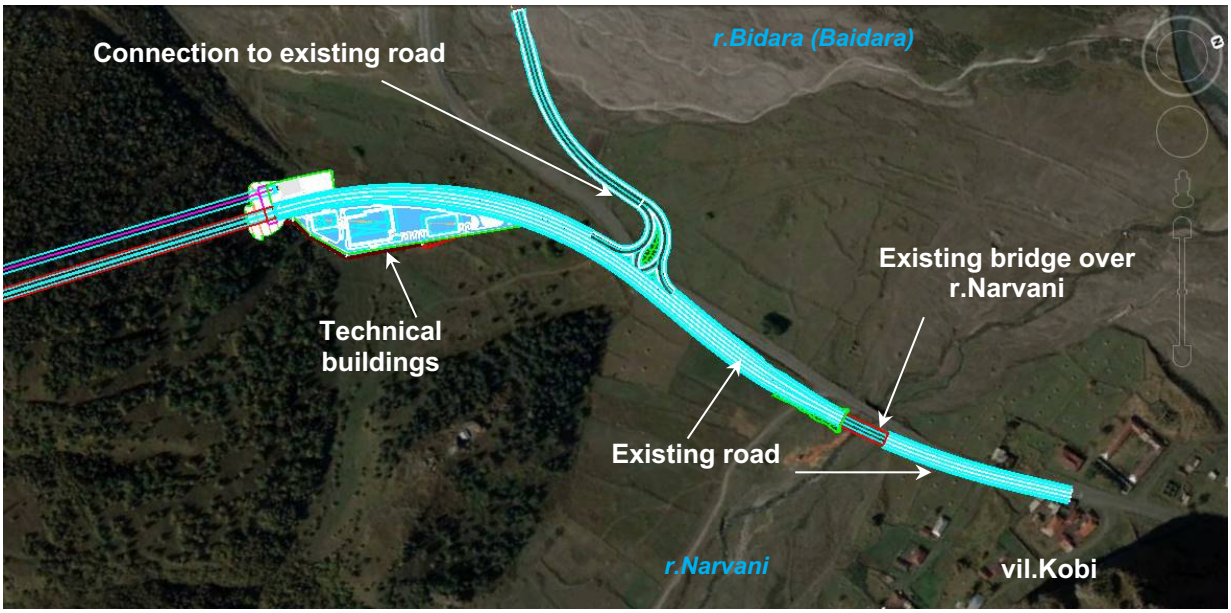


Figure 23. Existing Road Embankment, Kobi

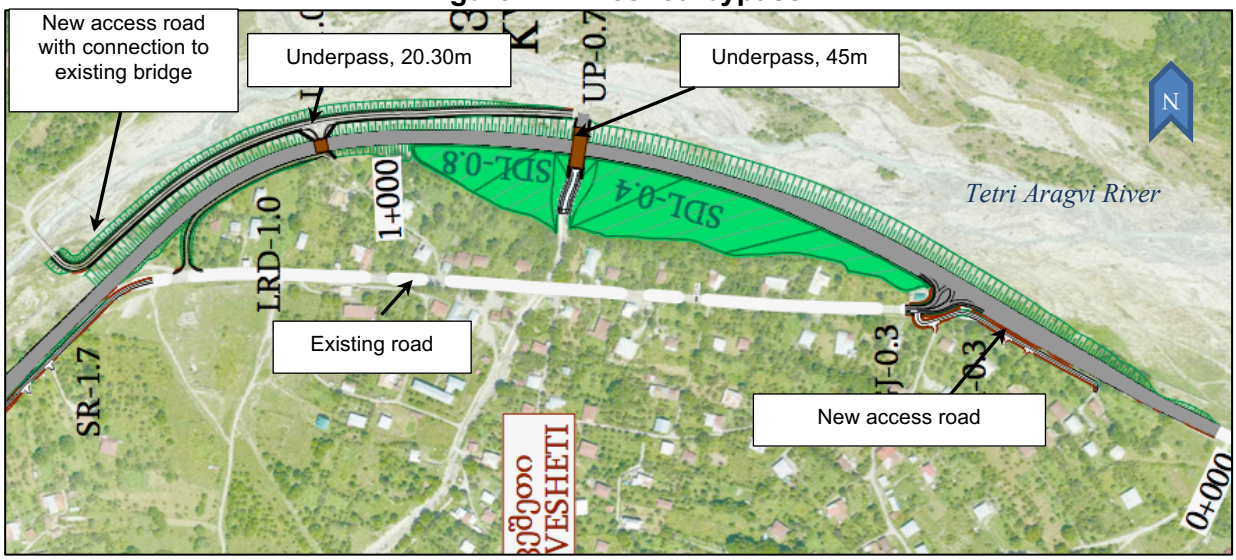
B.3.2 Lot 2 Summary

148. The Kvesheti – Tskere section, or 'Lot 2' includes 2.5 km of tunnels and 1.5 km of bridges. The main elements of this section are:

- Kvesheti bypass road (length 3.2 km),
- Bridge 1 (length 27.8m, height 14m, 2 lane)
- Bridge 2 over the Aragvi river (length 435.28m, height 62m, 3 lanes)
- Tunnel 1 (length 1540.64m, 2 lanes) with gallery (1092m) (New Austrian 72iltshire method-NATM [8])
- Bridge 3 – Arch bridge over the River Khadistskali (length 426m, height 164m, 3 lane)
- Tunnel 2 (length 193.42m, C&C, 3 lane)
- Bridge 4 over the left tributary of River Khadistskali river (length 147.80m, height 26m, 3 lane)
- Tunnel 3 (length 388.38m)
- Bridge 5 (length 322m, height 55m, 3 lane)
- Tunnel 4 (length 299m, C&C, 3 lane)
- Bridge 6 (length 218m, height 48m, 3 lane)
- Five grade junctions are planned (KM0.3, KM1.7, KM3.1, KM7.7, KM10,5) and 3 service roads.

149. The starting section of Lot 2 coincides with the existing road and then bypasses Kvesheti from the east and connects back to the existing road (see Figure 24). Two access roads (length 240m and length 405m) are planned as well as two underpasses allowing access to the river.

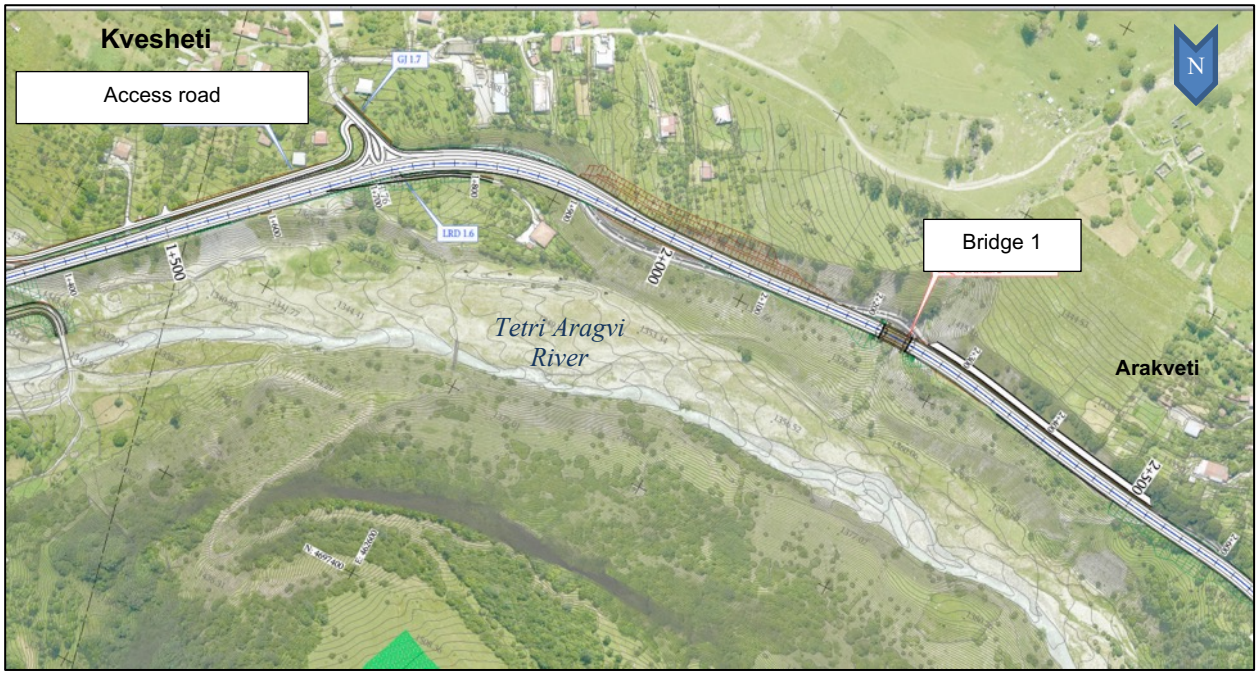
Figure 24: Kvesheti bypass



150. The new alignment then follows existing alignment up to Arakveti village. Just before reaching the village a small bridge, Bridge 1, is planned (see Figure 25). In Arakveti connection to the existing local road is provided via a junction and two service roads.

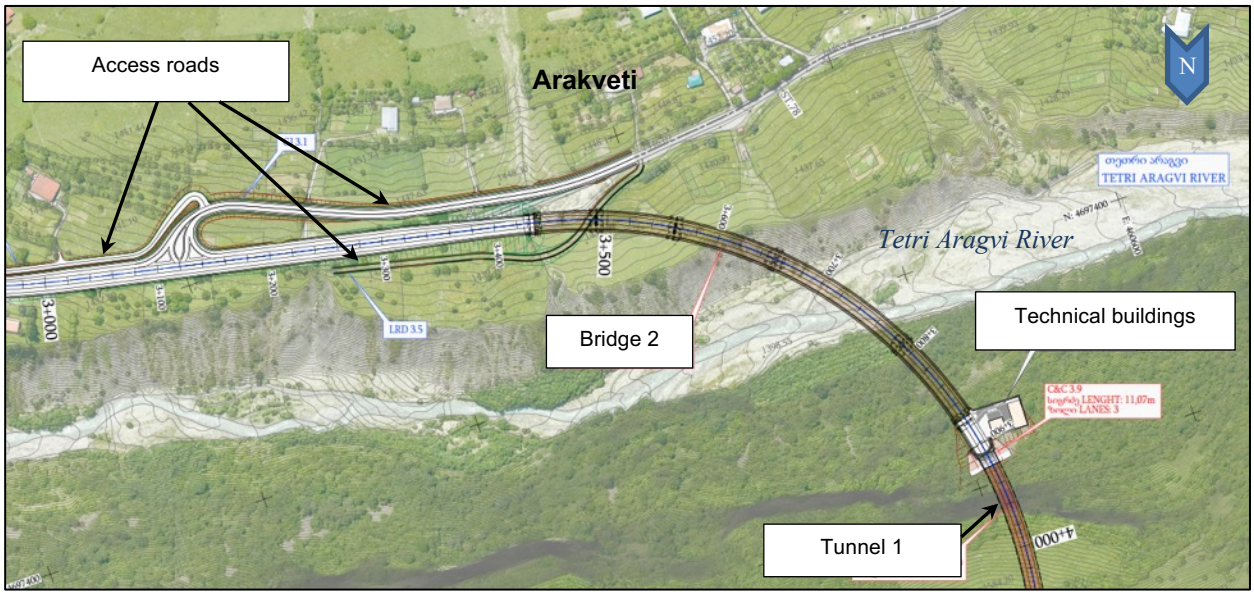
[8] The NATM integrates the principles of the behaviour of rock masses under load and monitoring the performance of underground construction during construction. The NATM has often been referred to as a "design as you go" approach, by providing an optimized support based on observed ground conditions. More correctly it can be described as a "design as you monitor" approach, based on observed convergence and divergence in the lining and mapping of prevailing rock conditions. It is not a set of specific excavation and support techniques.

Figure 25: Alignment in the Arakveti Village Area



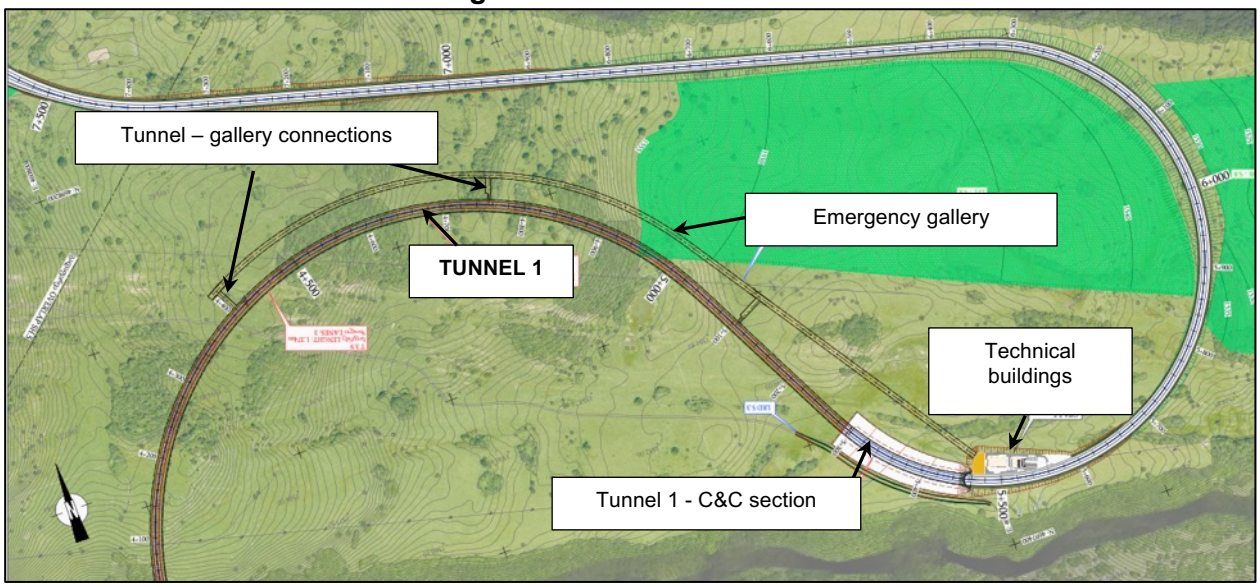
151. From Arakveti the alignment curves to cross the Tetri Aragvi River with a three lane, 435.38m long bridge, Bridge 2. Beyond the bridge there is the entrance portal for Tunnel 1, see Figure 26.

Figure 26: Tetri Aragvi River Crossing



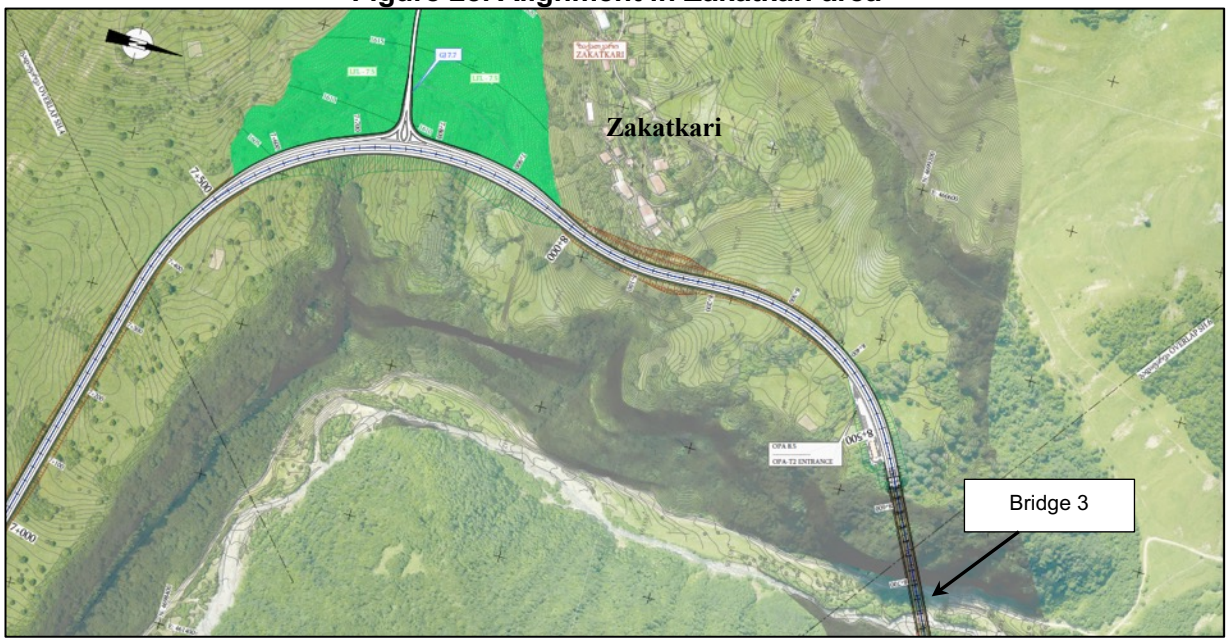
152. The alignment then enters Tunnel 1 curving and climbing towards the top of the plateau where it exits the tunnel and bends back along the edge of the plateau towards Zakatkari (see Figure 27). Note, there are plans to connect this portion of the road to Gudauri in the future via a new local road. Tunnel 1 is a three-lane tunnel, consisting of two short cut and cover sections at the portals and the main tunnel. At the north end of tunnel technical service buildings for the tunnel are planned.

Figure 27. Tunnel 1 Area



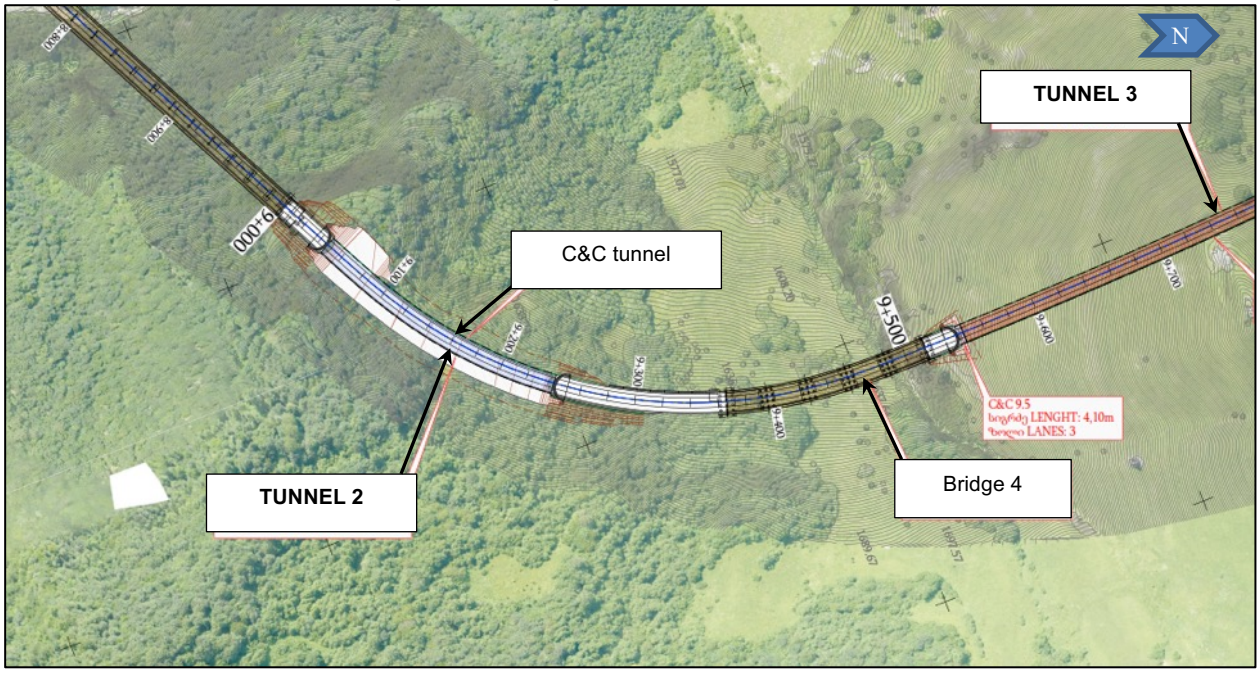
153. At Zakatkari connection to the village is provided via an access road. After Zakatkari, the new alignment crosses the Khadistskali river with 426m long, 164m high three lane arch bridge, Bridge 3 (Figure 28).

Figure 28. Alignment in Zakatkari area



154. After Bridge 3, on the left bank of the Khadistskali river Tunnel 2 and Bridge 4 is planned. Bridge 4 will connect to Tunnel 3 in Bedoni area. Tunnel 3 has been proposed to go across the mountainous terrain where landslides and avalanches are to be avoided. The new alignment bypasses the village of Sviana-Rostiani from the east to minimize disturbance to the local population as far as possible. The sequence of new tunnels-bridges allows to minimize the geotechnical risks of this area. The axis of the new alignment has been moved away from the edge of the cliff (minimum guard of 5 m) and by providing a minimum radius of 350 m. (see Figure 29).

Figure 29. Alignment in Bedoni area



155. In the Sviana-Rostiani area Tunnel 3 connects to Bridge 5, that ends at an interchange providing access to the villages of Gomurni and Benian-Begoni. (see Figure 30 & Figure 31).

Figure 30. Alignment in Sviana-Rostiani Area

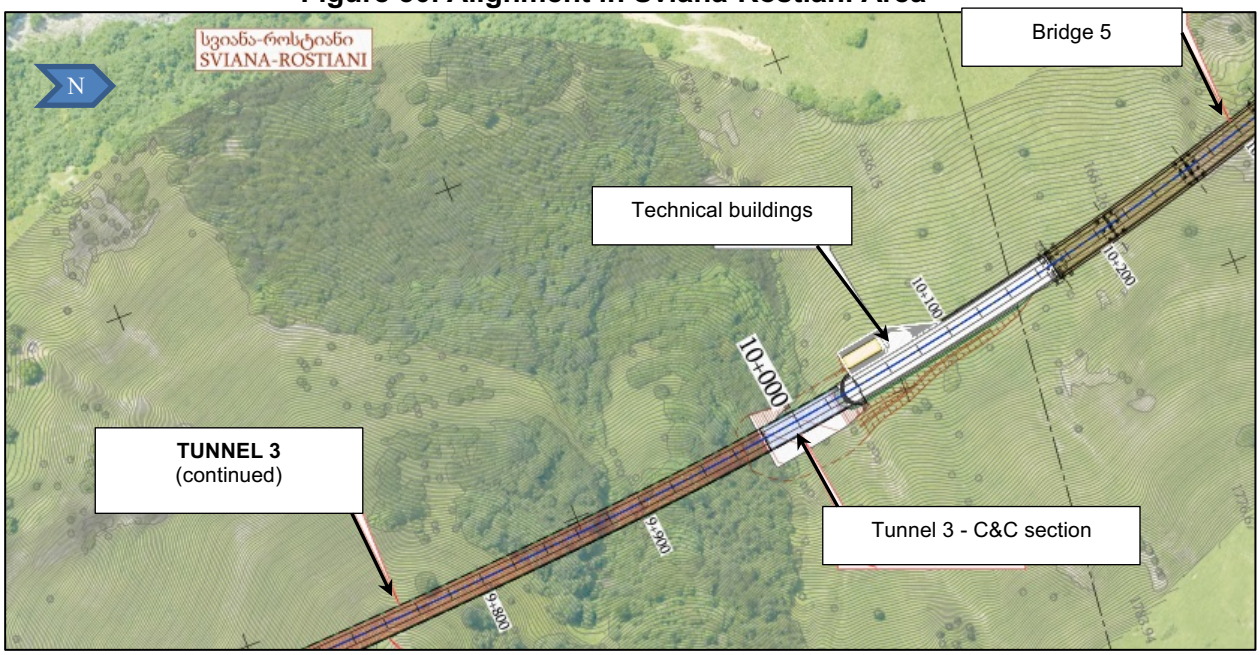
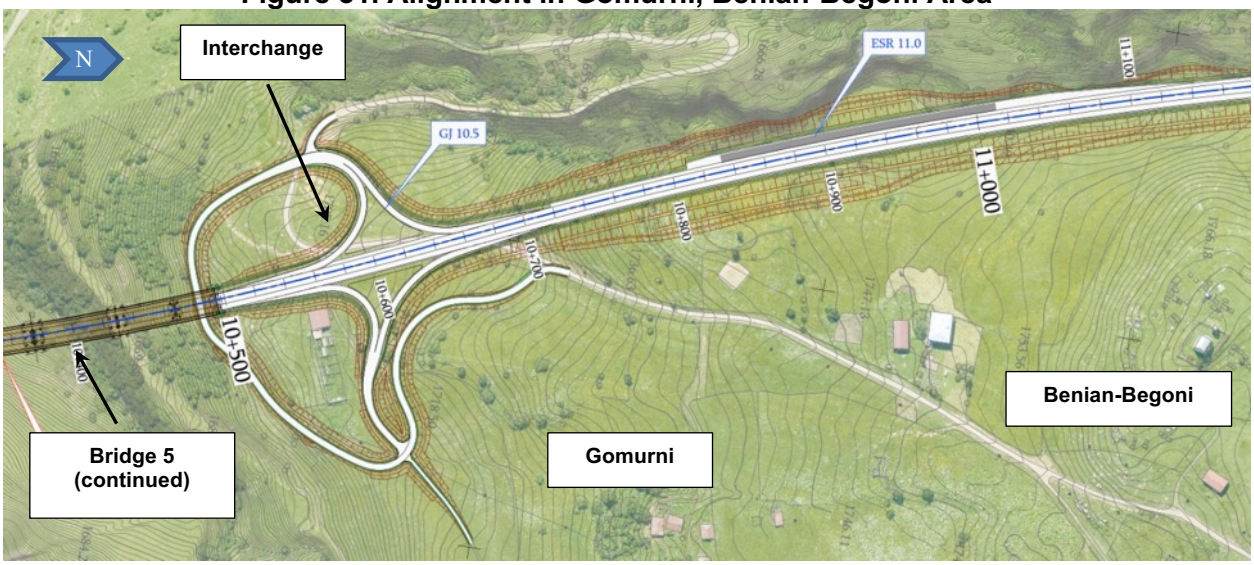
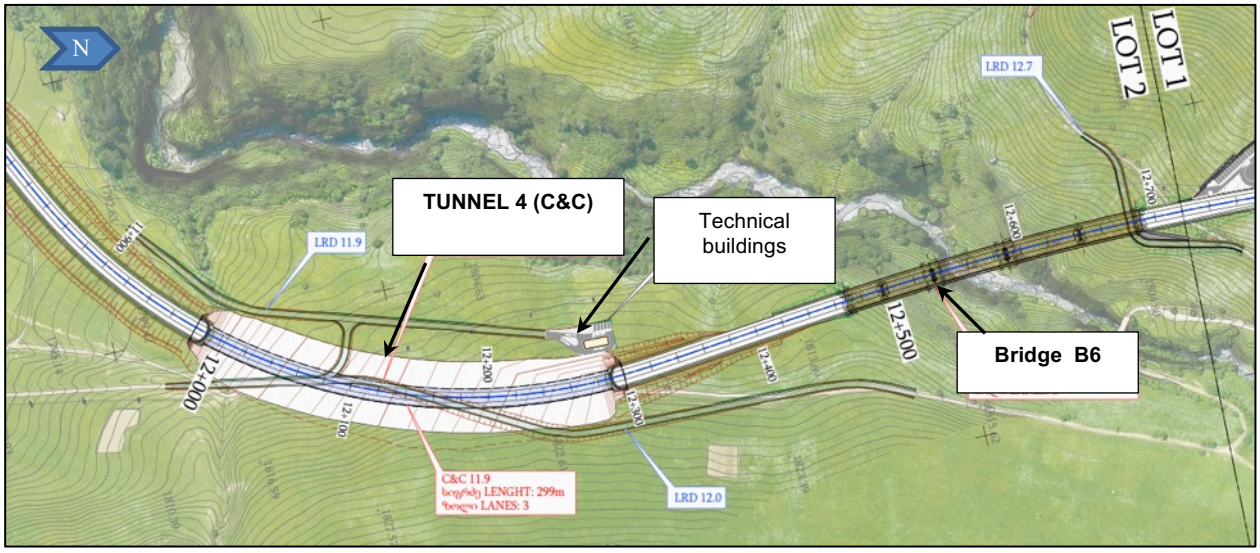


Figure 31. Alignment in Gomurni, Benian-Begoni Area



156. After KM 12 local access roads and a cut and cover three lane tunnel, Tunnel 4, are planned. Tunnel 4 will connect with Bridge 6. A local access road under the bridge is planned. Lot 2 ends at KM 12+720, where it joins Lot 1 alignment.

Figure 32. Alignment in Mughure Village Area



B.4 Design

B.4.1 General

157. The main technical characteristics of the design road sections are given below.

Table 5: Design Horizontal and Vertical Parameters and Values

DESIGN PARAMETERS	DESIGN VALUES ADOPTED
Road class	International
Design speed	80 km/h
Horizontal alignment	
Min horizontal radius	250m
Min length for min radius	45m
Min radius	2500m
Superelevation min	2.5%

DESIGN PARAMETERS	DESIGN VALUES ADOPTED
Superelevation max	7%
Min Stopping sight distance	140m
Vertical alignment	
Max grade	6%
Max length max gradient	3000
Min grade (exceptional)	0.50%
Max grade tunnel	5%
Min vertical crest curve (advised)	5000m
Min vertical sag curve (advised)	3200m
Vertical clearance (structures)	5.2m
Vertical clearance (tunnel)	5m

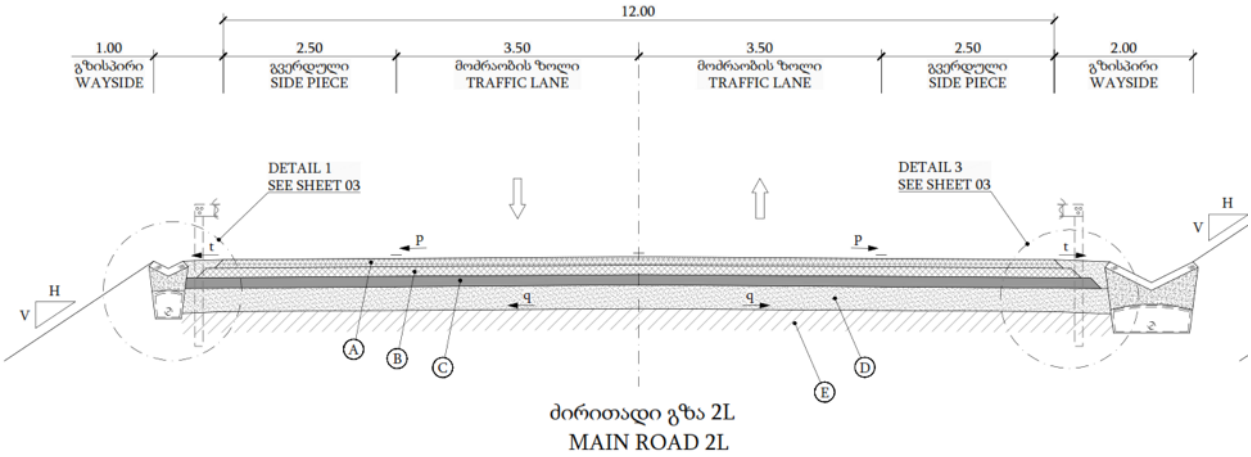
B.4.2 Tskere-Kobi (Lot 1) – Design Cross Section Parameters and Main Structures

158. The cross sections of the road section and the tunnel are described below:

Table 6: Cross Section Parameters (road and tunnel)

Road	Tunnel 5
Number of lanes – 2;	Number of lanes – 2;
Total width of the structure – 15m;	Tunnel total width – 12.5m
Total width paved – 12m;	Roadway width – 11m
Width of traffic lane – 3.5 m;	Lane width – 3.5m
Min shoulder – 2.5 m;	Min shoulder – 1.5+1m median
Min roadside – 1.0 m;	Min wayside – 0.75m
Min wayside – 1.5m	Wayside elevation – 7.5cm
	Vertical clearance – 5m

Figure 33: Cross Section of the Main Road (2 lane)



Lot 1 Tunnel 5

159. Tunnel 5 will consist of three portions:

- A 200m long C&C section in Tskere.
- An 8m long C&C section in Kobi.
- The main tunnel and an emergency gallery.

160. The C&C tunnel section consists of a reinforced concrete vault with a radius of 7m and vertical walls of 3m height.

161. An Emergency gallery runs parallel to the main tunnel. Connections between the emergency gallery and the main tunnel are provided every 500m.

162. 80% of the alignment of the tunnel is straight. The elevation profile of the tunnel is: 2.35 % uphill gradient from the south covers 7.3 km and 1.6% uphill gradient from the north covers 1.6km. A climbing lane in Lot 1 is not required.

163. Along the main tunnel niches for SOS posts will be provided.

164. Cross-sections of the tunnel and the emergency gallery are provided in **Appendix G**.

Lot 1 Tunnel Ventilation

165. The tunnel will be equipped with transversal mechanical ventilation.

166. The system will work in impulsion mode during normal operation to control pollution and it will work in extraction mode in case of fire. The main tunnel ventilation system comprises two large ventilation rooms near the tunnel portals and ventilation ducts both over the road and below it. The air is injected and extracted from the tunnel through the over-road ducts. Fresh air will always be sent into the tunnel from upper part.

167. The system includes a range of sensors that allow monitoring air quality and speed:

- Anemometers.
- CO detectors.
- Nox detectors.
- Opacimeters.

168. The parallel emergency gallery is equipped with five jet fans — equivalent to the ones located in the main tunnel— in order to guarantee minimum air renewals and provide the air flow required for the vestibule ventilations.

Lot 1 Tunnel Lighting

169. Gradual reduction of luminance will be used to enables the driver's eyes reaction to cope with the transition from daylight levels to the tunnels, lower interior levels. To allow visual adaptation the lighting of a tunnel is divided in to specific 'zones'.

170. A control system will be provided to easily integrate extra features like adapting the lighting according to traffic density, pollution environment adjustment, dynamic lighting evacuation systems and more. Monitoring and reporting the energy consumption and failures of luminaires, meters or other systems, provides tunnel managers with additional information and visibility concerning the network.

171. In addition to the mentioned above the tunnel will be equipped with:

- safety lighting powered by uninterruptable power supply unit (UPS); and
- evacuation lighting situated on both sides of the tunnel. The lamps will be places 1m above the carriageway in every 10m. (Capacity – 16W.),

Lot 1 Tunnel Fire fighting

172. The tunnel will be equipped with a manual extinguishing system. Hydrants, fitted with isolation valves, will be installed outside each tunnel portal and inside every 250m as maximum. Next to each hydrant inside the gallery, a cabinet equipped with hoses and other ancillary elements (jet-flows, torches, etc.) will be installed.

173. Design flow will be, at least, two consecutive hydrants working simultaneously (typically a total flow of 120 m^3/h is considered). The fire water tank and fire pumps will be located in

facility building at the tunnel portals within technical buildings area. Water for the fire water tanks will be supplied by tanker trucks.

174. Due to the large length of the tunnel and its height difference between the tunnel portals, the tunnel has been divided in two parts, each equipped with separate independent systems (hydrants, pumping rooms, water tanks, piping, etc.).

175. In addition to the system mentioned above, portable fire extinguishers will be provided.

176. Fire-fighting run-off water will be managed according to the requirements outlined below under Lot 1 and 2 Drainage.

Lot 1 Tunnel Power Supply

177. Energy will be supplied by 10 kV underground line by means of a corresponding Switching Substation. The installation of this Switching Substation and the underground line extension, are subjected to a separate project.

178. Three independent power sources have been designed for this installation:

- Medium Voltage line from the electricity supply in single grid (Main source).
- Stand-by diesel generator, which will automatically start in the event of failure of the main source. The diesel generator shall have the sufficient capacity to power all essential components and equipment. Diesel containers will be stored within a bunded area.
- Uninterruptible Power Supply (UPS) facility, which stores power to be used when all other sources fail. It would also cover any transition period and ensure that emergency systems remain operable.

179. More precisely, one Transformer Centre will be installed on each of the tunnel entrances. In addition to these two transformers, five more Transformer Centers will be installed inside the tunnel. The various transformers will be connected with each other by means of a Medium Voltage line that will pass through the emergency gallery in conduits specifically installed for Medium Voltage circuits. Oil used in the transformers will be PCB free.

180. Furthermore, next to the Transformer Centers, Technical Rooms for Low Voltage Switchboards will be implemented, in order to supply electricity to all the equipment in the tunnel. All Low Voltage cables that feed emergency systems (emergency ventilation, emergency lighting, detection equipment, etc.) shall be fire resistant (AS+).

181. On each entrance of the tunnel, next to the Transformer Centre, a stand-by diesel generator will be installed (diesel containers will be stored within a bunded area). The generator will supply all preference loads that are not supplied from UPS and which are fed from the Transformer Centers of the tunnel's entrances.

182. All Technical Rooms will have an uninterruptible power supply in case of power supply failure. Most critical electronic equipment will be fed from the UPS, such as, certain lighting and fire control. Power will be ensured for, at least, sixty (60) minutes.

Lot 1 Tunnel Safety

183. Safety will be ensured by availability of:

- Emergency walkways.
- Emergency gallery with cross connections in every 500 m.
- Lay-bays every 1,000 m (required if the total tunnel width that is accessible to vehicles, excluding elevated parts and normal traffic lanes, is less than the width of one normal traffic lane).
- Drainage system for flammable and toxic liquids.
- Normal lighting, safety lighting & evacuation lighting.

- Emergency stations SOS post and SOS/PCI in every 125m and 250m respectively.
- Water supply & hydrants in every 250 m.
- Road signs showing exit positions, distance and direction to safe area, location of firefighting equipment, etc. (Maximum distance between evacuation signs – 25 m).
- Control center.
- Video monitoring & Automatic Incident Detection.
- Tunnel closing equipment.
- Radio re-broadcasting equipment for emergency service.
- Public Address System in shelters and exits.
- Emergency power supply.

Consultations on Tskere C&C

As a result of visiting the site several times, not only for the surveys but also for gathering the best input for the design, the Detailed Design held discussions with local people to understand their expectations for the project and also to listen their proposals. These meetings were informal ones but were also attended in some instances by World Bank staff (managing the design process).

Regarding Tskere, the tunnel portal design is focused on limiting geological and technical issues while at the same time limiting impacts to the population in Tskere. In this sense, the C&C was lengthened as much as possible to move the tunnel portal south further from Tskere. In addition, the cuts are proposed to be cladded with local stones and slim trees (Populus nigra) to minimize the visual impact.

Another request from local people was to prevent the existing cemetery at Tskere from any damage during the construction period. The temporary cuts at the tunnel portal were reinforced and their location and slope were modified in order to ensure a safety corridor. Also, temporary accesses to the cemetery during the construction period has been adopted at the design.

Lot 1 Technical Buildings

184. There will be technical buildings at the tunnel portals. The technical buildings will accommodate:

- Pump room with fire water tank – below ground structure entirely designed with in-situ reinforced concrete. The room accommodates fire pumps, water tank with capacity sufficient for 1 hour.
- Facilities Building – below ground structure (level of 35 m length, 23 m width and 4 m depth) for ventilation utilities. Above ground part of the structure consists of 9m wide and 6m high section to accommodate ventilation utilities and lateral electrical building (width 7 m, length 18 m).

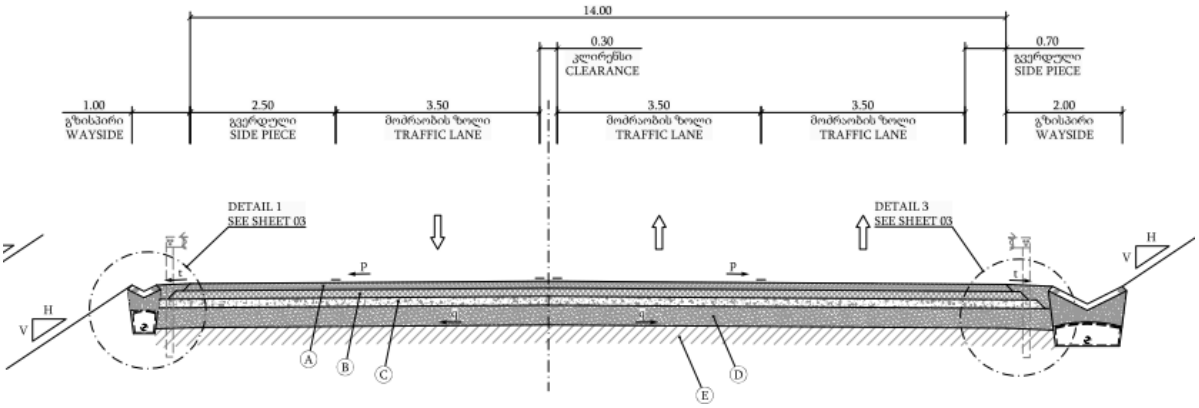
B.4.3 Kvesheti – Tskere (Lot 2) – Design Cross Section Parameters and Main Structures

185. The cross sections of the road section and the tunnel are similar to those given in Table 6.

186. A climbing lane has been located in lot 2 from KM3.4 up to chainage KM12.7 before the main tunnel, Tunnel 5 in Lot 1.

187. The following cross section is proposed for this project where a clearance 0.30 m width for a double line is added to separate both ways and the shoulder on the right is reduced to 0.70 m:

Figure 34: Proposed Cross Section of Climbing Lane



Lot 2 Bridges

188. Lot 2 comprises six bridges as shown in Table 7.

Table 7: Lot 2 Bridges

#	Chainage start	Chainage end	Total length (m)	Max. height (m)	Width (m)	Number of lanes	Number of spans	Span length (m)	Number of Piers in riverbed	Bridge type
1	2+216.100	2+243.9	27.8	14	15	2	1	30	0	Precast beams
2	3+437.225	3+872.34	434	62	18.2	3	5	53, 70, 93, 135, 83	1, partially	Balanced cantilever
3	8+575.092	9+007.09	432	164	18.2	3	22	19	0	Arch bridge
4	9+366.562	9+514.33	147.8	26	17	3	5	28.9; 3x30, 28.9	0	Precast beams
5	10+171	10+493	322	55		3	7	38; 4 x 55; 38; 26	0	Movable scafolding
6	12+470	12+688	218	48	17	3	5	26, 38, 2x55, 44	0	

189. The cross section of the 6 bridges is as wide as the approach road. Table 8 indicates the parameters of each bridge.

Table 8. Lot 2 Cross Section Parameters

	Bridge 1	Bridge 2	Bridge 3, 4, 5, 6
Lane width	3.5 m	3.90 m	3.5m
Lanes	2	3	3
Side piece (left)	2.5 m	2.5 m	2.5m
Side piece (right)	2.5 m	0.7 m	0.7m
Wayside	1.5 m	1.5 m	1.5m
Clearance	0	0	0.3m

Except for small bridge in Kvesheti-Arakveti area all other bridges along the design alignment are three lane (have climbing lines). Plans and cross sections of all Lot 2 bridges are provided in **Appendix G**.

Lot 2 Tunnels

190. **Lot 2 Tunnel 1** – The tunnel consists of two Cut and Cover sections at entrance (length 11m) and exit (length 155m) of the tunnel and the main tunnel body. At each portal a section 10 m long is designed at variable height in order to integrate the portals into the existing landscape (see Figure 36.

Table 9: Summary of Lot 2 Tunnel 1

	Tunnel cross section recommended according to "Cross section design for Bi-directional road tunnels" developed by World Road Association (PIARC)	**Curved section of Tunnel 1**
Number of lanes	2	2
Roadway width	14.3 m	15.2 m
Lane width	3.5 m	3.9 m
Shoulder	2.5 m	2.5 m
Shoulder reduced	0.7 m	1 m
Median	0.3 m	0.3 m
Walkway elevation	7 cm	7 cm
Walkway width	0.75 m	0.75 m
Vertical clearance	5m	5 m

191. There will be 11 SOS niches, 10 SOS+PCI niches and 3 emergency exits.

Figure 35. Lot 2 Tunnel 1 Main Tunnel Cross Section

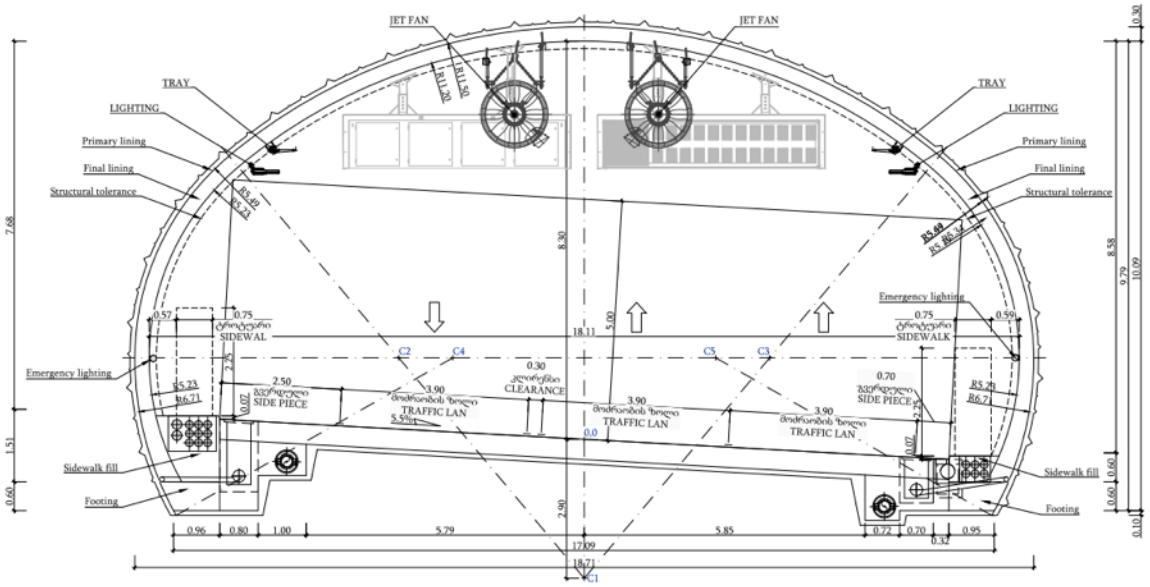
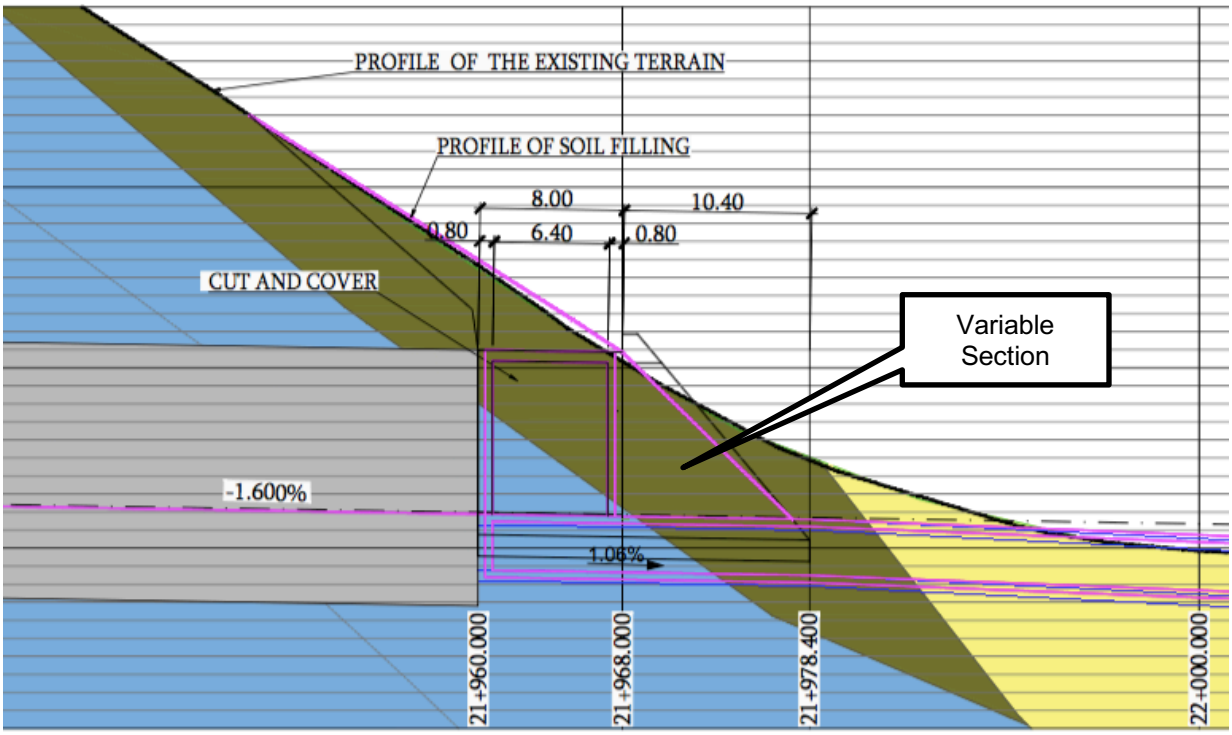


Figure 36: Tunnel Portal



192. As the tunnel is more than one kilometer long an emergency gallery is required. The cross section of the gallery is similar to one designed for Lot 1 tunnel (see **Appendix G**). Three connections between emergency gallery and main tunnel are provided at less than 500m between connections or portals.

193. **Lot 2 Tunnel 2 (Cut and Cover)** – The tunnel is a 193m long Cut and Cover structure. At each portal, a section 10 m long is designed at variable height in order to integrate the portals into the existing landscape. In the last 139 meters (between chainages KM9.1 and KM9.24), due to site conditions and to prevent snow avalanches, a protection gallery has been designed. The C&C was selected for Tunnel 2 due to the following design constraints:

- Type of soil – the rock is not good quality.
- Length (193 m) – short length.
- Overburden (less than 12 m in the worst section and less than 4 m in the main part of the tunnel).

194. The vegetation on top of the tunnel will be fully reinstated.

195. **Lot 2 Tunnel 3 (Cut and Cover sections, drill and blast tunnel)** – The tunnel consists of two Cut and Cover sections at entrance (length 4.1m) and exit (length 50m) of the tunnel. A variable section of 10 m length is designed in each structure as outlet in order to integrate the portals into the existing landscape.

196. Main tunnel cross section is similar to the plateau Lot 2 Tunnel 1, but lanes width are 3.5m. The main tunnel is less than one kilometer long so no emergency gallery is needed and, as the tunnel is also less than 500m no niches for SOS or PCI are needed.

Table 10: Summary of Lot 2 Tunnel 3

	Tunnel cross section recommended according to "Cross section design for Bi-directional road tunnels" developed by World Road Association (PIARC)
Roadway width	14.3 m

	Tunnel cross section recommended according to "Cross section design for Bi-directional road tunnels" developed by World Road Association (PIARC)
Lane width	3.5 m
Shoulder	2.5 m
Shoulder reduced	0.7 m
Median	0.3 m
Walkway elevation	7 cm
Walkway width	0.75 m
Vertical clearance	5m

197. **Lot 2 Tunnel 4 (cut and cover)** – Tunnel 4 is a 299 m long buried gallery located at chainage KM11.99. A variable section of 10 m length is designed at both sides of the C&C as outlet, in order to integrate the portals into the existing landscape.

198. **Lot 2 Tunnel Ventilation** – The length of the tunnels is different; therefore, their ventilation necessities are completely different. Lot 2 Tunnels 2, 3 and 4 do not need mechanical ventilation system. In Lot 2 Tunnel 1 there are two main zones that require independent mechanical ventilation:

- Traffic circulation area in the main tunnel.
- Emergency exits, which comprises the parallel gallery and the connections with the main tunnel.

199. The main tunnel ventilation system and the emergency gallery ventilation present a double objective- provide adequate air quality during normal operation and removal of exhaust and smoke from the main tunnel, emergency gallery and connections during fire.

200. Similar to Lot 1 Tunnel 5, the system includes anemometers, CO detectors, Nox detectors and opacimeters that allow monitoring air quality and speed.

Lot 2 Tunnel Lighting

201. Similar to Lot 1 Tunnel 5 permanent, reinforcement and evacuation lighting will be provided.

Lot 2 Tunnels Firefighting

202. Firefighting system along the tunnel comprises the following elements: manual extinction systems and fire detection systems. All the tunnels will be equipped with portable fire extinguishers. In addition, Tunnel 1, due to its long length, will be equipped with a firefighting hydrant network.

203. In addition to the hydrant systems, portable fire extinguishers shall be provided. In Lot 2 Tunnel 1 they should be installed next to each emergency call points and at gallery connections. In Lot 2 Tunnels 2, 3 and 4, they should be installed in each entrance and exit of the tunnel. In addition, all technical rooms should be equipped with portable fire extinguishers.

Lot 2 Technical Buildings

204. In order to house the installations required for the different tunnels, different groups of buildings have been planned close to each tunnel portal. These building include: Electrical Building the Pumping Station. The location of these buildings is the following:

- Tunnel 1 entrance and exit (KM3.9, KM5.5): electrical building and pumping station.
- Tunnel 2 entrance (KM8.5): electrical building.
- Tunnel 3 exit (KM10.0): electrical building.
- Tunnel 3 exit (KM12.2): electrical building.

205. Electrical buildings house the power supply facilities:

- Medium Voltage Room where a group of medium voltage cells and a transformer centre are located.
- Generator Room where a stand-by-diesel will be installed (diesel containers will be stored within a bunded area).
- Low voltage Room for low voltage switchboards and UPS.
- Facilities Room where racks are located.

206. Electricity will be supplied in Medium Voltage to the different Transformer Centres located along the road, and later transformed to Low Voltage in each Transformer Centre, to finally supply the equipment in the tunnel.

Lot 2 Underpasses

207. According to the original design two underpasses were considered for access (see **Figure 24: Kvesheti bypass**):

- Underpass KM0.9 – box type (length 20.31m, width 14m, height 6.65m).
- Underpass KM0.7 – box type (length 45.08m, width 14m, height 5.50m).

Consultations on Underpasses

As part of the consultation process for this Project some changes and additions to the underpasses have been made. These changes are discussed below.

208. ***Underpass KM0.9*** *– This proposed underpass affects some land plots and buildings, and local people (and the owners of these properties) complained about it during the public meetings for this EIA. At the same time, because of the height of the embankments for the new alignment (above of the existing ground), some buildings were affected regarding their sights to the Aragvi river and the valley. Considering this, when developing the survey on site, the resettlement team decided to extend the buffer at this location (see area A,* Figure 37: Buffer, Kvesheti*), in order to include these properties (see [1] and [2], Figure 38).*

Figure 37: Buffer, Kvesheti

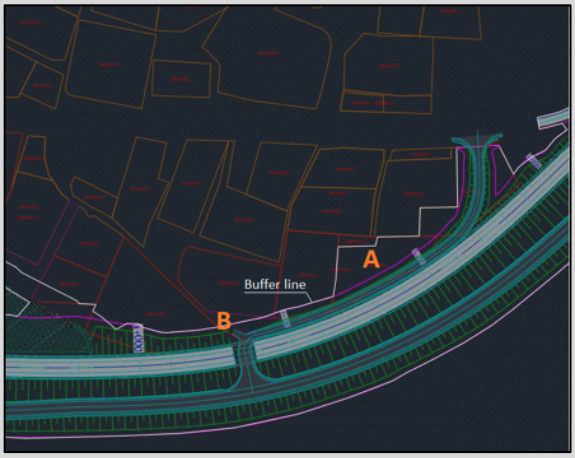
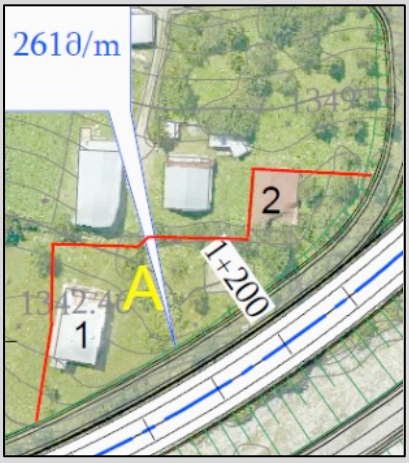
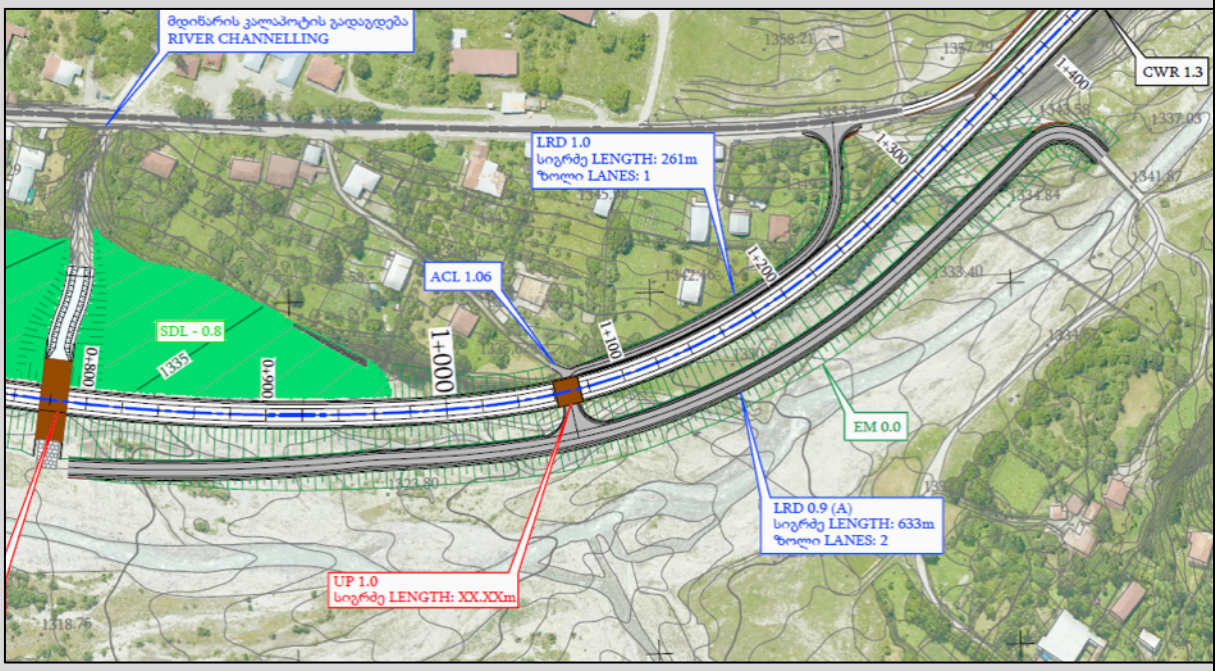


Figure 38: Properties Affected by Embankment



Accordingly, the design team developed a new alignment for the Khada valley road from Kvesheti and moved the underpass to a new location which connects an existing pedestrian path (see [ACL-1.06], Figure 39).

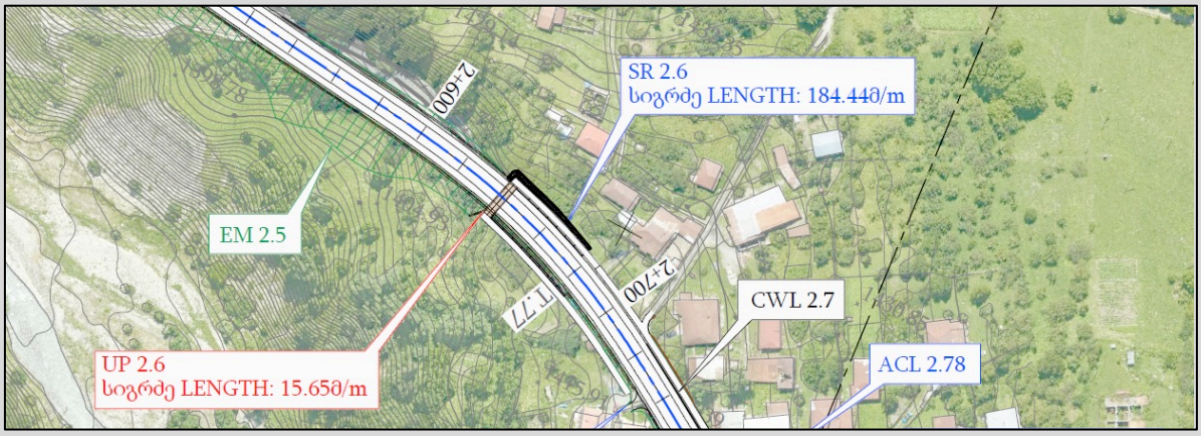
Figure 39: New Khada Valley Access Road and Underpass



Arakveti underpass – *As a result of the public consultations in Arakveti, a new underpass (see [UP-2.6],*

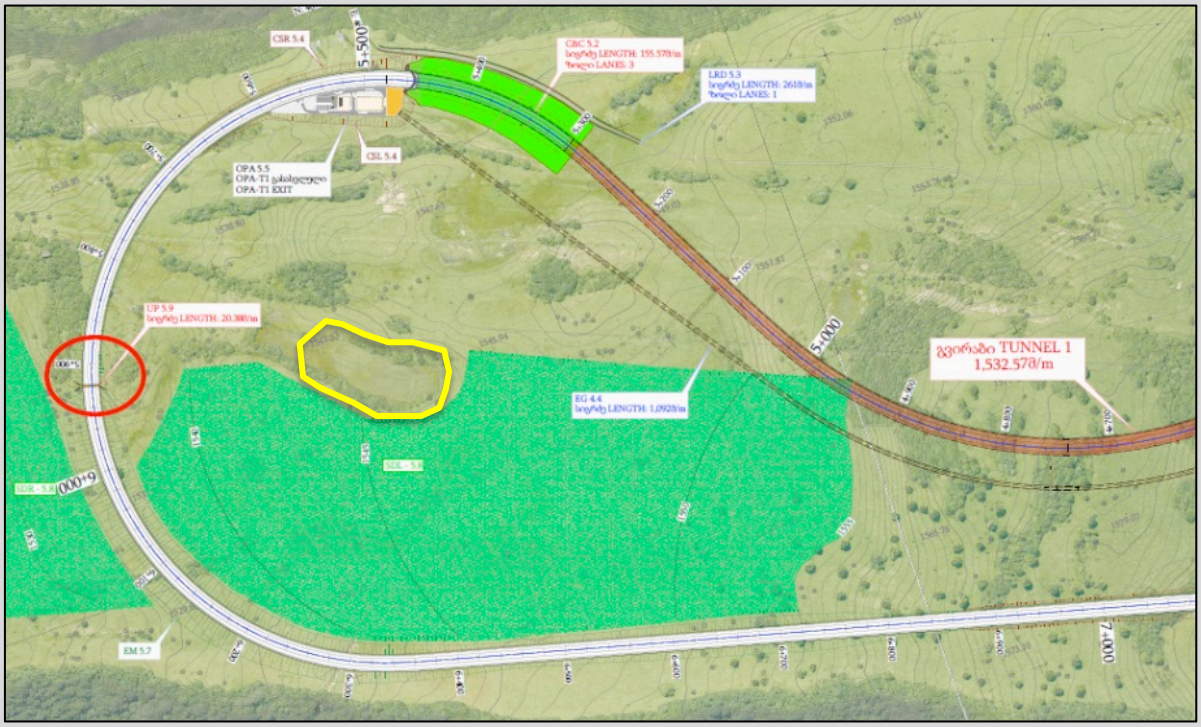
Figure 40) both for pedestrians and cattle, has been adopted. Even though the access to the river side was provided by a new local road which avoids crossing the new road, this underpass ensures a shorter path to some plots and also to an existing shop. The project team met with the woman in charge of this shop, explaining her the design criteria regarding safety, both for traffic road and pedestrians. Also, attending the demands from some local residents, some accesses to plots were provided.

Figure 40: Arakveti Underpass



Cattle underpass at the Plateau – *Considering the requests from the social meetings and consultations with NGOs (Sabuko), regarding the Plateau area which is used for cattle grazing, and also in order to prevent from accidents from cattle crossings and to allow a better access to the whole area, a new underpass was adopted (see [UP-5.9],*
Figure 41). In addition, a portion of the proposed soil disposal site has been moved to reduce impacts to a potential wetland area (highlighted in yellow)

Figure 41: Plateau Underpass



Lot 2 Retaining Walls

209. A group of protection wall will be arranged to retain the terrain at different levels as described in the table below.

Table 11: Lot 2 Retaining Walls

Cantilever concrete walls	are entirely cast on site with reinforced concrete and its height varies from 2 m to 10 m.	• Max height 6m, length 110m • Max height 6m, length 130m • Max height 3m, length 170m • Max height 10m, length 50m • Max height 10m, length 80m • Max height 10m, length 65m
Reinforced earth walls	are built on site using terrain, steel anchors and concrete shells.	• Max height 14m, length 180m
Rockery walls	are built on site using rock elements that allows to stabilize terrain slope effects.	• Max height 2m, length 40m • Max height 10m, length 35m
Anchored concrete walls	are established in general in order to permit excavation throughout the Project area of main road, anchored walls are cast on site reinforced concrete (shells elements) with individualized anchors dimensioned to control terrain stability.	• Max height 10m, length 260

B.4.4 Lot 1 and Lot 2 Shared Design Characteristics

Drainage

210. Longitudinal drainage, e.g. side drains – consists mainly in platform ditches and guard ditches.

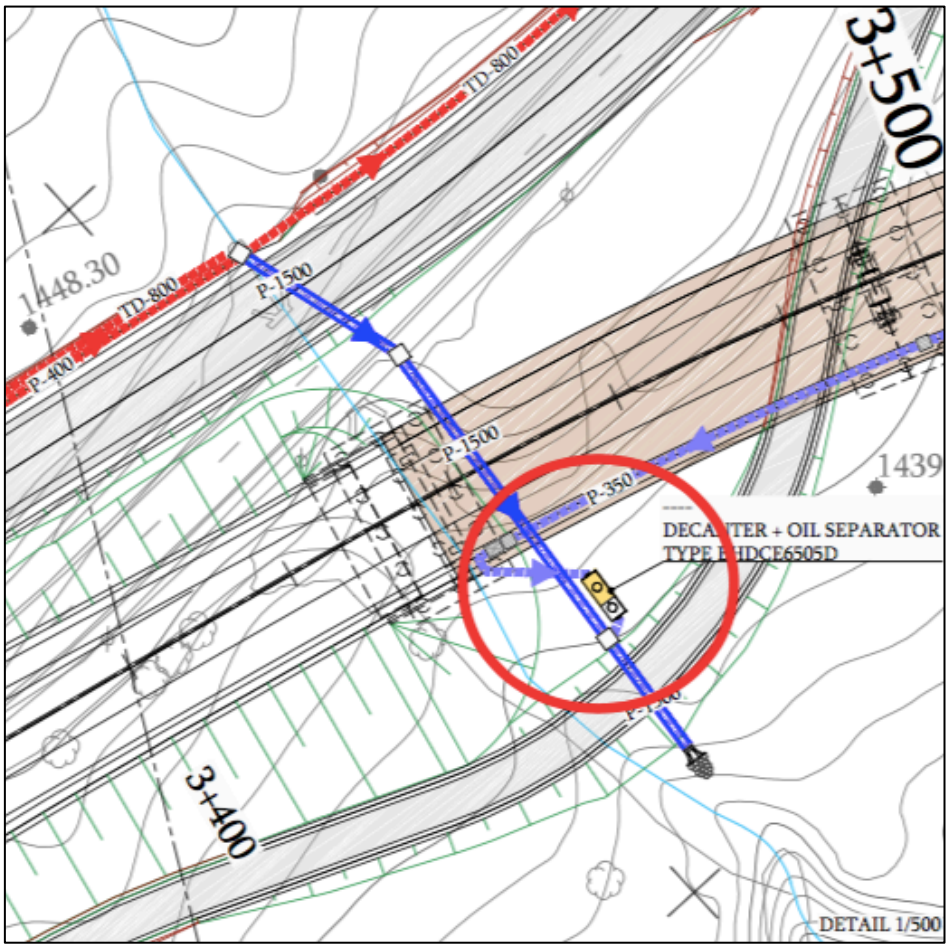
- Platform ditches drain the water of the road platform and the water of the cut slopes. They are triangular ditches, disposed along the road platform, with side slopes of 2H:1V.
- Guard ditches: These are trapezoidal ditches, located along the head of cuts and the foot of embankments. They drain the runoff water, preventing that this water reaches the road platform.

211. The longitudinal ditches connect to transversal drainage (culverts), which are composed of circular pipes or box culverts depending on the maximum discharge. In this section some bridges allow to pass the main flow of incoming water as well as the main transversal drainage pipes.

212. Along the alignment (Lot 1 and Lot 2) there are 7 bridges that allows the passing of the main flow of incoming water. In addition, three culverts are designed in Lot 1 at KM 12.73, KM 12.86 and KM 22.00 and nine culverts in Lot 2 at KM 3.20, KM 3.43, KM 5.69, KM 5.79, KM 6.10, KM 7.70 (2 units), KM 8.20 and KM 11.09. For drainage 1200mm and 1800mm pipes will be provided. The diameters/capacity of the pipes have been estimated based on 100-year recurrence discharge.

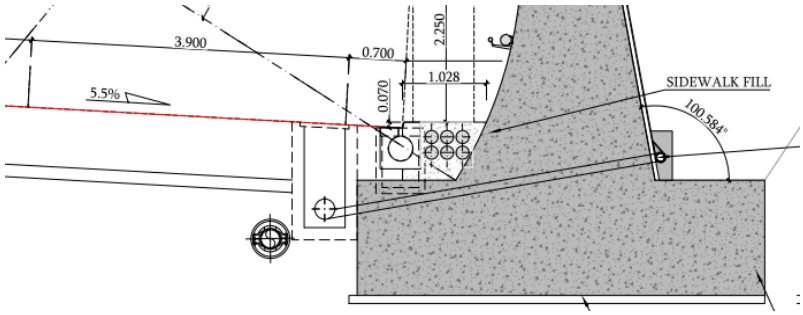
213. All bridges include oil-interceptor tanks to collect oil and grease run-off from the bridge decks. Figure 42 illustrates an example of where an oil interceptor tank has been included in the design, in this instance at the start of Bridge 2. The effluent from the tanks will discharge directly to the surrounding environment. On steep slopes erosion protection will be provided at the discharge points (planting of native wetland plant species in discharge locations to remediate the water and provide some soil stability is also recommended). All other above ground portions of the Project road will have the drainage system connected to settlement tanks.

Figure 42: Oil Interceptor Tank, Bridge 2



214. In the tunnels, where the transport of dangerous goods is permitted, the drainage of flammable and toxic liquids is considered. Additionally, the drainage system is designed to prevent fire and flammable and toxic liquids from spreading inside and between the tubes.

Figure 43: Tunnel and C&C Platform Drainage



215. The system platform drainage designed consists of a slotted precast chainage and a longitudinal pipe 300 mm diameter, in addition siphon manholes (600 x 800 mm) each 60 m prevent from the fire propagation (coordinated with the rest of facilities located in the tunnel).

216. The effluent collects in a storage tank of 120 m^3, these tanks are located in the technical building areas. The tank shall be fitted with an interceptor tank to filter out any oil and grease run-off within the tunnel. Water discharge from the tank shall be tested when the tank is full to ensure effluent discharge is compliant with national and IFC standards. In the event that a spill of toxic or hazardous liquid occurs the liquid shall be stored within the tank until they can be removed by a licensed contractor.

217. In the emergency gallery, infiltration water is collected and drained by means of a longitudinal pipe 250 mm diameter and manholes each 60 m apart.

Pavement

218. The pavement consists of asphalt base course and crushed rock base course. In order to reduce the negative effect of ice in pavement durability, it has been designed a dense-graded asphalt surface course, meaning it is relatively impermeable. As it can be observed, the thickness of the frost blanket course depends on the frost class:

Table 12: Proposed Pavement Structure

OPTION A: ASPHALT BASE COURSE AND CRUSHED ROCK BASE COURSE (RstO 12 Plate 1, Line 3)				
LOAD CLASS BK32		**FROST CLASS**		
		F1	F2	F3
ASPHALT SURFACE COURSE		12 cm	12 cm	12 cm
ASPHALT BASE COURSE		14 cm	14 cm	14 cm
CRUSHED ROCK BASE COURSE	E_{V2}>120 Mpa	15 cm	15 cm	15 cm
FROST BLANKET COURSE	E_{V2}>45 Mpa	30 cm	34 cm	44 cm
		Subsoil/Subgrade		

219. The pavement design of the structures is designed with two layers of dense asphalt with a thickness of 3 cm and 5 cm respectively and a tack coat (350 g/m²) between them. In the tunnel sections, the pavement design follows the same structure as the general outside sections. The pavement of the emergency galleries is composed of a concrete layer of 20 cm since the traffic along the gallery will be circumstantial. For main local road diversions where the traffic will be lower than for the main section (particularly the Mleta junction, Kobi junction (Lot1)), a traffic category of BK 10 has been considered, resulting in the following pavement design (Local Road Type 1):

Table 13:Pavement structure Local Road Type 1

ASPHALT SURFACE COURSE		12 cm
ASPHALT BASE COURSE		10 cm
CRUSHED ROCK BASE COURSE	E_{V2}>120Mpa	15 cm
FROST BLANKET COURSE	E_{V2}>45 Mpa	28cm

220. For the other local roads, for example at Kvesheti, Bedoni or the new Gudauri access road, designs for the lowest traffic category, BK 0.3, are considered as follows:

Table 14: Material specifications for Local Road Type 2 and Type 3

Layer Material	**Density (g/m2)**	**Thickness (m)**
		F1
Asphalt concrete type B, on viscous bitumen 60/90		0.04
Tack Coat	350	
Asphalt concrete porous coarse, on a viscous bitumen 60/90		0.08
Prime Coat	700	
Crushed mix with continuous granulometry C6		0.15
Gravel mixture with continuous granulometry C3		0.18

221. The same consideration applies for operation area at tunnel portals where the technical buildings are placed.

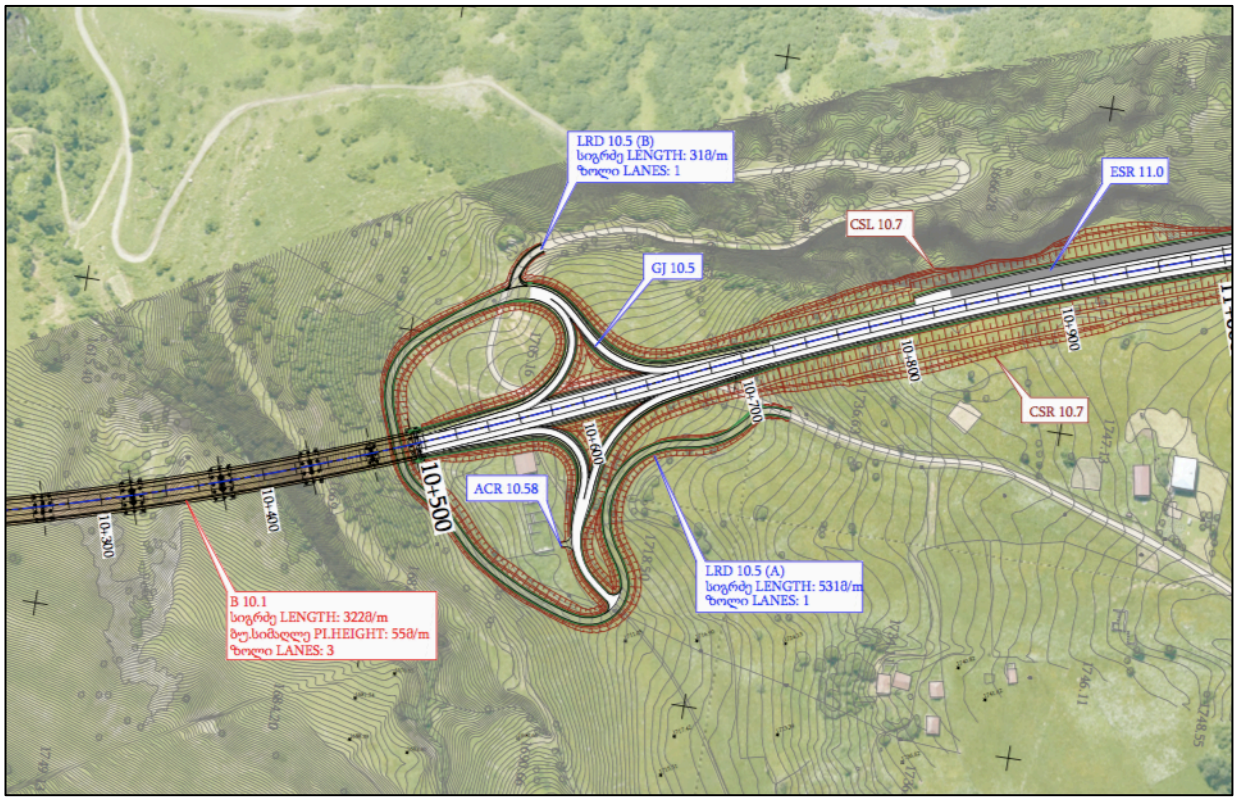
222. Where the slope is high in these areas (higher than 12%), a concrete surface course has been selected due to the constructive limitations to asphalt on high slopes.

Junctions

223. In Lot 2 five junctions have been considered, these junctions allow the connection to existing populations, existing roads or existing facilities improving the driving conditions of the proposed road. The junctions are shown in Figure 24 to Figure 28.

224. The first junction is located at KM 0.3, it is a three-leg intersection (T Junction) with extra lanes for left turns, it links to Kvesheti where there is a new access to Khada valley. The next junction is located at KM 1.7, it is other three leg intersection with extra lanes for left turns, it links to an urban area between Kvesheti and Arakveti on the left side where there is no other access. The third junction is located at KM 3.1, it is a three-leg intersection with extra lanes for left turns, it links to the existing road on the left side that goes towards Gudauri before Bridge 3 that rises to the plateau. The fourth junction is located at KM 7.7, it is a three-leg intersection with extra lanes for left turns, it links to Zakatkari on the left side. The final junction of Lot 2 is at KM 10.5, it is a diamond intersection for four possible movements, it links to Begoni and to the existing road along the Khada river. It is the last junction before the main tunnel and it is at 1,700 meters above sea level. Access to any village in the Khada valley will be less than 2.5km from this intersection thereby significantly increasing villagers' access in and out of the valley.

Figure 44: Diamond Intersection at KM 10.5



Lighting Specification

225. Lamps are Light Emitting Diode (LED) type and produced so that maximum durability and best performance is ensured. Luminaires are made of die cast aluminum alloy enclosure, sealed to IP66. Luminaires are mounted on galvanized steel columns with a 12 m height. The supports of outdoor lighting shall comply with the applicable regulations. The supports, anchorages and foundations, are sized to withstand the mechanical stresses, particularly considering the wind, with a safety factor not less than 2.5.

Fencing

226. Fencing has been only adopted for tunnel portals and operational areas. It is a simple twisted (diamond mesh) electro welded metal fence, with the corresponding tension posts, anchored to the ground by concrete cubes.

Local Road Diversions

227. According to the detailed design twelve road diversions are planned.

Table 15: Local road diversions

#	Id	Description	Type	Length	Max slope	Current conditions	New pavement
1	LDR 09	Kvesheti	1	242/633	5.5%/7%	Gravel secondary road	Asphalt
2	LDR 1.6	Kvesheti	4	158	14%		Concrete
3	LRD 3.1 (*)	Arakveti	2	390	3.5%		Asphalt
4	LRD 3.5	Plateau	5	251	6%		Gravel
5	LRD 5.3	Plateau, T1 exit	5	261	2.5%		Asphalt
6	LRD 7.7(*)	Future access to Gudauri	3	328	4%		Asphalt
7	LRD 10.5 (*)	Begoni access	4	531	10%		Asphalt & concrete
8	LRD 11.5		5	344	7%		Gravel
9	LRD 11.9	After Begoni	5	370/68	9%/5%		Gravel
10	LRD 12.0	Before the end of Lot 2	3	549	6%		Asphalt
11	LRD 12.7	Mughure access	4	167	12.5%		Concrete
12	LRD 12.9	KM 12+920	3&3	214	≤10%; >10%		Asphalt & concrete

B.5 Construction

B.5.1 Construction Process

228. During the construction phase the following activities will be undertaken:

(i) **Land Acquisition –** Under the terms of the Loan of the ADB and EBRD, before the commencement of the construction works, the *Employer* must prepare the Land Acquisition and Resettlement Plan (the LARP), obtain the approval of ADB and EBRD and then implement the plan and acquire the land.

(ii) **Specific Environmental Management Plan (SEMP)** – Ensure that the SEMP is submitted to the Engineer for review at least 30 days before taking possession of any work site. No access to the site will be allowed until the SEMP is reviewed by the Engineer and approved by the RD / PIU.

(iii) **Site Clearing Works –** The Works include the following site clearing works within or adjacent to the RoW (within the Project buffer[9]) of the Project Road, in accordance with the Drawings or instructions of the Engineer:

- (a) Clearing and grubbing.
- (b) Removal and disposal of any existing traffic signs, sign posts and their foundations.
- (c) Demolition, removal and disposal of any existing culverts, inlet and outlet structures, headwalls, concrete drains, channel lining, and erosion protection works.
- (d) Removal of any other natural or artificial objects within the RoW.
- (e) Removal and disposal of all vegetation and debris within the designated limits of the Right-of-Way.
- (f) Removal of any existing pavement in the Kvesheti and Kobi areas of the Project area. Recycling of this material is described further below.

[9] Buffer refers to the land that is required for the construction and operation of the road. The buffer, in its entirety will be the property of the GoG and as such all properties, or land not belonging to the GoG must be procured as part of the LARP before works can commence in this area.

(iv) **Relocation of Existing Services –** The Works include the relocation of all services affecting the construction of the Project Road within the Right-of-Way. The services include the following:
   (a) water mains
   (b) overhead electric supply lines
   (c) gas pipelines
   (d) underground telephone cables
   (e) sewer mains

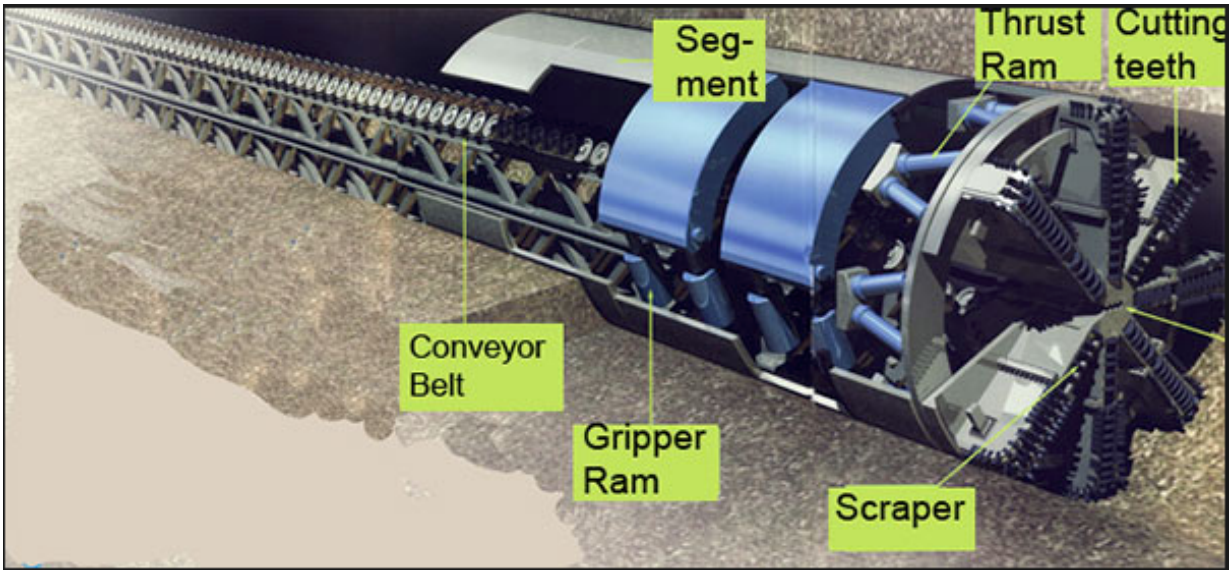
(v) **Construction Activities –** The main construction phase aspects are described in detail below.

Tunnels

Tunnel Boring Machine (TBM)

229. Due to the length of Lot 1 Tunnel 5, the type of ground, time restraints and the evaluation of costs, a simple shield TBM is considered the best option for this tunnel. The suggested TBM type is primarily intended for use in rock with a short stand-up time and fractured rock.

Figure 45: Example of a TBM



230. The TBM is fitted with a shield skin. The shield skin extends from the cutter head over the entire machine. The lining is installed in the projection of the shield tail, with a support consisting of reinforced concrete segments. To obtain the thrust necessary to excavate the full-face section and the advance rates required, the TBM is equipped with telescopic hydraulic cylinders which rest on the tunnel lining rings which are displayed in the previous phases. The shield forms an integral protection system, formed by a steel-sheeted structure. Its aim is to guaranty the temporary support of the terrain while the excavation process is advancing, and the lining is not placed. In order to install the lining segments a hydraulic erector is installed at the back of the TBM. This erector is in charge of the final placing of the lining.

231. As in this case presence of water inflows has been foreseen, special attention must be paid to the joints between the metallic shield and the lining finally placed. The lining segments are disposed inside the shield, so when the machine moves forward, a gap is left between the lining and the surrounding soil. This gap must be filled with grout.

232. The working cycle of a Simple Shield TBM is as follows:

- Excavation.
- Removal of the thrust hydraulic cylinders.

- Placement of the lining segments.
- Adjustment of the thrust hydraulic cylinders to their new position.
- Starting the next excavation stage.

233. The estimated time for TBM tunnel construction without manufacturing, transportation, assembly and dismantling is expected to take 22 months.

234. The disc cutters excavate the rock in a continuous way. The buckets collect the loosened rock and is tipped onto the conveyor belt intermittently. Buckets are constructed as slots around the perimeter of the cutter head and deliver the excavated rock to the conveyor belt while the cutter head rotates.

235. Waterproofing system will include:

- Sealing bands.
- Injected grout between the segment and the ground.

236. Another way to ensure waterproofing, is reducing the inflowing geological water by filling the gap with the surrounding rock by injecting grout mixture. Injecting by itself does not constitute and effective waterproofing layer, it is an additional way of decreasing the water pressure that the sealing band has to face. The whole gap between the segments and the ground will be filled with a concrete grout.

Emergency Gallery

237. The emergency gallery is going to be built using New Austrian Technology Method (NATM). Depending on the size of the tunnel and the quality of the terrain, it can be possible to excavate the full face of the tunnel in one or in two phases. The construction process involves:

- Excavation (blasting).
- Removal of spoil.
- Construction of the support (using robots equipped with concrete guns, hydraulic jumbos and platform lifts).
- Waterproofing.
- Positioning of the formwork and concreting of the lining.

238. Post blasting, ventilation of the excavation face area is required due to firing fumes, gases and dust. High temperatures and the concentration of harmful gasses (e.g. Carbon Monoxide CO, Carbon Dioxide CO_2, Nitrogen Dioxide Nox etc.) shall be decreased. The ventilation during construction will be done with simple jet fans installed outside the tunnel in the portal area. Through the pipe (installed in the upper part of the top heading) fresh air is pressed into the tunnel to the working face.

239. The spoil removal procedure can be divided into the loading, transport and disposal phases. The loading of the material can be completed with wheeler loaders.

240. The advance rates depend on the quality and the kind of terrain to be excavated. Excavation will start from both portals of the tunnel. Construction of the two portals will take up 2 months.

Bridges

241. The construction of the new bridges includes but is not limited to the following parts of the structures and associated works:

(i) Foundations.
(ii) Substructure including bridge bearings.
(iii) Superstructure, including construction of expansion and deformation joints and footpaths.

(iv) Deck pavement including hydro isolation, drainage, hand railing, and conduits for services.
(v) Approach slabs.
(vi) Slope treatments in front and around the abutments.
(vii) Construction and maintenance of traffic detours.
(viii) Scour and erosion protection of the waterway areas and river bank protection upstream and downstream of the bridge crossing, and removal of old foundations and substructure from the waterways.
(ix) All necessary and incidental items required for a complete bridge.
(x) All new bridges will be designed for the life expectancy of 100 years.
(xi) Oil and grease interceptor tanks.

Culverts

242. Project works include the construction of culverts and underpasses, including inlet and outlet structures and associated works in accordance with the Specification. The scope of the cross drainage works includes:

(i) Complete replacement of existing culverts which are old, structurally deficient or undersized;
(ii) Construction of new culverts at locations where no cross-drainage structure existed before;
(iii) Cleaning of existing culverts which are partially or completely silted;
(iv) Miscellaneous repair of the existing culvert joints, headwalls, wing walls, and scour and erosion protection works; and
(v) Construction of new scour protection and channel lining works.

Other Drainage Structures

243. Surface runoff from the carriageway and all other pavements, and any cut and embankment slopes must be discharged through longitudinal drains designed for adequate cross section, bed slopes, invert levels and the outfalls. The Works include construction of the drainage system components in urban and rural areas according to the types, dimensions, classes and material requirements for this work.

Earthworks

244. The Works include the following types of earthworks necessary for the construction of the Project Road and all associated works:

(i) Removal of topsoil.
(ii) Construction of embankments.
(iii) Construction of subgrade.
(iv) Excavation and removal of the existing pavement materials and the existing road embankment.
(v) Removal and replacement of unsuitable materials.
(vi) Structural excavation.
(vii) Excavation for the construction of side drainage and cross-drainage works.
(viii) Excavation for the removal and relocation of the existing utilities.
(ix) All backfilling necessary for the construction of bridges, retaining walls or other earth retaining structures, cross drainage structures and associated works, side drains and erosion protection work.
(x) Preparation of beddings and filters for all structural, cross drainage, side drains or pavement works.
(xi) Excavation, filling or backfilling necessary for the execution of any other incidental works.

Removal of Asphalt

245. There are some small sections of the existing pavement (both Lot 1 and Lot 2) which will need to be removed to make way for the new alignment. The Contractor shall remove the existing asphalt pavement layers in these areas and stockpile this material at locations that will be specified by the RD and instructed by the Engineer. The asphalt will be re-used, where practical, for access roads and temporary roads, and if not suitable will be re-used for shoulder material.

B.5.2 Construction Equipment and Staff

Construction Equipment

246. Table 16 provides indicative lists of the key equipment required in the construction phase.

Table 16: Key Equipment

No.	Equipment Type and Characteristics	Minimum Number required
1	Bulldozer (>245HP)	4
2	Excavator (>100HP)	12
3	Crushing and screening plant – mobile type at least 150 m3/h including rock material washing machinery	2
4	Concrete Paving Machinery width not less than 9.0 m for 2-layer concrete placing including film-forming machinery	2
5	Small Concrete Paving Machinery width not more than 5.0 m including film-forming machinery	1
6	Front Loader (>135HP)	15
7	Concrete batching plant (>150m3/hr)	2
8	Motor grader (>135HP)	10
9	Vibratory roller (> 13T)	8
10	Tipper truck (10T)	30
11	Tipper truck (16T)	30
12	Mobile concrete carriers (>25T)	25
13	Transit mixer (>6m3)	6
14	Crane (100 tons)	4
15	Crane (250 tons)	2
16	Rotary drilling Machine	8
17	Roadheader	2
18	Excavator Hammer	8
19	Jack Hammer	8
20	Pusher Leg	4
21	Truck mixer concrete pump	10
22	TBM	1

Personnel

247. The construction phase will last approximately 36 and 48 months for Lot 2 and Lot 1 respectively and it is expected that approximately 600 direct employment opportunities will be available during the peak of construction (with reduced needs over the other months of construction). This may be divided between two construction 'Lots'. It is estimated that around 70% of staff will be locally employed and 30% will be international staff. It is estimated that around 10% of the total staff for each Lot will be female. The estimated breakdown of skills required during the construction phase will be as follows:

(i) Skilled labor: 60%;
(ii) Semi-skilled labor: 20%; and
(iii) Unskilled labor: 20%.

B.5.3 Construction Program and Schedule

248. The proposed works schedule is as follows:

Lot 1

249. The layout of this section, mainly with a long tunnel and its parallel emergency gallery, provides only two main areas of work, located close to the portals, in which are concentrated the more important activities.

250. The work schedule establishes the main activities involved in the works, their duration and the relations between the activities. It is divided in five groups of actuations:

1. Access preparation 2 months.
2. Works from T5 entrance.
3. Works from T5 exit.
4. Works in tunnel and emergency gallery.
5. Other works.

251. The total duration expected for the Lot 1 works is 4 years.

Lot 2

252. The layout of this section (Lot 2) provides three main areas of work:

1. KM 0.0 – KM3.9 – Outside road works from Kvesheti to Arakveti.
2. KM 3.9 – KM 8.7 – Tunnel/outside road works at Plateau.
3. KM 8.75 – 12.72 – Tunnel/outside road works at Begoni plateau.

253. The total duration expected for the Lot 2 works is 3 years. The three different areas of works can act simultaneously with small interferences. As the cross section is composed of 3 lanes, the first portion along the existing road will develop works on one lane and allow crossing traffic at the other two. Bridge 2 should be totally completed from the existing road by a temporary river cross. Tunnel 1 is the main task for portion 2 – Plateau and the longer activity (31 months) and it is considered to drill only one side (top to down) because of the difficulties of accesses to the south portal (close to the riverside). In any case, earthworks for all this portion are related to the Plateau spoil disposal site. The arch bridge abutment, Bridge 3, must be completed from this side of the gorge. Portion 3 – Begoni plateau is the most limiting work area, because of the interferences with Lot 1 and local traffic, the distance to the spoil disposal site (potentially located at Kvesheti or the Plateau) and mainly because completing Tunnel 3 provides the access to bridges (for the precast beams), C&C tunnels (earthworks and transport of remaining material to the spoil disposal site) and abutment of the Arch bridge, Bridge 3.

B.5.4 Access to Site / Temporary Roads

254. The following section provides a summary of the access to site proposed as part of the Detailed Design. These roads have been represented in the project for the sole purpose of indicating possible access routes and to evaluate the cost of construction within the Bill of Quantities (BoQ). These schemes of design are indicative and not mandatory, although suggested: The Contractors, according to their working methods, available machinery and experience, can change them and must in any case submit to the Employer, or his Engineer, a detailed plan for such access roads and will also have to provide for the temporary acquisition of the relevant areas.

255. Such plan must be completed with detailed drawings of the elements that make up the road, the areas and the properties affected by possible occupation outside the areas owned by the administration, calculation reports if necessary. In addition, in this plan the existing traffic affected by the passage of construction vehicles must be shown and the Contractor will be responsible for requesting authorization from the Authority managing the use of the same infrastructure.

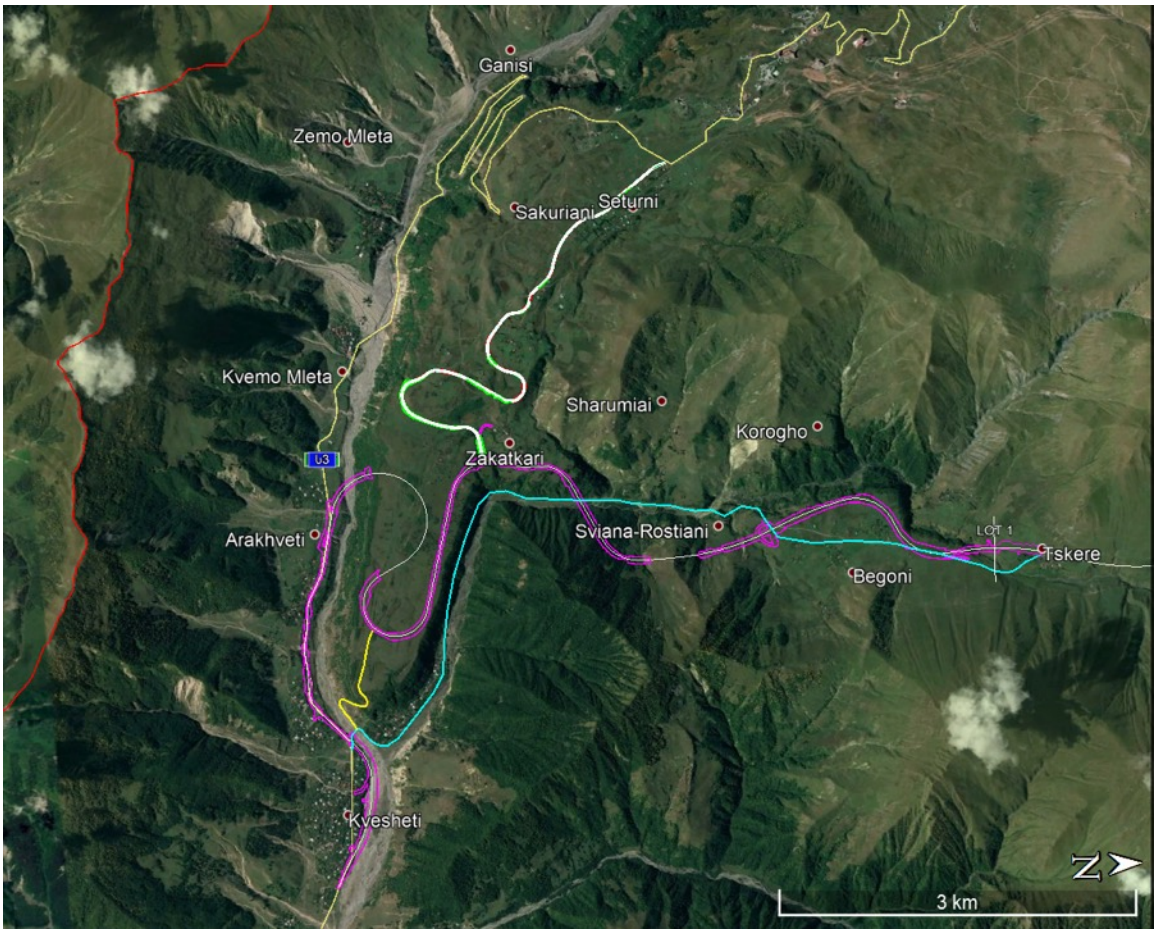
256. In addition, the EIA states (in **Sections F and G**) that specific environmental and social method statements shall be prepared for all temporary roads (and temporary river crossings and storage areas) in order to adequately assess the potential environmental and social impacts of these areas and the measures to manage any potential impacts. These method statements shall be prepared with the oversight of the Contractors Ecological Clerk of Works and then reviewed and approved by the RD and Engineer before any works can commence in these areas.

257. Access to the site is discussed below in detail, but broadly includes:

- **Lot 1:**
  - Portion 1: Access to Kobi and Tunnel 5 northern portal
  - Portion 2: Access to Tunnel 5 southern portal
- **Lot 2:**
  - Portion 1: Kvesheti
  - Portion2: Plateau and Potential Spoil Disposal Sites
    Portion 3: Begoni Plateau.

258. Figure 46 illustrates the three potential access roads up to Tskere.

Figure 46: Roads to access Tskere during construction



Key:
Blue line – existing road to Tskere with section bypassing Bedoni
Yellow line – connection to the plateau
White line – access from Gudauri
Purple Line – Project road

Lot 1

259. **Access for Portion 1:** The first portion relates to; a) the development of the northern portal of Tunnel 5 (where the TBM will be launched), b) the northern half of the excavation of the emergency gallery, c) all the works in the operation area of the exist of Tunnel 5 (including technical and service buildings and cut & cover structures), and d) and the junction with the existing road at Kobi.

260. **Access for Portion 2:** Relates to the southern portal of Tunnel 5 in Tskere. In order to quickly initiate the tunnel excavation, the existing access road at the Khada valley should be used (Figure 46 – Blue line). The distance from the main road at Kvesheti junction to Tskere through this way is around 7 kilometers.

261. The current condition of this route will allow it to be used for the initial delivery of tunneling equipment. But it will be necessary to enhance and enforce it so that it may be used as the main access for all construction equipment (Lot 1 and 2).

262. For this access route, it has been planned to bypass Bedoni to the north because of the narrow existing road and to not to disturb the villagers. Consultations undertaken as part of this EIA have indicated that trucks currently using this route to access the Khada valley are causing some noise and vibration impacts. The change of the layout solves the problem of space in the existing route, were the houses are close to the pavement, and there is not enough space for a regular traffic of construction vehicles and machinery. However, it is also noted that this route

requires temporary land access across some of the fenced agriculture areas of the village, which can be reinstated at the completion of construction.

263. To use this route the Contractor will need to reinforce or to build up a new bridge over the Aragvi river, because of the bad condition of the existing one. The existing bridge is not suitable for a regular traffic of construction vehicles and machinery.

264. The Contractor will be required to improve the access road by spreading (regularly during the construction period) compacted crushed stone. Some transversal drainage pipes will be also required for the winter-spring time (small crossing streams appears because of snow melting). Even though no risk of rock falls has been detected during the Project construction phase, it is recommended to have regular inspections all the way up to Begoni. Special passing areas should be provided every 250 m in order to facilitate the movement of heavy traffic (construction) and also the local traffic.

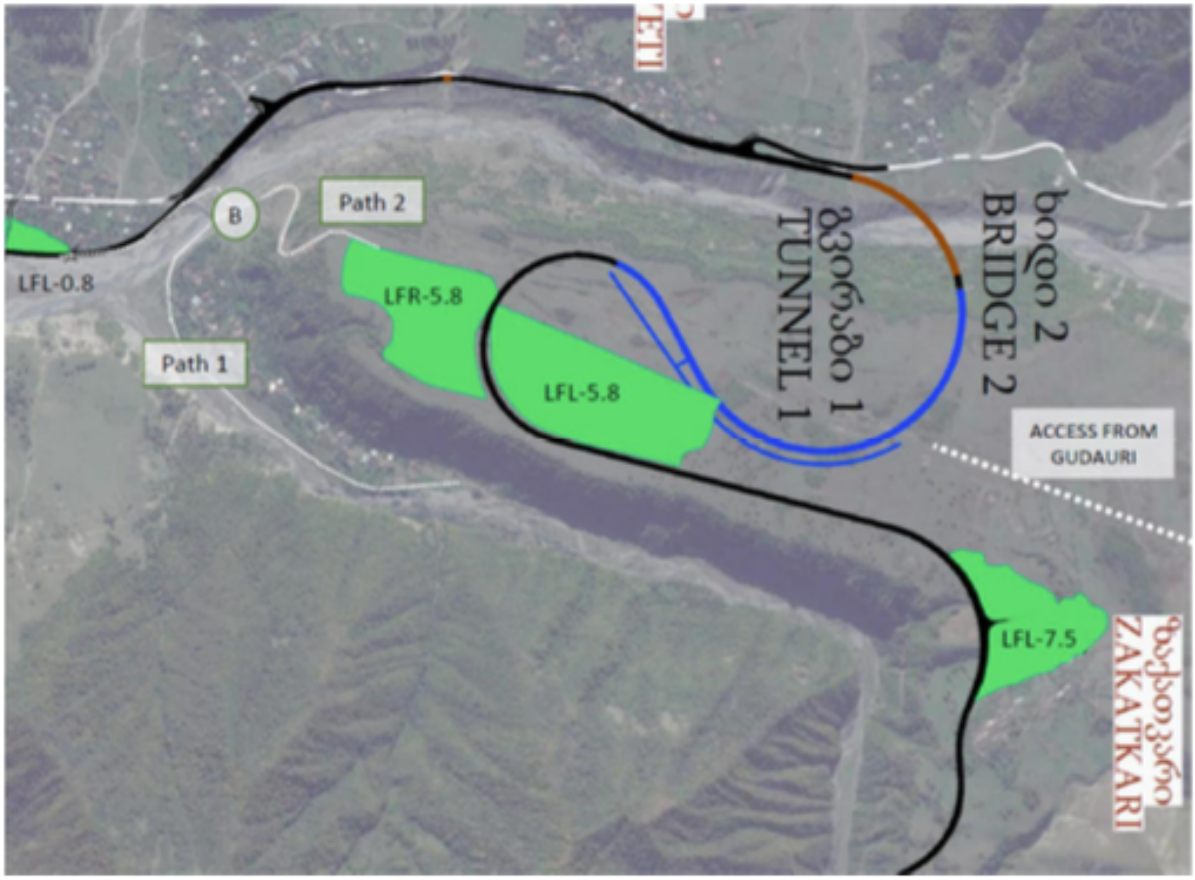
Lot 2

265. The objective is to provide access to all the work areas and also to the spoil disposal areas. The priority is to start as soon as possible with the activities which are the critical path for finishing the works, but specifically must be considered to minimize interferences with Lot 1 works and not to disturb existing traffic (main road to Gudauri and all local roads).

266. **Access to Portion 1:** The access to the first portion – Kvesheti and the associated embankment are proposed from the existing road. As the embankment at the riverside (KM 0.2 to KM 1.4) is constructed, it will be possible to provide an alternative track for construction equipment. For the whole stretch, as 3 lanes are proposed, it is recommended to build one of them and, at the same time, to use the other two for the existing traffic.

267. **Access to Portion 2**: Access to the Plateau and the associated potential spoil disposal sites (indicated as LFL-5.8, LFR-5.8 and LFL-7.5 on Figure 47) have been proposed by the design team from the existing road or Path 1 (point B) and by using the existing track (Path 2). However, due to the steep gradient of this path it is unlikely that Path 2 will be used. Accordingly, access to the plateau will be via Gudauri (White Line – Figure 46: Roads to access Tskere during construction). It is planned that the access road from Gudauri will now be a permanent road and as such it is discussed in more detail below under **Section B.5.5**.

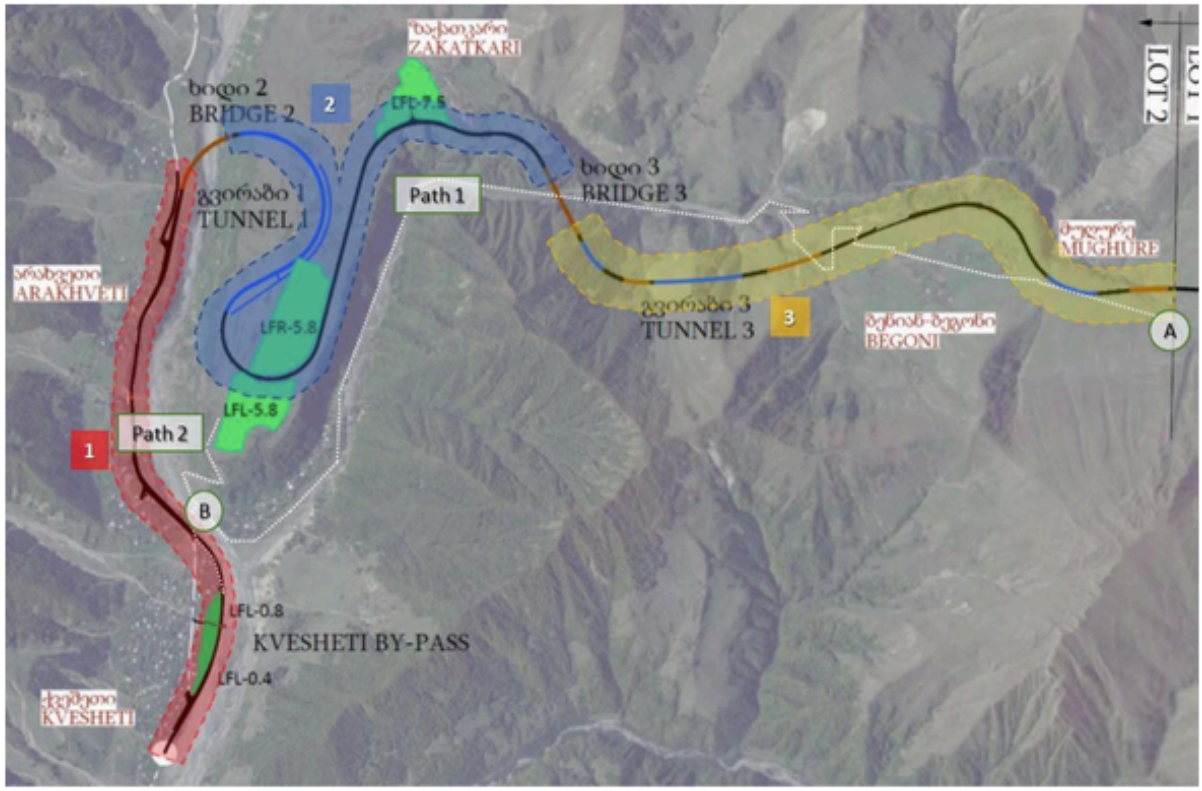
Figure 47: Access to Plateau



268. **Portion 3:** Begoni Plateau proposes to use the existing access road (Path 1, Figure 48: Lot 2 Work Sites / Blue Line, Figure 46: Roads to access Tskere during construction) in the Khada valley (shared with Lot 1).

269. The design team recommended that this road is upgraded by spreading (regularly during the construction period) compacted crushed stone layers. Some transversal drainage pipes would be also required for winter-spring time (small crossing streams appear because of snow melting). Even though no risk of rock falls has been identified in this area, the design team recommended to have regular inspections all the way up to Begoni. However, consultations undertaken as part of this EIA have identified this route as having potentially negative impacts on local residents in this area and as such changes to the alignment of this route are recommended and discussed further in the impact assessment section of this report, **Section F**.

Figure 48: Lot 2 Work Sites



270. Notwithstanding the above, all access road or temporary roads must be removed at the end of their use, unless otherwise notified by the Employer, or if at the end of the construction phase consultation with local residents has determined if they wish the temporary road to remain in place.

271. The Contractors, according to their working methods, available machinery and experience, can determine different access roads to those suggested above and must in any case submit to the Employer, or his Engineer, a detailed plan for such access roads and will also have to provide for the temporary acquisition of the relevant areas.

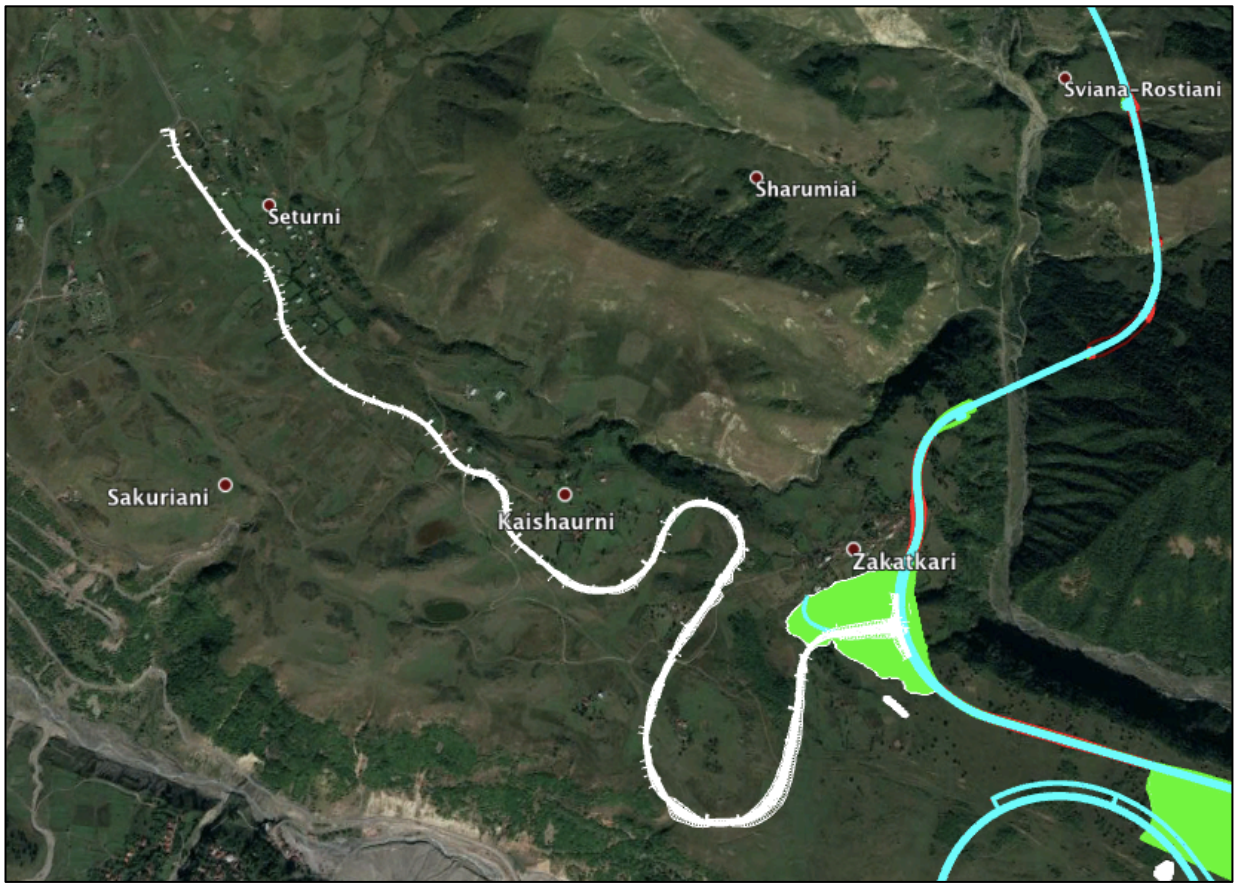
272. Such plan must be completed with detailed drawings of the elements that make up the road, the areas and the properties affected by possible occupation outside the areas owned by the administration, calculation reports if necessary. In addition, in this plan the existing traffic affected by the passage of construction vehicles must be shown and the Contractor will be responsible for requesting authorization from the Authority managing the use of the same infrastructure.

273. The Contractor shall install tanks for washing the truck wheels at the access points to the work site in order to reduce the level of mud and dust leaving the sites. The Contractor will also provide for the restoration of the existing roads if the Employer ascertains that the passage of construction vehicles has deteriorated the level of service. This assessment will be done in in the presence of the Contractor, the Engineer and the RD. Once ascertained, the costs for the restoration of such roads will be the borne by the Contractor.

B.5.5 Gudauri Road

274. As part of the Project the access road from Gudauri may be made into a permanent road. The road will be approximately 4.9km long, its location shown by Figure 49. The potential impacts associated with the road will be studied further and this EIA updated accordingly if the road becomes a permanent road.

Figure 49: Planned Gudauri Road



Key: White line: Gudauri Road / Blue line: Project Road / Green Areas: Proposed Spoil Sites

B.5.6 Source of Construction Materials

Borrow Pits

275. Borrow pits for materials to build the embankments are initially not foreseen, because the potential reserves of spoil material from the tunnel excavation works is likely to satisfy the necessary amounts of fill material for creating embankments.

276. Should additional borrow material be required the Contractor will follow the borrow pit guidelines outlined in **Appendix C.**

Concrete Batching and Asphalt

277. Bitumen and bituminous products are not produced locally in Georgia and is mainly imported from Iran, Azerbaijan and Romania. Bituminous products, which are necessary for the project (production and construction) must be imported and comply with European standards.

278. There is an asphalt plant near the north portal of the main tunnel. The facility is owned by "GRG" Ltd. The plant produces about 100-120 tons asphalt per hour.

279. Cement is produced locally by companies such as Saqcementi and Kartuli Cementi in Kaspi (approximately 70 km east of the Project area), other sources of cement may also be found closer to the site.

280. In the event that the Contractor decides to operate his own asphalt production facility consultations must be undertaken with MoEPA as asphalt production belongs to activities listed in Annex II of the Environmental Assessment Code. MoEPA will make a decision in the need of

EIA for this activity based on the screening procedure (ref. Environmental Assessment Code (document code: 360160000.05.001.018492).

281. The Contractor will be responsible for ensuring the concrete batching facilities and asphalt plant comply with the conditions outlined in this EIA and that all necessary permits to operate are obtained from the MoEPA.

Technical and Potable water

282. Approximately 200 m^3 of technical water will be needed per day during the construction phase and around 15 m^3 of potable water per day. Most technical water will be sourced from the rivers adjacent to the construction sites, or from tunnel groundwater. Potable water will be provided to camps in reusable bottles – no single use bottles will be permitted. Potable water will be tested regularly throughout the construction period to ensure it meets the drinking water standards of GoG. There will be no supply of potable water to construction camps or sites from existing potable water supply lines in the villages as this may impact upon the availability of water to the local population. The final locations of the extraction points (for both technical and potable water) will require the approval of the Engineer and the RD prior to the start of extraction to ensure that over extraction of water resources does not happen, this will include the requirement for the Contractor to provide a water balance indicating the amount of water available from the source and technical water requirements. In addition, all relevant water abstraction and discharge permits will need to be in place and reviewed by the Engineer prior to the start of construction.

B.5.7 Disposal of Spoil Material

283. A large volume of spoil material will be generated by the Project works, mostly from the excavation of tunnels. The following table outlines the amount of spoil generated by each Lot that needs to be disposed of in spoil disposal sites (after subtraction of suitable fill material for road construction works).

Table 17: Spoil Volumes

#	Lot	Volume (m^3)
1	1 – Kobi Side	2,156,749
2	1 – Plateau Side	342,498
3	2	1,130,841
Total		**3,630,088**

Potential Lot 1 Spoil Disposal Sites

284. For the works considered in Lot 1, there is a surplus of material, approximately 2.5 million m^3 (2.15 million m^3 from the Kobi side). Several spoil disposal zones have been identified by the Detailed Design team to manage the spoil on the Kobi side (spoil on the Tskere side will be sent to the spoil disposal sites discussed under Lot 2):

Table 18: Lot 1 Spoil Disposal Sites

#	Reference	Approximate Area (m^2)	Approximate Volume Available (m^3)
1	SDL-22.0	63,000	215,609
2	SDL-22.3	65,500	465,100
3	SDR-22.1	6,324	17,766
4	SDR-22.3	31,500	104,119
5	SDL-22.7	97,000	1,042,750
Total			**1,845,344**

285. The following figures illustrate the locations and layouts of these sites.

Figure 50: Lot 1 Spoil Disposal Locations

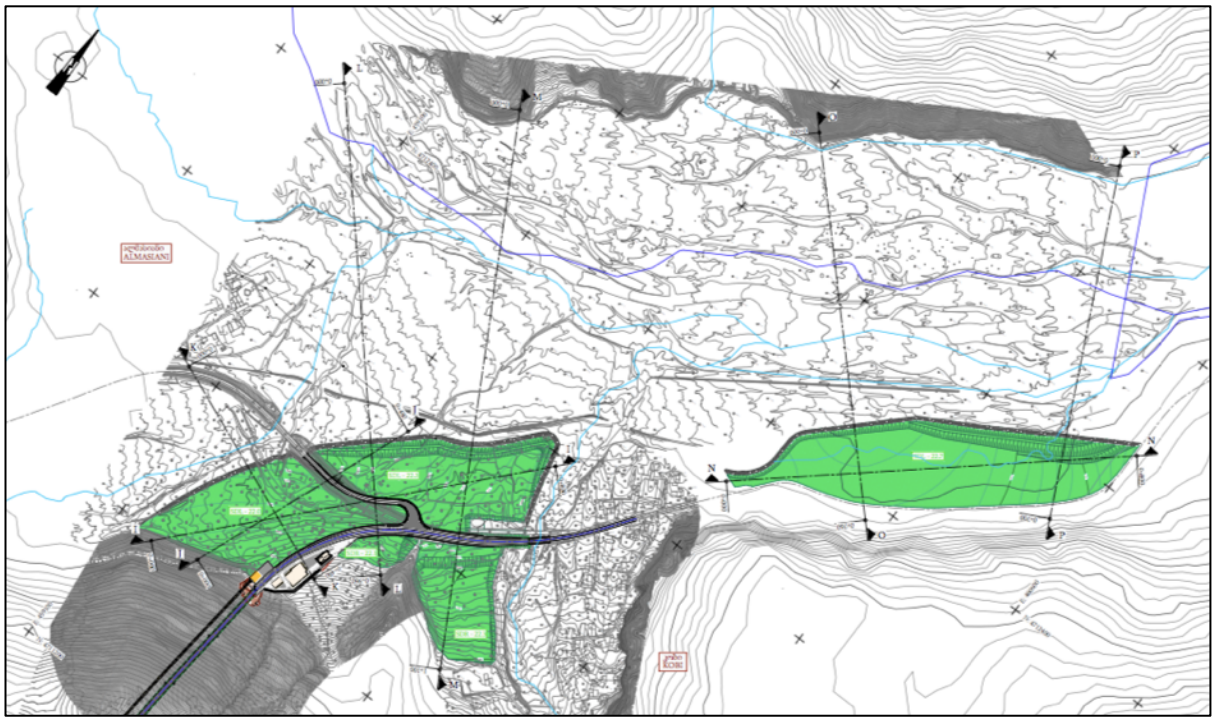


Figure 51: SDL-22.0

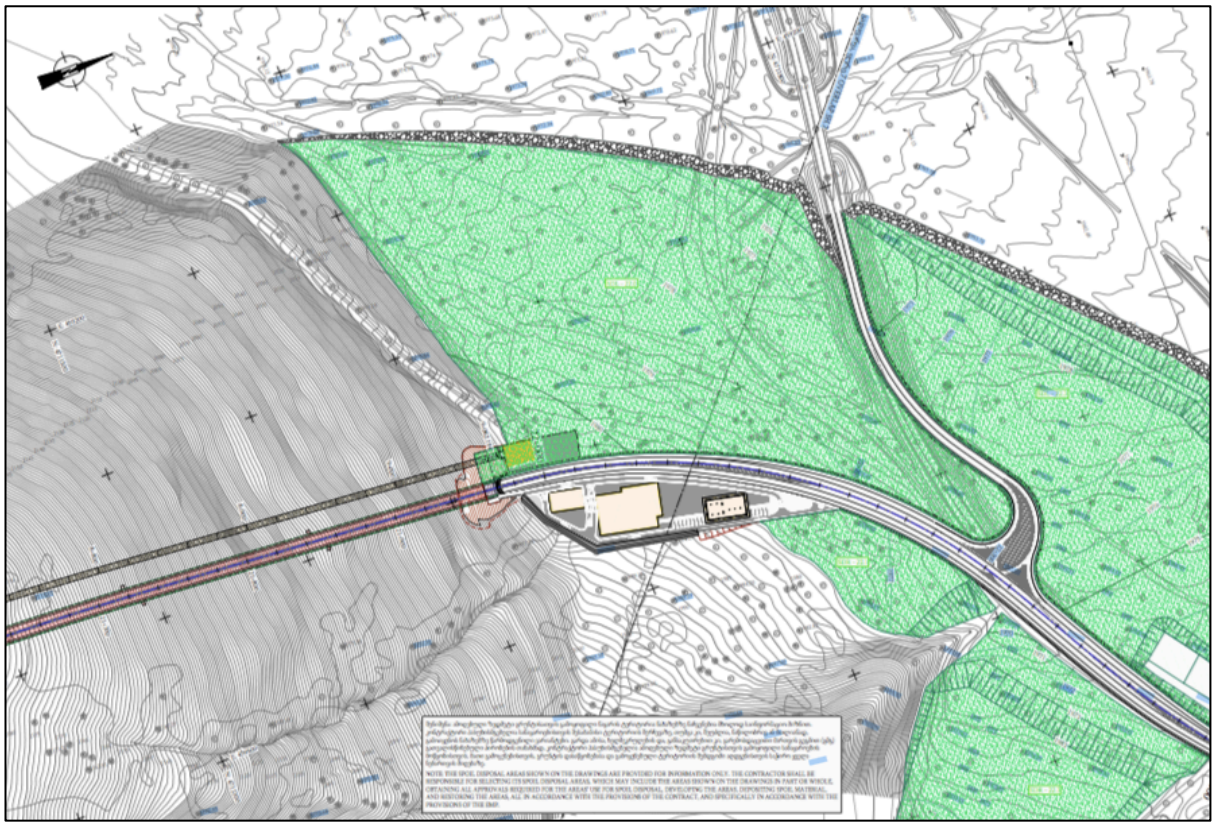


Figure 52: SDL-22.3, SDR-22.1, SDR-22.3

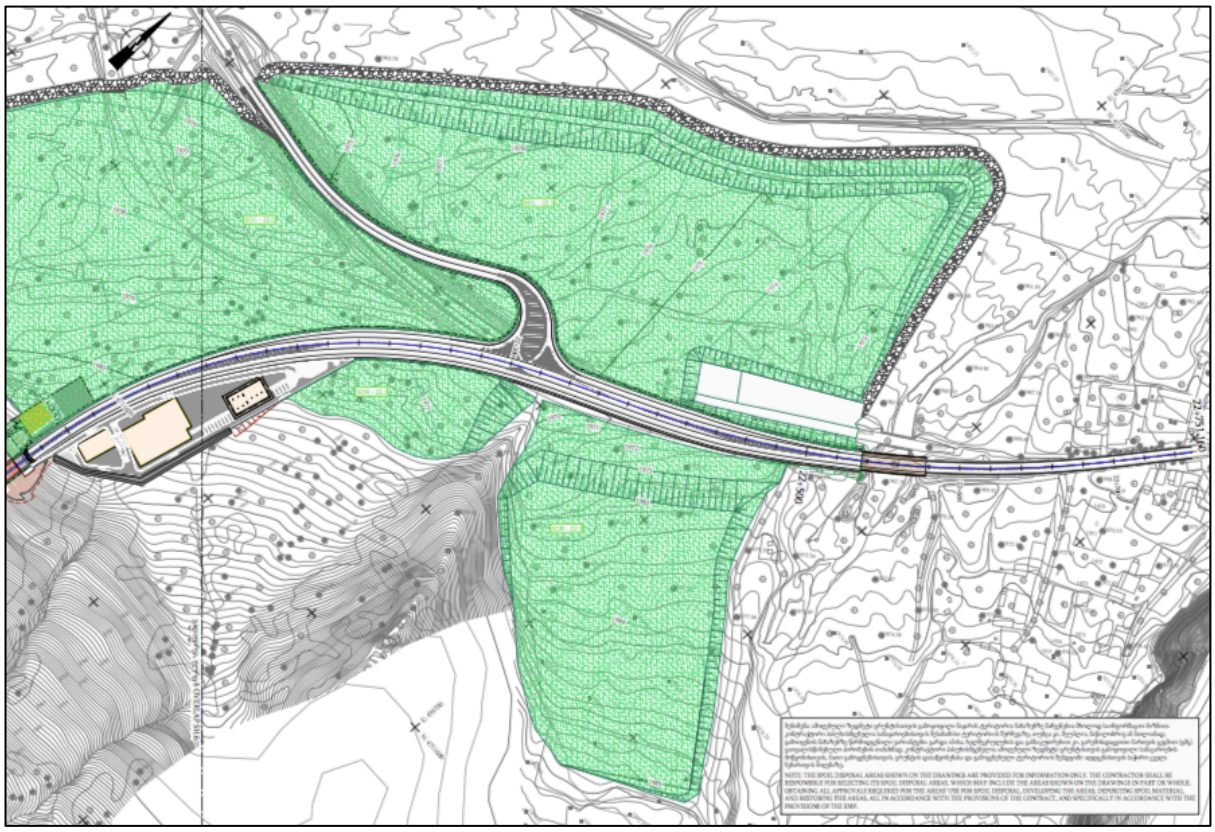
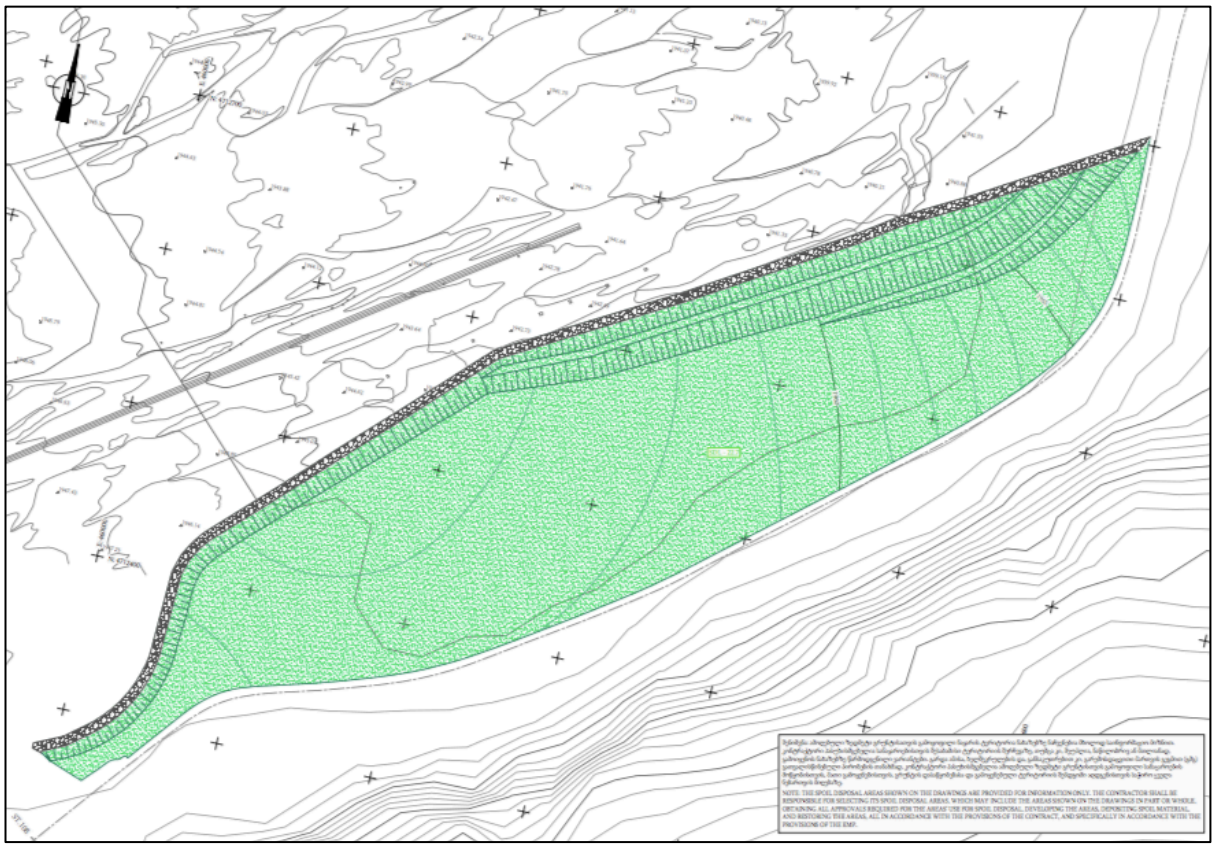


Figure 53: SDL-22.7



286. The profiles of the spoil disposal sites are presented in **Appendix O**.

287. These areas are designed to accommodate all the spoil material of Tunnel 5 and half of the excavation of Tunnel 5 emergency gallery, and the remaining material of the earthworks of the Tunnel 5 exit (north side), operation area Tunnel 5 exit (north side), and Junction of Kobi.

288. However, it is noted that there is a surplus of spoil material (2,156,794 – 1,845,344 = 311,450 m^3)

289. The use of the material from excavations as aggregates for concrete or pavements, as well as other uses like gravel, slope protections (rockery and rip-rap) and construction paths maintenance, will decrease the spoil disposal (soil disposal) volume.

290. The estimation of concrete volume for outside works (C&C and technical buildings structures, drainage, lean concrete, etc.) and tunnel T5 where excavation aggregates may be used is around 250,000 m^3.

291. The estimation of gravel volume for pavements is around 20,000 m^3. The estimation for rockery/rip- rap protections is around 40,000 m^3. Construction and local paths maintenance should be estimated around 40,000 m^3. Accordingly, the approximate total of re-usable material would be 350,000 m^2.

Lot 2 Potential Spoil Disposal Sites

292. A large amount of spoil will also be generated in Lot 2. The Detailed Design team have identified the following locations for the disposal of spoil material from Lot 2 (and the surplus 342,000m^3 from Lot 1):

Table 19: Lot 2 Spoil Disposal Sites

#	Reference	Approximate Area (m^2)	Approximate Volume Available (m^3)
1	LFL-0.4	8,500	99,367
2	LFL-0.8	19,000	208,287
3	LFR-5.8	97,000	54,509 (partial)*
4	LFL-5.8	160,000	407,640
5	LFL-7.5	106,000	681,230
Total			1,451,033

* - Partial meaning that more land is available in this area if required.

293. Locations within Khada valley have been avoided because of a high risk of instability. The following figure illustrates the locations of these spoil disposal locations. Profiles are provided in **Appendix O**.

Figure 54: LFL-0.4 and LFL-0.8

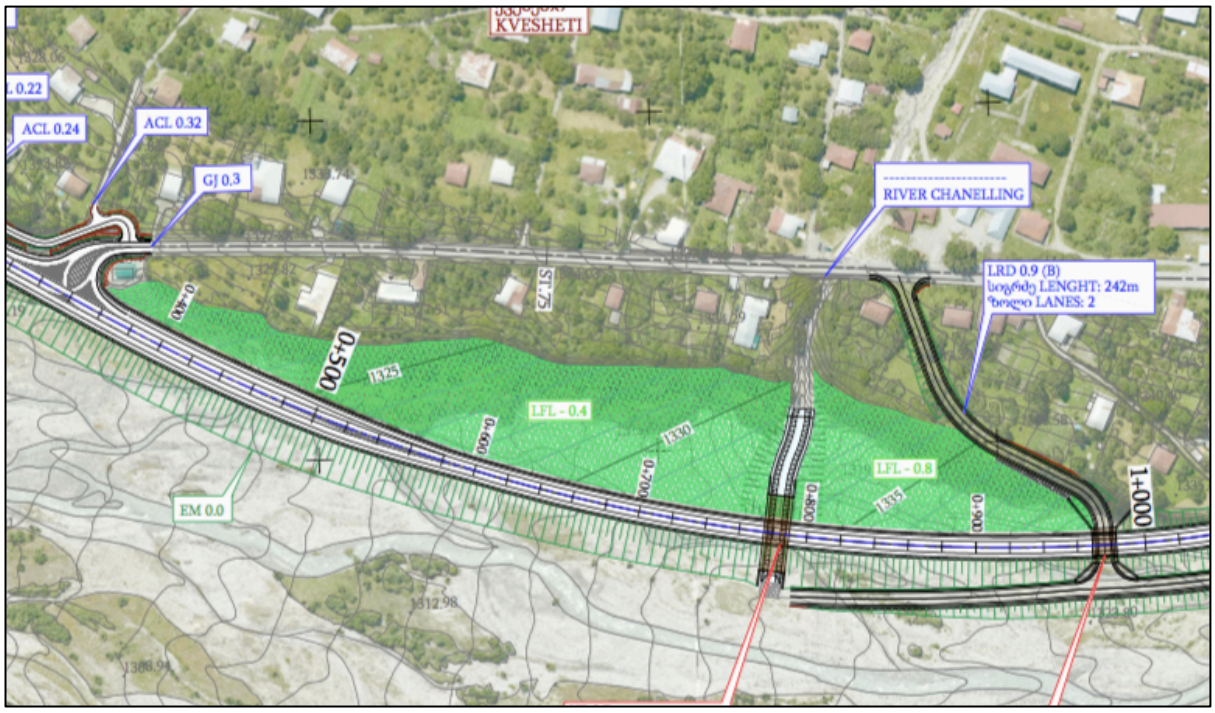


Figure 55: LFR-5.8 and LFL-5.8

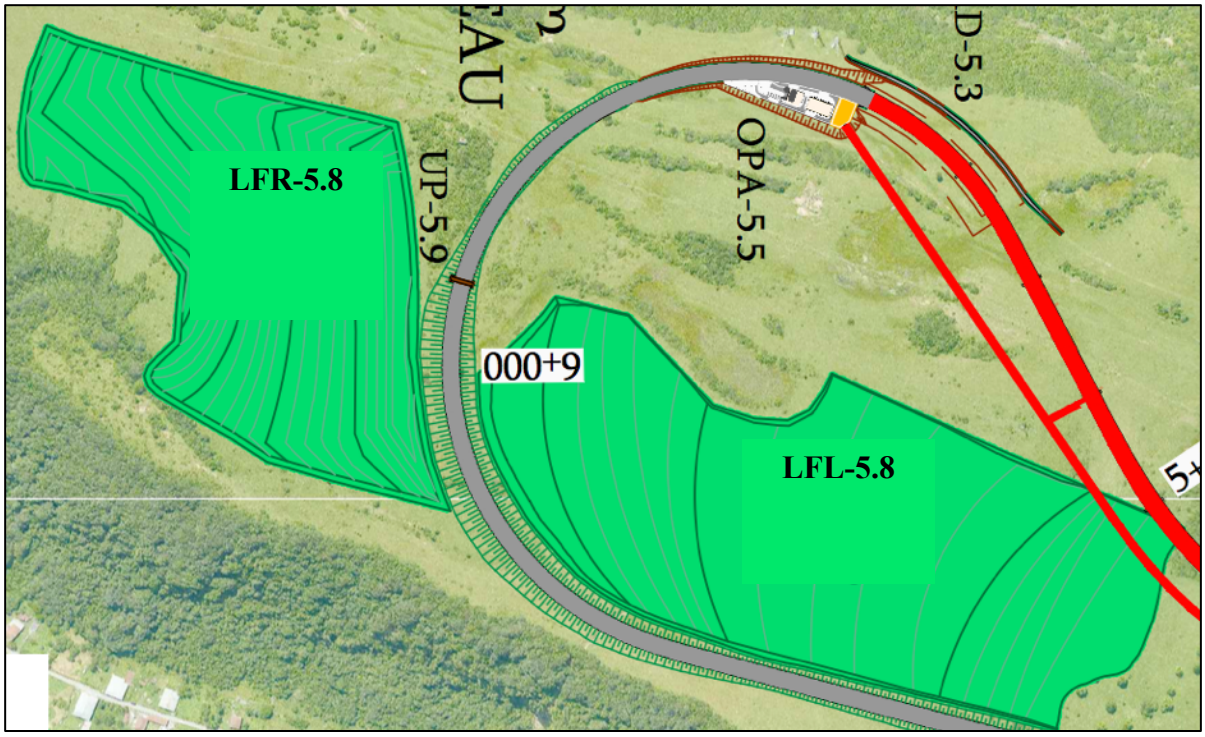
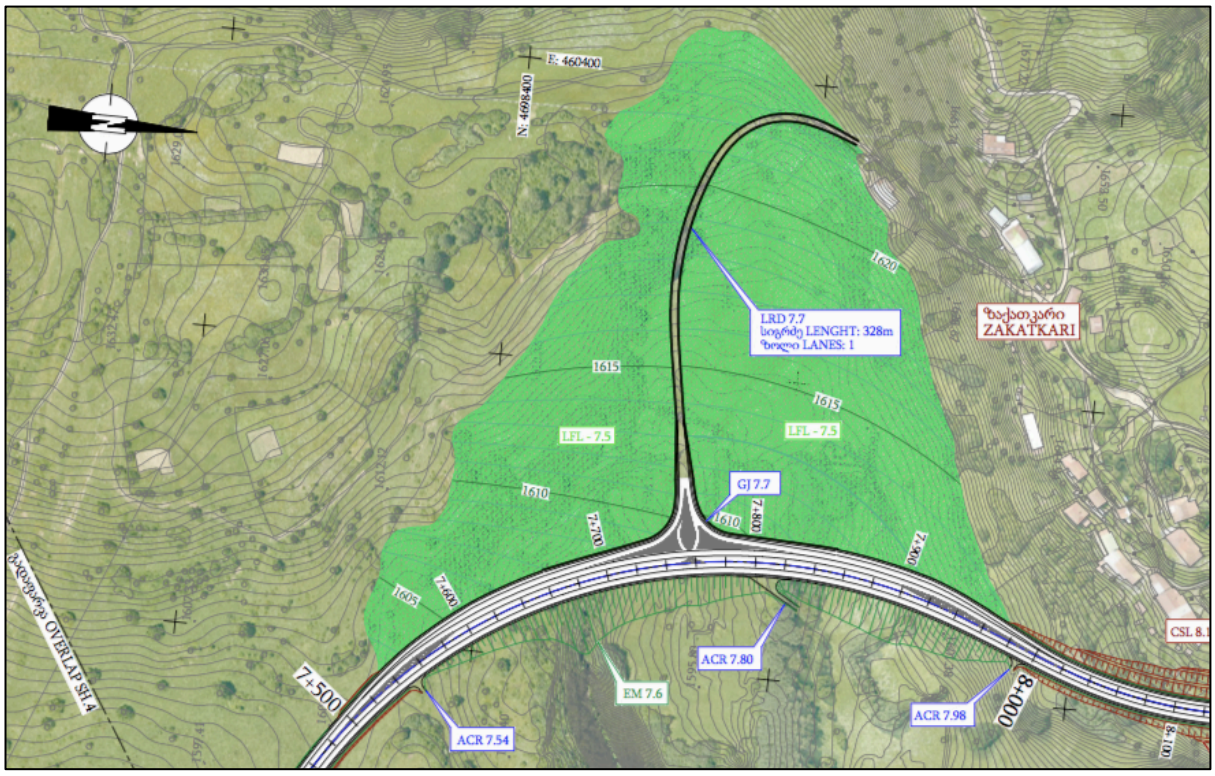


Figure 56: LFL-7.5



294. It is noted that the total volume of spoil material would be around 22,000 m^2 more than the spoil disposal site volumes, but it should be pointed out that the LFR-5.8 is only partially filled in the above tables and that more room is available in this site, and also that this material can also be used for concrete, gravel, rip rap, etc., as per Lot 1.

Transport of Material

295. The potential material destinations are distributed according to three different stretches, in order to reduce as much as possible, the transport distances.

- Stretch 1 (KM 0.0 to KM 3.9). All the remaining materials (outside earthworks) to the Kvesheti bypass.
- Stretch 2 (KM 3.9 to KM 8.75). All the remaining materials (tunnel T1 and outside earthworks) to the Zakatkari fill area.
- Stretch 3 (KM 8.75 to KM 12.72) All the remaining materials (C&C T2 and T4, tunnel T3 and outside earthworks) will be sent to Kvesheti bypass; when this is completed, the remaining material will be sent to the Zakatkari fill area, and Plateau spoil site (LFL-5.8 and LFR-5.8).

296. An assessment of each of these sites has been undertake as part of this EIA. The findings of the assessment and any necessary mitigation and management actions are outlined in **Section F.7.5 – Spoil Disposal.**

297. Notwithstanding the above, the final selection of spoil locations rests with the Contractor, who may wish to choose alternative locations to those listed above for cost reasons. In any case the sites used will have to be surveyed and permitted to ensure that no areas of particular ecological or social value are affected by the proposed spoil disposal. Critical actions that the Contractor must complete before using any spoil location, including the requirement to prepare a simple brief environmental assessment to meet national requirements (as per the conditions of approval of the national EIA prepared for this Project) are outlined in **Section F.7.5 – Spoil Disposal,** below and also further assessment of the spoil sites per the Spoil Disposal Plan (**Appendix F**) which will require approval by the RD, Engineer and Lenders (further details outlined in **Section F.7.5 – Spoil Disposal**)

B.5.8 Camps and Storage Areas

Construction Camps

298. Camp sites will be selected keeping in view the availability of an adequate area for establishing campsites, including parking areas for machinery, stores and workshops, access to communication and local markets, and an appropriate distance from sensitive areas in the vicinity.

299. The area requirement for construction camps will depend upon the workforce deployed and the type and quantity of machinery mobilized. For example, the camps may include rock crushing plant and concrete batching facilities. In view of the area required, it will not be possible to locate campsites within the RoW and the contractors will have to acquire land on lease from private landowners. The construction camp will also have facilities for site offices, workshop and storage yard, accommodation areas and other related facilities including fuel storage.

300. The Contractor will provide the following basic facilities in the construction camps:

- Safe and reliable water supply.
- Hygienic sanitary facilities and sewerage system.
- Facilities for sewerage of toilet and domestic wastes.
- Storm water drainage facilities.
- Sickbay and first aid facilities.
- Recreational areas.

301. The camp sites will strictly follow the IFC/EBRD guidance note "Workers' accommodation: processes and standards". Detailed criteria for siting of construction camps and establishment of facilities are given in **Section F.7.6**.

Storage Areas

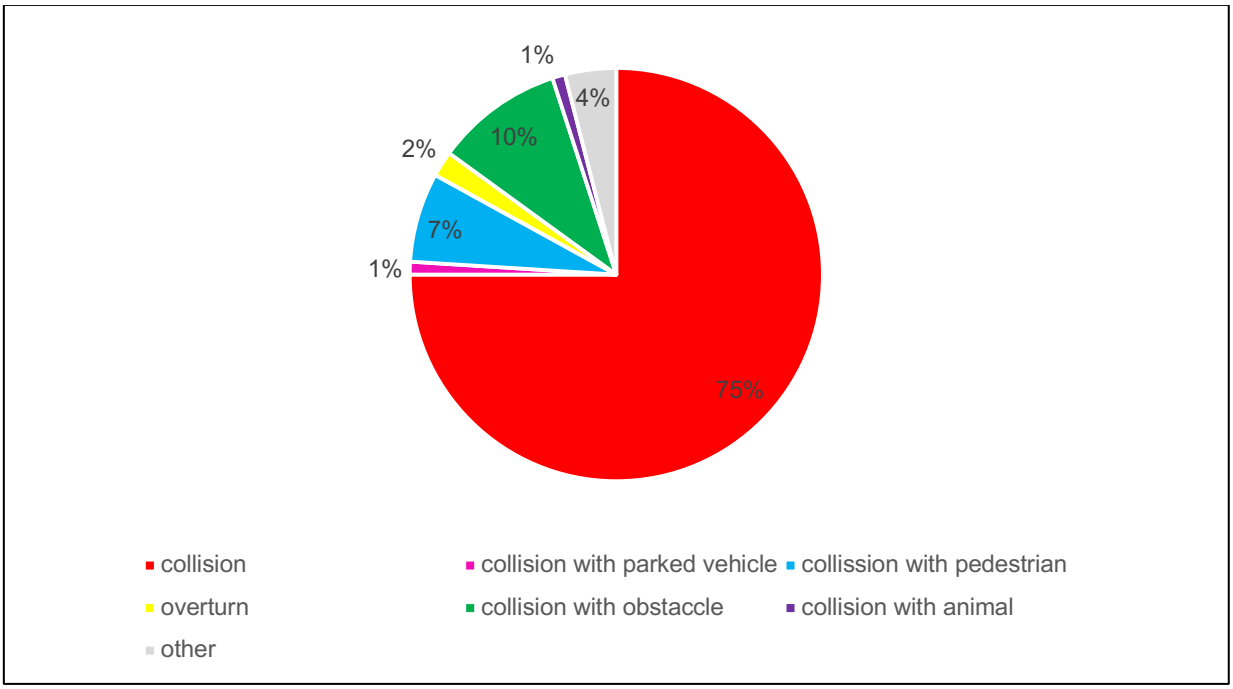
302. Temporary storage areas will be required for certain activities, such as the storage of sand and gravels and construction equipment. These storage areas may range in size from anything between 50 m^2 to more than a hectare. The precise locations of these temporary facilities is not known at this stage, as such mitigation measures have been prepared as part of this EIA to ensure that these areas are sited in approved locations.

B.6 Accidents and Safety

B.6.1 Accidents

303. There is a database from 2012 to 2016 with the accident data between kilometers 25 and 137 of the Larsi – Jinvali road. The information is classified by type and reason of the accident. There is no specific data relating solely to the Project road itself.

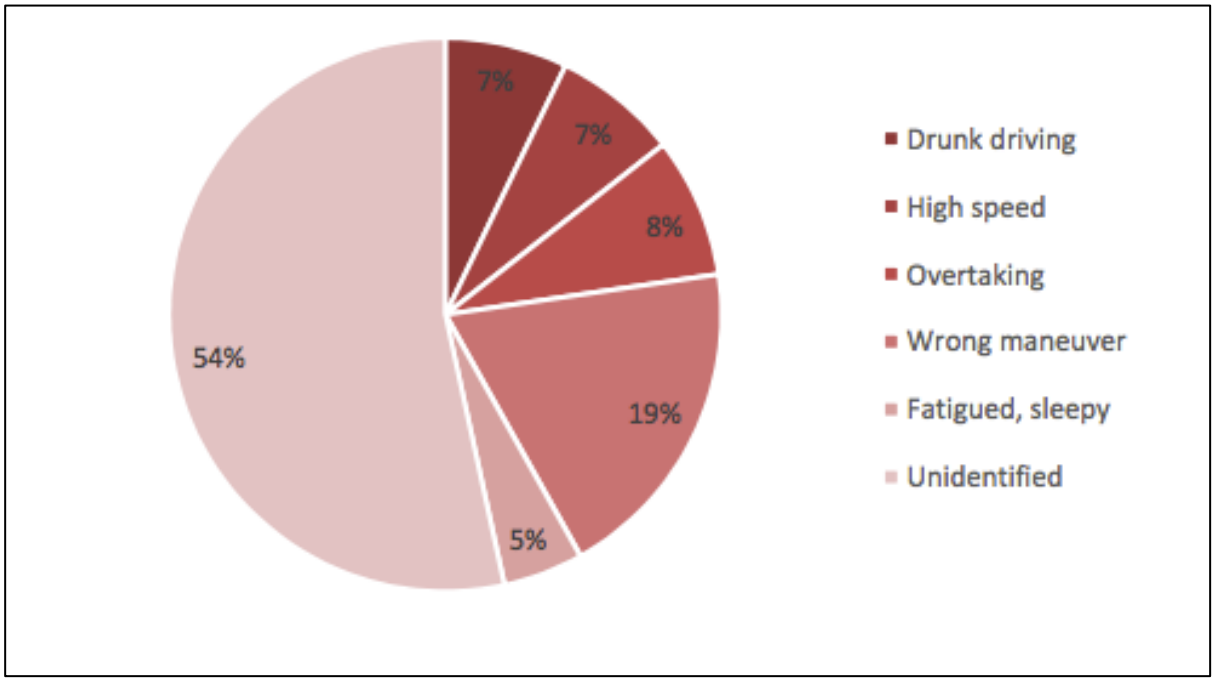
Figure 57: Crash Type (2012 – 2016)



Source: Road Department

Note: Collision is a collision between two moving vehicles

Figure 58: Crash Reason (2012 – 2016)

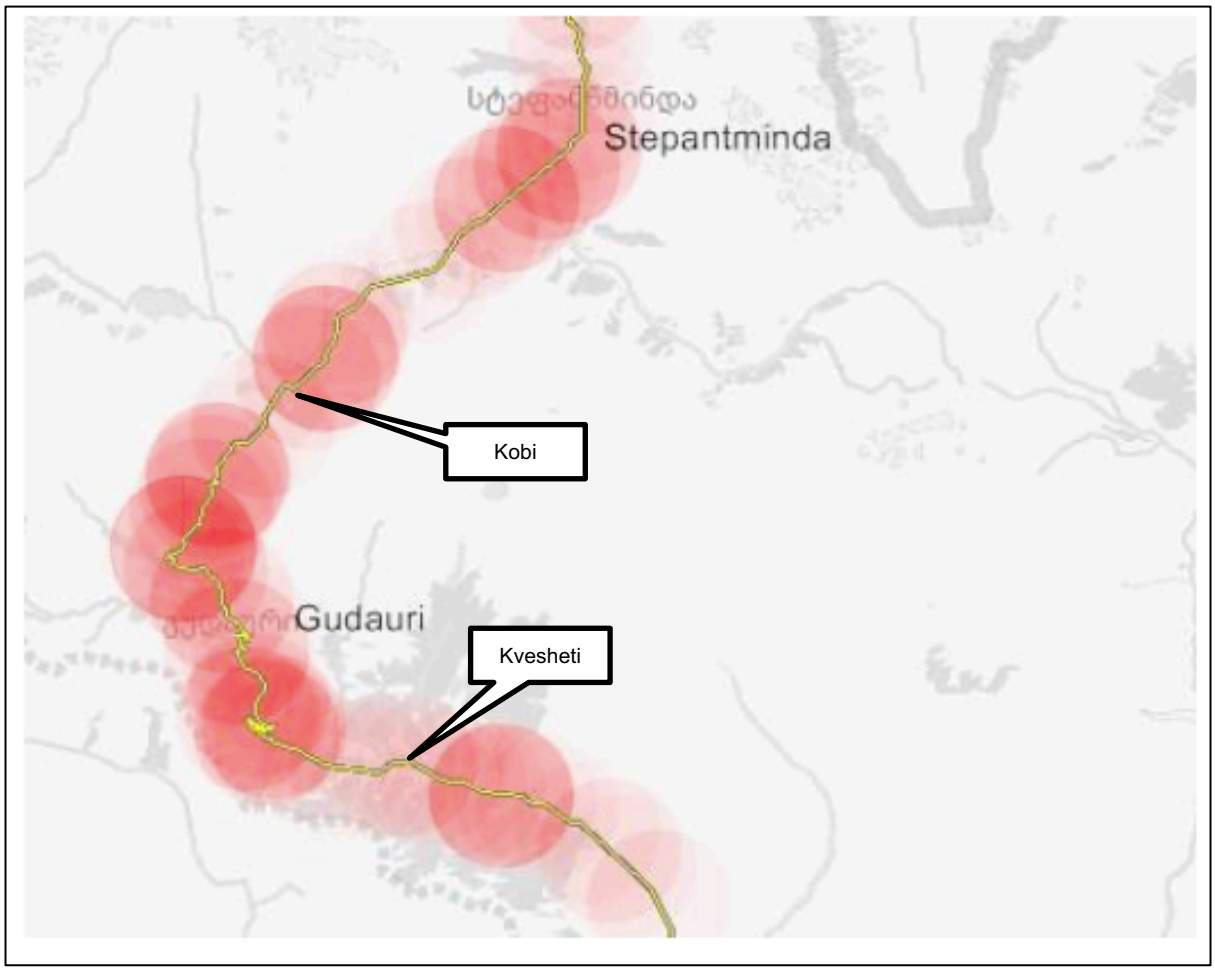


Source: Road Department

304. The following images show the most critical points of the existing road according to:

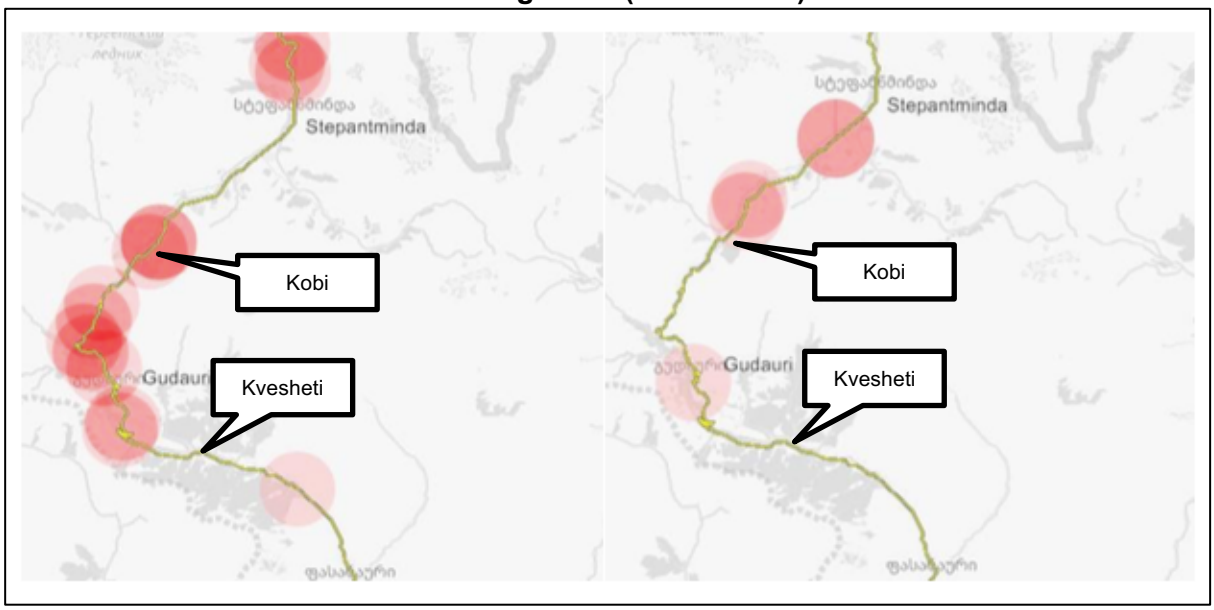
- Number of accidents.
- Fatal accidents (8% of accidents have associated at least one death in the incident).
- Pedestrian accidents involved.

Figure 59: Accidents Occurred on the Existing Road (2012 – 2016)



Source: Road Department

Figure 60: Fatal Accidents on the Left and Accidents involving Pedestrians on the Existing Road (2012 – 2016)



Source: Road Department

Table 20: Accident statistics

Year	Lethal	Injury
2012	6	65
2013	5	58
2014	0	55
2015	6	62
2016	10	82
Total	27	321

Source: Road Department

B.6.2 Safety

Tunnels

305. Safety measures to be adopted in the Tunnel under study will be mainly based on the European Directive 2004/54/EC on minimum safety requirements for tunnels in the Trans-European Road Network (TERN).

306. This Directive establishes a set of organizational, technical and operational requirements for all tunnels measuring over 500 meters that are part of the trans-European Road Network.

Roadway

307. An important part of the safety offered to the driver by the technical characteristics of the roads is that the elements and protective facilities, function as devices that, in case of accident or emergency, prevent the vehicle from leaving the road and will help reduce the harmful consequences of this situation.

308. The measures that have been planned include two types: semi-rigid security barriers and rigid security barriers. The installation of the containment system will be justified when the distance from the edge mark of the exterior roadway to an obstacle or dangerous area is less than a certain one, admitting that the risk of accident is associated with the containment system that is going to be eliminated. The containment systems parallel to the road used are the following; metal crash barriers, metal parapets, concrete barriers and railings.

B.7 Traffic Forecasts

309. Traffic forecasts have been prepared by the design team and are shown in Table 21.

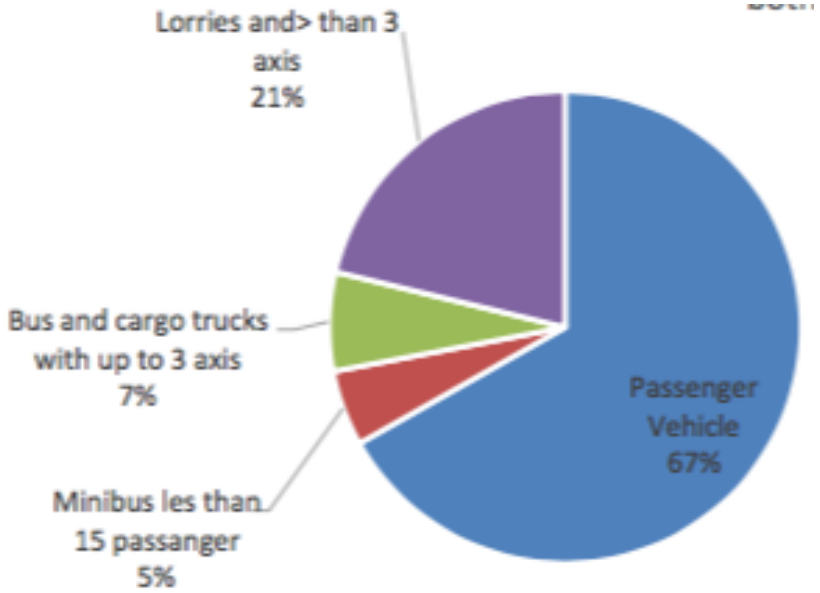
Table 21: Traffic Forecast

	Year	Car	Minibus	Van/pickup	Bus	2ax MGV	3ax HGV	T-T	Sum
	2017	2,396	191	191	112	144	81	316	3,432
	2018	2,546	203	203	119	154	86	337	3,649
	2019	2,705	216	216	127	164	92	359	3,879
	2020	2,873	230	230	135	175	98	384	4,124
	2021	3,023	242	242	142	185	104	405	4,341
	2022	3,180	254	254	149	195	109	428	4,570
Construction	2023	3,345	267	267	157	206	115	452	4,811
Year 1	2024	3,518	281	281	165	218	122	477	5,061
	2025	4,052	324	316	190	248	139	544	5,813
	2026	4,580	366	351	215	279	156	612	6,559
	2027	5,143	411	387	241	313	175	684	7,354
	2028	5,744	459	426	269	348	195	762	8,204

	Year	Car	Minibus	Van/pickup	Bus	2ax MGV	3ax HGV	T-T	Sum
	2029	5,974	477	443	280	364	204	798	8,541
	2030	6,213	497	461	291	379	212	829	8,881
	2031	6,437	514	477	302	392	219	858	9,199
	2032	6,669	533	494	313	406	227	888	9,529
Year 10	2033	6,909	552	512	324	420	235	919	9,871
	2034	7,157	572	531	336	435	243	952	10,225
	2035	7,415	593	550	348	450	252	985	10,592
	2036	7,682	614	569	360	466	261	1,020	10,972
	2037	7,959	636	590	373	482	270	1,056	11,366
	2038	8,245	659	611	387	499	279	1,093	11,774
	2039	8,542	683	633	401	517	289	1,132	12,196
	2040	8,849	707	656	415	535	299	1,172	12,634
	2041	9,168	733	680	430	554	310	1,213	13,088
	2042	9,360	748	699	439	569	318	1,246	13,380
Year 20	2043	9,555	764	718	448	585	327	1,280	13,677
	2044	9,603	767	732	450	596	334	1,305	13,788
	2045	9,643	771	746	452	608	340	1,330	13,889
	2046	9,673	773	760	454	619	346	1,355	13,980
	2047	9,693	775	768	455	625	350	1,368	14,033
	2048	9,701	775	775	455	631	353	1,381	14,071

Source: ADB

Figure 61: Type of Traffic



C. Alternatives

C.1 General

310. One of the objectives of an EIA is to investigate alternatives to the Project. In relation to a proposed activity "alternatives" mean 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.

311. Specifically, this section of the EIA Considers:

a) The 'No Action' Alternative

b) Upgrading of the Existing Road 'Alternative Zero'

c) Alternative Corridors and Alignments assessed during Pre-Feasibility and Feasibility Study

d) Alternative Pavement Types

e) Alternative Construction Camp and Laydown Areas

f) Alternative Tunneling Techniques

C.2 The No Action Alternative

312. The "No Action" Alternative in this instance is defined as a decision not to undertake the proposed construction of the Project Road meaning road users would continue using the existing road without any additional upgrades (above and beyond typical maintenance works).

313. The existing road is 35 km long. Between Kvesheti and Kobi it runs through Gudauri ski resort and Jvari Pass (2,400 masl). However, the existing road suffers from a number of technical and safety issues as follows:

- **Alignment:** the parameters are out of the National standard requirements (minimum radiuses, gradient, super-elevation, junctions, accesses, no population by-passes) and because of it, safety of road users and the local community is jeopardized.
- **Cross-section:** the minimum width of the carriageway/lane or shoulders is not enough at some stretches.
- **Pavement:** bad/very bad condition of the structural section of the pavement and/or the pavement itself.
- **Drainage:** lack of longitudinal/transversal drainage at some stretches. Rain water and debris running onto the road surface which can result in accidents.
- **Cut slopes, retaining walls and protection structures**: Currently in bad condition and do not fully prevent mudflows, rockfalls and/or landslides.
- **Avalanches:** Inadequate avalanche protection tunnels and galleries, meaning some parts of the highway are still exposed to avalanche risk and existing protection does not allow bi-direction movement of HGV traffic as shown in **Figure 62**.
- **Lack of visibility and/or lighting**.
- **Lack of signalling and/or safety barriers**, for traffic flow and pedestrians.

The "No Action" Alternative would see the continued deterioration of the existing road pavement and its drainage structures and a continuation of the high ratio of accidents noted in **Section B.6**.

314. In addition to the technical and safety aspects the following significant issues are associated with the existing road:

- The road is often closed due to snow fall during the winter months. From the strategic point of view, this road section has become a key traffic hub in the Caucasus region, the traffic discontinuity is a major impediment to meet the increasing transport demand on the North-South Corridor and harnessing the economical and tourism potential of the region.
- There can be significant congestion on the road especially during the tourist season which leads to degradation of air quality in and around Gudauri which is one of Georgia's prime tourist destinations during the winter.
- Difficulties maneuvering HGVs, especially in the areas highlighted in **Figure 62** below, which leads to a high level of delays and demand affected. The table below further illustrates this issue.

Table 22: Percentage of Annual Demand Affected Due to Prohibition of Traffic

	Kvesheti-Kobi		
	Bus	Heavy vehicles	Light vehicles
2012-2016 annual average delay (hr)	2,351	2,384	1,096
% of the annual demand affected	**34.6%**	**35.1%**	**16.1%**

Figure 62. Existing Road Conditions

315. **Table 23** provides a summary of the operational and construction impacts of the 'no action' alternative against the proposed Project.

Table 23: Comparison of No Action alternative and Alternative with a project

	Alternative with project		No Action Alternative	
	Positive factors	**Adverse factors**	**Positive factors**	**Adverse factors**
Natural environment: ambient air	**Operation:** An expected improvement of the road's performance properties and traffic conditions will lead to a reduction in individual vehicle emissions against the no action alternative. Traffic will be smoother, no stop and go related emissions, no waiting with switched engine required, shorter distance – i.e. less fuel consumption (less emissions).	**Construction:** Temporary air pollution by exhaust gases from construction machinery and vehicle emissions during transportation of construction materials. **Operation:** Traffic related emissions during operation of the road. However, as indicated later in this report, these emissions are not anticipated to be significant in Khada Valley.	**Construction and Operation:** There will be positive impacts for communities in the Khada valley along the proposed new alignment which will not be affected by vehicle emissions during construction and operation, although as noted they are not anticipated to be significant.	**Operation:** As traffic volumes grow air quality will be further degraded in the Project corridor, especially in the Gudauri area. Increased air emissions will be generated during acceleration and deceleration of vehicles and slow-moving traffic due to the complexity of the existing alignment and the poor throughput of tunnels will lead queuing related emissions as cars engines idle.
Acoustic impact	**Operation:** Noise levels in the Gudauri area, a significant tourist area, will be reduced. In addition, the proposed bypass around Kvesheti will reduce noise levels to an extent in the village if adequate mitigation measures are installed as discussed later in this report.	**Construction:** Short term localized noise impacts related to construction works will impact upon local residents. However, many of these impacts can be mitigated by the measures outlined in this EIA, e.g. through correct siting of camps and time and activity restraints. **Operation:** Operational noise levels may increase in the valley area, but the number of receptors is low, and the mitigation measures proposed as part of this EIA will ensure that all identified receptors are below national and IFC guideline limits for noise.	**Construction:** There will be positive impacts for communities in the Khada valley along the proposed new alignment which will not be affected by construction noise.	**Operation:** Noise levels in the tourist area of Gudauri will continue to increase which will have a potentially negative impact on tourism. Noise levels in Kvesheti will also continue to increase in the center of the village, thus having potentially negative impacts on residents.
Natural environment: soils, land resources, surface and ground water, vegetation/flora and fauna	**Operation:** Moving road farther from protected area boundaries.	**Construction:** New development in a greenfield area. Risk of impact on land and water resources during construction. Removal of vegetation within the road easement area. Impact/disturbance of fauna. However, most of these impacts can be mitigated via the recommendations made in this EIA and proactive	**Construction and Operation:** The no action alternative has significant benefits in the Khada valley in terms of biodiversity where forests will remain untouched and there will be no disturbance to fauna.	**Operation:** Roadkill on the existing road will continue, and this may lead to vehicle accidents as cars swerve to avoid animals on the road. The environment adjacent to the existing road will continue to be degraded by high noise levels and garbage which is scattered along the road.

	Alternative with project		No Action Alternative	
	Positive factors	**Adverse factors**	**Positive factors**	**Adverse factors**
		measures such as the requirement for a biodiversity action plan. **Operation:** Disturbance of wildlife caused by increase noise and light pollution. Increased access to previously undisturbed areas may result in poaching of wildlife.		
Socio-economic environment	**Construction:** Creation of jobs in an economically depressed area. **Operation:** Reduced number of road accidents. Reduced travel time. Improvement of access to the villages that used to be cut off in winter. Development of roadside services and entrepreneurship. Creation of new jobs related to road maintenance services. Improvement of the region's social and economic performance. Improved cargo traffic and traffic safety in particular in winter season. Potential improved tourism potential in Khada valley for winter sports, use of the new bridge, mountain biking and hiking. Potential to make living in villages viable all year round.	**Construction:** Short term noise, air quality and vibration related impacts during construction. Temporary deterioration of transport conditions during the construction phase. **Operation:** Landscape-visual impact, although this is subjective.	**Construction:** No construction related impacts such as noise and vibration. **Operation:** No landscape-visual changes. No loss of property or livelihood for residents.	**Operation:** Persisting problems with traffic and accessibility in winter. The expenses to repairing the existing road.

C.3 Upgrading of the Existing Road (Alternative Zero)

316. The upgrading of the existing road, referred to in this report as 'alternative zero' has been assessed from a technical, financial and socio-environmental perspective. The following section describes why this alternative has not been selected.

Technical Aspects

317. As noted in **Section C.2**, there are a range of technical and safety issues relating to the existing road. Technically, it is possible to upgrade the existing road, but it will not resolve the key issues described below.

318. It is possible to upgrade the pavement, add safety barriers, slightly upgrade the alignment at some curves (small enhancements at some points) and provide a few galleries. These actions would not have a significant impact to the landscape/local communities along the existing alignment. But functionality and safety of the road would remain at the same levels. It is possible to accommodate drainage, safety barriers, pavement within the existing road; but not a relevant change avoiding high gradient, U-turns or going through Gudauri.

319. In order to significantly upgrade the safety and functionality of the existing road the current alignment would need to be significantly changed, enhancing the gradient, minimum radius, cross section (enough space), visibility, etc.

320. This would result in a completely different scenario to what is currently seen. Deep cut-slopes, junctions, tunnels, and bridges would all be required which would have a significant impact on the landscape and the local communities.

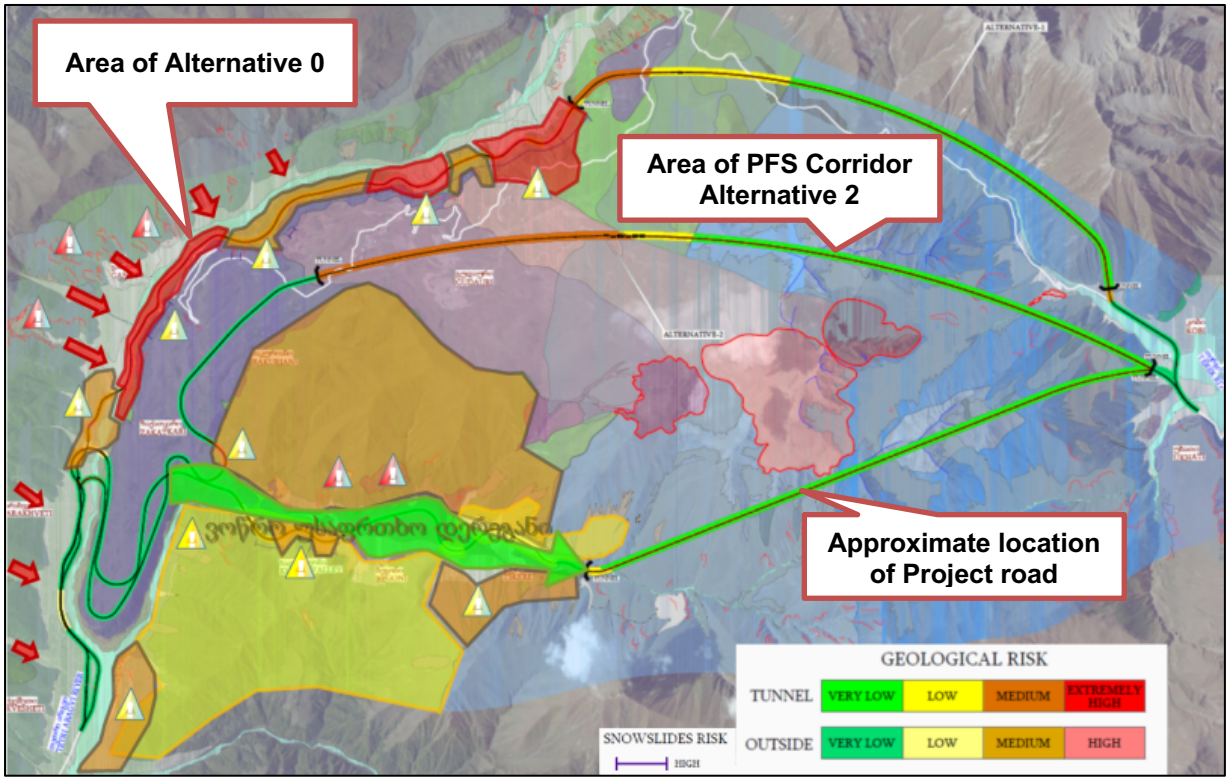
321. Further, to ensure no road closures because of adverse weather conditions in the winter (snow) something similar to a continuous gallery would be required for a long stretch (several kilometres, with a combination of tunnel and gallery). The end result would be very similar to a long tunnel after completion of the construction, but there would be significant construction impacts during this period, even more significant than constructing a tunnel on its own.

322. Given the fact that there is no alternative route to Kobi from Kvesheti (and no detour route) the construction period, of several years, would have huge impacts on road users and the local community as portions of the road are closed to allow for construction works. This could have significant impacts on the local economy for a number of years, including the Gudauri tourist area.

323. In this scenario the impact on the landscape and environment is also significant as well as the required investment. Even with these works completed, the functionality would still be lower than the proposed Project (as the alignment must still go up and down from the Jvari pass).

324. Alternative Zero was also assessed from a geological perspective. The alignment of the existing road is located in areas of medium and significant geological risk as shown in **Figure 63**.

Figure 63: Geological Risks in the Project Area



Note: this picture belongs to the Pre-feasibility stage; after that, the Khada valley alternative was enhanced by modifying the alignment (in advance of Begoni, Tskere) and providing some extra tunnels & protection structures to avoid geological risks at the outside road.

Financial Aspects

325. Alternative Zero was also analysed at pre-feasibility stage from a cost benefit persepctive. In all the cases, the proposed Project (which formed the preferred alternative) provides an Economic Internal Rate of Return (EIRR) > Social Discount Rate (SDR), which means that social returns for the project justifies the use of resources being proposed (for the purposes of the CBA, following World Bank suggestions a SDR, of 8.0% was used in the economic analysis as Georgia as a potential cohesion country). Therefore, alternative zero was not considered prudent.

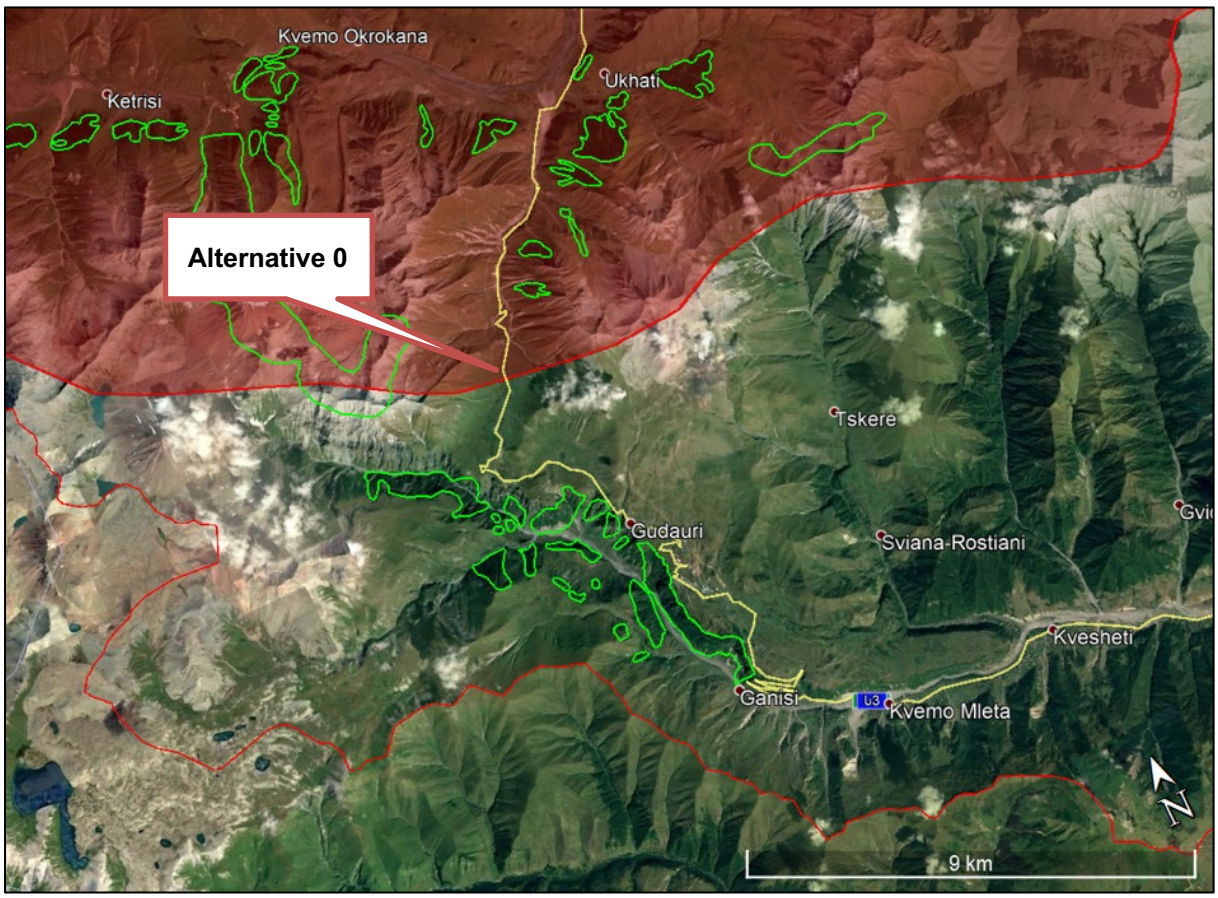
326. Previous studies clearly demonstrated the viability of the current investment, as well as defining the general lines of action, all in accordance with the technical professionals of the Georgia Department of Roads, and the involved international financial institutions (World Bank, Asian Development Bank and European Bank for Reconstruction and Development).

Environmental Aspects

327. Around 8 km of Alternative Zero is in the limits of the SPA/IBA area (see **Section E.2** for more details of these areas, and **Figure 64** for a map of the affected area). This area of the existing road suffers from a significant waste management issue as road users empty literally tonnes of garbage every year along the portion of the road in the SPA/IBA area. Continued use of the existing road would see this situation endure and degradation of the SPA/IBA environment continue. Crucially, the proposed Project avoids this area by tunnelling under the SPA/IBA for much of its extent in its northern portion and the resulting footprint within the SPA/IBA is much smaller than for the Alternative Zero.

328. The existing road is also located along a bird migration corridor, that goes along the Tetri Aragvi river close to portions of the fragmented Kazbegi National Park. The proposed Project follows the Tetri Aragvi river for a much shorter portion thereby reducing potential impacts to this area and the newly extended Kazbegi National Park.

Figure 64: Existing road vs protected areas (green shapes – boundaries of Kazbegi National Park (prior to December 2018 expansion approval) and Emerald network sites, red highlighted areas – SPA/IBA areas)



329. Alternative Zero would also involve many of the environmental impacts identified with the 'do nothing' scenario above, e.g. noise levels and air emissions would increase in the built-up areas of Kvesheti and Gudauri.

330. Given all of the above constraints Alternative Zero was ruled out for further consideration.

C.4 Alternative Road Corridors and Alignments

Introduction

331. This section of the EIA sets out the process that resulted in the selection of the alignment for the proposed road that is now being prepared for implementation.

332. At the outset of the project study, based on initial map assessments, it was generally understood that there would be two possible broadly defined locations for the proposed project road: (i) close to the existing road alignment through the Gudauri valley; and (ii) along a new alignment to the east, through the Khada valley. Presented below is the sequence of studies and decisions that ultimately led to the project road being located in the Khada valley.

333. The studies commenced with a pre-feasibility study (PFS) that assessed nine (9) alignments in three (3) specific corridors within both valleys. The PFS continued to refine the alternatives finally selecting four (4) potentially possible alignments in three (3) corridors. These alignments were further assessed during the PFS via a comprehensive multicriteria analysis approach that took into account three groups of criteria, briefly (i) functionality from

terrain and geological, traffic, local population access, and operational perspectives; (ii) economic and financial considerations for both construction and long term operations and maintenance considerations; and (iii) environmental and social aspects from biodiversity, surface water, protected areas, and other related perspectives.

334. The results of the analysis of alternative alignments are presented below, with the results for the environmental and social aspects criteria group set out in a detailed table. The outcome of the process was a rational and evidence-based decision that the proposed road alignment should be in the Khada valley, between Kvesheti and Kobi, and that it should include an 8 km long tunnel through the mountain range between Tskere and Kobi.

Pre-feasibility Stage

Inception / Interim Phase[13]

335. During the pre-feasibility study (PFS) of the Project the process of selecting the road alignment was initiated. Given the complex topography, presence of the aforementioned protected areas and geological conditions in the Project area the number of feasible alternative corridors and alternative alignments within those corridors was limited.

336. Nine alternatives were considered during the initial stages of PFS preparation (Inception and Interim phases of the PFS). Depending on the design speed, these options were bundled into three alternative corridors with two design speeds:

Table 24: Design speed by alternative

Corridor	Alternative	Design speed
I	Alternative 1	60 km/h
II	Alternative 2, 3	60 km/h
III	Alternative 4, 5, 6, 7, 8, 9	80 km/h

[13] Pre-feasibility phase included the production of several reports discussing potential alternatives, including the Inception Report, Interim Report, Draft Pre-feasibility Report and Final Pre-feasibility Report. Through this phase the alternatives were continually refined.

Figure 65: Alternatives for design speed 60 km/h

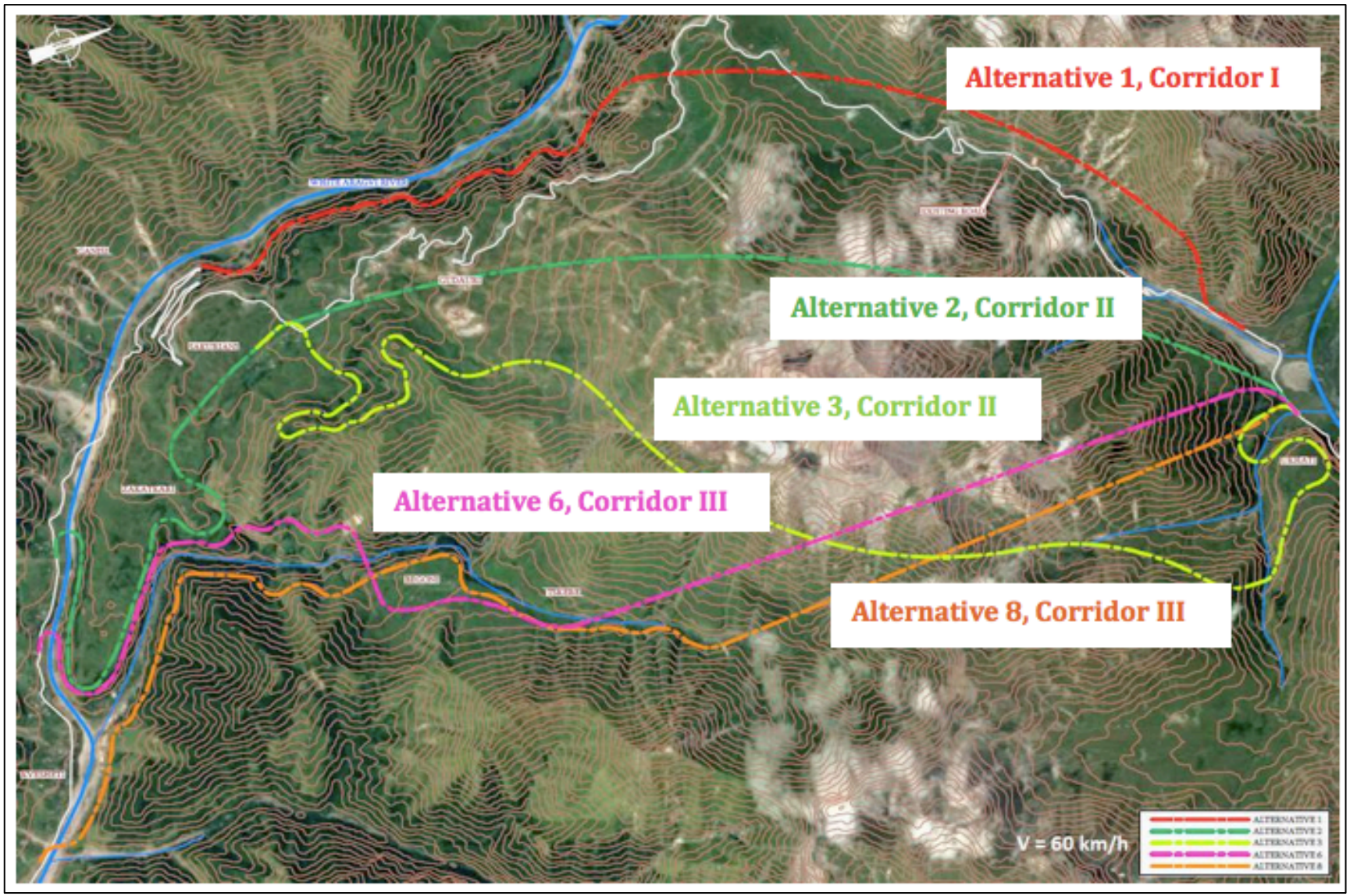
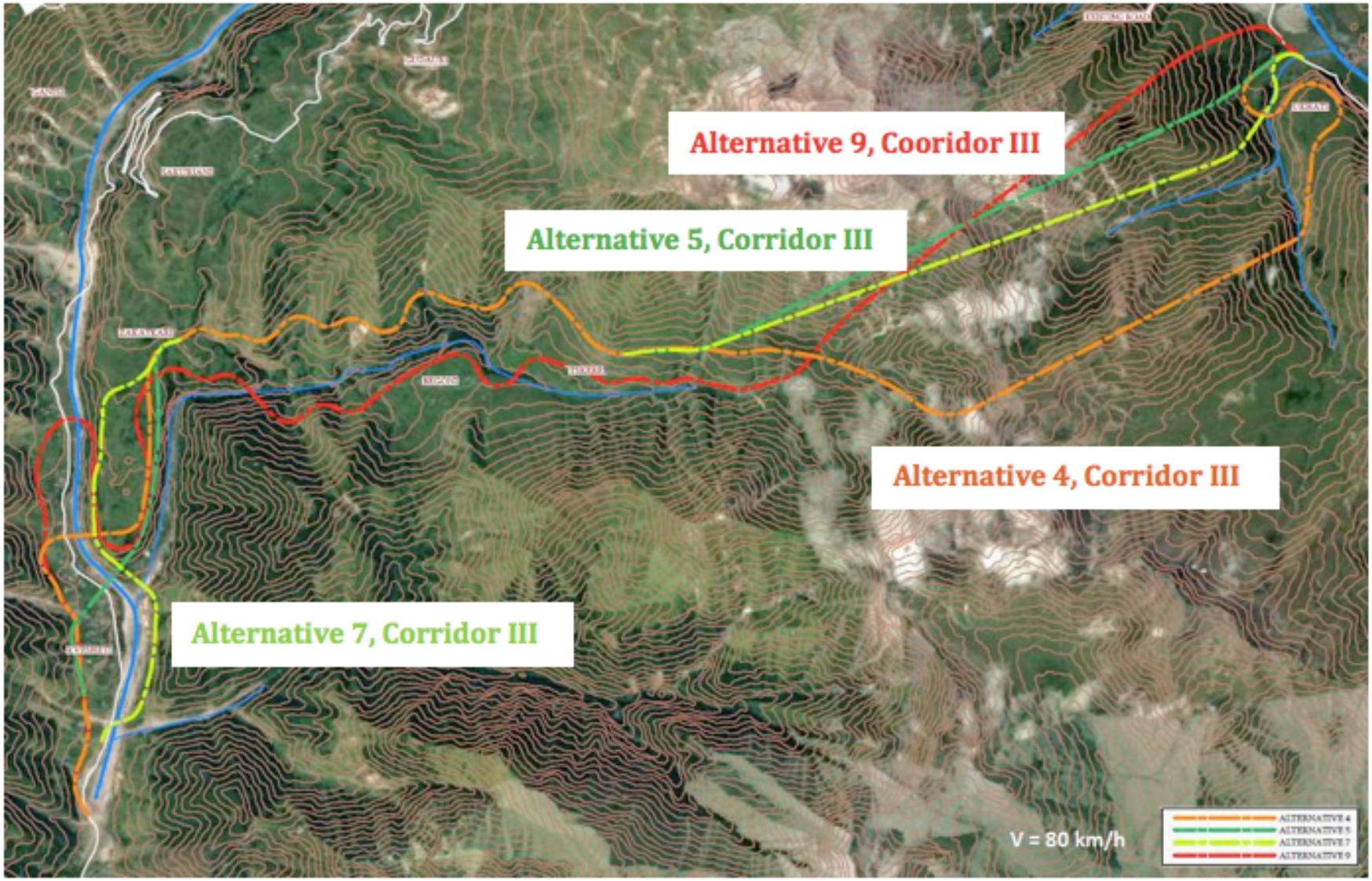


Figure 66: Alternatives for design speed 80 km/h



337. The following tables describe each of the alternatives illustrated above within its respective corridor.

Corridor I

Alternative Alignment	Description
1	Corridor 1 follows the river valley at its left side for a 60 km/h speed. The first stretch of the alternative consists of an upgrade of the existing road from Kvesheti to the zig-zag of Gudauri. From this point on, it is proposed a new alignment along the riverside, going ahead with 7% slope for 5 km and entering an 8.4-km length tunnel (level S portal 1930, N portal 2020). The main challenges are the landslides and the rock falls, and also the alluvial fans from the transversal valleys.

Corridor II

Alternative Alignment	Description
2	Corridor II goes up to the Gudauri area by lifting to the Kvesheti plateau from the existing road. Both alternatives, 2 and 3, have the same alignment to access to the top of the plateau. According to the existing slopes of the plateau, the best way is continuing upstream along the current road and then cross the river and turn back downstream and going up in the slope at the same time. The access way to the plateau sums up the opposite slopes: alignment from 1.6% to 6.8% up and plateau 3.5% down. Once there, the alignment continues along the Gudauri area. Alternative 2 presents a shorter outside road and enters a 11.3-km long tunnel, S portal at level 1,860 m and N portal at 1,920 m, rounding to the left the volcanic cone and the contact aureole. The main challenge is to avoid the volcanic cone and the contact aureole. Starting from the same first stretch, Alternative 3 runs outside for longer than 2, and because of that the tunnel for this proposal is shorter (10.0 km) and the portals higher (2,200 m), rounding the volcanic area to the right. Both alternatives, 2 and 3, are designed for 60 km/h
3	

Corridor III

Alternative	Description
4	Alternative bypasses Kvesheti by cutting the slopes and valleys behind the population (far from the river). On one hand this is a challenge from the geotechnical point of view, because of the landslides; but on the other hand, this allows the alignment to gain enough level to cross the river and enter the plateau. A 700-m long bridge with piers of height over 100 m would be required. Probably an arch bridge would fit for this situation. From the plateau on, the alignment remains at the same side of the Tskere valley, going up with a continuous slope of 7%. The high level of the alignment reduces the length of the tunnel, in this case to the shortest one (4.7 km). The portals are located at level 2,260 m (S) and 2,230 m (N).
5	Alternative is based on Alternative 4. Only differs for the Kvesheti bypass and the entrance to the south portal of the tunnel. The proposal crosses the river from the back of the population in a direct way by a 1-km long viaduct (high piers over 100 m). The slope of the elevation profile varies from 5% to 7%. The tunnel is 7.2-km long and the portal are located at levels 2,100 (South) and 1990 (North).
6	Alternative 6 continues upstream along the current road and after Kvesheti crosses the river and turns back downstream, lifting to the plateau (advantage of opposite slopes) and rounding it with an average slope of 6%. The alignment enters the Tskere valley crossing from one side to another to better adapt to the topography. Some bridges appear to be necessary, one of them around 0.5 km long and over 100 m of pier height; an arch seems to be a proper solution. The proposal finally enters an 8.2-km long tunnel, with a continuous slope. The South portal is located at level 1,870 m and the North at 1,980 m. Design speed 60km/h.
7	The alternative 7 avoids the population of Kvesheti by crossing in advance the river to the opposite side. The proposal is to gain enough elevation to jump to the plateau with a 550-m long bridge (height of piers around 80 m). The alignment connects to the Alternative 4 at the entrance of the Tskere valley. The proposed tunnel is 7.0-km long and the portals are located at level 2,100 (South) and 2,020 (North) respectively.

Alternative	Description
8	The corridor lifts the alignment to the Kvesheti plateau and from there enters to the Tskere valley. Located at the other side of the Corridor with a completely different approach to the Kvesheti plateau. Before entering this village, the alignment crosses the river and starts going up steeply (7%) surrounding the corner mountain; because of that it does not require significant bridges. Once in Begoni plateau, the proposal continues upstream forward than Alternative 6, to finally entering a 6.7-km long tunnel at level 2,000 m (South portal) and ending at level 1,970 m (North portal).
9	Alternative 9 bypasses Kvesheti close to the mountains, cutting the slopes and valleys behind the village. The alignment crosses the river upstream and turn back downstream at the other side, going up with an opposite slope to the plateau, which is an effective method to get the top. From the plateau on, the alignment enters the Tskere valley, changing from side to side in order to avoid the geotechnical problematic slopes. It would be required a 370-m long bridge (high piers over 120 m). An arch bridge is considered to suit for this proposal. The alignment continues for 5 km with a continuous slope of 7% to finally enter a 6.8-km long tunnel. The South portal is located at level 1,990 m and the North at 1,980 m.

Draft / Final PFS Phase

338. As the PFS progressed into the draft and final PFS phase these nine alternative alignments were narrowed down for further study into four alternatives each comprising one alignment.

339. The main assumptions to be considered for designing the alignments were:

- To avoid a three-lane long tunnel, which requires that the gradient be less than 2% in advance to the portal.
- To locate the long tunnel out of the influence of the volcanic cones and the related contact aureole zones (geological constraints).
- To set the long tunnel portals under the 2,000 m level (for better winter maintenance conditions).
- To avoid areas of debris deposits and landslides; and generally, to avoid deep cut slopes in the hillsides defined as geologically non-stable.
- To minimize the third lane length for the road generally (depending on the gradient and the lengths of the road sections).
- To bypass the existing populations for the 80 km/h design speed.
- To set a design speed of 80 km/h both for the long tunnel and other structures (whatever the design speed would need to be for the remaining sections of the road alignment).

340. Based on these assumptions, 4 alignment alternatives were developed across three corridors, differing in their way to access from Kvesheti (level 1,300 m) to the long tunnel portal (around 2,000 m). These alignments are described below, and illustrated in Figure 67 following.

341. **Alternative 1** runs through the Tetri Aragvi riverside, improving the alignment of the current road and adopting the Kvemo Mleta bridge and some other minor structures. From the starting point of the zig-zag curves to Gudauri, there would be a new alignment at middle height of the hillsides. This requires a continuous sequence of bridges going up to the south portal of an 8.4 km length tunnel, located under the Jvari Pass in the Gudauri area. After the north portal, the new alignment connects to the existing road for 2 km.

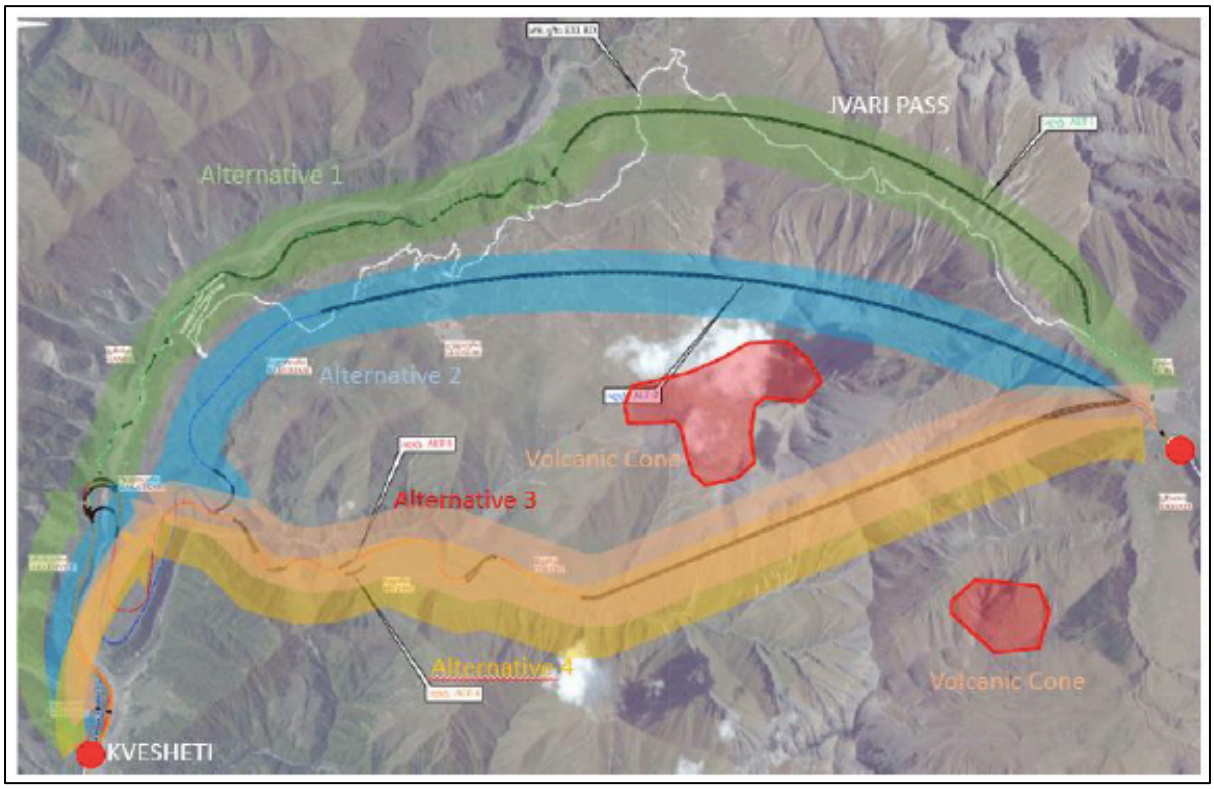
342. **Alternative 2** follows upstream of the existing road for 3 km; after passing Arakveti it crosses the Tetri Aragvi river and turns down in the opposite direction. The alignment goes up cutting the front hillside in order to get the Kvesheti plateau, where it then turns down again

(big S curve) towards the Gudauri area. The tunnel is 11.4 km long and connects to the existing road close to Kobi.

343. **Alternative 3** bypasses Kvesheti at the riverside and goes up to the Kvesheti plateau in a very similar way to Alternative 2 but adopting bigger parameters for the alignment geometry in order to provide an 80 km/h design speed. After that, it enters the Khada valley, changing from one side to another according to the geotechnical conditions as far as Tskere where it enters the south portal of an 8.0 km length tunnel.

344. **Alternative 4** bypasses Kvesheti and winds up to the Kvesheti plateau similarly as Alternative 3 but going up quickly with higher grades. Once along the Khada valley the road switchs from one side to the other for the most advantageous geotechnical conditions up to Tskere where it enters the south portal of an 8.0 km length tunnel.

Figure 67: Pre-feasibility Study Alignment Options



Multi-criteria Analysis

345. The alignments were further assessed based on a multi-criteria analysis approach (MCA). International standards (such as UK DMRB[14]) have been followed for defining alignment selection criteria. The MCA assessed three broad criteria:

- Functionality, including; a) alignment features, b) estimated traffic at opening, c) travel time for vehicles, and c) population served.
- Economic considerations including: a) total investment cost, b) total maintenance cost including winter maintenance and potential closures, and c) economic benefits.
- Environmental and social aspects including: a) biodiversity, b) surface water, c) ground water, d) protected areas, e) soils, f) landscape, g) resettlement and social factors, and h) road safety – summarised in the Table 25 below.

[14] http://www.standardsforhighways.co.uk/ha/standards/dmrb/index.htm

Table 25: Pre-feasibility MCA Summary – Environmental and Social Aspects

Criteria	Phase	Alternative			
		1	2	3	4
Protected Areas	Construction and Operation	Expected to affect a protected area. High risk should be considered.	Alternatives 2, 3 and 4 bypass the mentioned protected area, so no direct impact is expected.		
Spoil Disposal	Construction	Amount of spoil is slightly higher than for alternative 3 and 4. Impact is ranked as medium. Risk of other impacts (pollution with spilled fuel/oil, waste water, littering) is similar as for other alternatives	Longest tunnel, i.e. amount of spoil is highest compared to other alternatives. Impact related to disposal of spoil is ranked as high. Risk of other impacts (pollution with spilled fuel/oil, waste water, littering) is similar as for other alternatives	The tunnel is the shortest, i.e. amount of spoil is lower compared to other alternatives. Impact is ranked as low. Risk of other impacts (pollution with spilled fuel/oil, waste water, littering) is similar as for other alternatives	
Landscape	Construction	Medium visual impact related to the new infrastructure.	Medium visual impact related to the new infrastructure.	Medium visual impact related to the new infrastructure.	
Resettlement and Social Considerations	Construction	The alignment does not run though residential areas. No or negligible risk of resettlement. There are no cultural heritage sites in the direct impact zone. The project will affect roadside businesses (restaurants, shops) after diversion of the traffic from existing road to the new alignment. Keeping in mind that the area is winter resort and there are less people in other times of the year, the impact can be ranked as low to negligible.	Impacts related to nuisance caused by dust, emissions and noise/vibration is low. The scale of resettlement needs to be specified at subsequent stage of assessment. Presumably low impact.	Impacts related to nuisance caused by dust, emissions and noise/vibration is low. The scale of resettlement needs to be specified at subsequent stage of assessment. Presumably low impact.	

	Operation	Medium impact, depending on location, is expected during operation of the road. Impact will be observed in Kvesheti and Kvemo Mleta areas.	Impact related to dust, emissions, noise, vibration is expected in the stretches located close to alignment. Impact on Kvesheti and other settlements crossed by alignment will be the case. Impact is ranked as Medium.	Medium to low impact related to dust, emissions, noise, vibration is expected in the stretches located close to alignment.
Road safety	Operation	As a conclusion, the higher speed the more severity for the drivers. In this sense, design speed of 60 km/h (Alternatives 1 and 2) would be better than 80 km/h (Alternative 3 and 4). But on the other hand, Alternatives 1 and 2 do not avoid all the population areas (Alt.-1: Kvesheti and Kvemo Mleta; Alt.-2: Kvesheti), so it is assumed that pedestrian casualty for these alternatives would be potentially higher.		
Biodiversity	Construction	Most of alignment runs through tunnel. Alignment might affect a protected area. Impact on flora and fauna is ranked as high	Most of alignment runs through tunnel. Moderate impact on biodiversity in the sections where forest is crossed.	
	Operation	Keeping in mind sensitivity of the area according to preliminary evaluation impact is ranked as high	To protect wildlife and cattle from road accidents safety barriers can be used to reduce the risk of impact. Mitigation measures to avoid noise impact will be introduced. According to preliminary evaluation impact is ranked as medium	
Surface Water		Most part of the section will go via tunnel. Impact on surface water may be observed only in the starting section of the new alignment. According to preliminary estimate impact is ranked as low.	No impact on surface water expected.	Most part of the section will go via tunnel. Impact on surface water may be observed only in the starting section of the new alignment. According to preliminary estimate impact is ranked as low.
Groundwater	Construction	Impact on ground water may occur during construction of tunnels in case the ground water aquifer is crossed. There are springs along alignment at various distances from the RoW. According to preliminary estimate none of them is located in the impact zone. However, for avoidance of impact, mitigation measures will be identified on case by case basis.		
	Operation	No impact on ground water is expected during operation of the road and tunnel.		

346. Overall, the MCA concluded that the preferred alternative is Alternative 4: through the Khada valley which permits a design speed of 80 km/h.

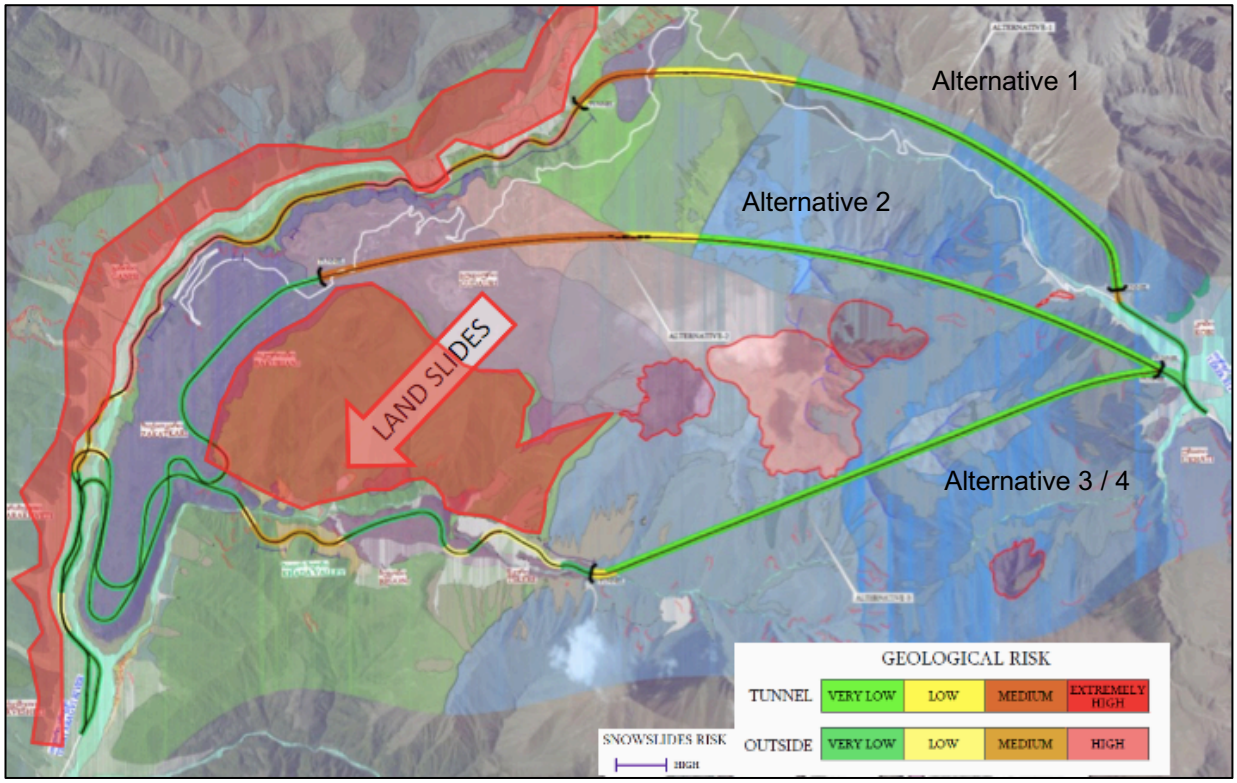
Specific Geotechnical Issues that informed the alignment selection

347. As part of the PFS a detailed analysis of the geotechnical aspects of the four alignment alternatives was prepared that fed into the MCA. The conclusions of the analysis were that the only feasible long tunnel option is the one that has its southern portal in Tskere. The other options, such as Alternative 2, are considered beyond an acceptable geological risk level and could result in tunnel construction failure, an "unaffordable" risk not just in terms of financial aspects, but also safety.

348. Regardless of the risk ranking provided in the geological risk maps below (**Figure 63** it is important to distinguish between unaffordable risks and any other ranked risks (from low to high). For the road section outside of the tunnel, avalanches are considered an "affordable" risk; the method to cope with this risk is providing protection structures (cut and cover tunnels, galleries).

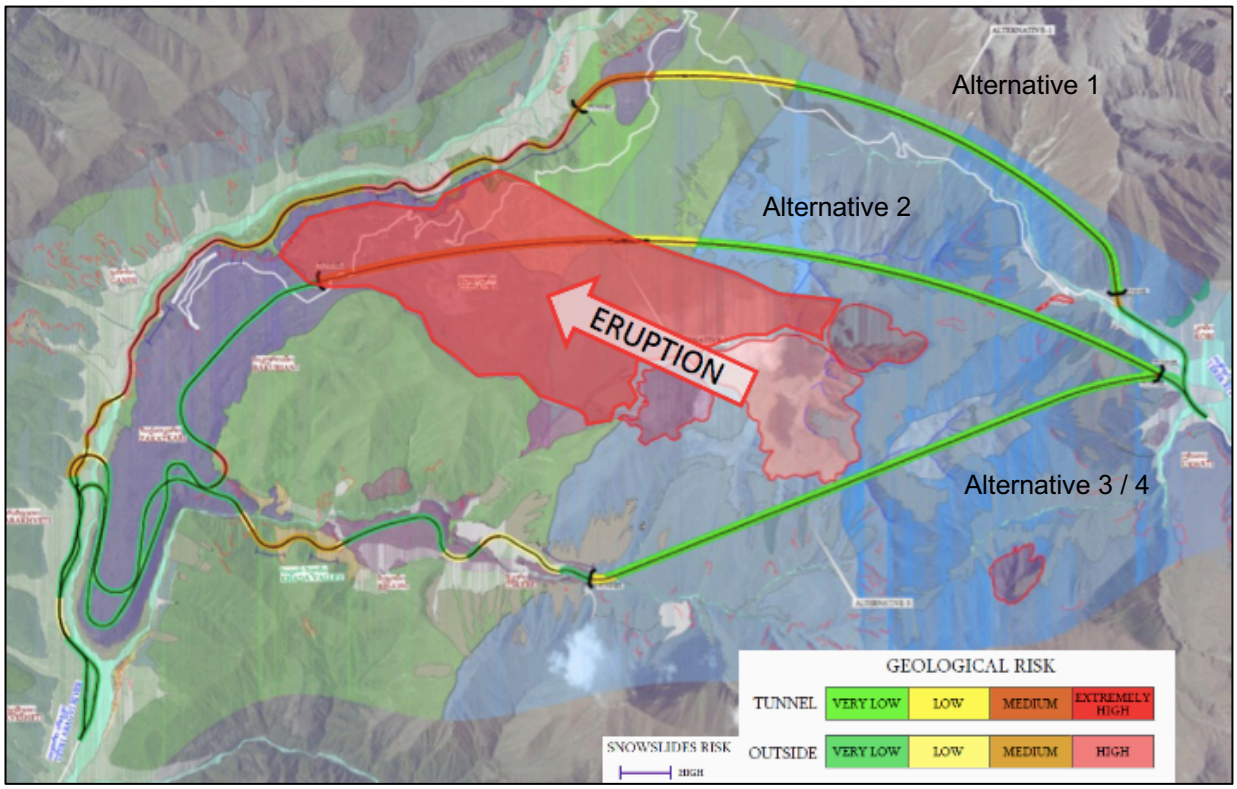
349. However, for the road section outside the tunnel, landslides are an unaffordable risk; there is no option to stop them, whatever the level of investment or the proposed protection structures. There is only one way to solve this issue; move the alignment into a different location. There are specific relevant examples of landslides at the existing road from Kvemo Mleta upstream. For this reason, the road has been designed to bypass Kvesheti at the riverside and not at the back, close to the mountains; and the reason for the arch bridge changing from one side to the other at Khada valley, e.g. to get away from hillsides ahead of Zakatkari (at this side of the Khada valley).

Figure 68: Landslide Risks



350. Something similar occurs when considering the location of the main tunnel. In this sense, for the tunnel, materials coming from a volcanic eruption (and affected because of that) are revealed as a serious issue for the feasibility of the tunnel as shown in **Figure 69** below.

Figure 69: Volcanic Eruption Risk



351. Focusing specifically on the Alternative 2 corridor located near Gudauri (particularly following feedback from two NGOs), the following risks were identified:

- Spring waters in volcanic rocks. High risk of construction delay and investment increment. Medium risk of construction safety.
- Stability of Cretaceous rocks (black shales) or squeezing characteristics of ampelite shales. This is related to poor properties of the materials coming from the volcanic eruption (and affected because of that). Considering the high overburden, this results in serious risks for the completion of the tunnel. High risks of construction safety and extreme risk of irreversible entrapment of the tunnel boring machine, which goes beyond significant expense or delay: the probability of a tunnel construction failure becomes relevant. This is the key point.
- Ground water inflows and rock falls in Jurassic limestones. Low risk.
- The tunnel intersects a regional fault related to a thrust fault between the Jurassic and the Cretaceous Succession, with potential risk related to ground water or weak materials. Medium risk of construction delay and additional cost, but since this is located over a small stretch, this is not a major issue.

352. In contrast to Alternative 2, the geological risks for the tunnel of Alternative 3 and 4 (located adjacent to Tskere) are lower. The Alternative 2 tunnel is 40% longer (meaning a much larger investment), requires heavier support (again, larger investment) and the risk of construction failure or additional costs is much greater.

353. In summary, based on the above analysis the Alternative 2 tunnel presents an unacceptable level of risk, and could not be recommended for the project.

354. Accordingly, the Khada valley option through Tskere presents the only technically and financially feasible option.

355. Therefore, the final conclusion of the geotechnical aspects of the PFS was that Alternative 3 and 4 (via Tskere tunnel) were the most safe, feasible and low risk options for the

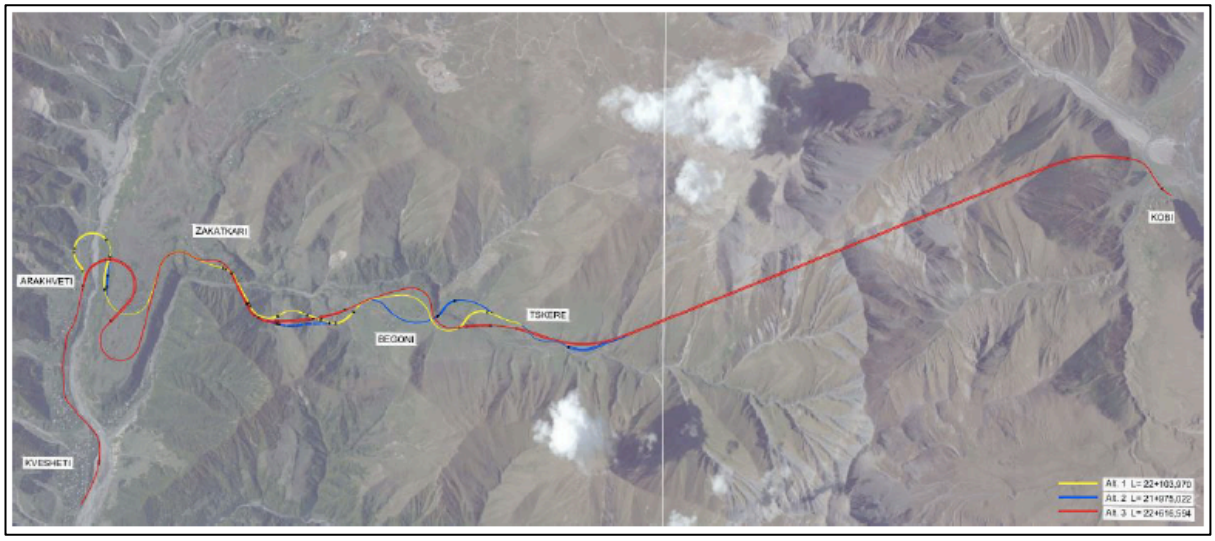
main tunnel, considering the geological complexity, the investment and the construction success.

356. From this point on, the feasibility study then focused on developing the alignment of the road in the Khada valley, to avoid natural hazards (landslides and avalanches), minimize environmental and social impacts and to ensure efficient operations and sustainability.

Feasibility Stage

357. At the Feasibility Study phase Alternative 4 was assessed further and three further alternatives were developed that broadly correspond with the Alternative 4 selected in the PFS. The following figure illustrates these three alternatives.

Figure 70: Feasibility Study Alignment Alternatives



358. **Alternative 1** is 22.10 km long bypassing Kvesheti at the riverside and goes up to the plateau crossing the existing road, the Aragvi river and the crest of the plateau by means of 3 long bridges, between 264 and 555 m. After that, it enters the Khada valley, changing from one side to another according to the geotechnical conditions, The highest bridge (169 m) is located on the Khada river to cross to the left bank and 4 more bridges are necessary up to reach the plateau of Begoni. After that another bridge is located to cross the river again changing to the right bank up to Tskere where it is placed the portal of an 8.1 km length tunnel.

359. **Alternative 2** is 21.97 km long and it bypasses Kvesheti in the same way and goes up to the plateau crossing the existing road, the Aragvi river and the crest of the plateau by means of 3 long bridges, but reducing the length of the bridge at the crest from 430 m to 136 m, this is due to the displacement of the route towards the plateau increasing the high of the slopes. After that, it enters the Khada valley through the highest bridge (173 m) located on the Khada river to cross to the left bank and 3 more bridges and a tunnel are necessary up to reach the plateau of Begoni. Finally, another bridge is located to cross the river again changing to the right bank up to Tskere where it is placed the portal of an 8.1 km length tunnel.

360. **Alternative 3** is 22.61 km long and it begins in the by-pass to Kvesheti as the previous alternatives and goes up to the plateau crossing the Aragvi river by one bridge 492 m long. Beyond the bridge there is a portal tunnel in the slope of the plateau that reach the top in a smoothly way, with a gradient of 4.5 %. Then, it enters the Khada valley through the highest bridge (164 m) located on the Khada river to cross to the left bank and 3 more bridges and 2 more tunnels are necessary on the lateral gorges up to reach the plateau of Begoni. From this point another bridge crosses over the river changing to the right bank up to Tskere where it is placed the portal of an 8.87 km length tunnel.

Detailed Design Alternatives

361. At the detailed design stage, Alternative 3 was developed further.

Figure 71: Alignment Considered in Feasibility Stage (orange line) vs Final Option

362. Some changes to the alignment were made in order to; a) reflect new environmental legislation (Since 2014 environmental legislation has changed. Some of laws, regulations and policy documents in the area of biodiversity (listed in Annex II to the referred strategy document) have been updated, revised. As example – Environmental Assessment Code was adopted.), b) reduce risks and impacts, and c) improve the safety of the alignment. The main changes were made in Kobi-Tskere (Lot 2) section.

Kvesheti-Arakveti section

363. In the starting section of the road two options were considered:

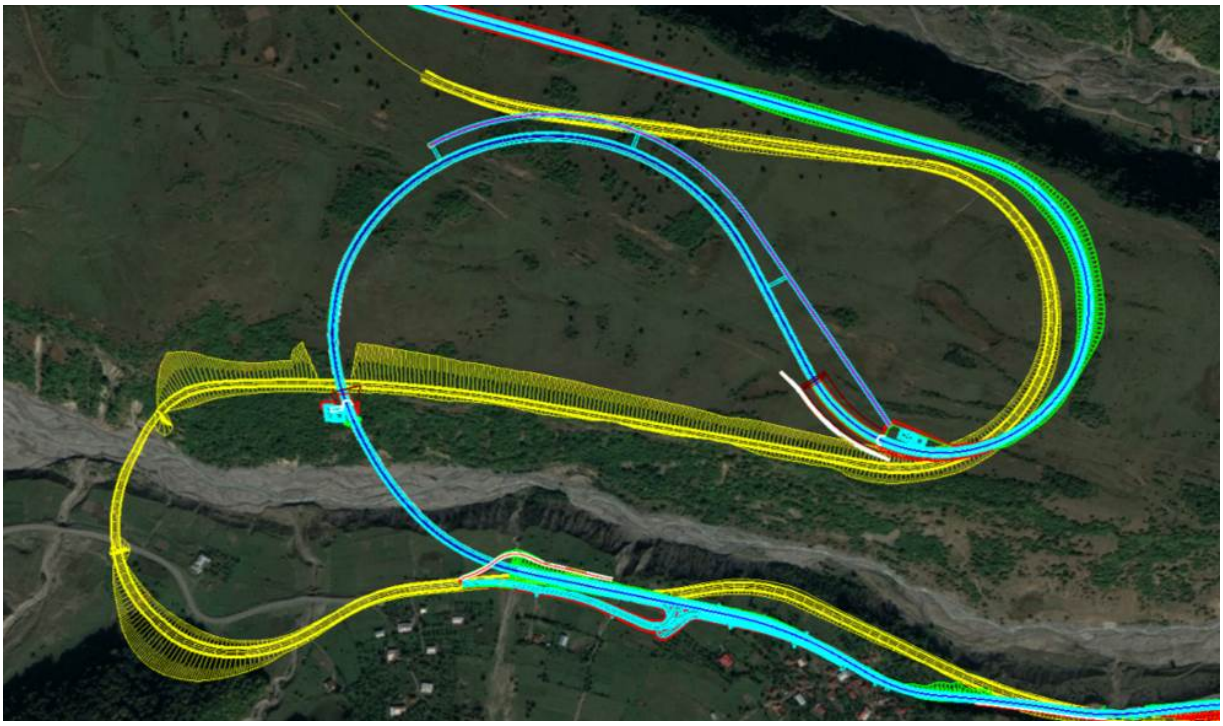
- Bypassing residential area closer to the mountains (not shown on the drawings given above).
- Bypassing Kvesheti by diversion of the traffic to the strip between the settlement and the river.

364. The first option was discarded because of geological risks (sequence of landslides, debris deposits and non-stable hillsides). In addition to that, the need of heavy supports and retaining structures leading to significant visual impact backed the decision. Based on hydrological analysis carried out by the Design team alternative 2 was found to be feasible. The option allows to use the space between the residential area and the new road for spoil disposal. After planting of the area with vegetation 5ha of green new space will be created. This will provide better protection of the village from impact during high water events and, on the other hand, act as a green barrier reducing noise in the residential quarters. Note: *implementation of flow modelling in this section is required to ensure that the change of hydrology after the change of the riverbed shape has no impact (does not cause scouring/erosion) on the area on the opposite side of the river.*

Access to the plateau on the other bank of the river

365. Option including bridge and the road to access the plateau was ‘replaced’ with tunnel alternative (blue one) to ensure better safety in winter. The tunnel was considered preferable from the view of visual impact. Use of the tunnel will help to reduce: the need of deep cut slopes; the scale of the impact on vegetation; the length of the stretch where during operation of the road impact on soil quality may occur; as well as disturbance of wildlife (the blue one represents the final design).

Figure 72: Access to the Plateau

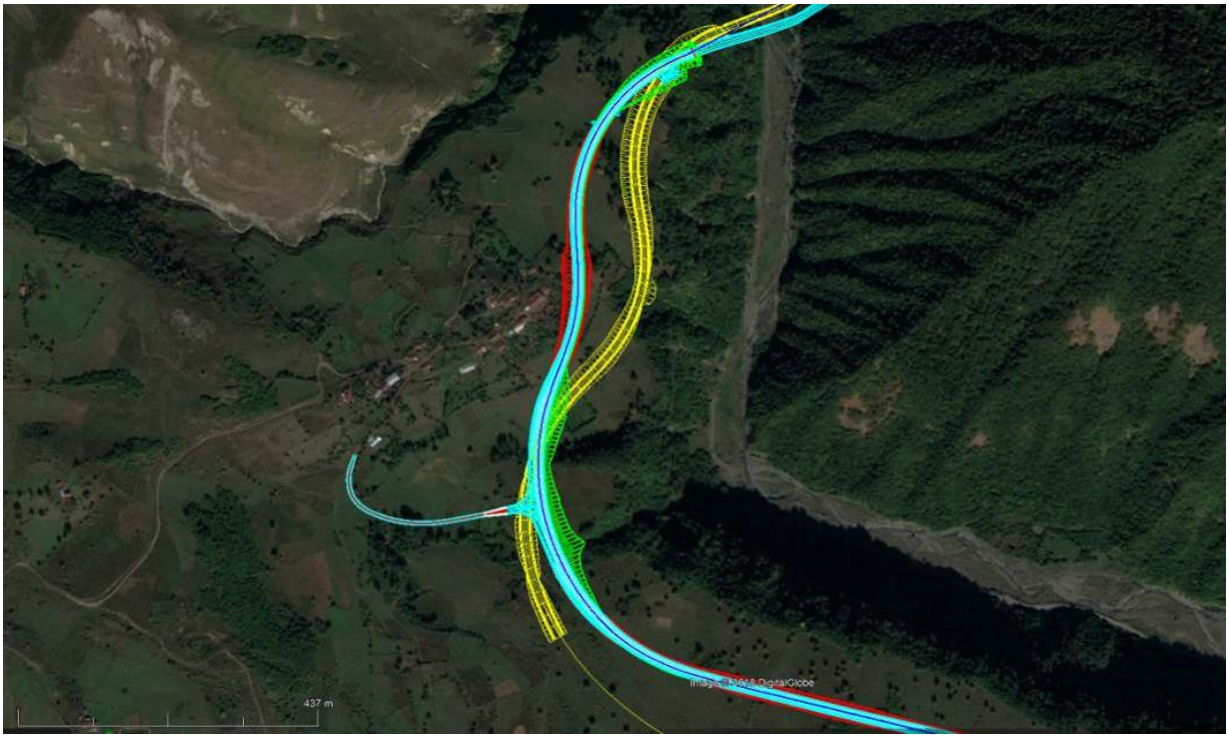


Note: alignment considered in Feasibility Stage (yellow line) vs Final Option (blue line)

Zakatkari section.

366. This realignment moves the road further from the protected areas and reduces the curves which may have safety impacts. (the blue one represents the final design).

Figure 73: Enhancing the Minimum Radius for Connection to Gudauri

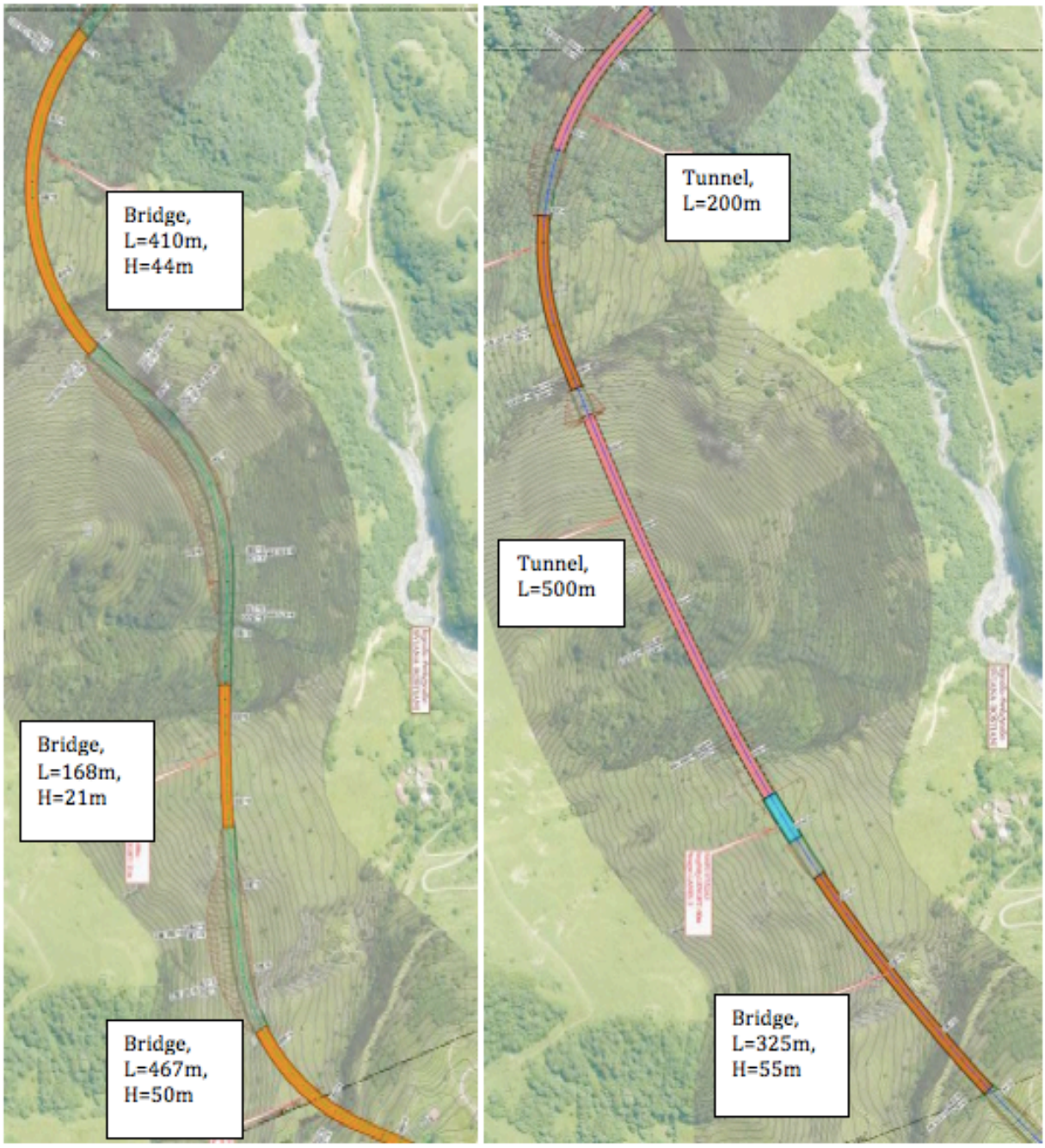


Note: alignment considered in Feasibility Stage (yellow line) vs Final Option (blue line)

Begoni section

367. With consideration of the rugged terrain and risk of landslides and avalanches in the area cutting slope was considered as non-advisable. To minimize geotechnical risks, the option with a range of bridges was substituted with a sequence of tunnels.

Figure 74: Previous Version (left) and Proposed alignment (right) at "Begoni Curves"



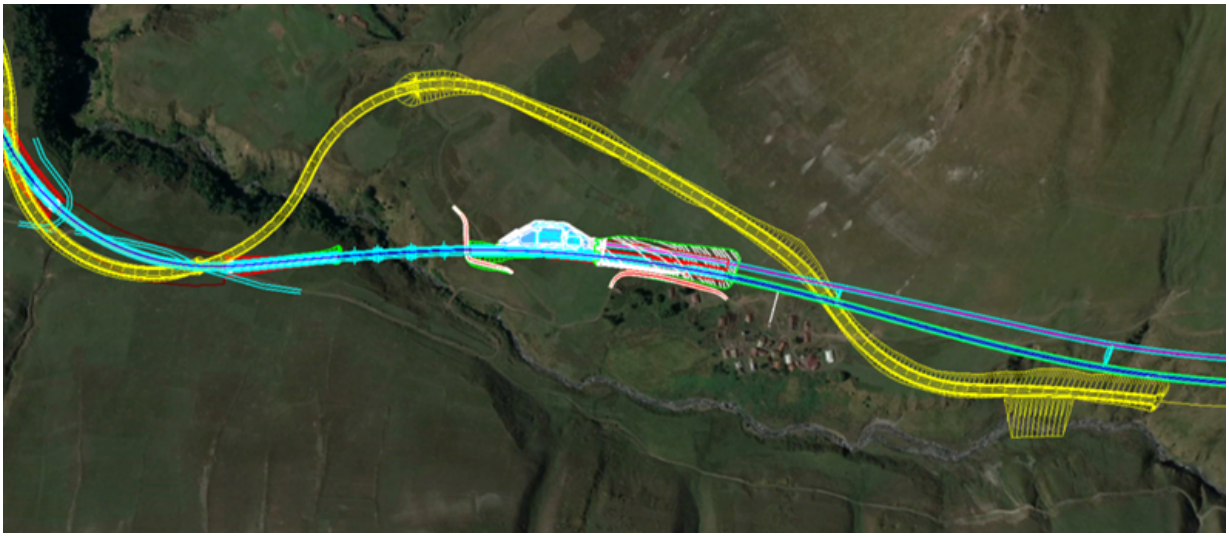
368. The alignment has been shifted towards the border (minimum distance from the edge 5m) of the cliff to minimize disturbance of population.

Tskere section

369. Alternative bypassing Tskere farther from the west (yellow alternative) with tunnel starting north to the village is longer. Respectively higher is its visual impact and impact on Tskere residents caused by noise and emissions from the road. Besides, the 'open' road alignment is under higher risk of avalanches.

370. To minimize cut slopes and avoid the mention problems, the tunnel entrance was moved away from the village. The tunnel will start with a cut and cover section. The surface of the C&C tunnel will be replanted to merge with the background environment and minimize visual impact. The arrangement of the tunnel will reduce noise and emission related impacts on Tskere residents. Safety risks associated with avalanches will also be avoided.

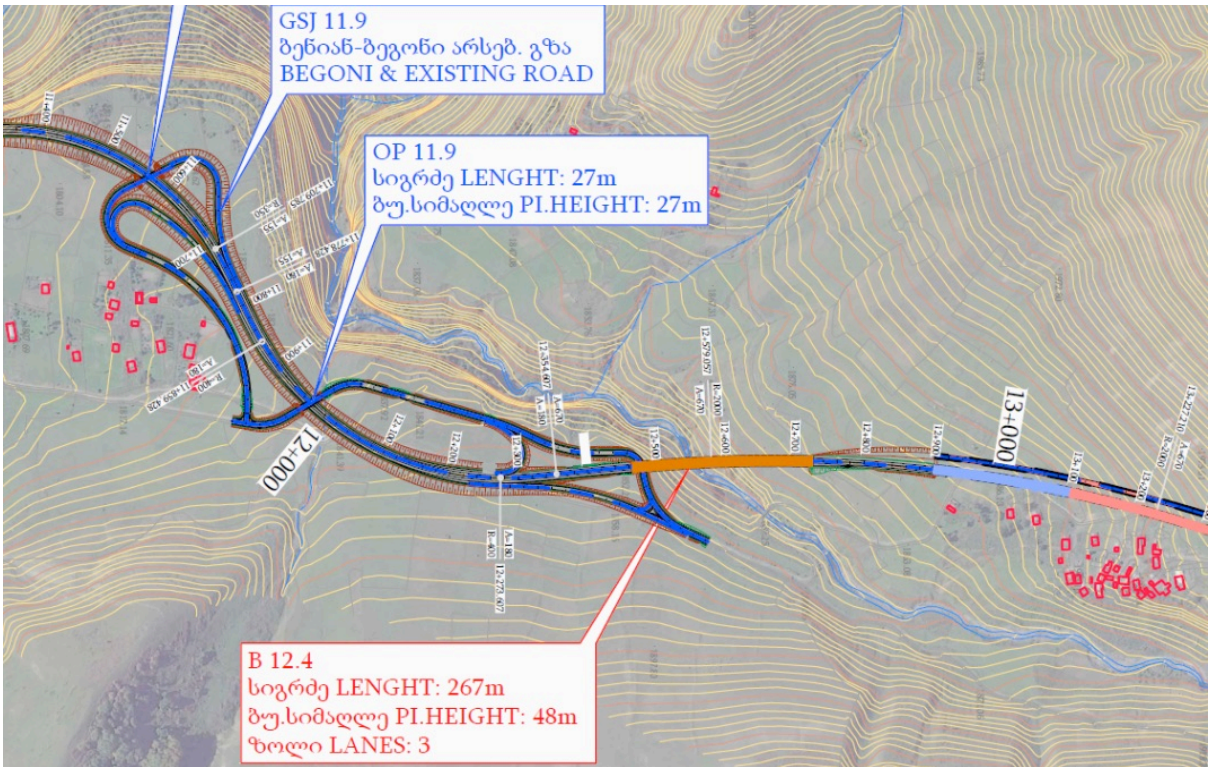
Figure 75: Tskere Area



Note: alignment considered in Feasibility Stage (yellow line) vs Final Option (blue line)

371. An alternative location of the junction closer to Mughure-Tskere was considered (see Figure 76). However, considering the landform, available space, technical requirements for the road, use of the junction, proximity to the residential areas and the expected scale of impact on environment, and despite the size of the junction, the current design was considered as preferable (see **Figure 31** for the final design).

Figure 76: Junction alternative



Kobi section

372. The last stretch of the tunnel has been reshaped to reduce interference with gas pipelines. The alignment has been adapted to the current road with a maximum gradient of 4.2 % to keep on using the existing bridge.

Figure 77: Kobi Area

Note: alignment considered in Feasibility Stage (yellow line) vs Final Option (blue line). Image is an old version which does not show the existing new road alignment as per Figure 19.

C.5 Alternative Transport Modes

373. Rail is cost-effective as a means of transporting bulk goods (coal, fuel, aggregates etc.) over long distances, or containers from port to port. There is no indication that there is demand for transporting bulk commodities along the project road corridor in anything like the quantities needed to create a viable service. The costs of developing a rail link have not been estimated but would be extraordinarily high.

374. The feasibility study origin and destination surveys revealed that the origins of northbound traffic at Jinvali and proceeding to Russia were almost equally split between Armenia and Georgia. The destinations of southbound traffic at Larsi originating in Russia (including Belarus and Ukraine) were, similarly, almost equally split between Armenia and Georgia. Consequently, at least half of the existing freight traffic cannot be routed by rail. Accordingly, rail is not a viable alternative option to the proposed Project.

C.6 Alternative Pavement Types

375. Asphalt and concrete pavement types have been considered. Priority was given to asphalt. This type of pavement has been chosen for the following reasons:

- less noise during operation – compared to concrete (less nuisance to the residents and wildlife);
- less vibration compared to the concrete (significant factor to consider, keeping in mind presence of the buildings construction without mortar);
- better visibility of horizontal marking on asphalt surface (safety consideration)
- better efficiency in snow/ice melt conditions;

- recyclability of material.

376. However, the other types of payment will also be used for other portions of the road:

- The pavement of the emergency galleries will be concrete, since the traffic along the gallery will be circumstantial.
- Concrete will be used on the high slopes (>12%) due to the constructive limitations to asphalt on high slopes.
- For local diversions with very low traffic, that are nowadays paved with asphalt and gravel the same type pavement will be restored.

C.7 Alternative Construction Camps and Laydown Areas.

377. The locations of these facilities are 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, including consultations with local residents. Employment of local labor force will reduce the need for a large construction camp size.

378. A range of auxiliary facilities during construction will include:

- Concrete batching plants and casting yard
- Pre-cast yard for piers and viaducts
- Laydown areas for tunneling and other equipment
- Materials storage areas
- Truck/vehicle parking areas
- Waste storage areas
- Construction Camps

379. The number, location, size and layout of these facilities will be specified by construction company. The EIA provides recommendations for site selection and mitigation of impacts. The Contractor will be responsible to prepare and submit Site installation layout plan, Construction camp layout plan and Construction Camp Management Plan for approval by RD, MoEPA and the Lenders. (See **Section F** for additional information).

C.8 Alternative Tunneling Techniques

380. Various tunneling option have been compared. The list includes:

- cut and cover,
- drill and blast,
- boring (using Tunnel Boring Machine (TBM)),
- NATM (sequential excavation – New Austrian Tunneling Method).

381. Advantages and shortcomings of methods are given below (). (Note: technical risks are not considered within this assessment).

Table 26: Comparison of Tunneling Methods

Method	Description of works	Disadvantage/shortcoming	Advantage
Cut and Cover (C&C)	Works include: • trench excavation, • tunnel construction • soil covering • excess material removal/disposal	• Dust along the C&C alignment • Noise along the C&C alignment • Visual impact during construction	• Negligible vibration compared to other methods • Efficient for shallow tunnels

Method	Description of works	Disadvantage/shortcoming	Advantage
	• reinstatement of the site	• Vegetation clearance required	
NATM - Drill and Blast (D&B)	Works include: • dividing excavation area in segments • drilling blast holes, • charging (explosives and detonators), • spoil removal • arrangement of supports • ground freezing to stabilize the soil for tunneling may be required	• Dust in the portal area • Noise in the portal area • Visual impact in the portal area during construction • Safety risks related to use of explosives • Structural support measures required • Higher vibration level compared to TBM	Localized potential environmental impacts: • Dust, noise and visual impact mainly in the portal areas • Lower dust, noise and visual impact compared to C&C • Less vegetation clearance compared to C&C • Less disturbance of land compared to C&C • Less duration of vibration compared to TBM
TBM	Works include: • Excavation. • Placement of the lining segments. • excess material removal/disposal	• High duration of vibration • Requires space for assembling and dismantling – i.e. is related with higher impact on land • Unexpected conditions tend to have bigger impact on the process than in case of D&B Hard rock can cause wearing of cutter and slow down the tunneling process or even make TBM inefficient	Localized potential environmental impacts as in case of D&B and NATM • Dust, noise and visual impact mainly in the portal areas • Lower dust, noise and visual impact compared to C&C • Less vegetation clearance compared to C&C • Less disturbance of land compared to C&C • Often used for excavation of long tunnels.

382. There are some technical limitations related to the methods listed above:

- In relation to the curve radius for D&B there are normally no practical limitations, whereas for TBMs, narrow curves may cause problems.
- TBM is unable to bore a niche.
- Cut and cover is not reasonable for long tunnels, besides, restriction related to landform are also worth to mention.

383. It is important to highlight that the risk for accidents from handling explosives is eliminated by TBM tunneling. The risk of accidents related to stability of excavation face is also much lower with the TBM option since the machine works under the protection of a steel shield.

384. Both operators of a TBM or drilling rig are exposed to noise and vibrations. This can be reduced to an acceptable level by installing an insulated and vibration dampened operator's cabin. The problem for the crew occurs when additional tasks have to be done outside the operator's cabin, like rock support, rail erections, charging during boring etc. The noise from a

jumbo is still higher than from a TBM, but on the whole there is no significant difference between the methods (drill and blast vs TBM) regarding noise.

385. Air pollution from the blasting is a problem in D&B tunnels, because of gas emissions and reduced sight. The main pollution problem in TBM tunnels is dust, especially if the quarts content in the rock is high. The content of fines in the muck is higher than in the D&B muck.

386. Mucking in D&B tunnels is normally executed with diesel engine loaders. Loaders with electrical motors are an option. In TBM tunnels the mucking is carried out by the TBM itself and the TBM is always electrical driven.

387. With consideration of the length of the main tunnel (> 8 km), advancement rates of D&B and TBM, geotechnical characteristics of the rocks – use of a TBM for the main tunnel is considered as advisable.

388. In some sections, selection between mechanical and drill and blast excavation technique (in NATM tunnels) will be made on case by case basis. In case feasible mechanical excavation must be given priority in locations particularly sensitive to vibration.

D. Environmental Laws, Standards and Regulations

D.1 Overview

389. 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 Licenses Required for Off-site Works During Construction;
(vii) International Conventions Relevant to the Project Ratified by Georgia;
(viii) An overview of the ADB and EBRD safeguard policies / performance requirements.

D.2 General

390. 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.

391. 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 & Social Legislation of Georgia

392. A list of Georgia's environmental legislation as it pertains to the proposed project is given in Table 27.

Table 27: 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 licenses and permits	23/12/2017	300.310.000.05.001.001.914
2003	Law of Georgia on conservation of soil and restoration-	07/12/2017	370.010.000.05.001.001.274

Year	Law / Regulation	Consolidated version -Last revision	Code
	amelioration of soil fertility		
2014	Waste code	07/12/2017	360160000.05.001.017608
2017	Environmental Assessment Code	07/12/2017	360160000.05.001.018492

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

394. **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).

395. **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 list 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.

396. **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.

397. **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).

398. 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.

399. 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 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 tons of non-hazardous

waste or 1000 tons 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.

400. **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, considering 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 sources19 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.

401. **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.

(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

[19] 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.

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 atomization, 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.

402. **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, considering 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.

403. **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.

404. **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.

405. **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.

406. **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.

407. **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.

408. **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.

409. **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.

410. **The Georgian Red List and Red Book** – The Red List of Georgia was adopted in 2006 based on work conducted by the Commission of Georgian Scientific Academy working in Endangered Species and updated in 2014. It now includes some 56 plant and 139 animal species, including 33 mammals, 35 birds, 11 reptiles, 2 amphibians, and 11 fish (including all sturgeon). Of these, 20 plant and 43 animal species are categorized as critically endangered (CR) or endangered (EN)20, and 4 mammals may be extinct.

411. The "Red Book" of critically endangered species includes information on the status, habitat, home range, quantity, reproduction areas and conditions, protection measures and risk factors for species listed in the Red List. In terms of plants, some 275 species of vascular plants are considered endemic to Georgia, of which approximately 60% (152 species) are considered endangered, although there is insufficient information form them all to be included in the Red List[21]. Further details on Red List species within the Project area are included within **Section E**.

[20] 44 vertebrate species are also included in the IUCN Red List as CR, EN or VU – see later
[21] https://www.cbd.int/doc/world/ge/ge-nr-05-en.pdf

412. Laws and regulations related to social aspects and land ownership applicable to the project are presented in Table 28**.**

Table 28: 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
2005	Law of Georgia on Spatial Development and Basis for City-building	25/07/2017	330.090.000.05.001.001.845
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	Labor Code	04/05/2017	270000000.04.001.016012
2015	Law on Development of High-mountain Areas	05/07/2018	010110020.05.001.017881

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

414. **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.

415. **Labor 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.

416. **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.

417. **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.

418. **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.

419. **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.

420. **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.

421. **Law on Labor Safety** defined general requirements and preventive measures related to safety on worksites; avoidance of existing and potential hazards, accidents/incidents and professional diseases; training, awareness raising, communication and consultations with equal involvement/participation of employees. The law regulates rights, obligations and responsibilities of state institutions, employers, employees and employees' representatives in providing safe and healthy environment. The law applies to dangerous, hazardous, heavy and works with/in dangerous working conditions. The list of high risk works is defined by the government in consultations with social partnership.

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

423. **Law on Spatial Development and Basis for City-building** regulates the spatial development and the process of city-building, including the development of the accommodations, settlements and infrastructure regarding the requirements of the cultural heritage and environmental policies. In this field, the law defines the rights and obligations of the state authorities, physical and legal entities, principles of spatial development and city-building, its priorities, goals and tasks, as well as the form and the role of the spatial-territorial planning and planning documents in terms of the development of the territorial development of Georgia.

424. **Law on Development of High-mountain Areas**. The policy implemented by the State towards high mountainous regions is part of the regional development policy of the country and is aimed at ensuring the equal socio-economic development of the entire territory of Georgia and at solving the social and economic problems of persons living in high mountainous regions. The aim of this Law is to determine the benefits of encouraging the social and economic progress of high mountainous regions as guaranteed by the Constitution of Georgia; such benefits ensure the well-being of persons living in high mountainous regions, raise living standards, promote employment and improve social and economic conditions. Regardless of their altitudes, the status of high mountainous settlement has been granted to settlements located within the following historic and geographic areas: Khevi, Mtiuleti, Pankisi Gorge, mountainous Adjara, Gudamakari Valley, Pshav-Khevsureti, Tusheti, Upper Svaneti, Kvemo Svaneti (lower Svaneti), Lechkhumi and Racha.

The State shall ensure the establishment of the following social benefits in high mountainous settlements:

a) a monthly bonus to the state pension being at least 20% of the state pension set for permanent residents of high mountainous settlements who have reached the retirement age and receive the monthly state pension as a social benefit, according to the amount of the state pension defined by the law of Georgia on the state budget of Georgia for the relevant year. The procedures and conditions for issuing the said supplement shall be determined by ordinance of the Government of Georgia. The permanent residents of high mountainous settlements who are the recipients of the social package determined by the Government of Georgia shall receive the monthly supplement in the amount of 20% of the social package provided to them.

b) medical personnel employed at medical institutions, which are under State management and where the State is an equity partner, located in high mountainous settlements, whose work is paid from the state budget, shall receive a monthly bonus in accordance with rules determined by ordinance of the Government of Georgia: b.a) doctors shall receive a bonus in the amount of the state pension; b.b) for nurses – in the amount of the pension;

c) the implementation of relevant measures during the winter period (from 15 October of the relevant year through to 15 April of the following year) in order to facilitate the provision of heating for permanent residents of high mountainous settlements;

d) compensation of 50% of monthly charges for electricity consumed by users (residential customers) in high mountainous settlements, but not more than the charge for 100 kWh of consumed electricity;

e) a contribution of monthly cash assistance, in accordance with procedures determined by ordinance of the Government of Georgia, being at least GEL 100 throughout the period of one year after the entry into force of this Law, for the birth of the first child and the second child, where one of the parents of the child is a permanent resident of a high mountainous settlement, and for the third child and every following child, a contribution of monthly cash assistance of at least GEL 200 throughout the period of 2 years after the entry into force of this Law;

f) the provision of a bonus being not less than 35% of the basic remuneration of a teacher in accordance with procedures established by the Ministry of Education and Science of Georgia to a teacher in a legal entity under public law -an institution of general education located in a high mountainous settlement and established by the Ministry of Education and Science of Georgia; the payment of a bonus being not less than 35% of the remuneration of teachers in accordance with procedures established by the Ministry of Education and Science of Georgia to a teacher in an institution of vocational education located in a high mountainous settlement and established by the Ministry of Education and Science of Georgia. In order to provide financial assistance to coaches employed in the sports sector and to promote the development of sports in high mountainous settlements, the government of Georgia shall develop and approve a relevant state program.

g) the provision of an increased number of vouchers to the pupils of public schools, multi-sectoral public schools, and to students of institutions of vocational education located in high mountainous settlements. The terms and conditions for issuing the said vouchers shall be determined by ordinance of the Government of Georgia.

h) the provision of a bonus of not less than 50% of the remuneration of a teacher in accordance with the procedures and conditions established by the Ministry of Education and Science of Georgia, or the head of the administrative body implementing this program, to a teacher who is a participant of a relevant program as defined by the Ministry of Education and Science of Georgia and/or the administrative body within under its authority, and who is employed within this program at an institution of general education located in a high mountainous settlement. The bonus provided for by this sub-paragraph shall not be given to a person entitled to the benefit provided for by paragraph 2(f).

According to the law, a natural person shall be granted the status of permanent resident of a high mountainous settlement if he/she meets the following criteria: a) he/she must be a citizen of Georgia; b) he/she must be registered in a high mountainous settlement; c) he/she must actually live in a high mountainous settlement for an aggregate 9 months or more than 9 months during each calendar year.

Permanent residents of high mountainous settlements shall enjoy tax privileges established by the Tax Code of Georgia in relation to income tax and property tax. Business entities which, in accordance with the legislation of Georgia, have been granted the status of high mountainous settlement enterprise shall be exempt from taxes under the terms and rules defined by the Tax Code of Georgia. The administrative body with power to grant to business entities the status of high mountainous settlement enterprise, and the terms and conditions of granting, terminating and suspending the status of high mountainous settlement enterprise, shall be determined by the rules for granting, terminating and suspending the status of high mountainous settlement enterprise, which shall be approved by ordinance of the Government of Georgia.

425. **The Constitutional Agreement between the State of Georgia and the Apostolic Autocephalous Orthodox Church** (2002) regulates the relationship between the state and the

Church. Its provisions (art. 7, 8 and 9) have a major impact on the management of cultural heritage in the country. By this agreement all the religious buildings and related structures on the territory of the country, in use or without function, standing or in ruins, together with their parcels and also all the immovable ecclesiastic treasures protected in museums and archives are handed down in the ownership of the Church of Georgia (art.7 and 8). The MoCMP must agree with the Church of Georgia in the process of adopting protection zones, rules and methodologies, planning and approving rehabilitation projects or scientific research of movable and immovable religious monuments. Together with the state, the Church is responsible for maintenance and care of the monuments in its ownership (art.7 and 9). The property of the Church is exempt from the state taxes (art. 5). According to the Concordat the church is the owner of the majority of immovable listed properties in the country, most of which, at the same time, are living heritage sites, with the religious function being restored and enhanced after the fall of Soviet regime. Because of this special circumstance, the specific rules for maintenance and exploitation of these properties need to be elaborated.

D.4 Action Plans and Strategies

D.4.1 National Biodiversity Strategy and Action Plan

426. The Georgian National Biodiversity Strategy and Action Plan (NBSAP) was adopted in 2005 and updated in 2014. It sets out the goals, objectives and policies for the protection and conservation of biodiversity in Georgia. The initial NBSAP included nine strategic goals to help ensure that Georgia "will be a country where biological diversity is sustained and rehabilitated within a political, social and economic context that favors the wise use of natural resources and adequate benefit sharing" by aiming to:

- Develop a protected areas system to ensure conservation and sustainable use of biological resources.
- Maintain and restore Georgia's habitats, species and genetic diversity through ex-situ and inter-situ conservation measures, and sustainable use of biological resources.
- Conserve Georgian agrobiodiversity through ensuring its sustainable use and by promoting of ex-situ and in-situ conservation measures.
- Promote sustainable hunting and fishing through adequate planning, restoration and protection of key biological resource.
- Develop a biodiversity monitoring system and an active and integrated biodiversity database to ensure sustainable use and conservation of biological resources.
- Protect both the human population and biodiversity from potential threats from genetically modified organisms (biotechnology), through strengthening the law and increasing public involvement in decision making.
- Raise public awareness of biodiversity issues and to encourage public participation in the decision-making process.
- Ensure appropriate financial and economic programs are in place in order to support effective conservation of biodiversity, and to ensure the delivery of the BSAP.
- Further improve national legislation (and associated institutions) relating to biodiversity conservation, through the creation of new, and elaboration of existing laws and regulations, and through ensuring harmonization to international legal responsibilities.

427. The first 10-year period did not see all of these fully implemented but did see a number of key achievements including:

- Development of the system of protected areas.

- Preparation of the National Red List of Georgia based on international criteria and categories.
- Development of conservation management plans for endangered species and groups of species and launching of their implementation.
- Initiation of the national biodiversity monitoring system.
- Ex-situ and/or on-farm conservation of several endemic and endangered plant species and crops.
- Launching of the Georgian biodiversity clearing house mechanism.

428. The 2014 update to the NBSAP (for the period of 2014-2020) has adopted a more holistic, cross-cutting and ecosystem-based approach and also goes further in terms of formulating a comprehensive policy and defining national priorities. It envisions that by 2030 Georgia *"will be a country with population living in harmony with nature, biodiversity will be commonly valued, biological resources – conserved and wisely used. This will provide natural continuity of ecosystem processes, healthy environment and benefits essential for all people*``.

429. It includes a situational analysis, strategic approaches and actions in five new areas including Inland water ecosystems, Forest ecosystems, Natural grasslands and Cross-cutting issues and governance. It also seeks to strengthen cross-sectorial cooperation and partnerships amongst key stakeholders[22] (including ministries, private sector, NGOs, Universities and media) and includes 21 national goals for protection of biodiversity, which are in line with key strategic targets of the Convention on Biodiversity and Aichi Targets[23]. These include actions to:

- Address the underlying causes of biodiversity loss through integration of biodiversity issues into governmental activities and public life.
- Reduce the direct pressures on biodiversity and promote sustainable use of biological resources.
- Improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity.
- Enhance the benefits to all from biodiversity and ecosystem services.
- Enhance implementation of biodiversity strategy through participatory planning, knowledge management and capacity building.

430. A primary goal of the NBSAP to help support national obligations under the EU Association Agreement and facilitate harmonization with EU environmental policy. It is especially important in promoting legislative changes, protection of global and European significance habitats and species and establishment of the "Emerald Network", and enhancement of the country's involvement in the regional process of sustainable forestry, such as "European forests" and reconciliation of the Georgian forestry policy, legislation and standards with EU requirements

D.4.2 Related Plans

431. In addition to the NBSAP there are a number of other key National Plans of relevance to biodiversity and conservation as outlined below.

[22] The process was coordinated by a supervision committee under the direction of MoENRP with representation from organisations including WWF (Caucasus Program Office), IUCN (Caucasus Cooperation Centre) and National NGOs such as NACRES, and GreenAlternative as well as Ilia State University:

[23] https://www.cbd.int/doc/world/ge/ge-nr-05-en.pdf

Table 29: Other National Plans

Document	Relevance
National Environmental Action Plan (NEAP 2012)	Outlines overall approach to environmental protection. Includes specific chapters on both biodiversity and protected areas and forests and forestry. The NBSAP includes detailed actions for achieving NEAP goals and objectives such as: • Rehabilitation, protection and conservation of viable populations and habitats of selected endangered species; • Improvement of effectiveness of hunting and fishery management to ensure sustainable use of fauna resources; • Development of an effective protected areas network; • Improvement of the effectiveness of the Protected Areas management through the capacity building of its administration and introduction of financial sustainability mechanisms; • Creation of proper data bases for biodiversity conservation and sustainable management of biological resources by developing the relevant national biomonitoring system; • Development of background for establishment of a sustainable forestry system; • Mitigation of unsustainable and illegal forest use (logging); • Mitigation of eutrophication.
National Forest Strategy	Aimed at establishment of a system of sustainable forest management to ensure: • protection of biological diversity; • effective use of the economic potential of forests considering their ecological value; • public participation in forest management related issues; • fair distribution of derived benefits; Priority is to be given to meeting the needs of the local population, and everybody's principally free access to forest resources. Restoration of degraded forests and afforestation are also identified as priority areas.
Rural – Agricultural Development Strategy (2015-2020)	Promotes long term agricultural development but includes preservation of biodiversity as a key aim, as well as strengthening cooperation with MoEPA and associated agencies of neighboring countries. Relevant activities include: • Introduction of "good agricultural practices ", which will promote mitigation of environmental pollution through optimal application of chemical fertilizers and substances; • Refinement of agrarian ecosystem and natural grassland management systems; • Introduction of the system for biofarm establishment, encouragement, sustainable management and certification. Special emphasis is placed on preservation of agrarian biodiversity and endemic species and it includes actions around: • creation of an effectively manageable genetic bank; • detailed inventory and restoration of local species and forms; • informing farmers and other stakeholders of agrarian biodiversity and endemic species.
Kazbegi Development Strategy (2016-2020)	Developed by Kazbegi Local Action Group (LAG Kazbegi). This Strategy has been developed within the frames of the Project "Kazbegi Local Action Group ". The Project is implemented by the international NGO "People in Need" (PIN), within the European Neighborhood Program for Agriculture and Rural Development (ENPARD). The Project is being implemented together with the partners of "People in Need": Biological Farming Association "Elkana" and the National Network of Local Action Groups (NNLAG) of the Czech Republic. The Project envisages introduction of LEADER[24] methodology in Kazbegi municipality, in order to facilitate rural development.
Dusheti municipality socio economic	The plan was elaborated through active cooperation with local authorizes. The plan contains detailed information on socio-economic state and development prospects of the municipality.

[24] "Liaison Entre Actions de Développement de l'Économique Rurale", which means "Links between the rural economy and development actions"

Document	Relevance
development plan	
Road Safety Strategy (2016).[25]	The strategy sets out the key directions recommended by international organizations and global experts for successful and sustainable long-term road safety management in Georgia. The need for the strategy has been conditioned by rising level of registered motor vehicle and necessity to allow Georgia to achieve substantially improved results and sustained success in its road safety activity. The strategy describes national capacity building and shared responsibility for road safety in the state. Developed through capacity review and in consultation with the key governmental partners and road safety stakeholders, the Strategy sets a new long-term vision and goal for road safety in Georgia, stresses benefits of long-term investment in road safety, mentions measures and targets to address the key road safety problems.

D.5 Administrative Framework

432. **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.

433. 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 our screening of planned development, c) to implement scoping, d) to issue environmental decision for project subject to EIA procedure (ref. Environmental Assessment Code), c) to control the execution of mitigation measures by the developer, d) 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.

434. **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. licensing activity). The MoESD is a responsible institution for developing and administrating Local Market Information System (LMIS). The LMIS information providers include: Ministry of Economy and Sustainable Development of Georgia, Enterprise Georgia, Georgia's Innovation and Technology Agency, National Agency of State Property, National Statistics Office of Georgia, Ministry of Education and Science of Georgia, Education Management Information System, National Center for Educational Quality Enhancement, Ministry of Environment Protection and Agriculture of Georgia, Agricultural Projects' Management Agency and Ministry of Labor, Health and Social Affairs of Georgia.

435. **Ministry of Regional Development and Infrastructure and the Roads Department** – The Roads Department (RD) of the Ministry of Regional Development and Infrastructure (MRDI) 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

[25] National Centre for Disease Control, Georgia, 2016 (http://www.ncdc.ge/Handlers/GetFile.ashx?ID=6164d012-744c-4077-bdc8-7943b43fe1f7)

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.

436. **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.

437. 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.

438. **Ministry of Labor, Health and Social Affairs (MoLHSA),** together with other ministries, institutions and social partnerships defines the state policy on labor safety; supports awareness raising and training sessions, develops proposals and recommendations related on labor safety programs. MoLHSA is represented in Trilateral Commission of Social Partnership together with the Ministry of Justice (MoJ), MoESD, MoRDI and Ministry of Education and Sport (MoES). MoLHSA defines the scope, qualification requirements, condition and rules for accreditation of labor safety officers; elaborates incident evidence gathering and keeping procedures as well as reporting rules and terms; together with Social Partnership acts and mediator in collective labor disputes, monitors implementation of OHS conventions, recommendations and agreements, develops reports on the subject, ensures cooperation with ILO and other international and governmental institutions, carried out labor market studies and analysis.

439. **Service for the Protection of Labor Safety Regulations** under the MoLHSA monitors and implements supervision over compliance with the labor safety rules, investigates incidents and professional deceases cases and registration.

440. **Trilateral Commission of Social Partnership (TCSP).** Parties to the Partnership are the government of Georgia, employers' associations and employees' associations. The term of office of the TCSP members is 1 year. Each member has 6 members in the commission. Objective of the TCSP is improvement of labor safety through supporting dialogue between the GoG, employers and employees.

D.6 Environmental Regulations and Standards

441. 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.6.1 Ambient Air Quality Standards

442. Maximum permissible concentrations (MPC) for air born pollutants are set by Technical regulations – Ambient air quality standards (approved by GoG decree 383, dates 27July, 2018,

see Table 30. This project will also ensure compliance with IFC guideline values [26] (not interim targets) and EU air quality standards as these values are, in some instances, more stringent than the national standards, the most stringent standards are highlighted in green and will be applied.

Table 30: Ambient Air Quality Standards

Parameter	Averaging Period	National limits (µg/m^3)	IFC/WHO (µg/m^3)	EU (µg/m^3) / Permitted Exceedences Per Year
Sulfur Dioxide (SO_2)	24 hour	125	20	125 / 24
	1 hour	350		350 / 3
	10 mins		500	
Nitrogen Dioxide (NO_2)	1 hour	200	200	200 / 18
	1 year	40	40	40 / n/a
PM2.5	1 hour		25	
	1 year	25	10	25 / n/a
PM10	1 hour		50	
	24 hours	50		50 / 35
	1 year	40	20	40 / n/a
Carbon Monoxide (CO)	Maximum daily 8 hour mean			1000 / n/a

D.6.2 Surface Water Quality Standards

443. Water 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 31: Water quality requirements by water use category

	Water use category			
	Household water use	**Recreational water use[27]**	**Fisheries**	
			Highest and first	**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 color	
	20cm	10cm	-	

[26] The IFC guidelines are based on World Health Organization (WHO). Air Quality Guidelines Global Update, 2005.

[27] According to the Technical regulations for protection of surface water from pollution three categories of water use are set:

1. სასმელ–სამეურნეო (хозяйственно-питьевое, literally drinking- domestic) which is generally translated as household water use. This category refers to water bodies for drinking and domestic water use

2. სამეურნეო–საყოფაცხოვრებო (хозяйственно-бытовое, domestic) which is genrally translated as domestic water use. This category includes surface water bodies used for recreation

3. water for fisheries (which is split in two - a) highest, first and b_ second category)

According to these clasification household water includes water for drinking.

	Water use category			
	Household water use	**Recreational water use[27]**	**Fisheries**	
			Highest and first	**Second**
Odor, taste	Water must not have odor and taste of higher than 1 unit intensity		Water must not result in unusual odor 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 (*Acipenseridae, Coregonidae*) 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 mineralization	<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.	

444. In addition to the above, the IFC provides guidelines values for effluent discharge to water courses. The following table provides these values with which the Project shall comply, for example relating to water discharge from construction camps.

Table 32: Indicative Values for Treated Sanitary Sewage Discharges

Pollutant	Unit	Guideline Value
pH	pH	6-9
BOD	Mg/l	30
COD	Mg/l	125
Total Nitrogen	Mg/l	10
Total Phosphorus	Mg/l	2
Oil and Grease	Mg/l	10
Total Suspended Solids	Mg/l	50
Total Coliform Bacteria	MPN[A] / 100 ml	400

A – MPN = Most Probable Number

D.6.3 Groundwater Quality Standards

445. 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 33: Drinking water quality criteria

Parameter	Units	Value
Odor	Unit	2
Taste	Unit	2
Color	Grad	15
Turbidity	Turbidity units (formazine) or mg/l (kaolin)	3.5 or 2
Metals and Miscellaneous		
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
Sulphates	mg/kg	250
Chloride	mg/kg	250
pH	pH value	6-9
Sodium, Na	mg/kg	200
Microbiological characteristics		
Thermotolerant coliforms	Bacteria in 100cm^3	not allowed
Total; coliforms	Bacteria in 100cm^3	not allowed
Mesophylic aerobes and facultative anaerobes	Colony forming units in 1cm^3	< 50
Colifagues	Negative colonies in 100m^3	not allowed
Sulphitereducing clostridia	Spores in 20cm^3	not allowed
Lamblias and cysts	Cysts in 50dm	not allowed

D.6.4 Noise Standards

446. 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 34.

447. For IFC noise impacts should not exceed the levels presented in Table 35 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 34: Georgian Standards for Noise Levels

Purpose/use of area and premises	Allowable limits (dBA)		
	L_{day}		23:00 – 08:00 L_{night}, Night
	08:00 – 19:00, Day	Evening 19:00-23:00	
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

Purpose/use of area and premises	**Allowable limits (dBA)**		
	L_{day}		**23:00 – 08:00 L_{night}, Night**
	08:00 – 19:00, Day	**Evening 19:00-23:00**	
Hotel/motel rooms	40	35	35
Trading halls and reception facilities	55	55	55
Restaurant, bar, I halls	50	50	50
Theatre/concert halls and sacred premises	30	30	30
Sport halls and pools	55	55	55
Small offices (≤100m^3) – working rooms and premises without office equipment	40	40	40
Small offices (≤100m^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 les 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 35: IFC Noise Level Guidelines

Receptor	**One-hour L_{aeq} (dBA)**	
	Daytime 07.00-22.00	**Night-time 22.00 – 07.00**
Residential; institutional; educational	55	45
Industrial; commercial	70	70

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

Table 36: IFC Work Environment Noise limits

Type of Work, workplace	**IFC General EHS Guidelines**
Heavy Industry (no demand for oral communication)	85 Equivalent level Laeq,8h
Light industry (decreasing demand for oral communication)	50-65 Equivalent level Laeq,8h

D.6.5 Vibration Standards

449. The Georgian Standards for vibration are designed for human comfort. These are shown in Table 37. Note that no Georgian standards for building damage exist.

Table 37: 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^2	dB	m/sec 10^{-4}	dB
2	4.0	72	3.2	76
4	4.5	73	1.8	71
8	5.6	75	1.1	67
16	11.0	81	1.1	67
31.5	22.0	87	1.1	67
63	45.0	93	1.1	67
Corrected and 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.

450. The German Standard DIN 4150-3 – Vibration in Buildings – Part 3: Effects on structures provides short term and long-term limits [28] for vibration at the foundation for various structures (see Table 38). This standard is considered international best practice and will be followed as part of the Project.

Table 38: Guideline Values for Vibration Velocity to be Used When Evaluating the Effects of Short-term and Long-term Vibration on Structures

Group	Type of structure	Guideline Values for Velocity (mm/s)				
		Short-term				Long-term
		At foundation			Uppermost Floor	Uppermost Floor
		Less than 10 Hz	10 Hz to 50 Hz	50 to 100 Hz	All frequencies	All frequencies
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40	10
2	Residential dwellings and buildings of similar design and/or use	5 (105 dB) [29]	5 to 15	15 to 20	15	5 (105 dB)
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Lines 1 or 2 and have intrinsic value (e.g. buildings that are under a preservation order)	3 (100.5 dB)	2 to 8	8 to 10	8	2.5 (99.0 dB)

Source: DIN 4150-3, Structural Vibration, Part 3: Effect of vibration on structures

[28] short-term vibrations are defined as those that do not occur often enough to cause structural fatigue and do not produce resonance in the structure being evaluated and long-term vibrations are all the other types of vibration.

[29] The formula for conversion from mm/s to dB can be found in **Appendix V** – Vibration Assessment

451. DIN 4150-3 notes that "*experience has shown that if these values are complied with, damage that reduces the serviceability of the building will not occur. If damage nevertheless occurs, it is to be assumed that other causes are responsible. Exceeding the value in the table does not necessarily lead to damage*".

D.6.6 Soil Quality

452. 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 39 along with the limits proposed by MoEPA and the Ministry of Labor, Health and Social Affairs.

Table 39: 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	
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.7 National Technical Regulations Relevant to the Project

453. Technical (national) regulations applicable to the road project in Georgia include:

(i) Law on Roads (310.090.000.05.001.000.089, last amended in 2013);
(ii) Construction norms and regulations 2.05.03-84 – Design of bridges, viaducts, overpasses and pipes;
(iii) 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.)

454. According to these documents:

(i) International and national importance roads should be built bypassing the settlements. Access roads to the settlements should be provided. To allow modernization, 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.

(ii) To protect residential area from noise and emission impact, 10m wide green barrier must be arranged;

(iii) Along with technical and economic aspects environmental impacts must be considered during design and construction;

(iv) 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;

(v) Roads along the rivers, lakes and reservoirs must be built with consideration of protection zone boundaries for the surface water bodies.

D.8 Environmental Permitting Procedures

455. Environmental permitting procedure is defined in Environmental Assessment Code.

456. According to the national regulations (Environmental Assessment Code), the main stages of EIA include:

- scoping procedure;
- preparation of an EIA report by the proponent or consultant;
- public participation;
- assessment of information (EIA report, if necessary- additional information, information obtained during public participation and consultations with competent administrative bodies) by the Ministry;
- expert examination of information/reports;
- implementation of a transboundary environmental impact assessment procedure – if necessary;
- issuance of environmental decision or making decision refusing implementation of the project.

457. The application procedure for obtaining authorization from environmental authorities required for implementation of the planned development, including Environmental and Social Impact Assessment coordination, timeframes for information disclosure and public review for this project follows Procedure described below:

Table 40. Procedure Applicable to the Project – Scoping

Step	Action	Comment	Timeframe
1	Scoping application and scoping report (hard copy and digital) is developed and submitted to the Ministry	A scoping report shall include: • a brief description of the planned activity, especially general information on: • location of the planned activity, with indication of GIS coordinates (along with the shp file); • physical characteristics of the planned activity (capacity, scale, production process, the amount of products to be manufactured); • any alternatives to the planned activity, and the place of its implementation;	Day 0

Step	Action	Comment	Timeframe
		• general information on the potential environmental impact and its types which will be examined in the EIA process, including: • information on the potential impact (if any) in protected areas; • information on the potential transboundary impact (if any); • information on the potential impact of the implementation of the planned activity on human health, the social environment, cultural property and other objects of cultural heritage; 3. information on basic/exploratory research to be carried out and on the methods necessary to prepare an EIA report; 4. plan for deposit processing (including a Recultivation project) drafted in accordance with the requirements established by the legislation of Georgia, where relevant; 5. general information on the measures which will be taken into account for preventing, reducing and/or mitigating significant adverse effects on the environment.	
2	The Ministry posts scoping application and the scoping report on its official website and on the notice board of the executive body and/or representative body of a respective municipality, and upon request, makes printed or electronic copies available	The Ministry shall be responsible for organizing and holding public reviews. Accordingly, it shall ensure the reimbursement of the costs associated with organizing public reviews, including the publication of information on holding public reviews. Public reviews shall be led, and the minutes of public reviews shall be drafted, by a representative of the Ministry.	Within 3 days after a scoping application has been registered
3	The Ministry organizes a public review of the scoping report. Information on the public review shall be published in advance	The meeting shall be held in the building of the appropriate administrative body located closest to the location of the planned activity or in the territory adjacent to the building; or if it is planned to carry out the activity within the administrative boundaries of a self-governing city, public reviews shall be held in the building of the appropriate administrative body determined by the Ministry or in the territory adjacent to the building. Public reviews shall be open and any member of the public.	• not later than 10 days before the public review • Not earlier than the 10th day and not later than the 15th day after the placement of the scoping application
4	Feedback from stakeholders		Within 15 days after the placement of the screening application

Step	Action	Comment	Timeframe
5	The Ministry reviews the scoping application and the scoping report and issues a scoping opinion	When issuing the scoping opinion, the Ministry shall ensure a review of the opinions and comments submitted by the stakeholders and, if there are appropriate grounds, take them into account. The scoping opinion shall determine a list of studies required and information to be obtained and examined for preparing an EIA report. When issuing scoping opinions, the guideline document on Environmental Impact Assessment may be used.	Not earlier than the 26th day and not later than 30th day after the scoping application has been registered
6	The Ministry posts scoping opinion and/or the decision refusing the carrying out of the activity placed on its official website and on the notice board of the executive body and/or representative body of a respective municipality, and upon request, shall make printed copies available		Within 5 days after completion of the scoping procedure

Note: If the project is expected to have transboundary impact relevant clauses of the Code must apply.

458. The scoping opinion issued by the Ministry shall be mandatory for a person carrying out activities in the preparation of an EIA report.

Table 41. Procedure Applicable to the Project – EIA

Step	Action	Comment	Timeframe
1	Written application is submitted by developer the Ministry.	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	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

Step	Action	Comment	Timeframe
	and upon request, provides paper copies of above mentioned documentation.		
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 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.	No less than 20 days prior to organizing 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		

Step	Action	Comment	Timeframe
	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

459. If, within 2 years after the scoping opinion has been approved, the proponent fails to obtain an environmental decision in accordance with the procedures provided for by the Environmental Assessment Code, the individual administrative act of the Minister approving the scoping opinion shall be declared as invalid.

D.9 Licenses, Permits, and Approvals

460. 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 42. The Law on Licenses 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 42: Permits Register

Permit Required Activity	Permit Title	Issuing Authority	Implementing Law	Responsible Party for Obtaining License
Pre-construction				
Construction activities	Project design approval Construction Permit	MoESD	Law on Licenses and Permits; Government Resolution N57 “On Terms and Conditions of issuance of Construction Permit”	RD
Construction activities	Environmental Decision	MoEPA	Law on Environmental Protection Environmental Assessment Code	RD
Construction activities	Cultural Heritage Clearance	National Agency of Cultural Heritage (NEA)	Law “On Cultural Heritage” Law on Licenses and Permits; Government Resolution N57 “On Terms and Conditions of issuance of Construction Permit”	RD

Construction activities	Geological-engineering conclusion	NEA	Government Resolution N57 "On Terms and Conditions of issuance of Construction Permit"; Order N7 of the Minister of Environment Protection Law on Licenses and Permits	RD
Construction				
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- NEA	Resolution No.242 of Government of Georgia on Approval of Rules for Forest Use (last revision 02/02/2018); Order N10/61 of the Chairman of State Department of Forestry" On Approval of the Special Cutting and its Rule" - Resolution #132 of the government of Georgia (consolidated version 16/05/2015) On Approval of Regulations on the Rules and Conditions of Issuing Forest Use Licenses Order #10/61 of the Head of the State Department of Forestry of Georgia	Contractor
Construction or upgrade of access roads	Approval of construction or upgrade activities	MoRDI; 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 "On Road Transport"; Law "On Road Traffic"	Contractor
Spoil disposal	Spoil disposal approval – Environmental Decision	MoEPA	Law "On Subsoils", May 8, 2012 Environmental Assessment Code. 2017	Contractor
Running own quarry (in case contractor decides to) *	License for abstraction of inert material.	MoESD	Georgia on Licenses and Permits aw on Fees for the use of natural resources	Contractor
Running asphalt plant**	Environmental Decision	MoEPA	Environmental Assessment Code. 2017	Contractor
Import of explosives	Permit to import explosives	Ministry of Internal Affairs	Tax Code of Georgia; Decree of the Government of Georgia N420;	Contractor

			Law "On Control of Technical Hazard"; Order N 1-1/2502 of the Minister of Economy and Sustainable Development	
Use of explosives	Permit to use explosives	MoESD	Tax Code of Georgia; Decree of the Government of Georgia N420; Law "On Control of Technical Hazard"; Order N 1-1/2502 of the Minister of Economy and Sustainable Development	Contractor
Right on land	Project's registered rights to land	MoESD, Court	Law on procedures for expropriation of property for pressing social needs (Document code: 020.060.040.05.001.000.670, last revision: 06/09/2013)	RD
		National Agency of Public Registry of Ministry of Justice	Civil Code (Document code: 040.000.000.05.001.000.223, last revision 23/12/2017)	
	Approval of the topsoil storage	Local administration, land owners	Law on subsoil (last revision 07/12/2017. Document code:380.000.000.05.001.000.140)	

Note: Purchase of material from already existing licensed quarries is preferable. In this case a copy of the license and agreement with the quarry operator must be provided. If contractor already has permit for operation of the asphalt unit – a copy of permit (Environmental decision) must be provided.

461. If waste water is to be discharge into the surface water body, the Contractor will be obliged to calculate the limits of discharge into the waterbody. The limits are to be approved by the MoEPA. The quality of waste water should ensure compliance of recipient surface water quality (in the section located in 1km upstream the point of use) with the limits set in the Annex 1 and 2 to the Technical regulation for protection of water from pollution. To protect the surface water quality, for each point of discharge maximum permissible discharge limits must be defined separately. The document (limits of discharge) must set the discharge limits to ensure compliance of recipient water body with the quality standard.

- For sewage the following parameters are generally considered – suspended solids, BOD, COD, total N and total P, pH, coliforms.
- For other ('industrial') discharge the list of parameters generally includes – suspended solids, BOD, TPH, pH. The set of components depends on the type of potential pollutants.

D.10 Construction Permits

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

463. 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.

464. 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.11 State Forest Fund

465. According to The Resolution No.242 of Government of Georgia on Approval of Rules for Forest Use, Article 27_1 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.12 International Conventions and Agreements

466. Important international environmental treaties that have been signed by Georgia and may have relevance to the Project are listed in Table 43.

Table 43: International Agreements and Treaties

Date	Title	Status in Georgia	Date
Natural environment			
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 Water birds	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
Environmental pollution, waste			
1997	Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management	Entry into force	2009
1998	Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International	Entry into force	2007

Date	Title	Status in Georgia	Date
	Trade		
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
Climate			
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
Cultural heritage			
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
Public participation and information accessibility			
1998	Aarhus Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters	Ratified	2000
Labor issues			
1930	Forced Labor Convention	Entry into force	1993
1936	Holidays with Pay Convention	Entry into force	1993
1949	Freedom of Association and Protection of the Right to Organize Convention	Entry into force	1999
1948	Right to Organize 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 Labor 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 Employment	Entry into force	1996
1975	Human Resources Development Convention	Entry into force	1993

Date	Title	Status in Georgia	Date
1978	Labor 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 Labor Convention	Entry into force	2002

D.12.1 Regional Cooperation

467. Georgia has worked with its neighboring countries to create an "Ecoregion Conservation Plan for the Caucasus" (2006, updated 2012), in line with the Aichi biodiversity goals. This identifies 56 regional hot-spots and 60 regional corridors to be prioritized for conservation [30] and also proposed specific actions to be taken with regards to establishment of a protected area network, enhancement of transboundary connectivity, restoration of degraded ecosystems, harmonization of policies and legislation, coordination of scientific researches and monitoring activities, environmental education and raising awareness. A "Regional Biodiversity Council" facilitates coordination of activities at the Ecoregion level.

468. In addition, the Transboundary Joint Secretariat in South Caucasus (TJS) assists Environmental Ministries/Protected Area Management Structures of Georgia, Azerbaijan and Armenia in strengthening regional cooperation and development and harmonization of the nature conservation sector. The TJS was founded in 2007, under the Ecoregional program "Sustainable Management of Biodiversity, South Caucasus", and contributes to development of tools for sustainable funding of policy and strategic documents and protected areas.

D.13 Asian Development Bank Safeguard Policies 2009

469. 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. [32]

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***

[30] http://d2ouvy59p0dg6k.cloudfront.net/downloads/ecp_2012.pdf
[32] ADB. 2009. Safeguard Policy Statement, Manila

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 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 Appendix A – 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. (***The project is not expected to trigger Critical Habitat for any of the site designations in the area or habitats present along the proposed project route. It is also not expected to trigger critical habitat criteria for any of the notable species that have the potential to be present within the Project area).***

(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. (***The EIA herewith has identified all physical cultural heritage within the Project area and prepared mitigation measures to avoid damaging or destroying them. 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.

470. 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 underscore 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.

471. 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. (***A LARP is currently being prepared for the Project according to the requirements of ADB*****)**

Safeguard Requirements 3: Indigenous Peoples.

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

D.14 EBRD and EU Requirements

D.14.1 EBRD Requirements

473. EBRD categorizes each project to determine the nature and level of environmental and social investigations, information disclosure and stakeholder engagement required. This will be commensurate with the nature, location, sensitivity and scale of the project, and the significance of its potential adverse future environmental and social impacts. Past and present environmental and social issues and risks associated with project-related existing facilities will be subject to environmental and social appraisal regardless of the categorization.

474. A project is categorized A when it could result in potentially significant adverse future environmental and/or social impacts which, at the time of categorization, cannot readily be identified or assessed, and which, therefore, require a formalized and participatory environmental and social impact assessment process.

475. In the case of the Project it is classified as category A as it meets the requirements of Appendix 2: Category of Projects:

"Construction of motorways, express roads and lines for long-distance railway traffic; airports with a basic runway length of 2,100 meters or more; new roads of four or more lanes, or realignment and/or widening of existing roads to provide four or more lanes, where such new roads, or realigned and/or widened sections of road would be 10 km or more in a continuous length".

476. A project is categorized B when its potential adverse future environmental and/or social impacts are typically site-specific, and/or readily identified and addressed through mitigation measures. Environmental and social appraisal requirements may vary depending on the project and will be determined by EBRD on a case-by-case basis.

477. A project is categorized C when it is likely to have minimal or no potential adverse future environmental and/or social impacts and can readily be addressed through limited environmental and social appraisal.

478. All projects undergo environmental and social appraisal both to help EBRD decide if the project should be financed and, if so, the way in which environmental and social issues should be addressed in its planning, implementation and operation. The appraisal will be appropriate to the nature and scale of the project, commensurate with the level of environmental and social impacts and issues, and with due regard to the mitigation hierarchy. The appraisal will assess whether the project is capable of being implemented in accordance with this Policy and its PRs and include the assessment of the potential financial, legal and reputational risks as well as identify potential environmental or social opportunities. The social and environmental appraisal is integrated into EBRD's overall project appraisal.

479. EBRD's environmental and social appraisal includes consideration of three key elements:

- The environmental and social impacts and issues associated with the project,
- The capacity and commitment of the client to implement the project in accordance with the relevant PRs, and
- To the extent appropriate, the facilities and activities that are associated with the project but are not financed by EBRD.

480. EBRD's appraisal requires the clients to identify stakeholders potentially affected by and/or interested in the projects, disclose sufficient information about the impacts and issues arising from the projects and consult with stakeholders in a meaningful and culturally appropriate manner. In particular, EBRD requires its clients to engage with relevant stakeholders, in proportion to the potential impacts associated with the project and level of concern. Such stakeholder engagement should be carried out bearing in mind the spirit and principles of the UNECE Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters. For projects subject to ESIA that have the potential to have significant environmental impacts across international boundaries, the Bank will

481. encourage the approach of the UNECE Convention on Environmental Impact Assessment in a Transboundary Context, regardless of geographical location of a project or its potential impacts. The Bank may, in some cases, conduct its own public consultation activities to gauge stakeholder views. Stakeholder identification and engagement may also be built into the Bank's technical cooperation activities, as appropriate.

482. Projects are expected to meet GIP related to environmental and social sustainability. To help clients and/or their projects achieve this, the Bank has defined specific PRs for key areas of environmental and social sustainability as listed below:

- **Performance Requirement 1**: Assessment and Management of Environmental and Social Impacts and Issues – establishes the importance of integrated assessment to identify the environmental and social impacts and issues throughout the life of the project. Category A projects will require the client to:
    - carry out a comprehensive Environmental and Social Impact Assessment (ESIA), including a scoping stage to identify the potential future environmental and social impacts (scoping study), examination of alternatives to the source of such impacts, and development of recommended measures needed to avoid/minimize potential impacts (***The EIA in hand provides this. A non-technical summary (NTS) of the EIA will also be prepared by EBRD and disclosed separately on the EBRD and RD websites****);*
    - establish and maintain an Environmental and Social Management System (ESMS) (***No ESMS for the Project is foreseen as part of the Project);***
    - establish as appropriate environmental and social policies (***this is not relevant to the Project; the RD does not have 'environmental and social policies' rather it follows the legal requirements of the GoG***);
    - develop an Environmental and Social Management Plan (***the ESMP is provided by the Project EMP and its Monitoring Plans, Appendix A and Appendix B)***
    - establish and maintain an organizational structure for ensuring on-going compliance with relevant national regulatory requirements and the PRs (***The EMP provides the necessary organizational structure for implementation of the EIA requirements***);
    - identify risks associated with its supply chain and exercise reasonable control of primary suppliers (***This is largely beyond the scope of the Project, however as part of the EIA and its EMP measures have been prepared to manage supply chain issues, such as borrow pits (if required)****);*
    - monitor the environmental and social performance of the project to determine whether the project is being implemented in accordance with the PRs or to take the necessary action to ensure such compliance (***The EMP provides the necessary monitoring requirements***).
- **Performance Requirement 2**: Labor and Working Conditions – establishes the need for establishing a human resources management system which guarantees respect of workers' rights and provides them with safe and healthy working conditions. The RD will need to

ensure the Contractor implements a range of measures to comply with the EBRD's labor and working conditions requirements. These include the development and implementation by the contractor of Human resources policies to hire, train, assess, and reward the project workforce. These policies should prevent any form of discrimination in the workplace and ensure that all employees are treated fairly and equally, in line with EU non-discrimination requirement. Prior to implementing any collective dismissals of the project workforce, the contractor will be required to conduct an analysis of alternatives to retrenchment. Further, policies should exclude the use of child or forced labor in the project, and that national and international requirements for non-employee workers and supply chain workers are also reflected in these policies. A grievance mechanism for workers will need to be provided for the workforce to be able to raise reasonable workplace concerns. The Contractor will inform the workers of the grievance mechanism at the time of hiring and make it easily accessible to them. The workers will additionally not be restricted from joining or forming workers organisations or from bargaining collectively, and the contractor will not discriminate or retaliate against workers who form or join collectives or bargain collectively. Working relationships and conditions of work are also to be managed and monitored in implementing the project. Aspects include the working environment; the organisation of work; training; health and safety; working hours; fair wages and decent working conditions; and terms of employment. Lastly of relevance to this project is that worker accommodation must be appropriate for its location, clean, safe and at minimum, meet the basic needs of workers. (***The EMP provides the necessary conditions for labor and working conditions according to PR2***).

- **Performance Requirement 3**: Resource Efficiency and Pollution Prevention and Control – recognizes the need to adopt and adhere to the approach which enables the client to avoid (where possible) or control the harm to the environment caused by the project. The design and operation of a project should address the issues of resource efficiency, management of harmful and hazardous substances and materials, waste generation, emissions and discharges, including GHG emissions (***Various sections of the EIA discuss the needs for management of waste, emissions etc. All of these conditions have been included in the Project EMP and where necessary the requirement for the Contractor to prepare specific plans, such as waste management plans, has been specified***).
- **Performance Requirement 4:** Health and Safety – recognizes the need to establish a system for managing health and safety of workers, consumers, and affected communities (***The EIA and its EMP have specific mitigation measures for occupational health and safety and community health and safety, including the requirement for the development of Occupuational and Community Health and Safety Plans***).
- **Performance Requirement 5:** Land Acquisition, Involuntary Resettlement and Economic Displacement – establishes the need to avoid or minimize involuntary resettlement and to ensure fair compensation to affected persons. The client will carry out a socio-economic baseline assessment and identification of potentially affected communities and individuals. This Project does not require physical resettlement and economic displacement (***A Land Acquisition and Resettlement Plan is being prepared as part of this Project. The LARP will be disclosed separately on the EBRD, ADB and RD websites***).
- **Performance Requirement 6**: Biodiversity Conservation and Sustainable Management of Living Natural Resources – establishes the need to assessment of the risks and impacts on biodiversity and develop biodiversity conservation measures (***The EIA and its EMP have included extensive surveys and assessment of impacts to biodiversity and natural resources. Specific species mitigation measures have been prepared as well as measures to ensure 'no net loss of habitat'. In addition, further surveys have been recommended prior to the start of construction to ensure the sustainability of the Project).***
- **Performance Requirement 7**: Indigenous Peoples. (***Not applicable to this Project***).

- **Performance Requirement 8: Cultural Heritage** – establishes the need to identify, as part of the environmental and social assessment process, potential adverse impact on cultural heritage. If the potential for such impacts exists, the client must develop measures to avoid/ mitigate such impacts and include these measures in the EMS and ESMP (including consultations with affected community groups). In addition, a Chance Finds Procedure will be required (***All cultural heritage has been identified in the Project area through site visits and consultations. Measures have been prepared as part of the EIA and its EMP to manage and mitigate impacts to these sites. A chance find procedure has also been prepared***).
- **Performance Requirement 9**: Financial Intermediaries. (***Not applicable to this Project***).
- **Performance Requirement 10**: Information Disclosure and Stakeholder Engagement – recognizes importance of a Stakeholder Engagement and consultation process. Under engagement the following is meant:
    - stakeholder identification and analysis (***all Project stakeholders have been identified as described in the Section H***);
    - stakeholder engagement planning and implementation of the Stakeholder Engagement Plan (SEP) (***A SEP will be prepared as part of this Project. The SEP will be disclosed separately on the EBRD and RD websites***);
    - disclosure of information and reports related to the project in a manner that is accessible and culturally appropriate (***This report will be disclosed according to the requirements of GoG, ADB and EBRD, as described fully in Section H of this report***);
    - consultations and public involvement in the decision- making process (***A range of consultations have been undertaken during the preparation of the EIA and they are described in full as part of Section H***);
    - establishing and maintaining of a Grievance Mechanism (***A grievance mechanism has been prepared and is included in Section H***).

D.14.2 EU – Related Obligations

483. Under the 2014 Georgia – European Union Association Agreement, Georgia is committed to harmonizing its national legislation with EU requirements, including those concerning EIA (and SEA) and conservation of species and habitats/sustainable use of biological resources. Key commitments that are currently being implemented include:

- Harmonization of national conservation legislation with EU Council Directive 92/43/EEC on the conservation of natural habitats and wild fauna and flora and Council Directive 2009/147/EEC on the conservation of birds.
- Identification of respective habitats associated with the Directives and their inclusion in the "Emerald Network",
- Identification of important bird habitats and carrying out adequate measures for their conservations.

484. The Draft "Law on Biological Diversity" is being developed to help meet these commitments as outlined above but has not yet been adopted into law.

485. One area that is currently underdeveloped is the application of Strategic Environmental Assessment (SEA), which can be an important tool for ensuring biodiversity aspects are considered in the development process. The National Biodiversity Strategy and Action Plan (see below) provides for establishment of SEAs for national plans, programs and legislation development but this has also yet to be enacted and biodiversity aspects are still often poorly integrated into strategic development.

D.15 Comparison of ADB, EBRD and National Requirements

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

Table 44: Comparison of ADB, EBRD and GoG Legislation Requirements

Aspect	ADB	EBRD	GoG	Harmonized Framework
Environmental and Social Policy and Regulations	ADB's SPS (2009) sets out the policy objectives, scope and triggers, and principles for three key safeguard requirement areas: • Environmental safeguards, • Involuntary resettlement safeguards, and • Indigenous people's safeguards	EBRD's ESP (2014) sets out • Assessment and Management of Environmental and Social Impacts and Issues • Labor and Working Conditions • Resource Efficiency, Pollution Prevention and Control • Health and Safety • Land Acquisition, Involuntary Resettlement and Economic Displacement • Biodiversity Conservation and Sustainable Management of Living Natural Resources • Indigenous Peoples • Cultural Heritage • Financial Intermediaries • Information Disclosure and Stakeholder Engagement	Environmental assessment and permitting procedure in Georgia are set out in the Environmental Assessment Code.	The Project shall comply with Lender's and national requirements.
Screening	Project screening and categorization at the earliest stage of project Four categories are defined Category A, B, C, FI.		Project screening is done at early stage of the project. Environmental Assessment Code provides list of A and B category activities. For category B project need of EIA is defined based on the scoping procedure by MoEPA.	The Project is Categorized as Category A.
	Rapid Environmental Assessment (REA) Checklist is used for categorization.	ESP includes the list of A category projects. Initial Environmental and Social Examinations ("IESEs") is carried out where insufficient information is available at the time of categorization to determine the appropriate category and scope of		
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.

Aspect	ADB	EBRD	GoG	Harmonized Framework
EIA Report	For Category A projects EIA (that includes EMP describing mitigation and monitoring issues) is obligatory. For Category B projects – initial environmental examination (IEE) is required to determine whether or not significant environmental impacts warranting an EIA are likely. If an EIA is not needed, the IEE is regarded as the final environmental assessment report. Guidelines and the outline of an EIA report are provided in SPS (2009).	EIA/ESIA content is consistent with the EU EIA Directive, A-Category projects undergo "special formalized and participatory assessment processes", generally a "comprehensive environmental and/or social impact assessment." The EIA/ESIA reports includes EMP describing mitigation and monitoring issues. B-Category projects also undergo due diligence process to identify and assess potential future impacts.	EIA report is required for Annex 1 listed projects. For Annex 2 project need of EIA is decided based on the scoping procedure. The content of the EIA report is structured so to cover requirements indicated in the Environmental Assessment Code. The EMP is a part of the EIA document.	The EIA and EMP reports will follow the table of contents proposed by ADB SPS (2009). The report for obtaining Environmental Decision from the MoEPA will consider national regulatory requirements
Public Consultations and public meetings	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. Minimum two consultations are required.		Publication of information in national and regional mass-media. Arrange two public meetings – one at the scoping stage, another not later that at 55th date from submission of the draft EIA report to MoEPA. All stakeholders are invited for the meetings. One two one meetings and consultations with stakeholders during EIA process. Consultation not later than 60 days from the date of publication.	Consultations will be carried out with the stakeholders, directly and in-directly 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.
	Presence of ADB representative at official meetings with stakeholders is obligatory.			
Public Disclosure	Draft EIA will be published in ADB website for 120 days before Project approval by the Board.	For Category A Projects, a disclosure package (ESIA, SEP, NTS, ESAP) is prior to Bank approval for at least 120 days for a public sector Project	The scoping document is available for public review for 45 days before public consultations.	Draft EIA report (English and Georgian) will be published in ADB, EBRD and Roads Department Websites. The copies of the draft EIA report will be

Aspect	ADB	EBRD	GoG	Harmonized Framework
				made available with the municipal offices.

E. Description of the Environment

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

- Physical Resources (air quality, hydrology, topography, etc.);
- Ecological Resources (notable habitats, notable species, etc.);
- Economic Resources (infrastructure, land use, etc.);
- Social and Cultural Resources (health, education, noise, cultural resources, etc.)

488. The methodology for the collection of the baseline data is provided by **Appendix H**.

489. 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 Project Area in this report. The Project Area selected for the EIA includes sensitive receptors [33] that are most likely to be impacted by the Project's development activities. The social area of influence includes villages that may lie outside the 1km zone due to potential impacts and benefits, such as economic contributions (supply of a local workforce or goods and services) or social effects of in-migration. For biodiversity, the EIA has addressed a project zone of direct influence which is considered to be a 300m working corridor (150m either side of the proposed route) plus additional elements such as access roads, working areas and spoil disposal sites.

E.1 Physical Resources

E.1.1 Topography

490. The Project area is mountainous. The relief is mainly hilly, dissected by gorges/gullies and difficult to access. Elevation in the Project area ranges from 1,320m to 1,975m above sea level (masl).

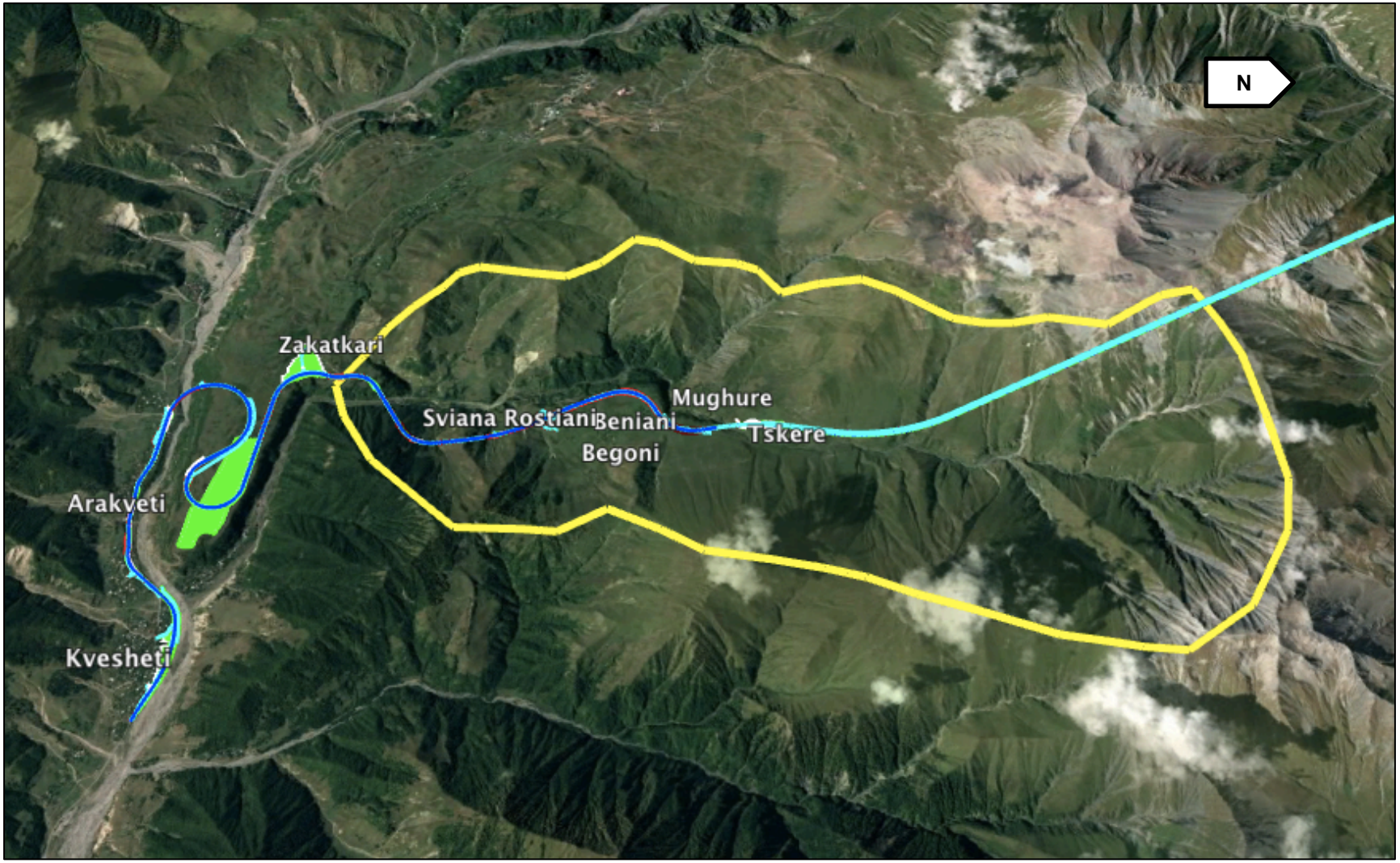
491. The Project area belongs to the eastern Greater Caucasus. The highest peaks in area are Mt. Mkinvartsveri (5,047m) and Mt. Tebulosmta (4,492m). The heights of most of the peaks exceed 4,000m, however, compared to the central and western parts of Greater Caucasus the glaciers are less developed. The reason for that is low morphometry and continental climate.

492. Volcanic relief is presented in the western part Eastern Greater Caucasus. Among the volcanic landforms, the volcanic upland is particularly notable. The central volcanoes are as follows: Sakokhe (3,268m), Sadzele (3,080m), Miliona, Tsiteldziri, Kaklo, Kabarjina (3,135m). The lava, erupted from Sakokhe extends up to Kvesheti (1,379m). The volcanic lava is spread upward in the Khada valley (see Figure 78) which is reflected in the morphology of the gorge. The Tetri Aragvi and Khadistskali rivers cut the gorges at the contact of base rocks and volcanic lavas. Rocky slopes are formed in the area of volcanic lava, contrasting with gentile slopes in the base rocks.

Figure 79 illustrates the mountainous topography of the Project area.

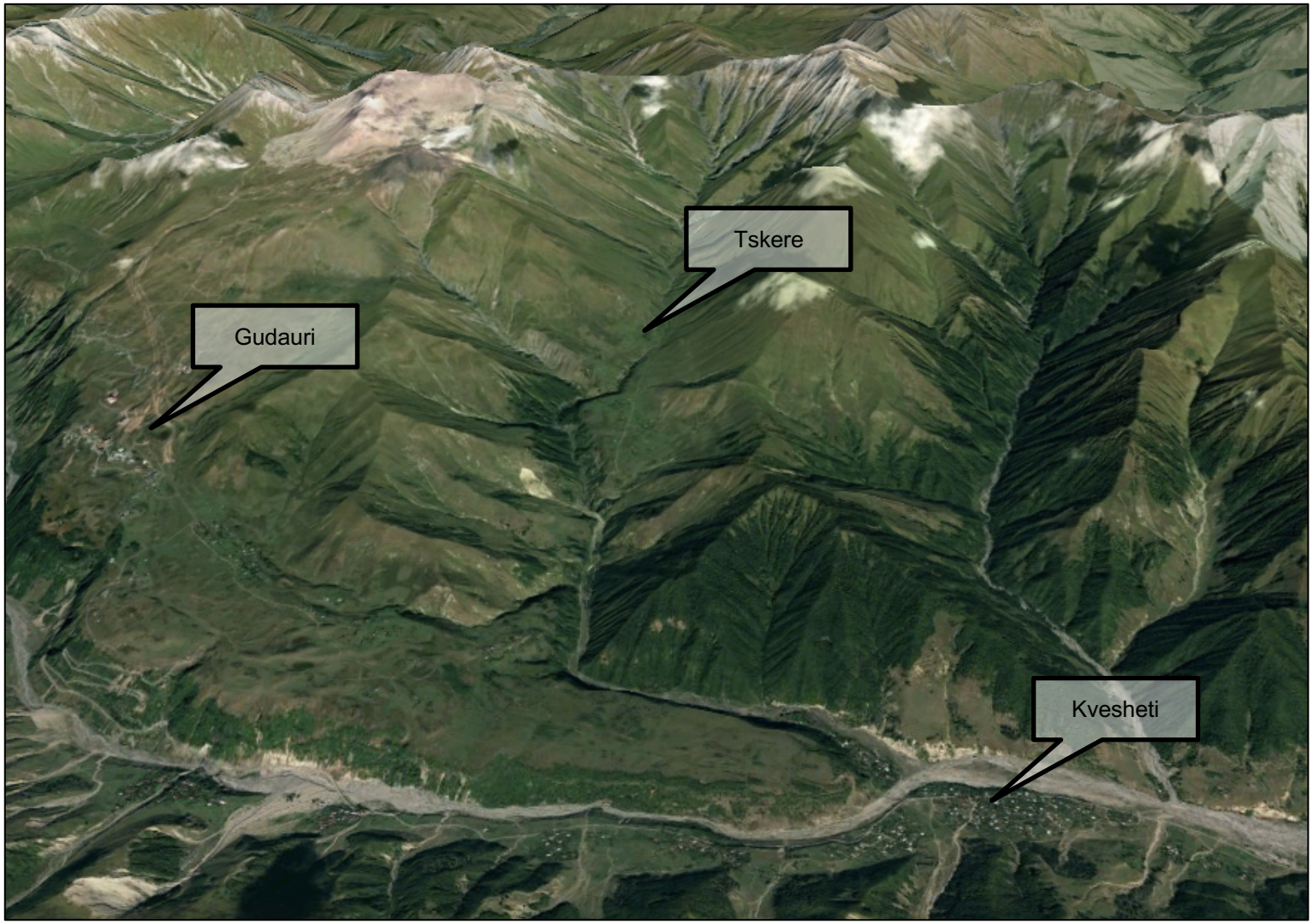
[33] Sensitive receptors include, but are not limited to, residential areas, schools, places of worship, wetlands, and habitats. These are areas which are more susceptible to the adverse effects of an anthropogenic activity such as noise, air emissions, traffic influx, and privacy issues

Figure 78: Khada Valley



Key: Blue Line: Lot 2 / Turquoise Line: Lot 1 / Yellow Area: Khada Valley / Green Areas: Potential Spoil Disposal Sites

Figure 79: Mountainous Topography of the Project Area



E.1.2 Geology

494. In the Kvesheti-Kobi zone upper Jurassic – lower Cretaceos (Valanginian) flysch formation and Pliocene Quaternary lava flows and volcanic strata are present. The area belongs to Shaori-Pasanauri carbonate flysch of the Mestia-Tianeti zone, Greater Caucasus area.

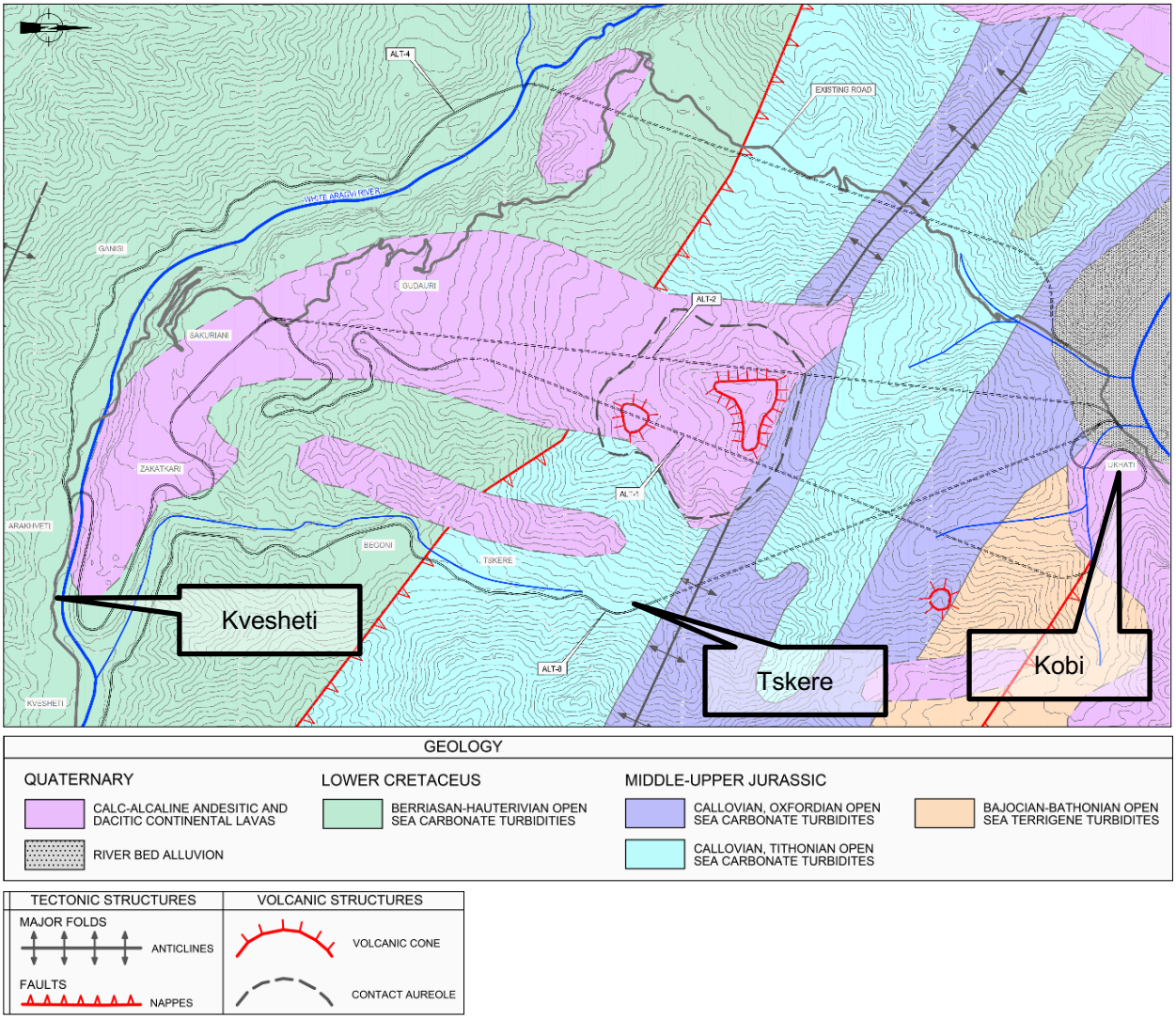
495. Sandstones, slates, limestones, clayey lump deluvial-proluvial sediments are widely present. In the glacier gorges up to 15m thick fluvioglacial formations (gravel-rock) are met. Aragvi riverbed is formed in Jurassic rocks. Because of erosion-mudflow processes in the river confluences debris cones are often present.

496. Kazbegi municipality area is characterized by a complex geological structure. The geological development history of the municipality started in the early and middle and upper Jurassic periods. The oldest rocks in the Tergi Ravine are the Gveleti and Dariali paleolithic (330 million years) granites. During the late Orogenesis (recent phase) the high mountainous relief was formed. Volcanic activities were expressed in multiple volcanic eruptions. Currently dormant Mount Kazbegi is one of these volcanoes, besides there are also some young volcanoes on the main ridge, to the northwest and north-east of the Jvari Pass. The area is notable for high diversity of quaternary (recent) geo-morphological features. Its high mountainous tectonic-erosive relief is composed of glaciers, volcanic elements, karsts and other forms. Quaternary sediments are widespread.

497. Alluvial, proluvial and deluvial sediments are also observed. The alluvial sediments in the Tergi ravine form four terraces. In higher places, alluvial sediments are mixed with fluvio-glacial, limno-glacial and moraine sediments. Volcanic structures (including lava outflows, pyroclastic accumulations, andesite-dacite and andesite-basalts) are from the quaternary period.

498. The project alignment runs from Kvesheti (S) to Kobi (N) along sea carbonate turbidites of Cretaceous and Middle–Upper Jurassic age, with thrusts (inverse faults) and discordant calc-alcaline andesitic and dacitic continental lavas as shown in Figure below.

Figure 80: Geological Map of Kvesheti-Tskere (1:500.000)



499. The alignment enters the Tskere valley through a volcanic plateau formed by basalts with columnar disjunction as shown in below. This rock is a good rock from the engineering point of view.

Figure 81: Basalts in the Plateau in front of Kvesheti

500. The stretch from Kvesheti to Begoni runs through cretaceous sandstones, limestones and black shales. The black shales are an important factor for the stability of the slopes because of their low strength parameters (residual strength between joints) and squeezing phenomena for tunnel assessment.

Figure 82: Black Shales Outcrop and Landslides Near Begoni in Cretaceous rocks and Alluvial-terrace Deposits

501. A landslide was registered near Begoni. Selected route and tunnel designed in this section allows to bypass the mentioned sensitive area.

Figure 83: Landslide in the slope in front of Begoni

502. Begoni and Tskere are located on volcanic plateau which is favorable bedrock for road construction.

503. The entrance portal area near Tskere will be located near the contact between basalts and limestone Jurassic bedrock. The tunnel portal near Tskere is proposed in tuff and

scoriaceous lavas with a layer of moraine deposits above (Qg). The moraine deposits as shown in the cross-section below, with 7 m on the left slope and with 1m on the right slope. The stratigraphic profile for this section is based on the engineering geological mapping together with trial pits and geophysical profiles. The main challenges of this portal area are to support to the moraine soils.

504. The exit portal is projected in a Jurassic carbonate sequence with sub vertical layers.

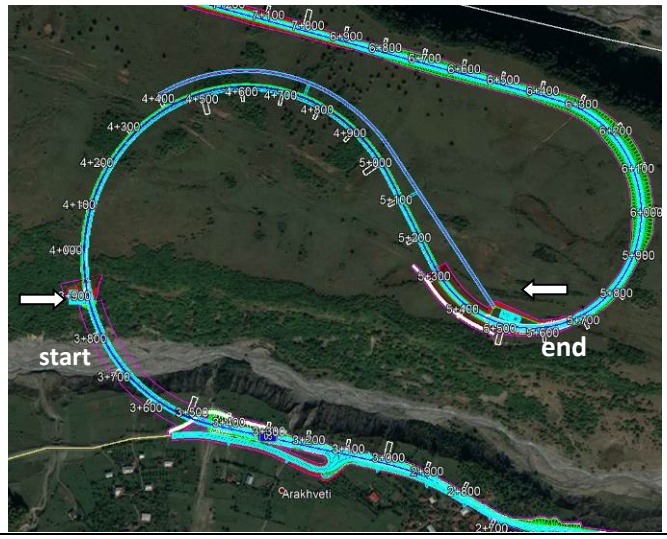
Figure 84: Jurassic bedrock below and discordant basalts above the river bed near the portal entrance of the tunnel

Figure 85: Sub vertical limestone and marly layers in the tunnel exit portal area

505. The main tunnel with 1,000 m of overburden is running through Jurassic limestones and marls with North-East dip direction of the bedding. The first section of the tunnel will run through limestones with inter-bedded marls and the final part of the tunnel – through a stratigraphic sequence of marls with inter-bedded limestones.

506. The first section of the tunnel alignment running through volcanic rocks, mainly along basaltic lavas (Pahoehoe lavas- Qvl unit) which are good quality for tunnel construction.

Table 45: Tunnel Geology

Structure #	Geology	Map
Tunnels		
Tunnel # 1	Quaternary volcanic rocks, mainly volcanic lavas and tuffs.	

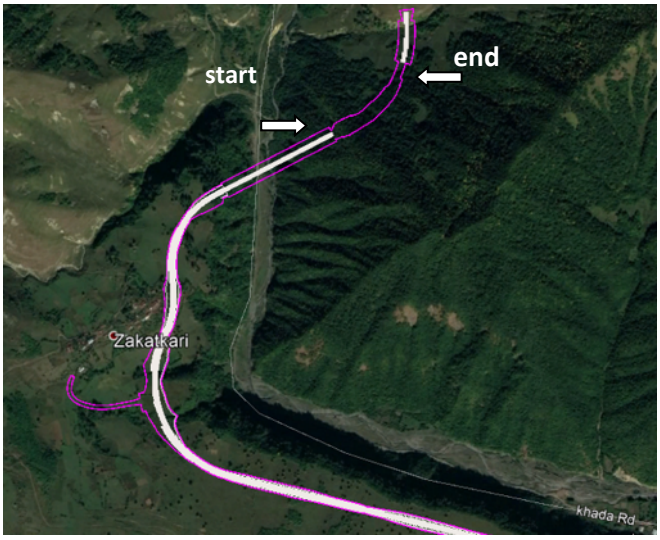
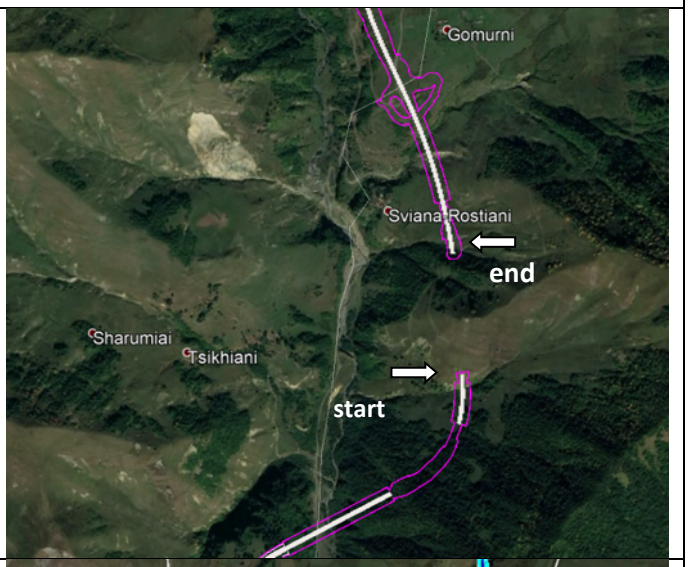
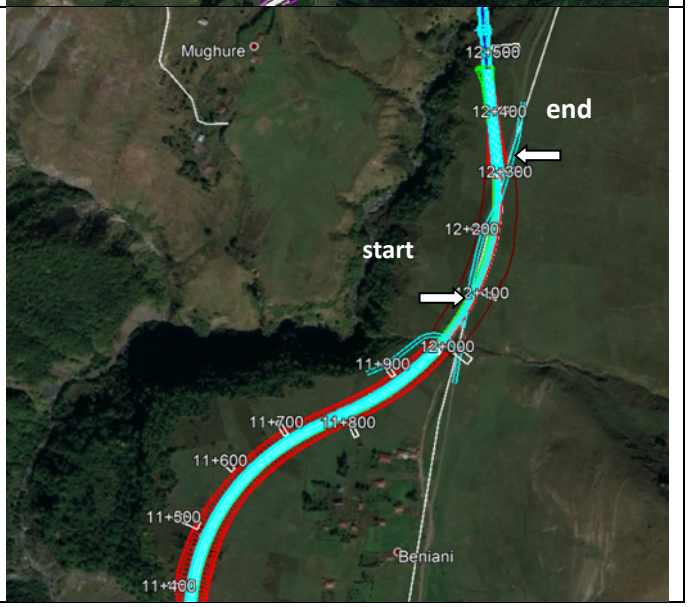
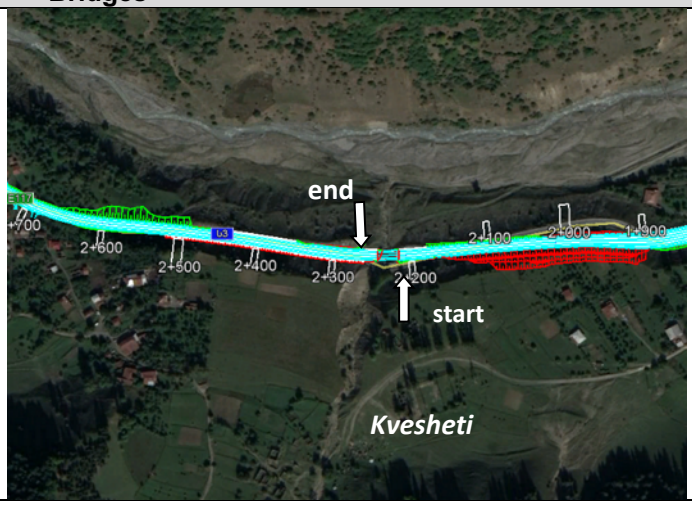
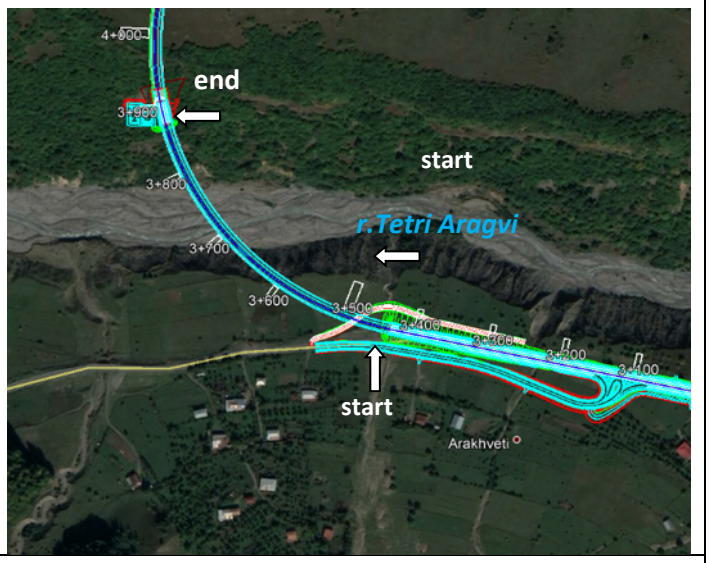
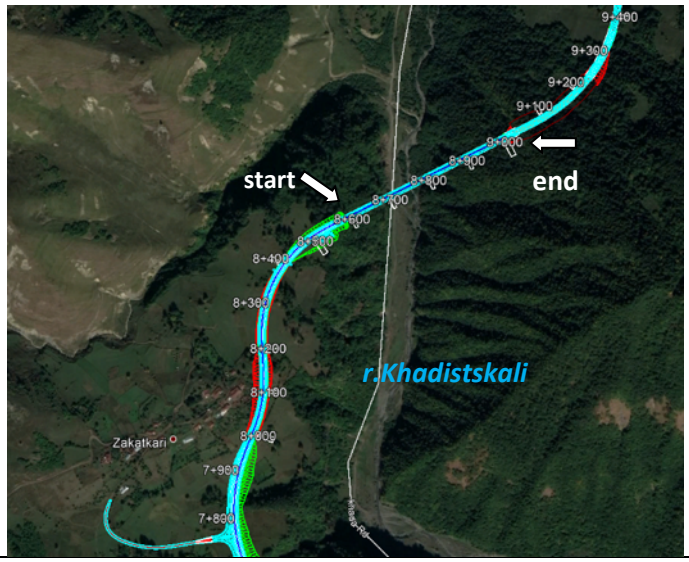
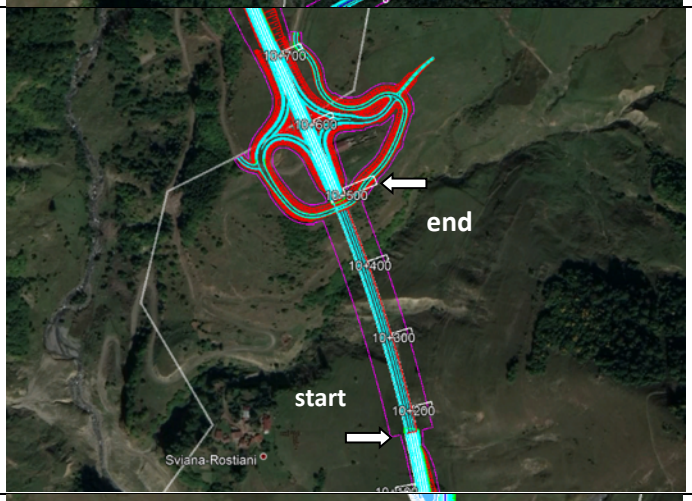
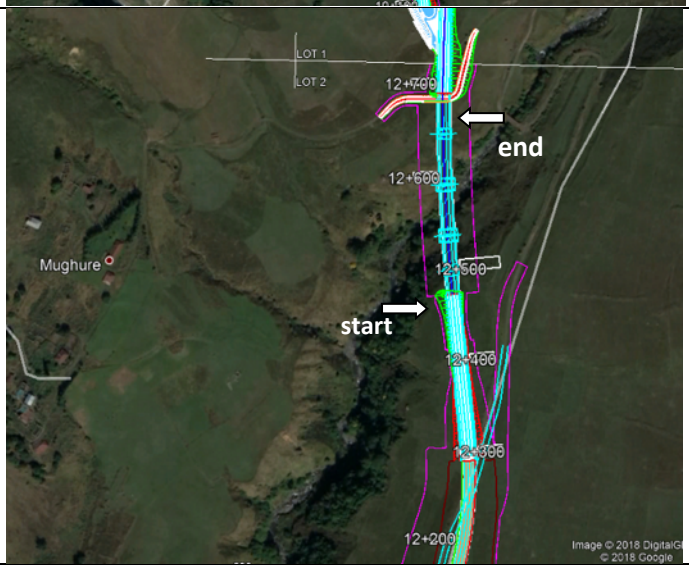
Tunnel # 2 (C&C)	Cretacic rocks, mainly limestone with inter-bedded marls.	
Tunnel #3 (C&C)	Cretacic rocks, mainly marly limestone with inter-bedded marls.	
Tunnel #4 (C&C)	Tuffs (Qvt) and moraine deposits (Qg) on the top.	

Table 46: Bridge Geology

Structure #	Geology	Comment
Bridges		
Bridge #1	Alluvial fan deposits (Qal-f).	
Bridge #2	alluvial deposits (Qal), alluvial fan (Qal-f), colluvial deposits (Qcl) and moraine deposits (Qg).	
Bridge #3	volcanic rocks (left abutment) and Cretacic carbonate bedrock (right abutment).	

Bridge #4	Cretacic carbonate bedrock	
Bridge 5	Cretacic limestone and marl (left abutment) and volcanic rocks (right abutment).	
Bridge 6	volcanic rocks with moraine deposits in the abutments.	

E.1.3 Soils

507. The soil types present in the region differ by elevation. Gray and brown forest soils and present in lowlands. In hilly areas, medium and small thickness forest gray soils – humus and calcareous soils are found. At higher elevations forest zone soils are replaced by caespitose and caespitose- turfy soils. Chernozem-like soil is rare and can be found on the Bazaleti Plateau.

508. Most part of the Kazbegi territory is covered with mountain and meadow caespitose (up to 1,100 – 2,600 m) above sea level and primitive soils. The forest light gray soils are found in the gorges of river Tergi and its several tributaries. Alluvial soil is present along the bottoms of the river gorges. In the highland areas soil is devoid of forest cover.

509. The soils of the Kazbegi Municipality are diverse reflecting diversity of geomorphology, geology, vegetation and climate of the area. Mountain-meadow skeleton soils and mountain-forest soils of average-acid and neutral pH dominate. Humus content is high. According to literary sources (Nakhutsrishvili et al. (2005)) the following soil types are met: (1) deluvial-proluvial soils; (2) mountain-forest brown, medium-depth and shallow skeletal soils, occasionally with stones and boulders; (3) mountain-forest lightbrown, medium-depth and shallow skeletal soils, with stones and boulders; (4) degraded medium-depth and shallow skeletal soils; (5) degraded forest and secondary meadow soils; (6) mountain-meadow soddy-skeletal soils; (7) weakly developed primitive soils, occasionally with exposed rock; (8) eroded and semi-eroded shallow skeletal soils, and (9) strongly eroded areas, ravines, exposed rocks, stone fills and bedrock outcrops.

510. Mountain-meadow soil (Leptosols) are present at 1,800 to 3,200 masl. At higher elevation Leptosols, at lower elevation Cambisols are met. The soils are characterized by acid/weakly acid reaction, a high content of humus as well as deep humus penetration. In alpine-sub-alpine landscape (1,750-2,300 masl) periglacial processes (solifluction, rockstreams, snow avalanches, talus trains and mudflows) are observed.

511. The ground freezing depth depending on the soil type varies from 83 to 229 cm.

Table 47: Seasonal Ground Freezing Depth (cm)

Location	Clay and clayey soil	Fine grain sands and loamy sand	Coarse and medium grain gravel sands	Coarse material
Gudauri	118	142	153	117
Stephantsminda	83	100	108	124
Jvari pass	153	183	199	229

512. **Soil quality**. There is limited information on soil quality in the project area. Limited scale analysis was carried out by the Design Team in the course of the project development. The results are presented below.

Table 48: Results of soil analysis

KM	Depth, (m)	Layer	Description	Organic content, %	Carbonates CO2, %	Sulphate, g	Chlorine, g	pH
22+570	24.23	Qal	Sandy, silty gravel	2.1	2.1	-	-	8.8
0+135	1.5	Qal-f	Sandy, slightly silty, angular gravel, angular cobbles	2.3	1.3	-	-	7.70
3+095	1.5	Qr	Slightly angular, gravel, with some angular cobbles	3.2	0	-	-	7.6
6+600	1.5	Qr	Slightly angular gravelly, slightly sandy, slightly silty, moderately plastic clay with small angular cobbles	2.4	2.6	-	-	7.8
7+223	1.5	Qr	Slightly angular gravelly, slightly sandy, slightly silty, moderately plastic	2.5	0	-	-	7.5

KM	Depth, (m)	Layer	Description	Organic content, %	Carbonates CO2, %	Sulphate, g	Chlorine, g	pH
			clay with small angular cobbles					
7+740	1.5	Qr		3.7	1.0	-	-	7.3
11+320	2.5	Qg	Slightly gravelly, slightly sandy, slightly clayey, moderately plastic silt	2.4	0	-	-	7.7
11+740	2.5	Qg	Slightly gravelly, slightly sandy, slightly clayey, moderately plastic silt	3.6	2.2	-	-	7.5
11+580	3	Qg	Slightly sandy, silty, clayey. Gravel with cobbles	1.4	1.7	-	-	7.6
12+680	3	Qg	Slightly sandy, silty, clayey, gravel with cobbles	14	1.7	-	-	7.6
13+990	1.5	Qg	Slightly gravelly, slightly sandy, clayey, moderately plastic silt	3.3	0.8	-	-	7.4
11+080	1.5	Qg	Silty gravelly, slightly sandy, clayey, moderately plastic silt	3.3	0.8	-	-	7.4

source: IDOM Feasibility Study

513. Soil samples from two locations have been analyzed as part of the EIA. Since there are no sources of potential soil contamination in the Khada valley no soil samples were analyzed for potential contamination there, however, prior to the start of construction the Contractor will be responsible for undertaking two samples in the valley. Kvesheti and Kobi were chosen for soil quality control. Two sampling points have been selected. The samples were collected from the roadside (distance to the edge of the carriageway- 1m, sampling depth- 20cm).

514. Samples were collected using so called envelope method from the edges of conventional 5x5m rectangle and the middle of the 'envelope' (diagonals crossing point). Prior to sampling stones and grass were removed from the sampled area. The samples were place in plastic bags, marked and sent to the lab for analysis.

515. Sampling and transportation guidance:

- Guidelines for assessment of the level of hazard of soil pollution with chemical substances, 2.1.7.004-03
- Guidance for hygienic assessment of the status of soil 2.1.7.003-02 (Sampling)

516. Results of analysis are presented below.

Table 49: Soil quality in Kvesheti, Kobi and Tskere

#	Parameter	Units	Kvesheti	Kobi	Tskere	Method/standard	National limit, maximum allowable concentration, mg/kg
1	Copper, Cu (mobile)	mg/kg	0.95	1.4	1.05	GOST P50683-1994	3
2	Zinc, Zn (mobile)	mg/kg	2.85	2.9	2.85	GOST P50686-1994	37
3	Nickel, Ni (mobile)	mg/kg	<0.5	<0.5	<0.5	GOST P50683-1994	4

#	Parameter	Units	Kvesheti	Kobi	Tskere	Method/standard	National limit, maximum allowable concentration, mg/kg
4	Chromium, Cr (mobile)	mg/kg	<0.5	<0.5	<0.5	GOST P50683-1994	6
5	Lead, Pb (total)	mg/kg	29.5	23.5	28.5	ISO 14869-.1-2001	32
6	Arsenic, As (total)	mg/kg	9.5	8.2	11.6	GOST 4152-89	10
7	Cadmium, Cd (total)	mg/kg	<2.0	<2.0	<2.0	ISO 14869-.1-2001	-
8	Total Petroleum Hydrocarbons		<2.5	<2.5	<2.5		1000
9	Asbestos		nd	nd	not detected	NIOSH 9002 -1989	-

MPC values are indicated according to the Georgian regulations – Source: regulation 2.1.7. 004-03

517. All measured parameters are within the national allowable limits, with the exception of naturally occurring Arsenic at Tskere. It is noted however, that the Georgian limit is well below other national limits for arsenic in soil, for example UK and Italy where the limits are 30 and 20 mg/kg respectively. According to historic data concentration of Pb within the roadside strip in the project area varies from 17 to 29mg/kg (reference – data from 1982 survey carried out as a part of the survey implemented by Geological Institute of Georgian Academy of Sciences).

E.1.4 Natural Hazards

518. Due to the complex geological and geographical conditions natural disasters take place on quite a large scale in Georgia. The frequency and recurrence of the natural disasters has increased in the recent past as a consequence of the effects of global climate change and human activities, such as deforestation, overgrazing of pastures, etc.

Landslides, Mudflows, Floods and Avalanches

519. Due to geological compositions, landform, steep slopes, large amounts of weathered and talus material accumulated at the tops of the gorges and climate conditions in the project region are favorable for development of hazardous processes – floods, flashfloods, landslides, mudflows and snow avalanches. These events occur spontaneously and can be rather strong.

520. According to historic data in 1987-89 strong rains triggered landslides in all municipalities of the region, mudflows were formed in almost all tributaries of the main rivers. Capacity of the flow was from several thousand cubic meters to 0.5-5 mil. M^3. Another natural disaster was registered in 1991-93. Strong earthquakes with epicenter in Pasanauri-Barisakho-Shatili area damaged houses and activated instable deep river gorges. The earthquake followed by rain resulted in landslide, stone avalanches and mudflows. Fissures formed on the surface of the slopes favored increase of infiltration. As a result, risk of mudflows increased. In May 2014 catastrophic-scale mudflow formed as a result of movement of Devdorak glacier in the Kabakhi river gorge (left tributary of the river Tergi). 7÷10 mln m^3 of the drifted mudflow material blocked the Tergi riverbed, forming 20÷30 m high so-called natural barrier; the length of an artificial pond reached 200 to 300 m.

521. Floods and flashfloods are typical for Dusheti and Kazbegi municipality rivers. These events pose floodplain areas and population living at low terraces under risk. In the sections upstream Ananuri, the tributaries of the Tetri Aragvi are notable for mudflows.

522. Problems are observed mainly during heavy rain and snow melting seasons. In the Khadistskali river tributaries excessive precipitations and snowmelt causes formation of mudflows. These events are particularly dangerous when the narrow riverbeds are blocked with

snow avalanches or debris. In the areas (slopes) devoid of vegetation linear and spatial erosion is observed. In such areas gullying is in process. The processes may intensify with consideration of the climate change.

523. According to National Environmental Agency data risk of natural hazard in the settlements within the project zone is as follows:

- **Kvesheti** – Mudflows (stone and dirt) use to form in the Kvesheti Khevi stream running through the village. Vast amount of debris material is carried in posing risk to school building, several houses and the road. Landslide located south to the village is in stabilization process (for several years no changes have been observed).
- **Arakveti** – 'Water-stone' type mudflows use to form in the Arakveti Khevi stream. The stream-bed is formed in the old debris cone. Near the road bank protection structure (gabions) are in place.
- **Bedoni –** The Khadistskali river is mudflow. For the river strong flashfloods are characteristic. The river washes the right bank posing risk to homestead plots. Besides, there is a mudflow gully running through the village. Material carried in by the flow causes siltation of the plots and the village road.
- **Sviana-Rostiani** – In the lower sited part of the village, on 30-35 degree slope landslide is registered. Development of the landslide may affect 4 houses. Landslide is registered in the east periphery, next to it on the slope there is a step-like terrace. Inclination above and below the step is around 30-35 degrees and 50-55 degrees respectively. The landslide affects pastures and hay lands. No risk to the residential houses exists.
- Landslides are registered in villages **Benian-Begoni**, **Khorogho**, **Sharumiani**. The landslide bodies are in stabilization process; however, climate conditions may activate them.
- **Tskere and Mughure –** No hazardous geological processes are observed. The only natural hazard is snow avalanche.
- **Kobi** is located on the right bank of the Narvani river, under a rocky cornice. The cornice is built of vertically layers, fissured andesite dacites. Stone fall from the cornice and mudflows in the Narvani river are the main risks in the area. The new bridge over the Narvani (the bridge will be used for the project) has been designed so to allow the mudflow stream pass through.
- In the project stretch KM 12.9 to KM 13.0 the hazard of snow slides and avalanches exists. In the south part of the tunnel (south tunnel portal), near the village of Tskere, the proposed road runs along a section with steep slopes with small valleys that came from the top of the mountains and serve as 'avalanche channels' during the snowy period and subsequent thawing.

Seismic Conditions

524. Georgia is located within the Mediterranean seismic belt, in the active seismic zone of the Caucasus. Its architectonical movement and activity are connected with the movement of the neighboring Eurasian and Afro-Arabic rocks.

525. 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 9-point earthquake zone (MSK 64 scale[34]) with the dimensionless coefficient of seismicity (A) equalling 0.3 to 0.39 (Kvesheti and Kobi villages) under the same document.

[34] *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 / IX can be compared to 6 – 7 on the richter scale.

526. Figure 86 illustrates the seismic conditions in Georgia. General information regarding seismicity in the project area is given in Table 50.

Figure 86: Seismicity Map of Georgia (MSK Scale)

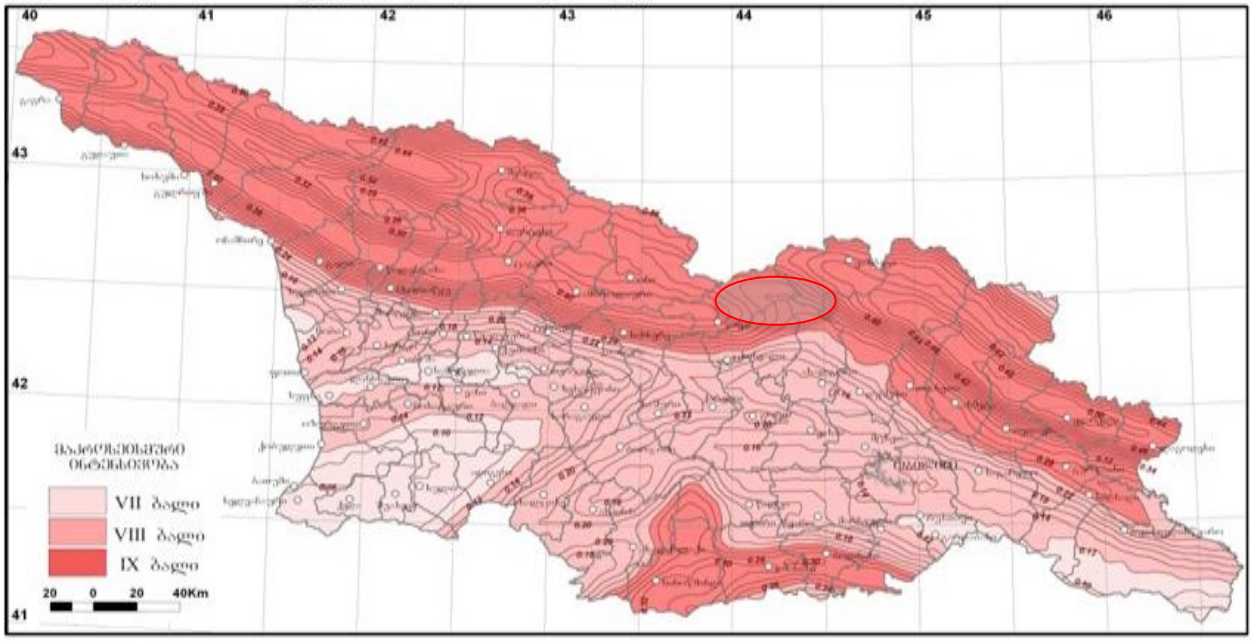


Table 50: Seismicity, according to the construction norms and rules (Aseismic construction, #01.01.09)

Residential area	A-seismicity coefficient	Unit MSK64 scale
Kvesheti community, Dusheti municipality		
Kvesheti	0.3	9
Arakveti	0.29	9
Bedoni	0.3	9
Zakatkari	0.3	9
Sviana-Rostiani	0.32	9
Benian Begoni	0.32	9
Mughure	0.33	9
Tskere	0.34	9
Kobi community, Kazbegi municipality		
Kobi	0.39	9
Almasiani	0.39	9
Ukhati	0.4	9

E.1.5 Air quality

527. Air quality in Tskere are as in the entire Khada valley is good. No significant point or mobile sources of air pollution are present in the valley. Vehicle emissions are low because of low traffic volumes, and air pollution is rapidly dispersed due to winds. The situation in Kobi and Kvesheti, Arakveti areas is different since the settlements are located along the main road where exhaust emissions occur from passing vehicles.

528. As part of the EIA four air quality measurements were made in Kvesheti, Arakveti and Kobi areas to get better understanding of the quality of air in the Project area. Measurements in Tskere and the Khada valley were not considered as there are no significant point sources or mobile sources of emissions. For air quality control, locations at the edge of the road and 10m from the edge of the carriageway were chosen.

Figure 87: Air Monitoring Locations

529. The monitoring session included 30 min duration measurement four times a day. In total 4 locations – 2 in Kvesheti area and 2 in Kobi were examined. The air quality monitoring was undertaken in accordance with Georgian standards. The results are presented in the table below.

Table 54: Ambient Air Quality Monitoring Results

#	Time	Wind speed, m/s	Wind direction	CO, µg/m^3	NO_2, µg/m^3	SO_2, µg/m^3	PM10, µg/m^3	PM 2.5, µg/m^3	Total dust, µg/m^3
A1 (464419.51 m E; 4697027.21 m N)									
1	12:30-13:00	1.3	SW	<1000	<200	<500	27	25	<100
2	18:00-18:30	1.5	SW	<1000	<200	<500	81	50	200
3	23:30-24:00	1	SW	<1000	<200	<500	16	13	<100
4	06:15-06.45	1	SW	<1000	<200	<500	9	8	<100
A2 (463059.52 m E 4697318.46 m N)									
1	13:15-13:45	1.3	SW	<1000	<200	<500	54	29	120
2	18:45-19:15	1.5	SW	<1000	<200	<500	72	39	180
3	01:20-01:50	1	SW	<1000	<200	<500	15	12	<100
4	06:05-06:35	1	SW	<1000	<200	<500	10	9	<100
A3 (461055.76 m E 4697161.40 m N)									
1	13:55-14:25	1.3	SW	<1000	<200	<500	15	11	<100

#	Time	Wind speed, m/s	Wind direction	CO, µg/m^3	NO_2, µg/m^3	SO_2, µg/m^3	PM10, µg/m^3	PM 2.5, µg/m^3	Total dust, µg/m^3
2	19:30-20:00	1.4	SW	<1000	<200	<500	16	11	<100
3	02:00-02:30	1	SW	<1000	<200	<500	<1.0	<1.0	<100
4	06:50-07:20	1	SW	<1000	<200	<500	<1.0	<1.0	<100
A4 (459887.61 m E 4712113.41 m N)									
1	11:30-12:00	2	W	<1000	220	<500	33	22	120
2	18:10-18:35	1.2	W	<1000	200	<500	32	23	120
3	02:00-02:30	1,1	W	<1000	<200	<500	16	13	<100
4	06:30-07:00	1.1	W	<1000	<200	<500	9	8	<100
National limit – max.permissible one time (volley) concentration (MPC), µg/m^3(Averaging period 30 min)				5000	200	500	-	-	500
IFC/WHO (updated 2016) –guideline value, µg/m^3				-	200*	500***	50*	25*	-
EU Air Quality Standards, µg/m^3				1000**	200*	350*	-	-	-

Note
***** Averaging period 1 hour
****** Maximum Daily 8 hour mean
*******Averaging period 10 minutes
Equipment
Carbon monoxide meter (China), diapason 0-100ppm
Dust measuring unit CW-HAT 200, diapason 0-500 µg/m^3
Air analyser, TESTO-350 (Germany),
Diapason: CO (0-10,000 ppm); NO (0-4,000 ppm); NO_2 (0-500 ppm); SO_2 (0-5,000 ppm)

530. 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_2 and SO_2. 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. Accordingly, national standards were considered relevant and followed for baseline data collection.

531. Although they do not provide a direct comparison (due to different averaging periods), the results do show that air quality is broadly in line with IFC and EU standards. In addition, as noted above, there are no major point sources of air emissions within the Project corridor and the only notable air emissions result from vehicle traffic on the existing road. **Section F.5.1** of this report provides an air quality model for the new alignment, and this model shows that the Project, in nearly all cases except one (in 2043 (above national limits, but below IFC limits)), will not result in significant air quality impacts.

532. Notwithstanding the above, as noted in the Project EMP Monitoring Plan (**Appendix B**) the Contractor will be required to undertake additional baseline monitoring in line with IFC standards for the parameters above in the same locations (and in the Khada valley) prior to the start of construction.

E.1.6 Climate

533. The project is located in two municipalities – Dusheti and Kazbegi.

534. Dusheti municipality comprises medium and high mountain areas. Elevation ranges from 870m to 4,000m above sea level, therefore the climate conditions are rather diverse. In the

lower areas, the climate is moderately humid with mild winter and warm lengthy summer. Average annual temperature in the low-sited areas (870-899 masl) is 9.7 °C. Precipitation level is around 750mm. In the higher-sited areas the climate is more humid, precipitation level increases and ranges from 1,200 till 1,600mm.

535. Elevation in Kazbegi municipality ranges from 1,700 m to 5,000 m. The climate is moderately humid. At comparatively low elevation (around 1,700m, up to 2,000m) winter is cold and dry, summer – cool. Steady snow cover persists for 3-4 months. In the 2,000-2,600m zone winter is comparatively dry, summer – cool and short. Average temperature of around 10 °C lasts 1-3 months. For 4-5 months temperature is below 5 °C. Temperature of the warmest month is 10-14 °C. In the upper zone, west winds dominate. Precipitation level is 1,000-1,200mm. Steady snow cover persists for 5-7 months. In 2,600-3,600m summer practically never comes. In January, average temperature is -11 -15 °C. In summer temperature is below 10°C. Above 3,600 m – is a nival zone. Steady snow cover is observed for 3-4 months. Average temperature is in -13 -16 °C range.

536. The climatic characteristics of the Project area, based on Construction Climatology (PN 01.05-08, Tbilisi 2009) are given below:

Table 51: Air Temperature (°C)

Location	Average monthly												Average Annual
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Gudauri	-6.7	-6.1	-2.6	2.0	6.8	10.5	13.2	13.3	9.3	5.2	-4.4	-4.4	3.3
Stephantsminda	-5.2	-4.7	-1.5	4.0	9.0	11.8	14.4	14.4	10.6	6.6	1.5	-2.6	4.9
Jvari pass	-11.4	-10.8	-7.2	-1.6	3.8	7.8	10.5	10.6	6.8	2.1	-4.6	-8.7	-0.2

Location	Abs min	Abs max	Aver max, hottest month	Coldest month 5-day aver	Coldest month aver	Coldest period average	Period with average monthly T<8C		Aver T at 13:00	
							Duration day	Aver T	Coldest month	Hottest month
Gudauri	-33	27	17.1	-16	-5	-7.9	263	-1.4	-3.9	15.0
Stephantsminda	-34	32	20.3	-14	-19	-5.3	215	-0.2	0.3	19.3
Jvari pass	-38	27	15.0	-21	-27	-11.5	282	-2.7	-6.9	15.8

Table 52: Relative Humidity

Location	Relative air humidity, %												
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Aver Annual
Gudauri	72	74	76	74	76	76	76	75	78	75	72	68	78
Stephantsminda	62	63	66	69	70	71	74	72	72	67	64	61	68
Jvari pass	78	80	84	80	82	82	83	83	86	82	79	75	81

Table 53. Wind Characteristics

	Max speed once in 1,5,10,15,20 yrs, m/sec					Recurrence of direction (%) January, July							
	1	5	10	15	20	N	NE	E	SE	S	SW	W	NW
Gudauri	16	20	22	24	25	30/18	5/9	16/22	17/16	4/12	3/6	5/11	11/6
Stephantsminda	18	20	21	22	22	11/46	¼	½	4/3	70/36	13/5	0/1	0/3
Jvari pass	14	20	23	25	26	5/2	28/36	½	3/8	15/27	31/15	16/3	1/1

	Aver. Max & min velocity, m/sec		Wind direction and calm recurrence (%) per year								
	Jan	Jul	N	NE	E	SE	S	SW	W	NW	Calm
Gudauri	4.3/0.5	2.8/0.2	26	14	19	9	8	7	10	7	72
Stephantsminda	5.0/0.9	2.3/0.6	25	2	1	4	57	9	1	1	33
Jvari pass	4.3/1.4	2.6/1.4	7	31	1	6	23	23	8	1	38

Figure 88. Wind rose

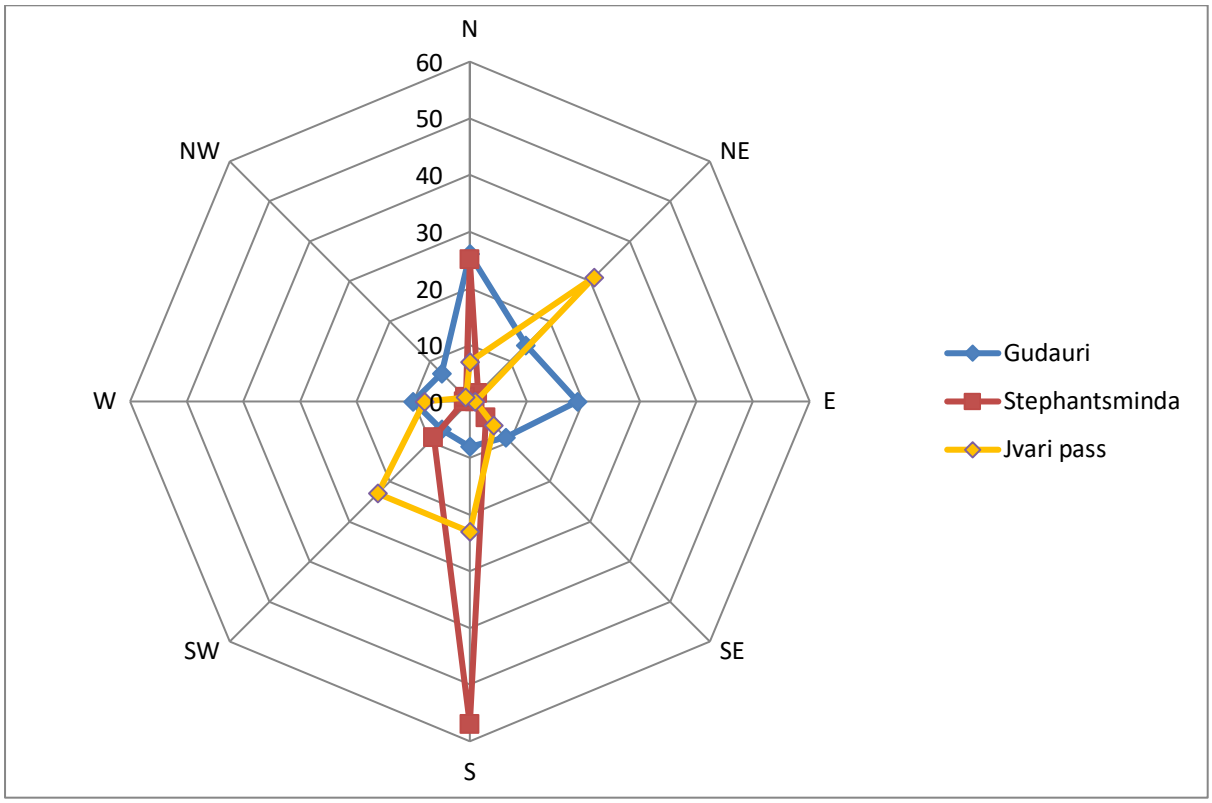


Table 54: Wind pressure standard values

Location	w0, once in 5 years, kPa	w0, once in 15 years
Jinvali	0.23	0.23
Stephantsminda	0.23	0.30
Jvari pass	0.23	0.38

Table 55: Precipitation

Location	Precipitation per year, mm	Daily maximum, mm
Gudauri	1585	100
Stephantsminda	786	111
Jvari pass	1537	122

Table 56: Snow Cover

Location	Weight of snow cover, kPa	Days with snow cover	Water content in snow layer, mm
Gudauri	2.50	179	456
Stephantsminda	0.84	104	180
Jvari pass	5.68	212	728

E.1.7 Climate Change & Greenhouse Gases

537. During the last 50 years (1961-2010) average annual temperature on the whole territory of Georgia showed an increasing trend. Between two periods of time (1961-1985; 1986-2010) this parameter most of all has increased in East Georgia (+0.7°C), in particular in Dedoplistskaro (Kakheti). Relatively small, but important trend of warming was revealed in other regions of Kakheti and Mtskheta-Mtianeti. Total annual precipitation between two periods (1961-1985; 1986-2010) in Pasanauri increased by 2%.

538. **Temperature**. In winter, in the 1986 – 2010 period of observations warming trend was revealed in East Georgia. In spring increasing trend of air temperature is sustainable only on two stations of East Georgia – Pasanauri and Bolnisi. Decreasing trend is not sustainable on any of the stations. In future warming trend is being continued and is more intensive in East Georgia than in West. According to forecasts, by 2071-2100 the lowest increase of temperature (0.9°C) is expected in Poti and Pasanauri. By 2100 increase of the winter temperature in Georgia in general will be 3.2°C.

539. In spring increasing trend of air temperature is sustainable only on two stations of East Georgia – Pasanauri and Bolnisi. In future warming trend is being continued and is more intensive in East Georgia. The biggest increment by 2050 is 2.6°C, while by 2100 it reaches 4°C.

540. Summer demonstrates the trend of temperature increase. The rise of temperature is being continued everywhere and reach the highest value of 4.7°C.

541. In autumn temperature growth trends will persist on the whole territory of Georgia. In the period of 2021-2050 the warming will still continue.

542. **Precipitation.** Between two periods (1961-1985; 1986-2010) in Pasanauri and Lagodekhi precipitation increased by 2% and 8% respectively. This trend will be preserved until 2050, and after that precipitation will decrease, except for some areas (Batumi, Pskhu and Mta – Sabueti). In East Georgia decreasing trend will change to increase and by 2050 the growth of precipitation on the average by 3.4% is expected (exception – Lagodekhi). In the period of 2021-2050 the warming will still continue, in autumn precipitation will increase together with temperature, that will be altered by intensive warming and decrease of precipitation by 2100. Number of days with more than 50 mm rainfall is reduced in East Georgia by 2050 and is maintained almost invariable by the end of the century. In autumn precipitation will increase on the whole territory of Georgia.

543. **Wind.** Average annual wind speed significantly decreased on the whole territory and according to the forecast, this decrease will continue till the end of the century.

544. There is no date on climate change for the project region, except for Pasanauri. Information showing the temperature and humidity dynamics for past three periods (till 1960, 1961-1985 and 1986-2010) and forecasted change (2021-2050 and 2071-2100) is given below.

Table 57: Mean Temperature and precipitation seasonal and annual values for three periods: till 1960 year-from station opening; 1961-1985 and 1986-2010 and their changes between mentioned periods

T1l	T2l	T3l	∆1l	∆2l	P1,mm	P2,mm	P3,mm	∆1%	∆2%
winter									
-2.8	-2.2	-2.0	0.6	0.2	161.0	147.2	160.9	-8.6	9.3
Spring									
7.2	7.6	8.1	0.4	0.5↑	317.0	313.1	299.9	-1.2	-4.2
Summer									
17.5	17.3	18.3	-0.2	1.0↑	317.0	315.9	322.3	-0.3	2.0
Autumn									
9.2	9.1	9.7	-0.1	0.6	204.0	194.6	219.1	-4.6	12.6
Year									
7.8	8	8.5	0.2	0.5	932	969.5	984.1	4	1.5

Source: Georgia's Third National Communication to the UNFCCC. 2015

Table 58: Mean Temperature and precipitation seasonal and annual values for three periods: 1986-2010; 2021-2050 and 2071-2100 and changes between mentioned periods

T3l	T4l	T5l	∆3l	∆4l	P3,mm	P4,mm	P5,mm	∆3%	∆4%
winter									
-2.0	-0.7	1.2	1.3	3.2	161	182	153	13	-5.1

Spring									
8.1	8.6	11.1	0.5	3.0	300	291	280	-3.1	-6.7
Summer									
18.3	19.0	21.8	0.7	3.5	322	331	234	2.8	-27.3
Autumn									
9.7	10.8	12.9	1.1	3.2	219	199	169	-9.2	-22.8
Year									
8.5	9.4	11.7	0.9	3.2	984	1002	846	1.8	-14.0

Source: Georgia's Third National Communication to the UNFCCC. 2015

Table 59: Mean annual relative humidity and wind speed values for three periods: till 1960 year-from station opening; 1961-1985 and 1986-2010 and changes between mentioned periods

RH1%	RH2%	RH3%	∆1%	∆2%	V1m/s	V2 m/s	V3 m/s	∆1 m/s	∆2m/s
Year									
74	74.8	76.7	0.8	1.9↑	1.2	1.5	0.8	0.3	-0.7↓

Source: Georgia's Third National Communication to the UNFCCC. 2015

Table 60: Mean annual relative humidity and wind speed values for three periods: 1986-2010; 2021-2050 and 2071-2100 and changes between mentioned periods;

RH3%	RH4%	RH5%	∆3%	∆4%	V3m/s	V4 m/s	V5 m/s	∆3 m/s	∆4m/s
Year									
76.7	74	73	-2.7	-3.7	1.2	0.9	1.0	-0.3	-0.2

Source: Georgia's Third National Communication to the UNFCCC. 2015

Key:

T- mean air temperature (seasonal and annual respectively); P- sums of precipitation (seasonal and annual respectively); RH-annual relative humidity; V – mean annual wind speed;
Subscript 1 – from station opening-till 1960 year; Subscript 2 – 1961-1985 period; Subscript 3- 1986-2010 period; Subscript 4 – 2021-2050 period; Subscript 5 – 2071-2100 period;
∆1 – difference between periods 1961-1985 and from station opening-till 1960 year; ∆2 – difference between periods 1986-2010 and 1961-1985; ∆3 – difference between periods 2021-2050 and 1986-2010; ∆4 – difference between periods 2071-2100 and 1986-2010;
↑ - ascending trend ↓ - descending trend.

545. **Greenhouse gas (GHG) emissions** – Georgia's 2014 GHG profile the transport sector accounted for 3.26 $MtCO_2$ or 0.87 tCO_2 per capita. High values are assumed to result mainly from the use of large, outdated second-hand vehicles. According to statistics, within the last decade number of vehicles doubled, and the number of buses and minibuses tripled. In 2013 emissions data compiled by the World Resources Institute (WRI) indicated that Georgia produced around 14 MtCO2e or 0.0003% of global GHG emissions. 2 MtCO2e represents 0.00004% of global GHG emissions. Of this amount 'contribution' of transport related carbon emissions as a % of total fuel combustion was 42.5% (see table below). According to the World Bank World Development Indicators the CO2 emissions from transport as percentage of total fuel combustion are growing.

Table 61: Carbon Dioxide Emissions, Georgia (2013, WRI data)

Carbon dioxide emissions									
Electricity and heat production		**Manufacturing industries and construction**		**Residential buildings and commercial and public services**		**Transport**		**Other sectors**	
% of total fuel combustion		**% of total fuel combustion**		**% of total fuel combustion**		**% of total fuel combustion**		**% of total fuel combustion**	
1990	**2013**	**1990**	**2013**	**1990**	**2013**	**1990**	**2013**	**1990**	**2013**
51.1	12.9	22.1	25.4	14.2	18.8	11.1	42.5	1.6	0.4

546. As indicated in the Biannual report total GHG emissions (recalculated on C02) dynamics from transport sector, recalculated on C02 is as follows:

Table 62: GHG Emissions from Transport Sources

	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013
CO2	3793	1537	1112	1212	1747	2022	2167	2423	2558	2521	2639	3071
CH4	0.59	0.28	0.26	0.29	0.37	0.19	0.47	0.5	0.46	0.45	0.47	0.86
CO2 eq	12.39	5.88	5.5	6.18	7.78	3.99	9.82	10.56	9.66	9.45	9.87	18.06
N20	0.07	0.03	0.01	0	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02
CO2 eq	21.7	9.3	3.07	0.94	4.45	5.1	5.52	6.32	6.2	6.2	6.2	6.2
Total CO2 eq	3827	1552	1121	1219	1759	2031	2182	2440	2574	2537	2655	3095

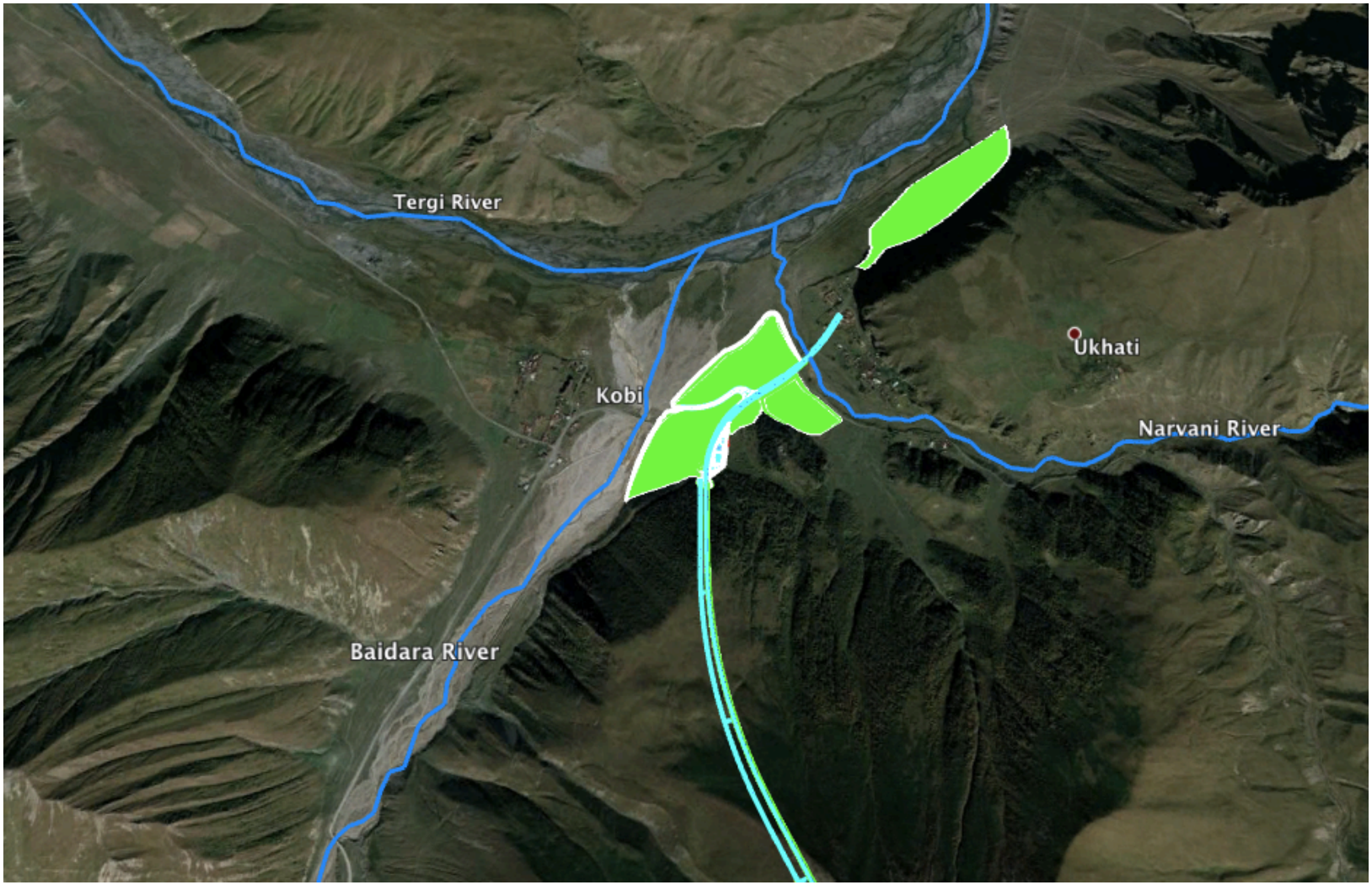
E.1.8 Surface Hydrology

547. The Project road crosses several rivers in the Project area. Initially it runs adjacent to the Tetri Aragvi river in Kvesheti and Arakveti before crossing the river via Bridge 2 to the Zakatkari plateau. After leaving the plateau the road crosses the Khadistskali river gorge via Bridge 3, a 164m high arch bridge. After the bridge the road continues up the Khada valley crossing the Khadistskali river again via Bridge 6 just before Tskere. After leaving the main Tunnel 5 close to Kobi the road crosses Narvani river via an existing bridge. The Narvani is a tributary to Tergi river. The Baidara river also runs west to the site in this area and a connection to the existing road will be provided over this river. The proposed spoil disposal sites are partly located along Tergi and Baidara rivers, close to Narvani riverbed. The water courses are shown by Figure 89 and Figure 90.

548. The **Tetri Aragvi** originates at 3,180m asl. The river is 41km long, with an average inclination of 52% a watershed area 339 km² and an average elevation of the basin 2,129 m. The river basin comprises 121 tributaries, with a total length of 315km. The main tributary is Khadistskali. The flow rate is around 2-3.5m/sec in vortexes and rapids and 0.8-1.5m/sec in rifts. High water flow is registered in warm seasons and during the rest of the year the flow is stable. Increased flow starts end of March and depends on the snow melting and rain pattern. Maximum flow is registered in May (water level reaches 2.5m). Flow starts to reduce after this until the end of August and depends on weather conditions (rainfall amount and frequency). In autumn, when rainy season starts, water flow increases again. However, mean discharge is significantly lower compared to the spring one. Flow in winter (more precisely from November till early march) is stable. Minimum flow is registered in February – end of January. From March to August the flow equates 74.3% of annual discharge, the flows in spring and summer totals 33.9% and 40.4% respectively. Winter discharge is low – only 8.6% of annual flow value. Ice appears in the end of November and lasts until the end of February. Sediment flow correlates with the hydrological regime. Maximum sediment flow is observed during high flow periods.

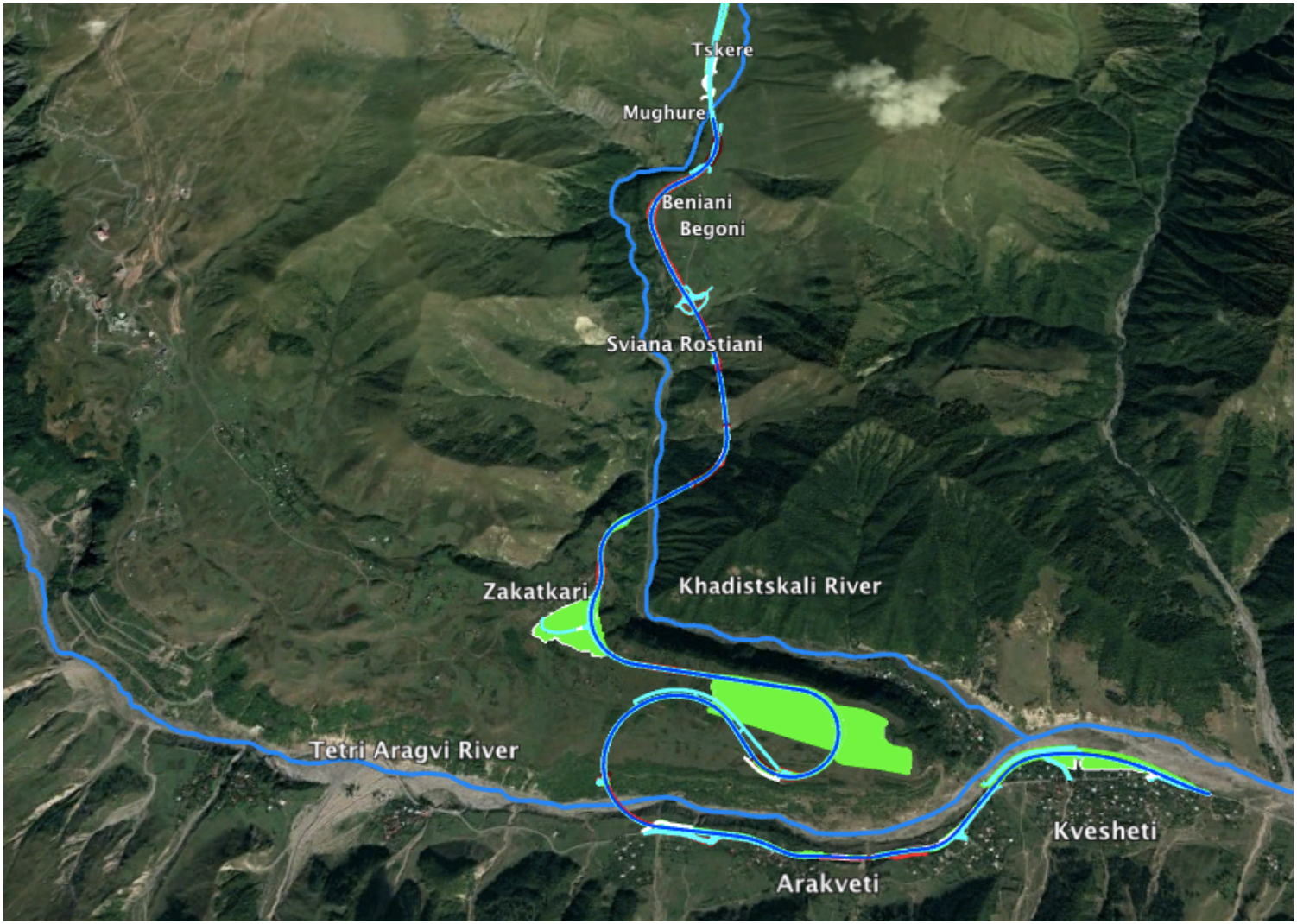
549. The inclination of the **Khadistskali river** is around 50-60%, therefore the flow is fast with frequent mudflows. The riverbed is meandering. The width of the riverbed at the river mouth is 20 m, in the lower flow the river is 14m wide. Floodplain develops downstream. The floodplain width increases from 200 to 290m. In this section the floodplain is on both sides of the stream. The height of the floodplain is 0.4-0.7m from the water surface. During high water events the area is sometimes flooded (the water level within the flooded area is 0.4-0.7m. The areas stay flooded for 1-2 days in average). In the Project area the river width reaches 3-4m, depth is around 5-10m, flow rate equates 1-2m/sec.

Figure 89: Location of Surface Water Courses in the Project Area (Kobi Area)



Key: Green Area: Potential Spoil Disposal Site / Turquoise Line: Project Road

Figure 90: Location of Surface Water Courses in the Project Area (Lot 2 Area)



Key: Green Area: Potential Spoil Disposal Site / Turquoise Line: Project Road

550. The **Baidara river** originates in the north slope of the Mtiuleti ridge, the south branch of Caucasus ridge. The river source is located 1 km north-west to Jvari Pass at 3,000m above sea level and flows into the Tergi river near Kobi (0.8km north-east to the village). The river originates from the north slope of the Jvari pass watershed. The riverbed in the upper reaches is narrow and its banks rocky. Rifts and waterfalls are present. Inclination of the banks ranges between 76°and 90°. Width of the riverbed varies between 12 and 20m, water depth is around 0.3-0.5m. The flow rate – 0.5-1m/sec. The riverbed is rough, some sections blocked with large boulders. Closer to the Tergi confluence the river gorge becomes wider reaching 350m. The width at the confluence section is the highest. The elevation at the spot of the confluence is 1,940m.

551. Steep slopes in the Baidara river gorge result in avalanches in early spring. The Baidara basin is denudated. This leads to gravity processes (stonefalls, screes) causing mudflows. Mudflows occur, mainly in summer. Most of sold material carried by the stream accumulates near the confluence. The riverbed is moderately meandering and not branching in most of the stretch. The river is fed by precipitation and ground water. The river flow is low in summer-autumn, increasing in winter with high water in spring-summer. The river length up to the north portal of Tunnel 5 is 8.75km

552. **Narvani river** – The river originates at the north slope of Artmi gorge. The river source is located in 6.5km from the confluence with the Tergi at 2,609m asl. The average inclination is 100m/km. The catchment area is within 2,900-3,289m asl. In the upper reaches the river gorge is V shape. South of Ukhati it gets wider, water is shallow, banks – flat. The width of the riverbed is 8-12m. Water depth is 0.35-0.7m. Flow rate totals 1.5-2.0 m/s. The river is fed by snow melt, rainfall and ground water. The landscape is represented by alpine and sub-alpine meadow (in the upper reaches). In the lower section, closer to Ukhati, on the left bank of the river forested areas are registered.

553. The **River Tergi** originates from Mount Zilgakokh (3,856 m) at 3,400 m above sea level in the Greater Caucasus ridge. The river traverses the territories of Georgia and Russia and flows into the Caspian Sea north of the Agrakhan Peninsular. The catchment area is 43,200m^2. The country's shares are as follows: 869km^2, 18% of the basin – Georgia, and 3,941km^2, 82% of the basin – Russia.

554. The riverbed is mildly meandering, branching in widened sections of the gorge. Average gradient of the riverbed totals 4.4m/km. The river is 623 km long. The river bottom is uneven, rocky, in some areas – blocked with massive lumps of rock. Minimum water levels are observed in February. The high-water period is in spring summer. It lasts from the end of March to September, which is characteristic for rivers fed by glaciers (large glaciers in the area are Susaiti, Mna, Ortsveri and Devdoriki) and rainwater. Glaciers find a frequent occurrence in the basin, playing an important part in feeding the rivers. The main tributaries of the Tergi are the Snostskali, Baidara, Mnaisi, Suatisi, Gimara, Desikami, Amali and Kistura. The Mnaisi, Suatisi and Desikami are mud torrent-prone rivers. Particularly sensitive is Amali river gorge.

Water Quality

555. Chemical analysis of surface water has been carried out in the samples collected from the cross sections located near the planned bridges and potential spoil disposal areas. Samples were collected in Spring-Summer as a part of baseline data collection session. Sampling methodology is included as part of **Appendix H**. The results are given in Table 63.

Figure 91: Water Quality Monitoring Locations, Lot 2

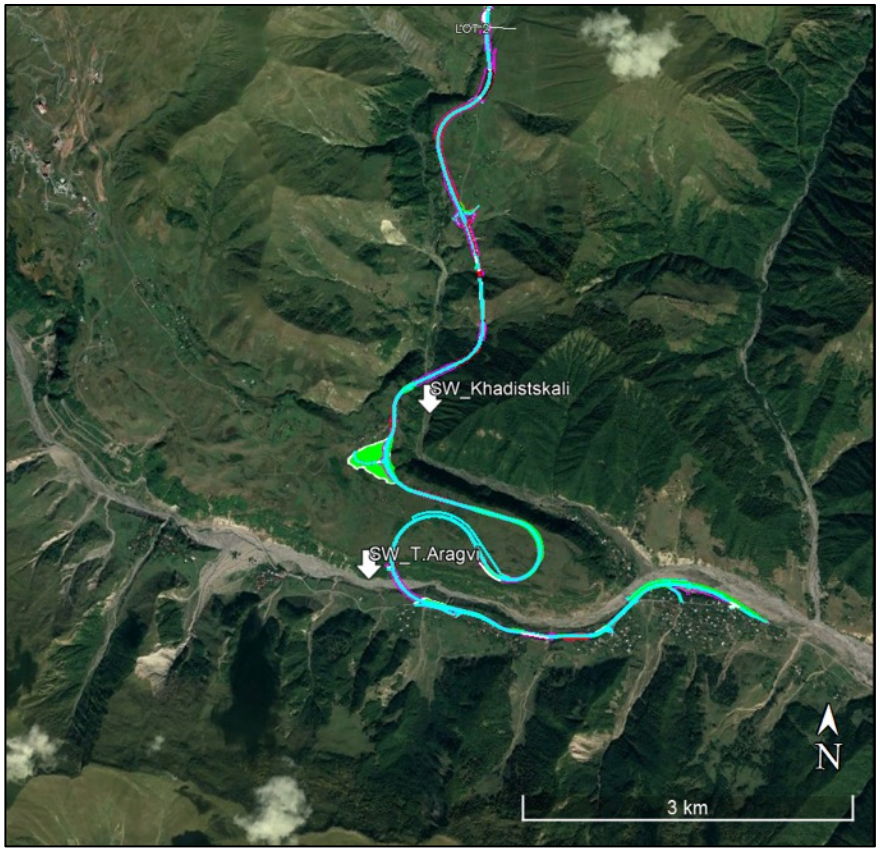


Figure 92: Water Quality Monitoring Locations, Lot 1

Table 63: Results of surface water analysis[35]

#	Parameter	Tetri Aragvi	Khadistskali	Baidara	Narvani	Tergi	National, maximum allowable concentration	Method/ standard
1	pH	8.10	7.72	7.70	7.75	7.60	6.5-8.5	ISO 10523-08
2	Conductivity, S/m	0.0255	0.0235	0.0311	0.0233	0.0343	n/a	ISO 7888-85
3	Turbidity, FTU	348.0	5.0	6.0	3.97	50.0	n/a	ISO 7027-99
4	$BOD_{5,}$ mg/l O2	1.4	1.7	3.2	1.7	1.5	6	ISO 5815-03
5	COD, mg/l O2	<15.0	<15.0	<15.0	<15.0	<15.0	30	ISO 6060-89
6	Dissolved oxygen, mg/l	8.3	9.0	9.1	9.0	9.0	≥4	ISO 5815-03
7	Suspended solids (TSS), mg/l	21.0	8.4	14.4	8.4	42.8	≤ 0.75[36]	ISO 11923-97
8	Total P, mg/l	<0.1	<0.1	<0.1	<0.1	0.1	2	ISO 6878-04
9	Total N, mg/l	0.44	0.33	0.35	0.32	0.44	n/a	GOST 18826-73
10	Total ammonium, mg/l	<0.1	<0.1	<0.1	<0.1	<0.1	0.5 mg/l NH4	GOST 4192-82
11	TPH, mg/l	<0.04	<0.04	<0.04	<0.04	<0.04	0.3	EPA 48,1-97
12	Total Zn, mg/l	<0.003	<0.003	<0.003	<0.003	<0.003	1	ISO 8288-A-86
13	Dissolved. Cu, mg/l	<0.003	<0.003	<0.003	<0.003	<0.003	2	ISO 8288-A-86
14	Manganese, Mn, mg/l	<0.02	<0.2	<0.2	<0.2	<0.2	1	EPA 3005 A-92
15	Total coliforms in 1000ml	3600	2000	3200	2100	560	≤10 000	ISO 9308-1:2014

556. The analysis shows that water quality is good. All values are in line with allowable national limits set for the category of surface water bodies. Turbidity/suspended solids occur naturally and their levels depend on the season. Usually there is an increase during high water season. However, due to time restrictions, no seasonal monitoring has been carried out within the scope of the EIA. In addition, sampling specifically in areas close to villages was not undertaken due to the fact that the local population do not use surface water for domestic use.

E.1.9 Groundwater

557. The region is rich in ground water. Mineral waters in the Project area are shown in Figure 93.

558. In the project area a system of fissure aquifers in the Mesozoic sediments and in the volcanic rocks is present. The aquifers are free, semi-confined or confined. During the Project Feasibility Study, a range of tests was performed on groundwater. In most of the boreholes drilled in the area where the groundwater table was encountered, piezometers were installed in

[35] IFC Environmental, Health, and Safety (EHS) Guidelines – General EHS Guidelines: Environmental Wastewater and Ambient Water Quality - provides Indicative Values for Treated Sanitary Sewage Discharges only – therefore not indicated in the table. EQS values for most of the components are not available.

[36] Note, as per Table 31: Water quality requirements by water use category, For rivers with natural content of suspended solids 30mg/l, around 5% increase is allowed.

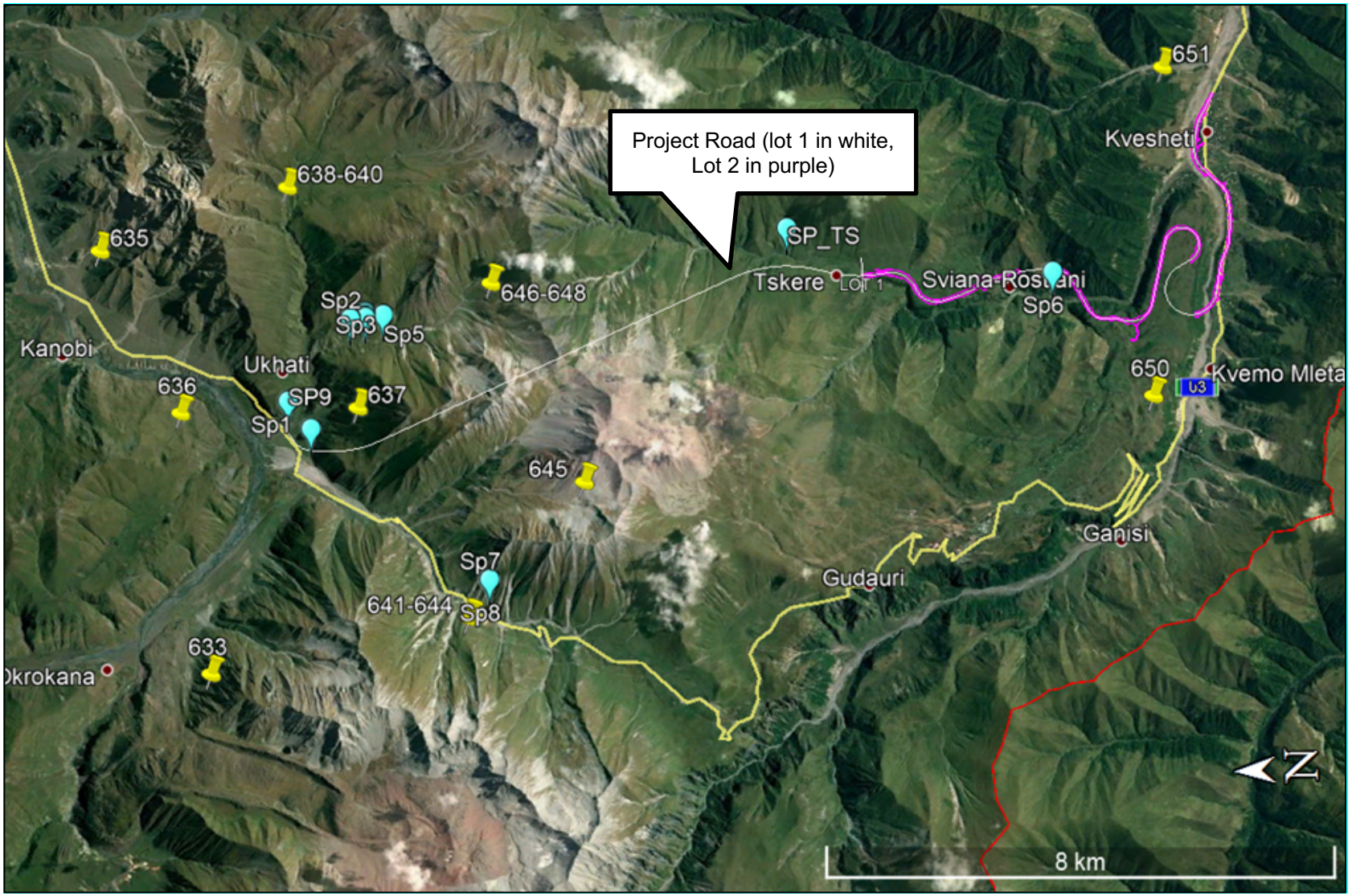
order to monitor the groundwater table. Water level monitoring was performed in 10 locations (boreholes). Water level in the boreholes was found to vary from 14 to 28m. Significant seasonal variation has not been detected although the duration of observation was limited.

559. In the recent alluvial, glacial and slope deposits there are porous aquifers, with less extension and storage capacity than the fissure aquifers. Secondary aquifers are present in the tunnel area. These aquifers have an important function in the recharge of the fissure aquifers.

Table 64: Mineral waters in the project area

N	Elevation	Location	Geology	T, C	Flow, l/sec	Type
636	1970	Kobi	Deluvial slates	6	3.0	Narzani
637	1950	Kobi, BH	Carbonate flysch	5	Level 7.8m	
638	2100	Sadzeliskhevi	Quatern. Below lavas	6	0.3	
639	2080		Slate-lava contact	5	1-1.5	Alkaline mineralized
640	2400	Kobi	Deluvial carbonate flysch	5	2	Narzan
641	2150	Baidara		8	0.1	
642	2300	Didi Maiorsha	Travertines on carbonate flysch	6	4	
643	2200	Patara Maiorsha		5	0.5	
644	2200	Baidara	Deluvial quaternary lavas – overlaid with carb. Flysch	4	2.4	
645	2200	Kulaginski	Deluvial carbonate flysch	8	0.2	
646	2290	Milioniskhevi	Carbonate flysch	5	0.3	
647	2350			5	0.1	
648	2140			5	0.5	
649	2050	Sanchoskhevi	Limestones and marls	9	0.1	Soda
650	1590	Khadiskhevi	Travertines on carbonate flysch	9	0.5	
651	1350	Sanchoskhevi	Delivial carbonate flysch	9	0.2	Narzan

Figure 93: Water sources in the Project Area



Blue balloons indicate springs registered/studied by the team during the survey

Water Supply

560. A spring located north to Tskere supplies water to Tskere and the villages located at lower elevations within the Project area. A simple water supply system consisting of small tank and metal pipes was built in former soviet times. Since then more pipes have been added. The flow is stable throughout the Project Area and only slight seasonal variation can be observed. The quality of water is not controlled. The identified natural springs in the Project area are shown by Figure 94.

Figure 94: Springs in the Project Area

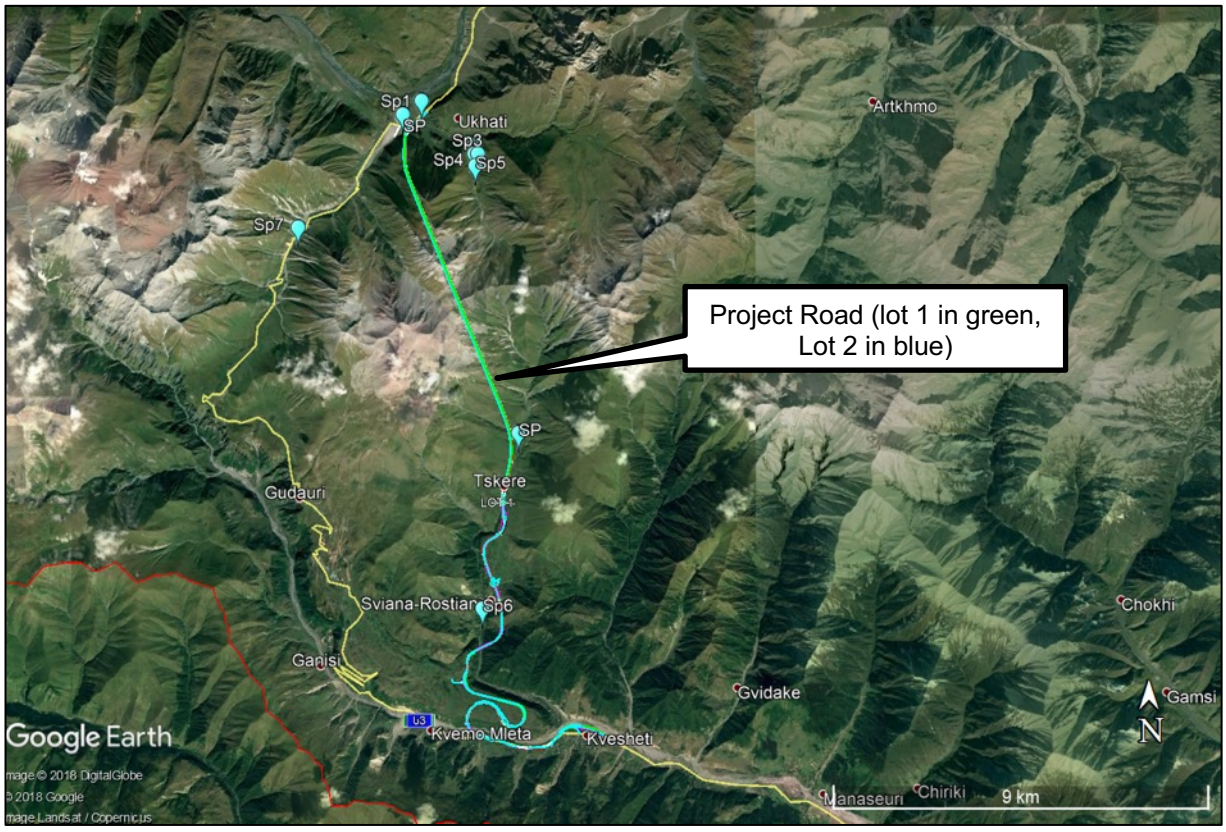


Figure 95. Running Water Taps in the Project Area (Tskere)

561. Groundwater quality has been sampled within the Project area. The results of the chemical and microbiological sampling (sampling point Kobi) are given in the table below.

Table 65: Results of Drinking Water Analysis

Parameter	Value	MPC
Turbidity (FTU)	0.00	
pH	7.35	6.5-8.5
Dry residue (mg/l)	216.883	
Conductivity (S/m)	0.03210	n/a
Hardness	4.179	7-10
Alkalinity	N.D.	n/a
COD (mg/l O)	0.560	

Cations				
	mg/l	mg-Eq	mg-Eq%	MPC, mg/l
NH4	N.D.	N.D.	N.D.	
Calcium, *Ca	50.000	2.5000	58.58	<140
Magnesium,*Mg	20.400	1.6790	39.34	<85
Sodium, Na	1.870	0.0817	1.91	<200
Potassium, K	0.280	0.0072	0.17	n/a
Total	72.550	4.2679	100%	
Anions				
Cl	4.963	0.1400	3.25	250
*HCO3	219.600	3.6000	83.52	-
CO3	N.D.	N.D.	N.D.	-
SO4	26.000	0.5417	12.57	250
NO2	N.D.	N.D.	N.D.	0.2
NO3	1.770	0.0285	0.66	50
Total	252.333	4.3102	100%	

Parameter	Allowable limits, according to the regulations	Measured value
Mezophyl aerobes and facultative anaerobes, in 1 ml	37^0 C ≤ 20 22^0 C ≤ 100	5 20
Total coliforms, in 300ml	Not allowed	Not detected
E.coli,in 300 ml	Not allowed	Not detected

562. All measured values are in allowable national limits. Water is not polluted microbially.

563. Agressivity of water has been tested as a part of the Detailed design engineering and geological surveys. In general, the water samples analysed shown low content of sulphate, PH > 6.5 and low magnesium content. In any case, in those areas where spring waters are present, sulphate resistant cement should be used.

E.2 Biodiversity and Nature Conservation

564. This section describes the existing biodiversity baseline and conservation status of the Project area. It addresses designated sites, notable flora and fauna and the potential for "Critical Habitat" to be present. The section has been developed through a combination of desk study, expert consultations, and site surveys, with input from both Gamma and DG Consulting, and specialist input from the following:

- Birds: Gia Edisherashvili and Ilia Mirotadze
- Bats: Ioseb Natradze
- Otters: Sasha Bukhnikashvili and Nugzar Surguladze

565. In addition to extensive literature reviews and meetings with national experts, the work has included specific surveys for:

- Flora (spring and summer 2018) – See **Appendix V**

- Fauna (spring and summer 2018) – see **Appendix Y**
- Migrating birds (autumn 2018) – See **Appendix W**
- Otters (autumn 2018) – See **Appendix W**

566. Further information on the methodology and people involved in the work is provided in **Appendix H** to this EIA, together with the outcomes of key consultations. Details of the data search from the IBAT database are also include here. In addition, this section of the report is supplemented by the findings of the Critical Habitat Assessment (CHA) which is presented in full by **Appendix V** and Autumn Ecological Surveys **(Appendix W)** which were undertaken in 2018. Finally, further survey work is to be undertaken from 2019 as part of the Project's Biodiversity Action Plan (BAP) and will be reported through that mechanism.

E.2.1 Overview

567. The Caucasus ecoregion is one of the world's most ecologically important temperate ecosystems and is where the major bio-geographical regions of Europe, Asia and the Middle East converge. Its complex inland landscape and large climatic variations support a wide range of habitats including mixed forests, high mountains, meadow grasslands and fresh water/wetland systems. These in turn support many unusual assemblages and species, and the region is recognized internationally as a designated **"biodiversity hotspot"** by Conservation International, "**priority place"** by the World-Wide Fund for Nature (WWF) and world center for agro-biodiversity, and an **Important Bird and Biodiversity Area**[37]. Further details of its international and national conservation importance are provided later in this document.

568. Much of the Georgian landscape is mountainous, with over 50% of the land at more than 1,000 meters above sea level (masl). Around 40% of the country (over 28,000 km^2) is still covered in natural forests (broadleaf, coniferous and mixed) while a further 25% is given over to hay meadows. Only around 13% is used for arable land or perennial crops.

569. **Flora:** Georgia's flora is particularly rich with some 4,300 vascular plant species recorded. These include some 300 species endemic to the country and a further 600 endemic to the Region[38]. The high mountain areas are considered especially notable for their diverse assemblages of species and high levels of endemism. Over 2,000 species of Georgian flora have direct economic value and are utilized as timber, firewood, food (fruit, hazel nut), forage and animal food or used in medicine, painting and volatile oil extraction. Many local variations of domestic crops as well as their wild relatives (especially wheats and legumes) are distributed in Georgia.

570. **Fauna:** Georgia's fauna is equally rich with over 16,000 species described, of which over 750 are vertebrates. Regional endemic species include 19 mammals, three birds, 15 reptiles and three amphibians although only one, the Adjarian lizard (*Darevskia mixta*), is endemic to Georgia itself. Georgia is also considered specifically important for large carnivores, many of which are increasingly endangered especially as the traditional shepherding lifestyle of many rural people means that they are a perceived threat to people and livestock. Georgia is also an important migratory flight path for many bird species, and this is described in detail later.

571. **Pressures:** Georgia's biodiversity is, however, under increasing pressure, especially from hunting, an unregulated livestock industry, and habitat destruction for development, further exacerbated by economic pressures following the collapse of the Soviet Union. This is described more under cumulative impacts. Over 29 mammal, 35 bird, 11 reptile, two amphibian, 14 fish and 56 woody plant species are included on the national Red List, and some 44 vertebrate species are included on the IUCN Red List as either Critically Endangered (CR), Endangered (EN) or Vulnerable (VU). Conservation objectives have been further complicated by a lack of effective tools for data collection, storage and analysis, and although a national system of

[37] The region is one of only three Endemic Bird Areas in the broader European region
[38] Indeed 17 genera are endemic to Georgia and Caucasus.

biodiversity monitoring was set up about 10 years ago, this is still relatively immature. (See for example the Georgian Biodiversity database http://www.biodiversity-georgia.net/ hosted by Ilia State University).

E.2.2 Protected and Notable Areas

572. **Biodiversity Hotspots** – The proposed Project lies within the Greater Caucasus Corridor[39] biodiversity hotspot, an area of some 4.68 million hectares that cover most of the middle and high mountain areas of the Greater Caucasus Range (see area "2" in Figure 96 below). Biodiversity "hotspots" are not formally recognized or governed areas but are global regions which are characterized by both exceptional levels of endemism and significant levels of habitat loss. There are currently 35 recognized biodiversity hotspots globally that represent just 2.3% of the Earth's land surface, but between them contain around 50% of the world's endemic plant species and 42% of all terrestrial vertebrates. Such "hotspots" include both areas of high biodiversity importance and areas of degraded land and more detailed assessments are always needed to locate the actual distribution of biodiversity within them. Other designations for biodiversity conservation are often present within hotspots, some of which may have more formal management structures.

573. The Greater Caucasus Corridor hotspot is of note for both the habitats and species that it supports. Important **habitats** are found at both middle elevation (1500m-3000m) where deciduous and coniferous forests are present and high elevations (3000m+) where areas of elfin woods, shrublands, alpine meadows, glaciers and snowfields are present. The large areas of pristine forests and high mountain habitats which remain intact support a number of **endemic species** of plants and animals with 20 globally threatened and seven restricted-range species recorded including East and West Caucasian turs and Dinnik's viper. WWF consider the region as a large herbivore hotspot by for the abundance of ungulates.

574. **Protected areas –** These cover around 35% of the Greater Caucasus Corridor, and include 15 strictly protected nature reserves, as well as 3 national parks and 23 sanctuaries. Several reserves are located adjacent to each other across national borders, offering great potential for transboundary cooperation although further wildlife corridors are required to facilitate migration (e.g. of red deer). Further information on protected areas is provided in below. Threats to biodiversity inside the hotspot area include illegal logging, overgrazing in high mountain areas and poaching and these are discussed further under Cumulative Impacts.

575. A large number of NGOs are active in the corridor to help to try to address this, they include international and local NGOs such as Conservation International, WWF (Caucasus Program Office), and IUCN (Caucasus Cooperation Centre), Caucasus Nature Fund (CNF), Caucuses Environmental NGO Network (CENN); Greens Movement of Georgia (Friend of the Earth); Georgian Centre for the Conservation of Wildlife (http://gccw.bunebaprint.ge); Centre for Biodiversity Conservation and Research (www.nacres.org); Sabuko (Society for Nature Conservation/ Birdlife Partner) www.sabuko.ge and GreenAlternatives. Where practical input from these organizations has been sought as part of this ESIA, and is reported in Appendix **H.**

39 https://www.cepf.net/sites/default/files/final.caucasus.ep_.pdf

Figure 96: Greater Caucasus Corridor[40] Biodiversity Hotspot

Corridor outcomes for the Caucasus hotspot
1 - Kuma-Manych; 2 - Greater Caucasus; 3 - Caspian; 4 - West Lesser Caucasus; 5 - Javakheti; 6 - East Lesser Caucasus; 7 - Iori-Mingechaur; 8 - Southern Uplands; 9 - Arasbaran; 10 - Hyrcan

576. **Key Biodiversity Areas**[41] - Key Biodiversity Areas (KBAs) are nationally identified sites of potentially **global** conservation significance which are identified based on the two key criteria of vulnerability and irreplaceability. Whilst such areas are not considered to represent uniformly high conservation value, they typically contain a number of smaller high value areas that are best managed for conservation purposes as part of a larger integrated landscape. KBAs are therefore seen as an 'umbrella' designation, and can include Important Bird and Biodiversity Areas (IBAs); Important Plant Areas (IPAs); Important Sites for Freshwater Biodiversity; and Alliance for Zero Extinction (AZE) sites.

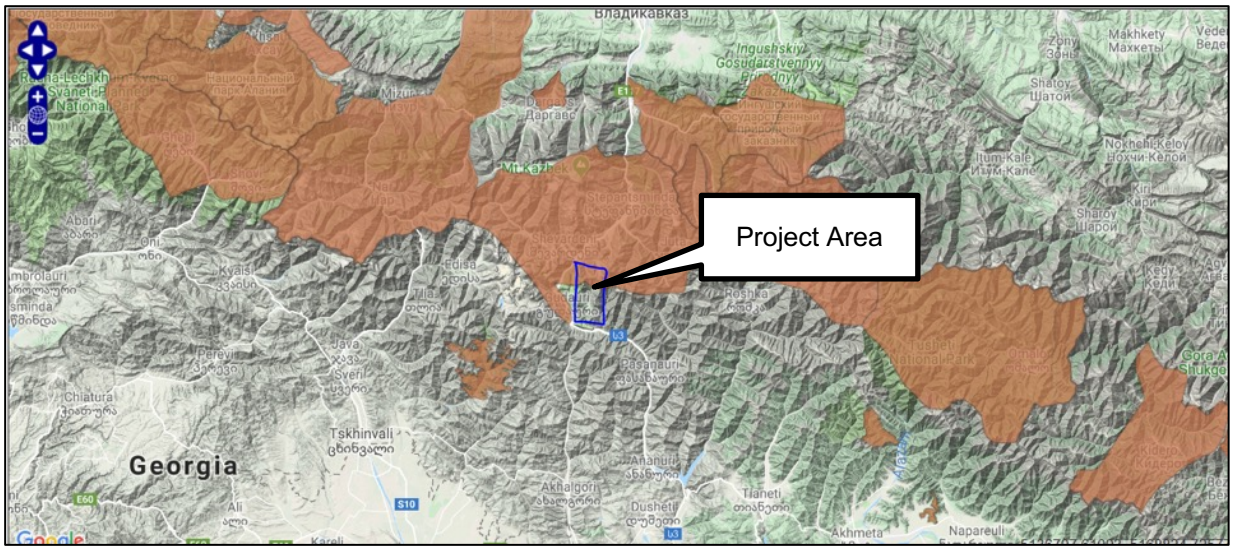
577. The KBA delineation process suggests the exclusion of areas that have been converted to human use (e.g. urban areas, agricultural areas and transportation corridors). Preliminary KBA boundaries normally represent (a) existing protected areas, (b) existing IBAs and IPAs, (b)

40 https://www.cepf.net/sites/default/files/final.caucasus.ep_.pdf
41 http://www.keybiodiversityareas.org/site/mapsearch

polygons derived from species-habitat models, (c) polygons defined from radio-telemetry, and (d) polygons delineated by outlining terrain features (e.g. watershed, streams, forest cover or other vegetation type, roads, urban areas) around point locality records of species. Final KBA boundaries should ensure the realistic management of the site for conservation and should be set by minimizing conflicts with stakeholders (e.g. land use, logging concessions, administrative and political divisions, planned development)

578. KBAs are mapped by national conservation organizations, and once identified require further national-level mechanisms to legally protect them. Much of the Caucasus have been proposed by as KBAs as shown in the figure below. The formal national KBA evaluation process is still immature in Georgia however and most of these sites still need to be properly mapped and their potential assessed before they are formally adopted and suitable protection/restoration measures developed. The proposed Kazbegi KBA is no exception to this.

Figure 97: Proposed Kazbegi KBA



579. The Kazbegi proposed KBA has been nominated for the following trigger species:

- Birds: **Caucasian Blackgrouse** (*Tetrao mlokosiewiczi*); **Caucasian snowcock** (*Tetraogallus caucasicus*); **Great rosefinch** (*Carpodacus rubicilla*); **Güldenstädt's Redstart** (*Phoenicurus erythrogaster*); **Corncrake** (*Crex crex*)
- Mammals: **Eastern Caucasian Tur** (*Capra cylindricornis*); **Caucasian Chamois** (*Rupicapra rupicapra*); **Brown Bear** (*Ursus arctos*); **Long-clawed mole** (*Prometheomys schaposchnikowi*); **Kazbegi Birch Mouse** (*Sicista kazbegica*)

580. Whilst not considered trigger species, the proposed KBA also includes the following:

- Cliffs used for breeding by Bearded Vulture (*Gypaetus barbatus*– nationally vulnerable), Griffon Vulture (*Gyps fulvus*– nationally vulnerable), Egyptian Vulture (*Neophron percnopterus*– globally endangered), Golden Eagle (*Aquila chrysaetos* – nationally vulnerable).
- Seabuckthorn areas (*Hippophae rhamnoides*) on the River Tergi which provides food and cover for many passerines and small mammals, and is the wintering habitat for Great Rosefinch (*Carpodacus rubicilla*) and Güldenstädt's Redstart (*Phoenicurus erythrogaster*).
- Areas of forests that grow on slopes dominated by birch (*Betula litwinowii*), juniper (*Juniperus spp*) and pine (*Pinus cochiana*) trees. Whilst forest cover in Kazbegi District is very low (4% of the district) it can support a high diversity of species (including endemics) as well as providing protection from landslides, avalanches, flash floods and sediment load.

Forest cover is the basis for the existing Kazbegi Nature Reserve (see below) and many of the endemic plants found in Kazbegi District grow in forests and wetlands.

581. The northern portal of Tunnel 5 lies within the Kazbegi KBA / IBA (see below) and part of the tunnel passes under it. The potential for this to trigger critical habitat is addressed later in this section.

582. **Important Bird and Biodiversity Areas (IBAs)** – Important Bird and Biodiversity Areas (IBAs) are part of the KBA umbrella and are designated specifically because of their conservation value for bird species. Like KBAs, their identification is also based on a set of internationally agreed, standardized criteria based on the occurrence of "trigger" species that are considered vulnerable to global extinction or whose populations are otherwise irreplaceable[42]. As with KBAs, IBAs are also identified by national and regional stakeholders and/or Birdlife International. Whilst their status in Georgia is still being confirmed, within the EU IBAs are used as the basis for designation of "Special Protected Areas" under the EU Birds Directive. Further information on IBA qualifying criteria in the Annex.

583. The **Kazbegi IBA[43] (GEO21)** covers an area of almost 95,000 ha and includes the Kazbegi National Park and Protected Areas. Two trigger species have been recorded namely:

- **Caucasian Black Grouse** *Lyrurus mlokosiewiczi* (IUCN NT) resident for which over 21 males have been recorded (category A1, A2) and
- **Corncrake** *Crex crex* (IUCN LC) with over 20 breeding pairs recorded (category A1).

584. Further details on both of these species are provided under "Birds" in the section below.

585. The overall area is also recognized for its importance as a migratory flightpath, with over 30,000 raptors a day recorded at peak migration times (including large numbers of black kite and steppe buzzards) and the autumn eagle migration often recorded as being particularly impressive. Table 3 of the "Memorandum of Understanding on the Conservation of **Migratory Birds of Prey** in Africa and Eurasia[44]" lists the area (albeit with a slightly different description from that of the Georgian database[45]) as the Khevi SPA (SPA 9). As with the KBA it is also recognized for its importance for **breeding birds of prey** and wintering populations of Great Rosefinch and Güldenstädt's Redstart. The proposed IBA and SPA sites are shown below.

[42] In Europe, the IBA criteria take into account the requirements of regional conservation treaties, such as the EU Birds Directive, the Ramsar Convention, the Emerald Network, the Helsinki Convention and the Barcelona Convention. Hence, IBAs are priority sites for conservation that should be protected by governments owing to their obligations under these legal instruments.
[43] see https://sabuko.ge/iba/, http://datazone.birdlife.org/site/factsheet/kazbegi-iba-georgia
[44] https://www.cms.int/raptors/en
[45] (http://aves.biodiversity-georgia.net/spa-n-9)

Figure 98: Proposed Kazbegi IBA

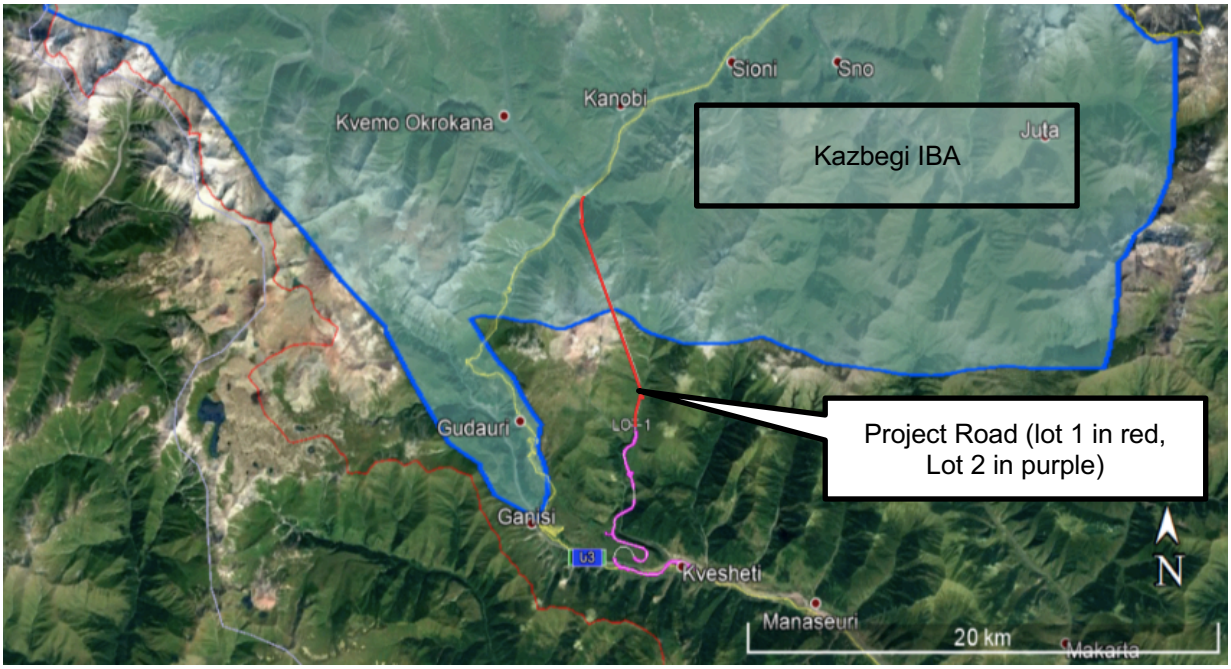
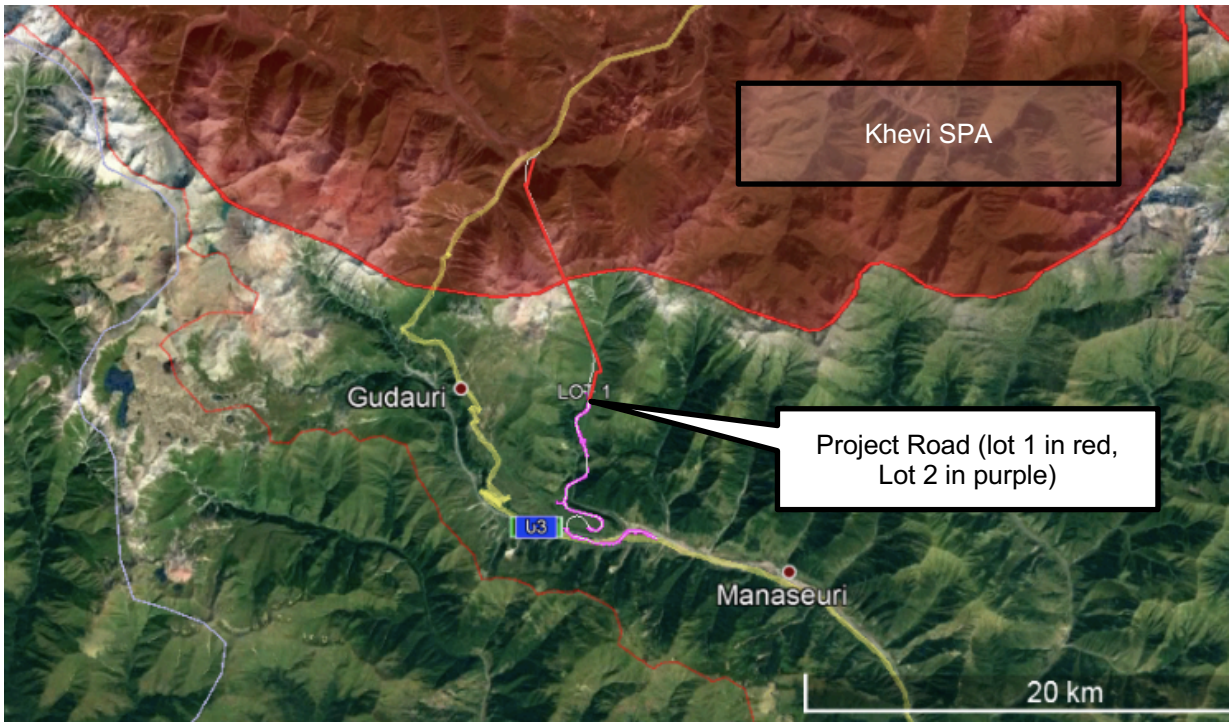


Figure 99: Proposed Khevi SPA



586. The northern end of the Project is also located within the proposed IBA/SPA. The existing road also falls within the proposed IBA (and KBA) primarily because of the presence of riverine forest nearby. The potential for this to trigger critical habitat is addressed later in this section.

587. **Nationally Designated Areas** – Georgia's has over 500,000 hectares of protected areas, which cover over 7% of the country's territory which are managed by the Georgian "Agency for Protected Areas" (www.apa.gov.ge). These include:

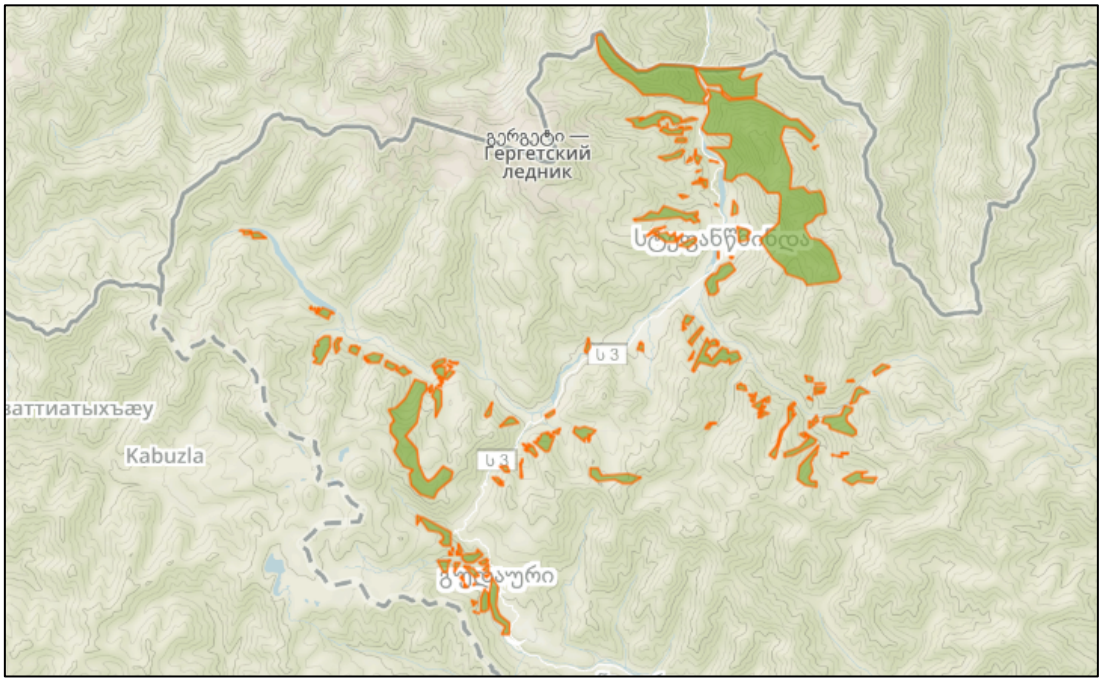
- Strict nature reserves (IUCN Protected Area category I equivalent), with very limited public access and high level of protection. (14 SNRs total 140,000 ha)

- National Parks (IUCN category II equivalent) where some recreational or traditional natural resource use may be permitted (10 NPs; 350,000 ha)
- Managed Nature Reserves (IUCN IV-VI) formerly hunting refuges. Poorly protected Hunting and fishing and foraging may be permitted. No logging or drainage. (19 in total, 60,000 ha)
- National monuments (40 in total) small areas of rare and unique features. Limited use may be permitted.
- Protected Landscapes (2, 37,700 ha) managed by local municipality seek to support conservation objectives e.g. through promoting ecotourism.
- Multipurpose areas – none designated to date.

588. As of 2018, Georgia has also begun to designate areas under the "Emerald Network" approach to Protected Areas set up by the contracting parties to the Bern Convention[46] This network is intended to help ensure the conservation and protection of those habitats and species listed under Appendices I and II of the Convention and to link Areas of Special Conservation Interest (ASCIs)[47]. In Georgia many of these initial sites in the mountains have been designated because of their designation as forested areas as described under KBAs. The ecological value of these sites is often still to be determined and these designations are to be reevaluated as the process matures. The Kazbegi National Park been included within the initial Emerald Site network.

589. The **Kazbegi National Park**[48] is the only nationally designated area within the Project area. A legally protected area administered by the Kazbegi National Park Administration, its status is that of an IUCN Protected Area Management Category II equivalent. It is made up of a fragmented group of sites, many of forest land, which between them cover an area of some 8,700 hectares in and around the valleys and northern slopes of the Caucasus Mountains near Kazbegi as shown in the figure below.

Figure 100: Kazbegi National Park (pre December 27th 2018 expansion approval)



[46] Convention on the Conservation of European Wildlife and Natural Habitats.
[47] This is as part of the EC program on "Establishment of the Conserved Area Emerald Network in South Caucasus and Central and East Europe"
[48] www.apa.gov.ge/index.php?siteid=39&page=4&id=1

590. The Park was established in 2007 around the high mountains of the former Kazbegi Strict State Reserve (~8687 ha) and was expanded in 2012 through the inclusion of the Nature Monuments of the Sakhidzari cliffs (~336 ha), Abano mineral lake (0.04 ha) and Jvari pass travertine (4.2 ha). Around 35% of the National Park is covered by forests, with the rest made up of a mix of alpine pastures, screes, snow-covered peaks all at an altitude of over 1,400m.

591. Some 1,347 plant species have been recorded in the area in and around the National Park of which about 26% are endemic, many special alpine or subalpine species. Around 2,600 ha of the Park is forested and includes areas of birch groves, pine forests[49] (369 ha); beech forests (49 ha); aspen forests (32 ha) Caucasian rhododendron (28 ha) hectares, sea-buckthorn (23 ha); birch forest with barberries (28 ha) willows (15 ha) and other groves dominating by woody species (22 ha). Large areas of sea-buckthorn are found along the river valleys and provide an important winter food source for birds.

592. The area around the National Park also supports Georgian "Red List" species such as East Caucasian tur, chamois and brown bear as well as more common species such as martens, wild cats, rabbits, squirrels and others. It also provides important habitat for birds of prey such as golden eagle, vulture and bearded vulture as well as Caucasian Black Grouse and Caucasian Snowcock. Further information is provided in the fauna section.

593. The National Park is one of the most visited of Georgia's protected areas and a new administrative and visitors center has recently been constructed with the help of the Caucasus Nature Fund (CNF) and others. No management plan has yet been developed for the Park though and it is still being managed by means of provisional regulations.

594. During the course of preparing this EIA the Government has started the process of further expanding the Kazbegi National Park boundaries, to include both areas of strict ecological protection and areas of traditional livelihoods. According to official legal database – the change in the law on the Status of the Protected area was approved 27.12.2018 and published officially on 03.01.2019.[50]

595. However, the expansion does not affect the Khada Valley to any extent and only marginally increases the area the tunnel passes beneath on the Kobi side of the Project (see Figure 101). Despite the expansion of the Kazbegi National Park, the candidate Emerald Site will not be expanded and will be applied to the boundaries of the previous fragmented park area discussed above.

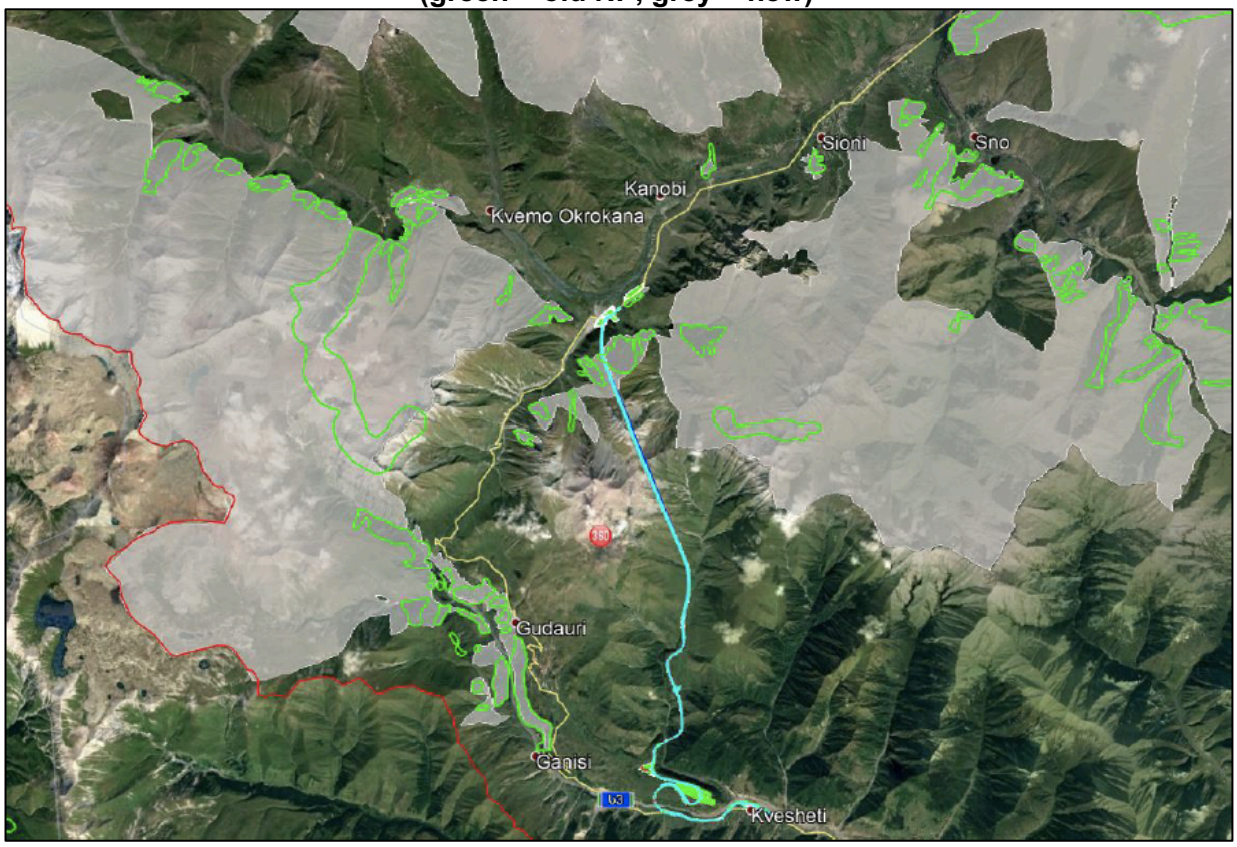
596. The park development has been supported by a range of organizations including:

- BMZ/KfW "Support Programme for Protected Areas in the Caucasus – Georgia"
- Caucasus Nature Fund (CNF) which has helped Kazbegi (and other National Parks), with operating costs, capacity-building long-term planning, monitoring of biodiversity, sustainable development and ecotourism.
- UNDP/GEF project on "Catalyzing Financial Sustainability of Georgia's Protected Areas System" has produced a ten-year (2012-2022) investment plan to assist the Agency for Protected Areas in identifying and raising investment funds whilst the
- EU backed "Strengthening of Management of Protected Areas of Georgia" (TWINNING) project has been helping in the development of protected area management plans.

[49] Litvinov;s birch, Sosnovski pine, junipers and cranberries

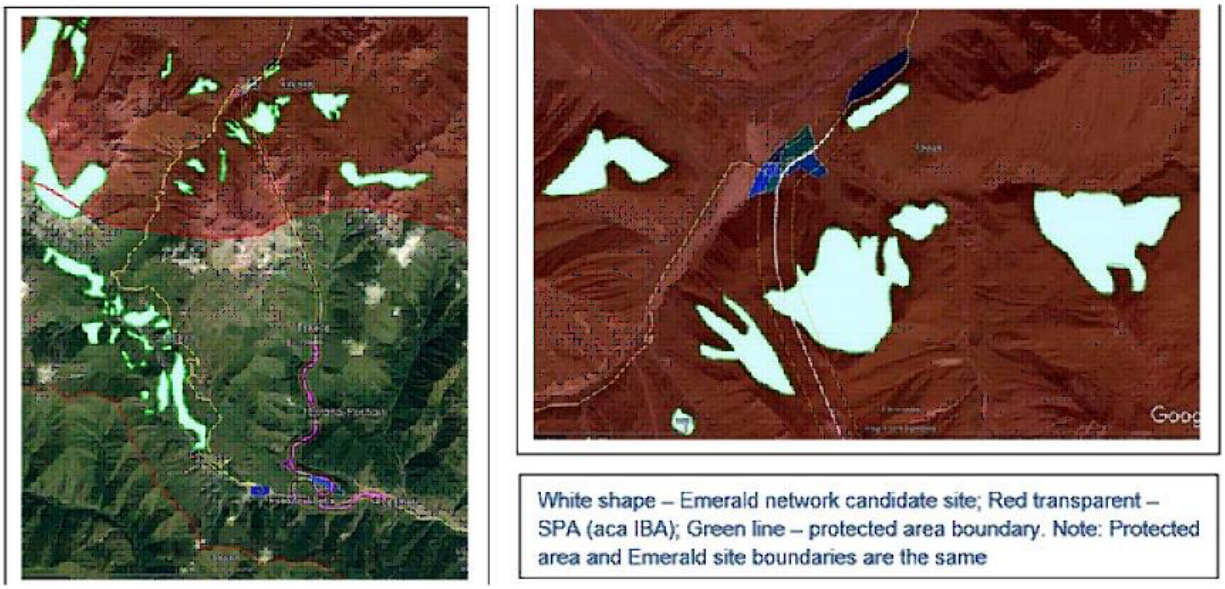
[50] https://matsne.gov.ge/ka/document/view/4440030?publication=0

Figure 101: Approved[51] Expanded Kazbegi National park, showing the proposed scheme **(green = old NP, grey = new)**



597. The proposed Tunnel 5 passes at a depth of about 300m under one of the forested depressions which is included within the previous and recently expanded national park designations and as a candidate emerald site (for historic forestry reasons).

Figure 102: Candidate Emerald Network, SPA and Protected Area Boundary



White shape – Emerald network candidate site; Red transparent – SPA (aca IBA); Green line – protected area boundary. Note: Protected area and Emerald site boundaries are the same

598. Whilst an emerald network designation can potentially trigger critical habitat status, given the depth at which this site is being passed under and the minimal area that is being

[51] Approved according to the official legal database

passed under, this is not considered to be applicable in the context of this project, and this has been confirmed through consultation with the National Parks Authority.

599. **Summary of Protected and Notable Areas** – The following summarizes the overall position with regard to the potential for Critical Habitat (CH) and Priority Biodiversity Features (PBF) arising from designated regions of conservation importance:

Table 66: Summary of Protected and Notable Habitats

Designation	Name	Proximity	Potential CH / PBF	Recommendation
Biodiversity Hotspots (WWF: priority place)	Greater Caucasus Corridor	Overlap	No	This does not trigger critical habitat, although critical habitat sites might be present within this regional unit. Special attention should be paid to endemic species at a site level.
Bird Migration Flyways	Central Asian and east Asia/East Africa	Overlap	No	This does not trigger critical habitat, although critical habitat sites might be present within this regional unit.
Key Biodiversity Areas (KBAs)	Proposed Kazbegi KBA	Overlap	Potential	The proposed northern end of the Tunnel 5 and its northern portal are located just within the southern edge of the KBA/IBA. The implications for trigger species is discussed further under “fauna” (mammals and birds).
Important Bird & Biodiversity Areas (IBAs)	Kazbegi / Khevi IBAs	Overlap	Potential	The proposed northern end of the Tunnel 5 and its northern portal are located just within the southern edge of the KBA/IBA. The implications for trigger species is discussed further under “fauna” (mammals and birds).
Emerald Network	Kazbegi National Protected Areas	Adjacent/ Beneath	No	Consultation with the Parks Authority indicates that this is not considered relevant as the tunnel will pass under only one small area of a historic forest fragment at a depth of 300m
National Park	Kazbegi National Protected Areas	Adjacent/ Beneath	No	As above. The newly expanded park will support mixed use of the landscape here and exclude the Tunnel 5 northern portal area.

E.2.3 Notable Habitats

600. Georgia is currently aligning its traditional habitat classification system with that of the European Nature Information System (EUNIS)[52].As part of this (as well as the development of both the Emerald Network and the new National Biodiversity Strategy and Action Plan – NBSAP), some 27 national priority habitats have been identified that are considered both sensitive and under threat. These include habitats which may be present within the Project area such as:

[52] https://eunis.eea.europa.eu/

- Marshes and wetlands: including Mezo-oligotrophic marshes with sphagnum (*Sphagnetapalustrae*); Tall and low grass marshes, Tussock sedge wetlands Short and long rhizome sedge marshes;
- Caves;
- Subalpine beech woods with Acer spp. Limestone beech forests (*Cephalanthero-Fagion*) Beech forests with Colchic understory (*Fageta fruticosacolchica*) Tilio-Acerion forests of slopes, screes and ravines Bog woodland;
- Forests including Alluvial forests, Xero-thermophyte oak forest, Bichvinta Pine Forest (*Pinus pithyusa*), Yew forest (*Taxus baccata*), Chestnut forest (*Castanea sativa*) Zelkova forest (*Zelkova carpinifolia*), Forest with Boxwood (*Buxus colchica)* Kolhketi relic broad-leaved mixed forest Arid open woodlands Sub-alpine birch krummholz; and
- Sub-alpine tall herb vegetation and Prostrate scrub vegetation (Rododendretum)

Two specific national priority habitats have been identified that could be affected by the project as follows:

- **9BF-GE: Sub-alpine birch krummholz** This habitat is represented by forested areas of tall birch trees with closed canopies and is typically found from 1,800-2,300m above sea level. At higher elevations, sub-alpine forest of up to 3m tall elfin birch and mountain ash are found together with Caucasian evergreen rhododendron (*Rhododendron caucasicum*) and other evergreen shrubs. Other typical species include *Betula litwinowii, B. radeana, B. pendula, Sorbus caucasigena, Salix caprea, S. kazbegensis, Rhododendron caucasicum, Vaccinium myrtillus, V. uliginosum, V. vitis-idaea, Daphne 223 iltshire, D. mezereum, Anemone fasciculata, Polygonatum verticillatum, Swertia iberica, Festuca drymeja, Calamagrostis arundinacea, Dolichorrhiza renifolia, D. caucasica, Cicerbita 223iltshir*. **Some 2.5ha of this habitat have been identified within the Project area near the Tunnel 5 northern portal.**
- **70GE03: Low grass marshes** These are found at up to 2300m asl in the lowland and low zone of the mountains. Horse tails communities include Equisetum *heleocharis, E. palustris,and E. ramosissimum* whilst *Hyppuris vulgaris* is a rare obligatory hellophyte. *Sparganium erectum (S.polyedrum) or S. simplex* creates the most widely distributed habitat. Some 0.7 ha of low grass marshes have been recorded on the plateau near Zakatkari.

601. **Other "natural" habitats[53] -** Most of the area affected by the scheme consists of modified habitats (see below). However, three other "natural habitats have been identified within the proposed road corridor namely:

- **Hornbeam forest (*Carpinus betulus*). 91CB-GE**: Hornbeam is widely distributed in Georgia and thrives on fertile, well-drained soils, often together with beech, oak and/or Rhododendron luteum. Around 0.7 ha of Hornbeam forest was identified within the Project area, mostly near the bridge crossings of the southern road.
- **Alluvial forest with Alder (*Alnus glutinosa*) & ash (*Fraxinus excelsior*) (91E0 *)** Riverside forests are present both within forested areas and as a narrow line along the river. A range of herbaceous species are found alongside the common alder including Holcus lanatus, Paspalum paspaloides, Briza minor, Pycreus colchicus, Poa trivialis and Polygonum persicaria. Some 45 ha of this habitat was identified within the Project area, but only around 0.7 ha expected to be directly impacted by the scheme.
- **Alpine rivers and their ligneous vegetation (323 GE)** – Shrubs and "crook-stem" forest habitat is found along the mountain rivers of the Project area with secondary meadows and

[53] Unlike some financial institutions, the EBRD does not use the term "natural habitat" which is used by to describe areas composed of viable assemblages of native species where human activity has not essentially modified primary ecological functions or species composition. Such areas are likely to include priority biodiversity features.

stands of pine also found in gorge areas. Along the silty river banks a thin scrub is present with hawthorn (*Crataegus kyrtostyla*), oriental hornbeam (*Carpinus orientalis*), and Jerusalem thorn (*Paliurus spina-christi*) present. Sandier banks are covered with a thick undergrowth which can completely disappear when flooded (and then revive again). Species present include mainly annual plants such as cereals and perennial dicotyledons with Deschampsia cespitosae community on river banks and in waterlogged areas. Other typical plants include: Tinweed (*Equisetum arvense*), various sedges (*Carex canescens, C. hirta, C. Irrigua*), and marsh grass (*Parnassia palustris*), etc. ~ 72ha (16% of the total) of this habitat is present within the Project area. Around 1.4ha are expected to be permanently affected by the scheme (excluding disposal areas) and none of these have been found to support stands of sea buckthorne.

602. **Modified Habitats** – Modified Habitats are defined as "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 areas primary ecological functions and species composition. Modified habitats may include areas managed for agriculture, forest plantations, reclaimed coastal zones and reclaimed wetlands." Most of the areas affected by the scheme are considered to be modified habitat consisting of agricultural and cultivated habitats (62GE04), pastures (62GE05) and Sub-alpine meadows (61GE02). The latter are not expected to be significantly directly affected by the works as much of them are located in the area that the tunnel will pass underneath. Whilst all of these habitats still have the potential to support notable species (see flora and fauna), none are considered notable in their own right.

- **Agricultural and Cultivated habitats (62GEO4)** – This habitat is found over almost 36% of the Project area (134ha) and is especially common around settlements such as those at Kvesheti, Begoni and Tskere, as well as by roadsides and other transformed habitats. It typically includes pioneer plants and other widespread species associated with agro-ecosystems as well as early colonizers of eroded slopes. The habitat is characterized by low levels of biodiversity but may still support small semi-natural and natural areas that can function as important biodiversity reservoirs and/or provide foraging and shelter for small mammals, reptiles, amphibians and nesting birds as well as occasional foraging for larger mammals. Various native and introduced plant species are present which are often related to wild relatives of plants used in traditional gardens and medicine). These include common species such as chicory (*Cichorium intybus*), meliot (*Melilotus officinalis*), yarrow (*Achillea milllefolium*), agrimony (*Agrimonia eupatoria*), creeping couch-grass (*Agropyron repens*), white briony (*Bryonia dioica*), shepherd's purse (*Capsella bursa-pastoris*), greater calistine (*Chelidonium majus*), European dodder (*Cuscuta europaea*), henbane (*Hyoscyamus niger*), mother of nettle (*Lamium album*), forest mallow (*Malva sylvestris*), mint (*Mentha arvensis*), great plantain (*Plantago major*), chickweed (*Stellaria media*), dandelion (*Taraxacum officinale*), coltsfoot (*Tussilago farfara*), and nettle (*Urtica dioica*).
- **Pastures 62GE05:** This habitat is found over around 33% of the Project area (120ha), particularly around the villages of Tskere and Begoni and the proposed southern spoil disposal site. It is common across the region on shallow mountain slopes and is used for summer pastures for sheep and other livestock. The habitat is characterized by grasses, with typically more than 30 species represented. Much of the pasture is heavily overgrazed and degraded as indicated by the presence of weeds and exotics such as Heracleum, Agasyllis caucasica, Inula and Astrodaucus orientalis. Other common species recorded include: Sheep's fescue (*Festuca ovina*), Sibbaldia (*Sibbaldia procumbens*), Fox-tail (*Alopecurus vaginatus*), Colourful brome (*Bromopsis variegate*), Alpine timothy grass (*Phleum alpinum*), Sheep clover (*Trifolium ambiguum*), Lady's bedstraw (*Galium verum*), Mountain betony (*Stachys macrantha*) Alpine creeping cinquefoil (*Potentilla alpestris*), Centaury (*Gentiana septemfida*), Caraway (*Carum caucasicum*), Hare's foot clover (*Trifolium repens*), Alpine aster (*Aster alpinus*), Woodrush (*Luzula 224iltshi),* Creeping bellflower (*Campanula collina*), Creeping cinquefoil (*Potentilla gelida*).

- **Sub-alpine meadows (61GE02):** This is a common meadow habitat in the Caucasus at between 1800-2700 masl and is used for mowing. When properly managed it has a much greater floral diversity than the grazing pasture and is dominated by species such as *Bromopsis 225 iltshire, Agrostis tenuis, A. planifolia. Ambiguum, Lotus caucasicus, Alchemilla sericata,* etc. Areas of meadows may support protected and notable plant flora and invertebrates, as well as small mammals, reptiles and amphibians and can also provide foraging habitat for large mammals and nesting for some birds. Exact communities will vary with water regime with drier bits of meadows supporting *Agrostis tenuis, Festuca varia, Kobresia capilliformis, and Astragalus captiosus* whilst Mesophilous meadows may have eg *Anemone fasciculata or Hordeum violaceum.* Within the Project area, areas of well managed meadows are uncommon due to the overgrazing described earlier and where they are present they tend to be in areas that will be passed under by tunnels. No hay meadow communities are therefore expected to be directly affected by the project.

603. Areas of habitat affected are shown in Figure 103, Figure 104 and Table 67

Figure 103: Habitat Map – Lot 1

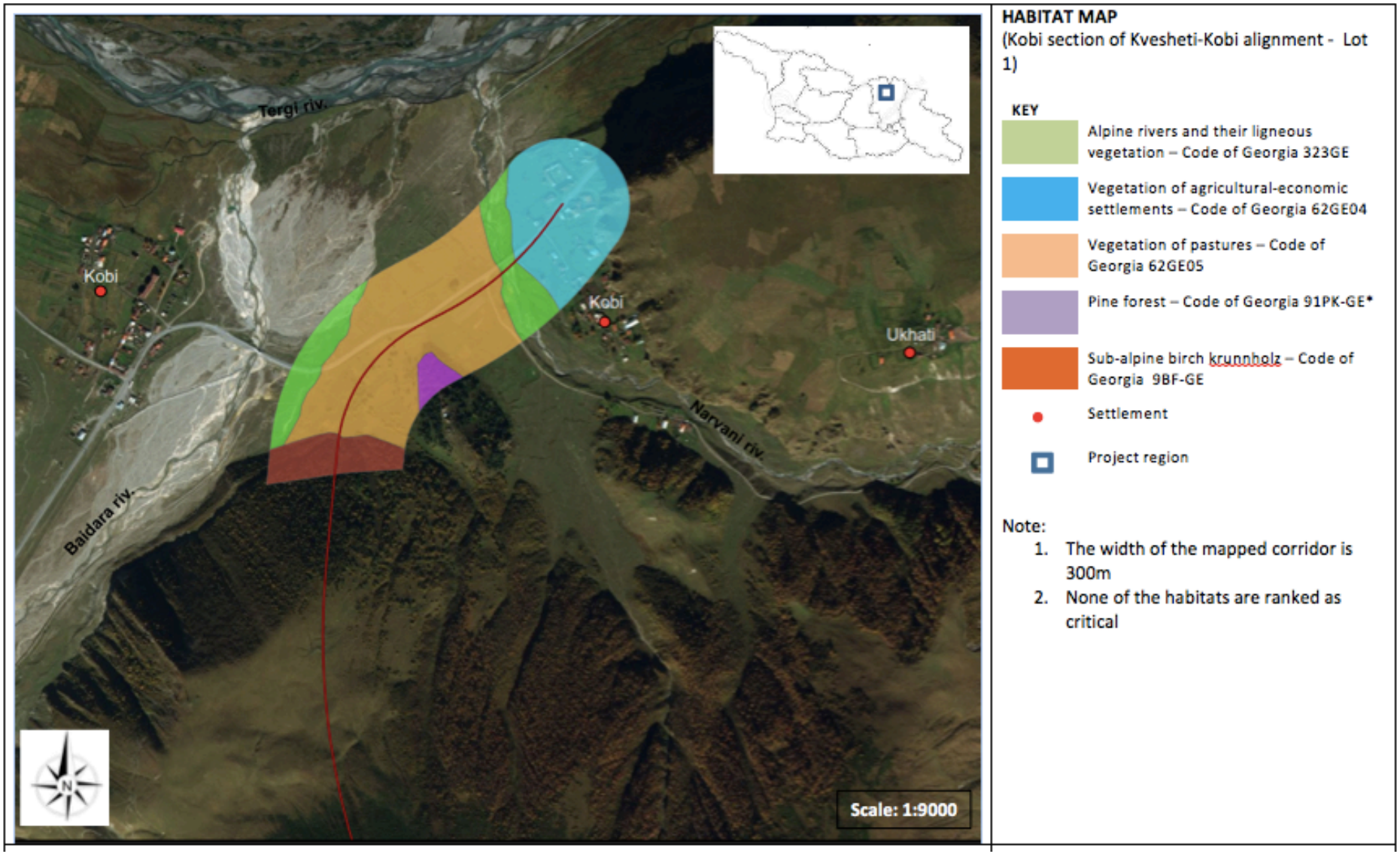


Figure 104: Habitat Map – Lot 2

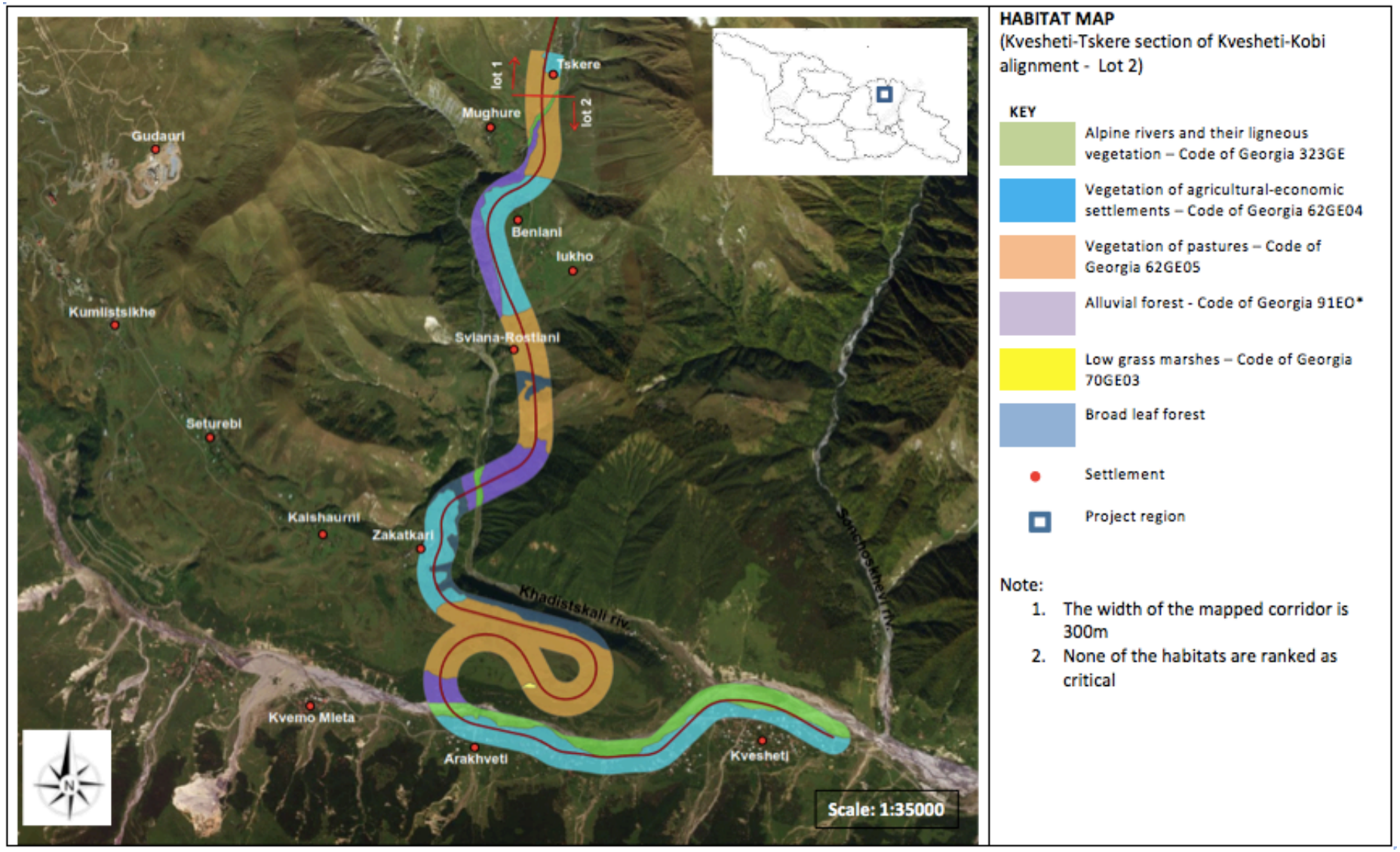


Table 67: Habitats in the Project Area

Georgian Code	Habitat	Project Area	Direct Impact	Disposal sites	Where	Natural / Modified	Notable?
62GEO4	Agricultural and Cultivated habitats	134ha	7.9ha	11.4ha	Tunnel 5 South portal	Modified	No
62GE05	Vegetation of pastures	157ha*	6.1ha	40.7ha	Tunnel 5 Both portals	Modified	No
61GE02	Sub-alpine meadows	Under main tunnel area and no direct impact				Modified	No
9BF-GE	Sub-alpine birch krummholz	2.5ha	>0.1ha	0ha	Tunnel 5 Northern Portal	Natural	Possible
323GE	Alpine rivers and their ligneous vegetation	56 ha	1.4ha	15.7ha	Tunnel 5 Both portals	Natural	No
70GE03	Low grass marshes	0.7ha	0	0ha	Zakatkari plateau	Natural	Possible
91E0 *[54]	Alluvial forests/ Alluvial forest with Alder and ash	44.6ha	0.7ha	0ha	Both lots	Natural	No
91CB-GE	Hornbeam forest (Carpinus betulus)	22.4	0.3	0.8	Near Gorge crossings	Natural	No
Total		**417 ha**	**16.2ha**	**67.8ha**			

*Of this 157ha, 39ha will be protected by tunneling

604. Overall, the scheme is expected to result in the loss of some 14ha of modified habitat and 2.5ha of natural habitat. A further 52ha of modified habitat and 16.7ha of natural habitat, are at risk from the proposed spoil disposal sites. These will be subject to separate assessment (Spoil Disposal Plan – **Appendix F**) that will require review and approval from RD, the Engineer, ADB and EBRD in advance of any works. The vast majority (>87%) of the natural habitat that may be affected is alpine river habitat, this is generally very common in the area, and none of the habitat affected support sea buckthorne**. The grass marshes on the Zakatkari plateau and the sub-alpine birch krummholz near the Tunnel 5 northern portal are considered to be the habitats with the greatest potential conservation value.** The Ecological Clerk of Works (ECoW) will demarcate these areas to exclude them from the spoil disposal areas.

605. **Forest Resources –** Georgia has retained large areas of natural forests, especially in the mountain areas and within the broader region in which the project is located there are around 265,000 ha of forest. These provide a wide range of ecosystem services including water regulation, soil protection and climate stabilization as well as important habitat for many relict, endemic and endangered species of plants and animals (about 65% of Caucasus species depends on forests). Forest stands are protected through the Forest Code of Georgia[55] which regulates functions and use of forest, including protection, management of water catchment basin, wood production etc. Under these regulations private ownership of forest and commercial

[54] Equivalent to United Kingdom classification: "W5 Alnus glutinosa-Carex paniculata woodland", "W6 Alnus glutinosa-Urtica dioica woodland)" and "W7 Alnus glutinosa-Fraxinus excelsior Lysimachia nemorum woodland".
[55] The Forest Code is a framework law and requires execution of detailed regulations.

woodcutting is allowable, but only under license. The Forest Code also sets categories of protected forests, and lists floristic species of the Red List[56]. Forest ecosystems in Georgia are threatened by unsustainable utilization of forest resources, overgrazing, forest pests and diseases; alien invasive species; and forest fires. Forest type changes with elevation as follows:

Table 68: Forests Types and Elevations

Forest Type	Altitude (asl)	Typical species
Maszl	800-1400m	Cherry (Cerasus silvestris), Caucasian pear (Pyrus caucasica), Crab apple (Malus orientalis, blackberry (Rubus), Cornelian cherry (Cornus mas), common
Broad leaf Forest	1,000-1,400m	Oak & hornbeam forest (Quercus iberica Carpinus orientalis/ C. caucasica). At higher elevations mixed deciduous and coniferous woodlands are present with Pine (*Pinus Sosnowskyi*), Birches (*Betula litwinowii, Betula pendula*), Poplar (*Populus tremula*), Sorb (S*orbus caucasigena*) and Buckthorn (*Hippophae rhamnoides*).
Sub Alpine	1,800-2,400m	High mountain light forest (Quercus macranthera, Acer trautvetteri), and crookstem forest (Betula litwinovii, B. raddeana), with Rhododendron caucasicum. In humid areas crook stem beech forest and Birch (Betula litwinowii, Betula raddeana and Mountain ash (Sorbus caucasigena) are met. Meadows support Meadow Fescue (Festuca varia), Bellflower (Campanula latifolia), Mat grass (Nardus stricta), Sosnowsky Hogweed (Heracleum sosnowskyi) and Monkshood (Aconitum nasutum). (Kvachakidze 2010).
Alpine zone	1,400-2,800m	Alpine shrubs dominate (e.g. Empetrum nigrum, Daphne mezereum) and meadows

606. Generally forested areas within the Project area are patchy and partly modified, resulting in only low-medium conservation value, although in some areas (e.g. the Khadistskali gorge) patches of natural forest occur of medium to high local conservation value. These are typically mixed-species deciduous forests, with oak and hornbeam) although at the higher elevations of the Tunnel 5 northern portal more conifer trees are found. Narrow strips of riparian woodland dominated by Alnus barbata are present alongside rivers and streams.

607. **Inland Water Ecosystems –** All of the valleys within the Project area support "braided" rivers with seasonal flows that are vary with time of year and have greatest flow after snowmelt. Of these the three most important for the project are the:

- Tetri (or "White") Aragvi which runs parallel to Kvesheti and Arakveti (where the road will cross it)
- Khadistskali River which runs through the Khada valley (the project route) to join the Aragvi at Kvesheti
- Tergi River which runs adjacent to Tunnel 5 northern portal and ultimately drains to the Caspian Sea.

608. The freshwater ecosystems of Georgia are known to support some 91 fish species, over 100 crustacea species, 58 shellfish species and more than 2,600 algae species, although information on freshwater biodiversity and critical habitats in Georgia remains limited. The WWF Global Freshwater Program identified 18 freshwater critical habitats in the country, only about one third of which were included in the protected area network. These habitats are still threatened with water pollution (mostly organic matter and heavy metals), illegal facilities, invasive species and infrastructure construction and operation which are increasingly affecting the migration routes and feeding/breeding grounds for important fish.

[56] Further institutional reforms in the sector, including development of forest monitoring systems using remote sensing technology, setting up of forest management information systems, and development of sustainable forest management plans have been supported by the GIZ Georgian-German technical assistance project – "Sustainable Management of Biodiversity – South Caucasus".

E.2.5 Notable Species

609. The habitats present in the Project area contain support a number of "notable species" including those listed as Critically Endangered (CR) and/or Endangered (EN) on the IUCN Red List of Threatened Species (IUCN RL). Where habitats are of sufficient (inter)national importance to these species this can also trigger their designation as Critical Habitat and/or Priority Biodiversity Features. A preliminary list of IUCN red list species that could occur within a 50km radius of the Tunnel 5 Southern Portal has been obtained from the IBAT tool and this has been used to guide a further assessment of the potential occurrence of such species (flora and fauna) within the Project area. This assessment has included a range of walkover and species-specific surveys as detailed further in **Appendix H**.

Notable Flora

610. Over 6,500 species of vascular plants have been recorded in the Caucasus, with around 25% of these regionally endemic. This is the highest level of endemism in the temperate world and is largely due to the fact that the Caucasus was spared glaciation during the last Ice age. Some 700 higher plant species are listed in the national Red Lists, many of which are found at Altitudes of over 3,000 masl. Within the broader Kazbegi region, over 1,000 species of vascular plants have been recorded[57], including around 28% of the endemic plants of the Caucasus. At least five of the eleven endemic genera (*Agasyllis, Dolichorrhiza, Symphyoloma, Trigonocaryum and Pseudovesicaria*) are present and about 60% of endemic plant species are classified as endangered due to disturbance to their habitats, excessive use, pathogens and other pressures.

611. The mountain forests of Kazbegi itself are dominated by the birch ***Betula litwinovii*** and other Betula spp. With pine plantations near Stepantsminda and Khumlistsikhe. A unique woody plant community dominated by Sea-Buckthorn (*Hippophae rhamnoides*) is found at the Tergi valley bottom north and south of Stepantsminda.[58]

612. Within the Project area itself, the site visits to the meadow and forest edges near the northern portal of Tunnel 5 recorded small numbers of five Caucasian endemic plants namely *Gladiolus caucasicus, Parnassia palustris, Iris caucasica, Ranunculus baidarae* and *Ligularia subsagittata.* Although endemic, none of these are considered at risk on the IUCN Red List or the GRL and all are widely found across the Caucasus.

613. Data from the National Park also indicates the potential for the following to be present within the Project Area. Again, although endemic, none of these are considered at risk and all are widely found across the Caucasus. The exceptions are *Heracleum ossethicum and Eritrichium caucasicum* and these species will be specifically targeted by the Ecological Clerk of Works (ECoW) in pre-construction surveys as described later in this document[59]:

Table 69: Species Potentially within the Broader Project Area

Designation	Species Potentially within the Broader Project Area
Georgian Endemic Species:	*Arabisk azbekensis, Galanthus platyphillus, Heracleum ossethicum* (Ossethian Cow-Parsnip – also Georgian Red List and IUCN NT), *Lilium georgicum, Muscari pallens*
Caucasian Endemic Species:	*Delphinium flexuosum, Delphinium speciosum, Campanula hypopolia, Campanula petrophilla, Campanula sosnowskyi, Dianthus caucaseus,*

[57] See flora of Kazbegi (Nakhutsrishvili et al. 2005),

[58] Important winter habitat for Great Rosefinch (Carpodacus rubicilla) and Güldenstädt's Redstart (Phoenicurus erythrogaster) - see "birds" The combined total size of both areas is less than 250 ha. Neither are affected by the scheme itself.

[59] The following are also listed by Georgian Center for the Conservation of Wildlife (2006) as endangered, without having been assessed with Red List methodology: Delphinium caucasicum, Primula bayernii, Eritrichum caucasicum, and Galanthus platyphyllus (snowdrop).

Designation	Species Potentially within the Broader Project Area
	Eritrichium caucasicum, Fritillaria latifolia, Fritillaria lutea, Gladiolus tenuis, Inula magnifica, Primula cordifolia, Primula darialica, Sobolewskia caucasica
Local Endemic Species	*Heracleum roseum var. latilobum*

614. During the site surveys (see **Appendix H**), single individuals of three GRL **Vulnerable species** were recorded within areas of deciduous and mixed woodland, namely *Quercus macranthera* (high mountain oak), *Ulmus minor* Miller (Small elm), and *Ulmus glabra* (Bare elm). The forest fund inventory has since confirmed that none of these will be affected by the scheme itself.

615. IBAT records also show the following IUCN Red List (IUCN RL) but not Georgian RL species as being potentially present within the broader Project area and whilst none of these have yet been recorded during site visits, or their presence recorded in the literature or reported during consultations, special care will be taken by the ECoW to identify any potential plants in advance of any works commencing:

Table 70: IUCN Red List (IUCN RL) Species as Being Potentially Present within the Project Area

IUCN RL Status	Species Potentially within the Broader Area
Vulnerable	*Carum grossheimii* (Grossheim's Caraway); *Jurinea exuberans* (Profuse Jurinea) and *Trapa maleevii* (Maleev's Water-Chestnut)
Near Threatened	*Medicago papillosa* (Alpine Alfalfa)
Data Deficient	Alisma gramineum (Ribbon-leaved Water-plantain), Pilosella abakurae (Abakurian Hawkweed), Pimpinella © (Ida's Burnet Saxifrage), Prunus incana (Willow Cherry) Sempervivum ermanicum (Ermanian Houseleek)

616. A number of IUCN species of "Least Concern" are also recorded from the Project area. Of these only *Betula raddeana* (Radde's Birch) is included in the GRL, where it is listed as Vulnerable.

617. **Overall no Critically Endangered or Endangered flora species (either IUCN RL or Georgian RL) have been recorded from the Project area. All species identified as potentially present within the project area to be affected are considered common across the region. The forest inventory has demonstrated that three tree species of greater interest will not be affected by the scheme. Whilst none of the species recorded within the AoI are expected to trigger Critical Habitat or Priority Biodiversity Feature designations, specific additional surveys will be done for endemic plants prior to construction commencing.**

Notable Fauna: Birds[60]

618. The Caucuses are an important flyway in spring and autumn as the three major global migration routes of the Black Sea/Mediterranean; Central Asian and east Asia/East Africa flyways all come together here[61]. Since the migrating birds tend to avoid crossing large bodies of water (like the Black Sea) or flying high over the top of mountains, the Georgian Black Sea coastline and key inland mountain passes tend to form "bottlenecks" where large numbers of birds fly together over a relatively small area of land. Within Georgia the "Batumi bottleneck" is considered the most important but the Jvari Pass through which the existing road passes is also

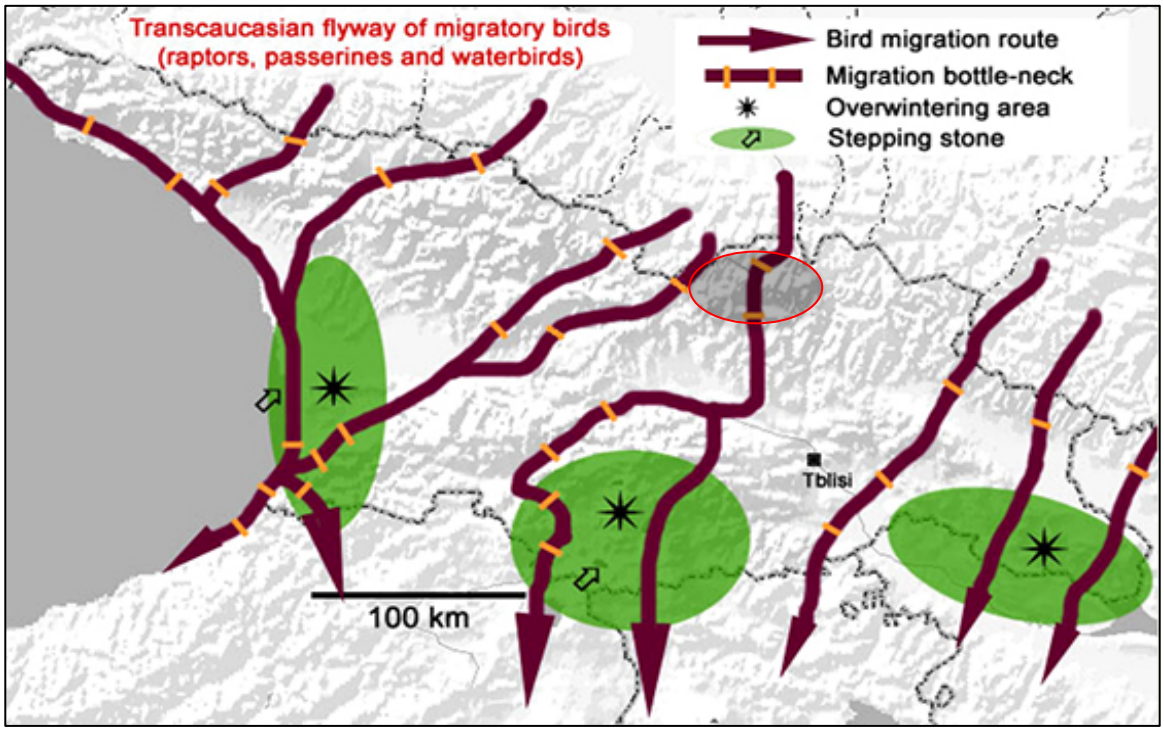
60 See also # http://aves.biodiversity-georgia.net/spa-n-9

61 see http://www.birdlife.org/worldwide/programme-additional-info/migratory-birds-and-flyways

used by a range of raptors, water birds and passerines. These include species such as European Honey-buzzards, Black Kites, Lesser Spotted, Greater Spotted, Steppe and Booted Eagles, Marsh, Montagu's and Pallid Harriers, all passing from their breeding grounds in Eastern Europe and West Siberia, to wintering grounds across Africa. The Khada valley is not considered as important however as it is would require flying over the top of local mountain, and this is described further below and in the results in **Appendix H.**

Figure 105: Important Flyways Convening in Georgia

Figure 106: Georgian Bottlenecks



619. The overall importance of the region for migrating birds is however part of the reason that the broad landscape within which the project is located has been internationally recognized as an internationally Important Bird and Biodiversity Area (discussed above).

620. Resident Species – The Caucasus Eco-region supports over 400 species of resident birds, of which 35 are included on the Georgian Red List. These include a number of KBA and IBA trigger species namely: **Caucasian Blackgrouse** (*Tetrao mlokosiewiczi*); **Caucasian snowcock** (*Tetraogallus caucasicus*); **Great rosefinch** (*Carpodacus rubicilla*); **Güldenstädt's Redstart** (*Phoenicurus erythrogaster*) and **Corncrake** (*Crex crex*). Other species of note known to breed in the national park include golden eagle, lammergeyer, griffon vulture, Egyptian vulture and black vulture. Of these, the three species with unique or endemic populations which could be present are as follows:

- **Caucasian snowcock** (*Tetraogallus caucasicus)* www.iucnredlist.org/details/22678661/0 This IUCN LC but GRL VU species is endemic to the Caucasus and is found in the Alpine and sub-Alpine zones of the high mountain ranges generally at altitudes of 2,300 – 4,000 m (occasionally from 1,800 m). Birds are found on mountain slopes with rocky outcrops, alpine meadows, clumps of bushes and patches of melting snow but avoid forest, scrub and large areas of snow cover. The species is threatened by habitat degradation caused by overgrazing by domestic stock and hunting. Following consultations with national experts, **this species is not expected to be present at the lower elevations affected by the Project.**
- **Caucasian black grouse** *(Tetrao mlokosiewiczi)* www.iucnredlist.org/details/22679483/0 This is an IUCN NT, GRL VU and IBA trigger species. It is suffering population declines from habitat fragmentation as well as increased hunting, grazing and wood cutting. It is found in subalpine meadows and subalpine forests throughout the region on north-facing slopes with Rhododendron and Juniper, and on the edge of birch forest in spring and winter, at elevations of 1,300-3,000 m. Meadows used for hay production are important for breeding birds and lek sites are found above the timber line not far from winter food resources such as *Betula litwinowii, Quercus macranthera, Fagus orientalis, Juniperus and Rosa* spp. The Mtskheta-Mtianeti Region holds about a quarter of the Georgian population of Caucasian Black Grouse, including a large concentration in Kazbegi. Consultations with national experts indicate that, whilst the species may be found occasionally within the broader Project Area near the Tunnel 5 northern portal, **no lek sites have been recorded here and given that the project will be some 200m underground where the Project area coincides with birch forest edges above the timberline no potential habitats will be affected by the work.**
- **Corncrake** (*Crex crex*) www.iucnredlist.org/details/22692543/0. An IUCN LC and IBA qualifying species but not GRL. It is a long-distance migrant that breeds in open or semi-open habitats, mainly meadows with tall grass. Significant populations are present in the Kazbegi valleys and hay meadows with more than 20 breeding pairs recorded here. No areas of tall grass meadows are expected to be affected by the project, although further work is needed to confirm this, especially near the Begoni Plateau, and Tunnel 5 northern and southern portals.

621. With regards to **Great rosefinch** *(Carpodacus rubicilla)* and **Güldenstädt's Redstart** *(Phoenicurus erythrogaster) (*IUCN Red List LC/GRL VU), both are found as small and isolated populations separated from their "main" ranges in the Himalayas by thousands of kilometers. The conservation of the species' wintering grounds and the seabuckthorn *Hippophae rhamnoides* bushes and berries that they feed on within the upper Terek basin and Tergi valley near Stephantsminda is important, although these sites are not, within the proposed Project area. The redstart has been recorded at both the northern and southern end of the scheme and may be breeding here. No sea buckthorn areas expected to be affected by the Project but this will be confirmed by the ECoW and further surveys will be undertaken as part of Biodiversity Management Plan.

622. Two other resident bird species that could trigger CH/PBF are the following:

- **Egyptian vulture** (Neophron *percnopterus)* (IUCN: EN GRL: VU) – This species forages in lowland and montane regions over open country and scavenges at human settlements. It

breeds in the National Park and has been recorded in the Project area where it is likely to forage over pastures and scavenge in villages. It nests on ledges or in caves on cliffs crags and rocky outcrops and occasionally in large trees, buildings and electricity pylons. Anecdotal evidence indicates that a single pair may nest in some years near the proposed Tunnel 1 portal in Kvesheti and in other years may nest elsewhere in the broader Project vicinity. This will be studied further as part of the BAP. The species has a broad diet including carrion, tortoises, organic waste, insects, young birds etc. It is under threat from disturbance, lead poisoning (from hunting), direct poisoning, electrocution (by powerlines), collisions with wind turbines, reduced food availability and habitat loss/change.

- **Black (Cinerous) Vulture** *(Aegypius monachus)* (IUCN: NT GRL: EN) – This species forages over many kinds of open terrain including forest, bare mountains, steppe and open grasslands etc. It is recorded as breeding in the National Park and is likely to forage over the pastures of the Project area. It nests in trees or on rocks, often aggregated in very loose colonies and feeds mainly on carrion from medium-sized or large mammal carcasses. It is under threat from degradation of nesting habitats and human persecution. Whilst recorded flying over the Project area, this is not considered particularly important habitat.

623. Other species of interest are as follows:

- **Bearded vulture (Lammergeyer)** (*Gypaetus barbatus) (I*UCN: NT GRL: VU) – This species is found in remote, mountainous areas, with precipitous terrain, usually above 1,000 m. 2-3 pairs are known to breed in the National Park and given their vast home ranges are likely to forage over pastures in the Project area. They breed on remote overhung cliff ledges or in caves which will be re-used over the years and feed mostly on carrion, with a large proportion of bones. They are under threat from poisoning, habitat degradation, disturbance of breeding sites, and collision with powerlines.
- **Griffon vulture** *(Gyps fulvus)* (IUCN:LC GRL: VU) – This species forages over many types of wide expansive open areas and is recorded regularly up to c.3,000 m. 15-20 pairs breed in the National Park on rocky outcrops, with sheltered ledges or small caves preferred. The species is likely to forage over pastures in the Project area and feeds almost exclusively on carrion. It is under threat from poisoning, habitat degradation, disturbance of breeding sites, and collision with powerlines although effective protection in areas with a plentiful supply of food has been shown to catalyse impressive recoveries.
- **Golden eagle** *(Aquila chrysaetos*) (IUCN: LC GRL: VU) - This species is mainly migratory and most breeding birds overwinter in sub-Saharan Africa. Some are resident in the Caucasus (although juveniles may disperse as far as 1000km in their first few years). The species is known to breed in the Kazbegi National Park (favoring cliff ledges but also large trees or similar artificial structures) and may forage over the pastures of the Project area looking for a broad range of mammals, birds, reptiles, fish, amphibians, insects and carrion.
- **Long-legged Buzzard** *(Buteo rufinus)* (IUCN: LC GRL: VU) - A species of open areas, including steppe up to 3,500 m, and one that migrates between Europe and North Africa, it is a potential breeder in the National Park (Cliff ledges and crags) and may forage over meadows in Project area looking for small mammals.
- **Falcons:** Lesser Kestrel (*Falco naumanni)*, Saker Falcon (*Falco cherrug) and* Peregrine Falcon (*Falco peregrinus*) are all also expected to breed in the National Park, but not within the areas affected by the Project.

624. Passage Species – The broader Project area is recognized as an important migratory flightpath with over 30,000 raptors a day recorded at peak migration times (mostly black kite and steppe buzzards). Most of these pass the mountains via the Jvari pass rather than the Project area, as the mountains within the region create barriers that are considered too high for easy migration (see Autumn 2018 migratory report, Annex H). Migrating birds of prey such as eagles (*Aquila spp.*), harriers (*Circus spp.*) and Black Kite (*Milvus migrans*) are particularly common during spring migration (with more than 1,000 migrating raptors per day) in the vicinity

of the Cross Pass and Sameba Church in Stepantsminda. Other species recorded on passage through the area include black storks and common and demoiselle cranes, whilst areas of woodland have been recorded as "excellent" for migrating passerines.

625. Other species – IBAT records also indicate the potential for the presence of a number of other species within the study Area, including **European Turtle-dove** (*Streptopelia turtur*) (IUCN: VU): a widespread migrant breeder across much of central and southern Europe, typically found in woodland areas and may be present in and around villages. The following IUCN RL Near Threatened (NT) are also recorded by IBAT from the area, together with a large number of species of least concern (LC) – see Appendix for details:

- Meadow Pipit (*Anthus pratensis*);
- Pallid Harrier (*Circus macrourus*),
- Great Snipe (*Gallinago media*),
- Black-winged Pratincole (*Glareola nordmanni),*
- Black-tailed Godwit (*Limosa limosa*),
- Eurasian Curlew (*Numenius arquata*),
- Redwing (*Turdus iliacus*)
- Northern Lapwing (*Vanellus vanellus*)

Notable Fauna: Large Mammals [62,63,64]

626. A number of large mammal species are present in the study area. These include three KBA trigger species (**Eastern Caucasian Tur** (Capra cylindricornis); **Caucasian Chamois** (Rupicapra rupicapra); **Brown Bear** (Ursus arctos); and a further five "notable" species (Georgian Red List/ IUCN Red List CR, EN or VU, Habitats Directive). These include:

- **Caucasian Chamois** *(Rubicapra rubicapra) (ssp caucasica*) (IUCN: LC GRL: EN) A focal species at risk from hunting. **The species has not been recorded within the Project area and is considered unlikely to be present because of hunting pressure.** It is known from the National Park (Sakhizrebi area) and the slopes of the Truso gorge and Sno valley where it can be found in higher alpine meadows. It inhabits steep, rocky areas in the mountains, utilizing a variety of habitats including alpine meadows, open rocky areas, mixed broadleaf woodland, and coniferous woodland where it feeds on grasses, herbs, leaves of trees, buds, shoots, and fungi It is a focal species for a number of conservation programs in the Caucasus Mountains, and although its range is beginning to fragment, in general, habitat loss is not considered a major threat to the species, as much of its range falls within protected areas.
- **Eastern Caucasian Tur** or (*Dahestanian Tur Capra cylindricornis)* (IUCN: NT, GRL:EN). A focal species at risk from hunting with only about 3,000 animals remaining nationally. Known from the slopes of the Truso and Dariali gorges, Khada gorge and some steep scree areas east of Stephantsminda it may be found occasionally in higher alpine meadows. **It has not been recorded from within the project area, and is considered unlikely to be found there.** This species inhabits elevations of up to 4,000 m asl in subalpine and alpine meadows and rocky talus slopes at higher elevations. Animals avoid thick forests on gentle slopes but stay readily in open forests growing on steep precipitous slopes. In winters, the proportion of animals dwelling below timberline increases, and their seasonal migration covers a vertical distance of 1,500 to 2,000 m moving upwards in May and downwards in October. The latest data suggest that there may be around 1500-2000 animals in the National Park but these have all been recorded much further north.
- **Brown Bear** (*Ursus arctos*) (IUCN: LC EN II, IV) Small, isolated populations with around 1,600 individuals nationally. Locals mention that traces of bear are sometimes seen near cattle barns. Recorded at start of scheme near mountain birch forests but non-

[62] http://www.batlife.ro
[63] http://www.iucnredlist.org
[64] The Caucasus Leopard Panthera *pardus saxicolour* is considered virtually extinct in Georgia with only one male recorded in Vashlovani national park (SW of Georgia) in 2004, although some may still remain in high mountainous areas.

territorial and can travel seasonally huge distances. Feeds on anthills, fruits and crops. Threatened due to poor forest management, loss of fruit trees and death during human contact.

- **Eurasian Lynx** (*Lynx lynx*) (IUCN: LC GRL: CR; Special Concern; HD II,IV). This species is solitary and territorial with home ranges typically > 120 km2 for males and 80 to 500 km2 for females. It is strictly carnivorous: feeding on deer, chamois, hares, forest birds and domestic sheep. IUCN range maps indicate it may be resident in the study area and recent research suggests that this species has a larger population size than previously thought in Georgia. Local reports of a "cat" seen in the middle flow of the Narvani river may have been lynx, although no such reports have been made in the last 5-6 years. It is still considered critically endangered and is under threat from poaching, persecution, and habitat fragmentation.
- **Eurasian Otter** *(Lutra Lutra)* (IUCN: NT GRL: VU; HD II, IV) Otters lives in a wide variety of aquatic habitats, including rivers and streams and independent of their size, origin or latitude although vegetated banksides are considered of great importance. They breed in holes in the river bank, cavities among tree roots, piles of rock, wood or debris. For most otters most of their activity is concentrated to a narrow strip on either side of the interface between water and land. Fish typically makes up > 80% of their diet, but may be supplemented with aquatic insects, reptiles, amphibians, birds, small mammals, and crustaceans. The species is currently under threat from a combination of declining wild fish stocks, habitat destruction (e.g. removal of bank side vegetation), and persecution due to perceived predation on fish. Pollution from organochlorines, polychlorinated biphenyls and mercury is also a major threat as are drowning in culverts and road kills. The autumn 2018 assessments recorded signs of otters near the northern portal of Tunnel 5 and other areas where bankside vegetation is present may also be suitable.
- **Gray Wolf** (Canis lupus) (IUCN: LC; Not GRL; HD: II, IV) Wolves occupy a wide range of habitats across Georgia and are not considered locally endangered. They are, however, a priority EU carnivore species and their populations are declining across the broader region due to poisoning and persecution for perceived predation on livestock. Local residents report that in winter and early spring wolves are seen in the study area, and that every year there are local cases of wolves attacking the cattle. The species is mainly carnivorous (especially wild ungulates), but can also feed on small and medium sized vertebrates, carrion and human garbage, as well as livestock.

627. A number of other species may also be present in the Project area, including Stoat (*Mustela ermine*) and wild cat (*Felis silvestris*) but no other endangered species such as the bezoar or wild goat, the Caucasian subspecies of red deer, the Caucasian leopard (*Panthera pardus saxicolor ciscaucasica*) nor the striped hyena (*Hyaena hyaena*) have been recorded from the area.

Notable Fauna: Bats

628. Around 30 bat species are found in Georgia, all of which are legally protected under the framework of the Convention on Conservation of Migratory Species of Wild Animals (CMS), Annex IV of the Habitats Directive and the associated Agreement on the Conservation of Populations of European Bats (EUROBATS). Of these, four species are in Red list of Georgia and one species in IUCN red list.

629. 25 species are recorded in IBAT as potentially present in the Project area, although there has been no comprehensive bat undertaken in the area yet (one is planned for 2019) and there is only limited information available in the literature data about bat species here. What literature there is includes records from:

- Close to Kobi of Brown long-eared bat (Plecotus auritus) (Bukhnikashvili 2004).

- Close to village Sno: Whiskered Bat (Myotis mystacinus), Natterer's bat (Myotis nattereri), Common Pipistrelle Bat (Pipistrellus pipistrellus), Soprano Pipistrelle (Pipistrellus pygmaeus) and Leisler's Bat (Nyctalus leisleri) (Bukhnikashvili 2013)
- In Dariali gorge as well as Common Pipistrelle Bat (Pipistrellus pipistrellus) in 2013.

630. Given this information and the existing habitats present within the project area and its vicinities, Consultations with national experts indicate that some 19 bat species might occur in the study area and its vicinities in different seasons of the year, as shown in the Table below.

Table 71: Species that Might Occur in the Project Area and its Vicinities

#	Scientific name	Common name	Status
1.	*Rhinolophus ferrumequinum*	Greater Horseshoe Bat	Habitats Directive Annex II species
2.	*Rhinolophus hipposideros*	Lesser Horseshoe Bat	Habitats Directive Annex II species
3.	*Myotis blythii*	Lesser Mouse-eared Bat	Habitats Directive Annex II species
4.	*Myotis mystacinus*	Whiskered Bat	
5.	*Myotis nattereri*	Natterer's bat	
6.	*Pipistrellus pipistrellus*	Common Pipistrelle Bat	
7.	*Pipistrellus pygmaeus*	Soprano Pipistrelle	
8.	*Pipistrellus nathusii*	Nathusius' Pipistrelle Bat	
9.	*Pipistrellus kuhlii*	Kuhl's pipistrelle bat	
10.	*Hypsugo savii*	Savi's Pipistrelle Bat	
11.	*Nyctalus noctula*	Noctule	
12.	*Nyctalus leisleri*	Leisler's Bat	
13.	*Nyctalus lasiopterus*	Greater noctule bat	IUCN - VU
14.	*Vespertilio murinus*	Particoloured Bat	
15.	*Eptesicus serotinus*	Serotine Bat	
16.	*Eptesicus nilssonii*	Northern Bat	
17.	*Plecotus auritus*	Brown long-eared bat	
18.	*Plecotus macrobullaris*	Alpine Long-eared Bat	
19.	*Tadarida teniotis*	European free-tailed bat	

631. Of these, only one species is on the IUCN Red List as follows and none are on the National Red List.

- The **Giant Noctule *Nyctalus lasiopterus*** (IUCN VU) forages over mixed and deciduous forest and wooded river valleys. It is highly dependent on mature forest colonies which 40 year-old trees and any mature tree removal can be a threat. It feeds mostly on moths and beetles but may also take small songbirds and will fly at heights of up to several hundred meters to do this. A migrant, summer roosts are in hollow trees and bat-boxes, and occasionally in buildings. Trees and rock crevices may also be used as hibernacula in winter. Threats include loss of mature woodland, particularly the loss of old trees.

632. A further three are, however, IUCN LC but Habitats Directive Annex II species as follows:

- **Greater Horseshoe Bat *Rhinolophus ferrumequinum*** - Forages in deciduous woodland (particularly early in the year) shrubland and summer-grazed pasture (particularly late in the summer). Feeds on beetles, moths and other insects at low level and flies up to 3 km from the roost each night. Summer roosts are located in warm natural and artificial underground sites and they will use caves all year, as well as buildings for some summer maternity colonies. In winter it hibernates in cold underground sites (usually large caves). Threats include fragmentation and isolation of habitats, change of management regime of deciduous

forests & agricultural areas, loss of insects (pesticide use), and disturbance and loss of underground habitats and attics.

- **Lesser Horseshoe Bat *Rhinolophus hipposideros*** - Forages close to the ground within and along the edges of broadleaf deciduous woodland (primary foraging habitat), but also in riparian vegetation and shrubland areas, although open areas are avoided. Feeds on midges, moths and craneflies. Summer roosts (breeding colonies) are found in natural and artificial underground sites and in winter it hibernates in underground sites (including cellars, small caves and burrows). Habitat loss and fragmentation pose a threat to this species.
- **Lesser Mouse-eared Myotis *Myotis blythi*** - Forages in scrub and grassland habitats, including farmland and gardens. Maternity colonies are usually found in underground habitats such as caves and mines, and sometimes in buildings. Hibernates in winter in underground sites. Threats include changes in land management, including agricultural pollution and disturbance to roosts in caves.

633. Further surveys are being undertaken to fully clarify species actually present within the Project area, but given their protected status and the national downward trends in bat populations due to habitat fragmentation, intensification of agriculture, and cave disturbance (see Eurobats National report of the Parties [65] (Georgia 2014)) a precautionary approach will be taken to any potentially suitable breeding, hibernating or roosting sites (caves, houses, mature trees, rock fissures, etc.) within the Project area which will be presumed to be potentially important for bats unless cleared by the ECoW.

Notable Small Mammals

634. The Project area is expected to support many species of small mammals including two KBA trigger species **Long-clawed mole** (*Prometheomys schaposchnikowi)* and **Kazbegi Birch Mouse** (*Sicista kazbegica*) and two others[67] that are included in the Georgian Red List and/or listed in the IUCN Red List as CR, EN or VU. Of these

- **Long-clawed mole** (*Prometheomys schaposchnikowi)* (IUCN: LC; GRL: VU). Sole representative of a monotypic genus which is endemic to the region. Found in the Alpine zone in tall grass meadows on slopes with long-standing snow cover but also found on meadows inside forest and on arable land. Avoids steep slopes and rocky places Recorded from isolated montane areas and has a fairly small range, but there are no major threats and the species has been found in degraded areas such as arable land.
- **Kazbegi Birch Mouse (*Sicista kazbegica)*** http://www.iucnredlist.org /details/20189/0 (IUCN: EN, GRL:VU). This mouse is endemic to the Kazbegi region and found across the area. It lives in mixed forest (1,500 -2,300 masl) and subalpine meadows with tall grass and is locally common. Little is known about it but it is reported to spend much of the day in shallow burrows, and eats insects, fruits and seeds. Habitats are reported to be threatened by over-grazing.
- **Caucasian Squirrel** (*Sciurus anomalus) (*LC VU) Still relatively abundant where found, the species lives mostly in mixed and deciduous forest. IUCN range maps indicate it may be resident in the study area.
- **Grey dwarf hamster** (*Cricetulus migratorius)* (LC VU) This species has a very wide range, and is abundant in at least parts of its range. No major threats are known at the global level. It originally occurred in dry grasslands, steppes and semideserts. Now, it also inhabits agricultural land and gardens, sometimes even living in houses. Arid areas with relatively

[65] http://www.eurobats.org/sites/default/files/documents/pdf/National_Reports/Inf.MoP7_.19-National%20Implementation%20report%20of%20Georgia.pdf

[67] Four species of insectivores and five species of rodents that are endemic to the Caucasus occur in and around the Kazbegi Park, primarily associated with birch forest and grassland habitats.

sparse vegetation are preferred, and forests and damp habitats are avoided. IUCN range maps indicate it may be resident in the study area.

635. A number of non-Georgian Red List and IUCN LC species are also listed by IBAT as potentially present in the Project area [68].

Notable Reptiles and Amphibians[69]

636. The Caucasus support some 77 species of reptiles and 14 species of amphibian of which 28 reptiles and 4 amphibians are regional endemics. Within the Project area there are few records of herpetofauna, although IBAT records that the following species of note may be present:

- **Tessellated Water Snake** (*Natrix tessellate)* (IUCN LC; HD **Annex IV**) A largely aquatic species that appears not to be globally threatened is common in much of its range. It is threatened by loss or modification of wetland habitats in parts of its range, for example through river channelization. It is often killed by road traffic, particularly in the mating season and was recorded as present in the project area.
- **Dinnik's Viper** (*Vipera dinniki)* (IUCN: VU; GRL: VU). Extent of occurrence is less than 20,000 km^2, its distribution is severely fragmented, and there is continuing decline due to persecution, over collecting and overgrazing of its habitat. It inhabits the upper-forest zone, stream borders, shrub forests, subalpine and alpine meadows, rocky scree, talus slopes and montane moraines. An endemic species recorded from across the upper-forest zone, stream edges, shrub forests, subalpine and alpine meadows, rocky scree, and montane moraines of the Caucasus. A potential resident within the Project area, little is known about this species, which will eat small rodents, lizards, frogs and the young of ground nesting birds. It is however threatened by persecution, over-collecting and overgrazing of its habitat.
- **European Tree Frog** (*Hyla arborea)* (IUCN: LC; HD IV). A widespread lowland species that has been recorded up to 2,300masl and is common in suitable habitats in parts of its range. Generally associated with open, well-illuminated broad-leaved and mixed forests, bush and shrublands, meadows, gardens, vineyards, orchards, parks, lake shores and low riparian vegetation.

637. Other species recorded in IBAT as IUCN Least Concern, Near Threatened or Data Deficient (but not GRL listed or in the Habitats Directive Annex II or IV) include the following[70]:

Table 72: Other Recorded Species Potentially Present in the Project area

Reptiles		Amphibians	
Caucasian lizard	*Darevskia caucasica,*	Marsh Frog	*Pelophylax ridibundus*
Spiny-Tailed Lizard,	*Darevskia rudis*	Brusa Frog.	*Rana macrocnemis*
Caspian Green Lizard	*Lacerta strigata*	Caucasian toad	*Bufo verrucosissimus (NT)*
Meadow Lizard	*Darevskia praticola (NT)*	Northern Banded Newt	*Ommatotriton ophryticus (NT)*
Dahl's Whip Snake	*Platyceps najadum*	Varying Toad	*Bufotes variabilis (DD)*
Transcaucasian Rat Snake	*Zamenis hohenackeri,*		

[68] Several of these are Caucasian endemics, including : Brandt's hamster (Mesocricetus brandti), Red-backed vole, Myodes glareolus ponticus, Radde's Shrew (Sorex raddei) Shelkovnikov's Water Shrew (Neomys schelkovnikovi) and Gudauri Snow Vole Chionomys gud

[69] See Tarkhnishvili and Gokhelashvili 1999, D. Tarkhnishvili, pers. Comm (2009)

[70] Grass Snake (Natrix natrix) has also been recorded on site

Notable Invertebrates

638. Hundreds of species of invertebrates are likely to inhabit the Study Area and an initial list of species recorded from field survey is provided in **Appendix Y**. Whilst data on invertebrates in Georgia is generally poor, no species have yet been identified that are listed as critically endangered or endangered by IUCN and field surveys did not identify any species nationally red listed. One species, the River Orb Mussel (*Sphaerium* rivicola) is listed as Vulnerable and two others *Potamon ibericum* and *Sphaerium solidum* are listed as Near Threatened. This, however, is likely to reflect a paucity of recording rather than the real situation, for example. Invertebrates recorded in IBAT as being present in the Study Area but designated as Data Deficient (DD) or Least Concern (LC) are shown in **Appendix M**.

Notable Fish

639. Over 200 species of fish are found in the rivers and seas in and around Georgia, with almost one third of these endemics and a number of which migrate from the Caspian and Black seas to spawn in the freshwater rivers[71]. In general, the fish of Kazbegi are poorly studied, although the **Brook Trout** (*Salmo fario*) is regularly recorded in the region, and along with Brown trout (Salmo trutta: IUCN – LC) Salmo coruhensis and Salmo ciscaucasicus are included in the Georgian Red List as "Vulnerable". This is primarily because of the effect of illegal poaching which saw trout populations decline by around 30% between 1995-2005.

640. A number of fish species are recorded in the literature as being present in the rivers of the project area. These include the following:

Table 73: Fish species in the project area

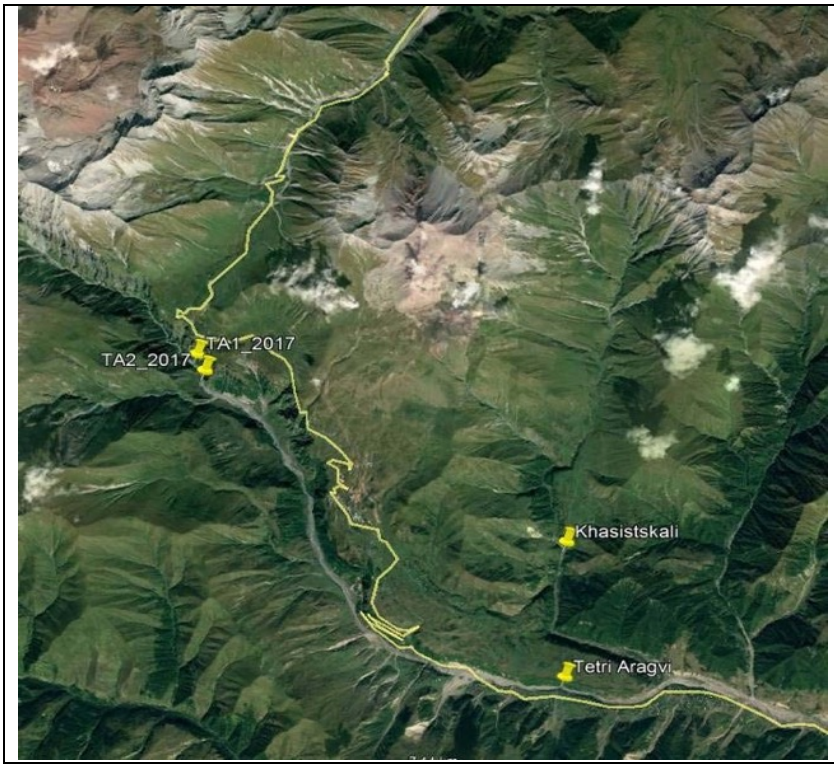
	Common name	Scientific name	IUCN	GRL
Tergi				
1	Trout	*Salmo trutta morfa fario*, Linnaeus 1758	LC	Ald
2	Gudgeon	*Gobio gobio* Linnaeus, 1758	LC	-
3	Roach	*Rutilus rutilus* Linnaeus,1758	LC	-
4	Chub	*Squalius cephalus* (Linnaeus, 1758) (=*Leuciscus cephalus orientalis* Nordmann, 1840)	LC	-
Narvani				
1	Trout	*Salmo trutta morfa fario*, Linnaeus 1758	LC	VU
Baidara				
1	Trout	*Salmo trutta morfa fario*, Linnaeus 1758	LC	VU
Tetri Aragvi				
1	Trout	*Salmo trutta morfa fario* Linnaeus, 1758	LC	VU
2	Khramulya	*Capoeta capoeta* Güldenstädt, 1773	NE	
3	Kura nase (undermouth)	*Chondrostoma cyri* Kessler, 1877	NE	
4	Caucasian river goby	*Neogobius (Ponticola) constructor* Nordmann,1840	LC	
5	Chub Skelly	*Squalius cephalus* Linnaeus, 1758) (=*Leuciscus cephalus orientalis* Nordmann, 1840)	LC	

[71] This includes six species of sturgeon (Acipenser spp.) as well as the beluga (Huso huso), all of which are endangered by overfishing and habitat degradation.

	Common name	Scientific name	IUCN	GRL
6	Kura barbel	*Barbus lacerta* Heckel, 1843	NE	
7	Kura roach	*Rutilus rutilus kurensis* Berg, 1932		
Khadistskali				
1	Trout	*Salmo trutta morfa fario*, Linnaeus 1758	LC	VU
2	Kura barbel	*Barbus lacerta* Heckel, 1843	NE	
3	Murtsa	*Luciobarbus mursa* Güldenstädt, 1773 (=*Barbus mursa* Güldenstädt, 1773)	NE	

641. As part of the baseline study, control catches were performed in four locations in the rivers of interest using cast nets.

Figure 107: Control Catch Sites



River	Coordinates
Khadistskali	461245 m E 4700270 m N
Tetri Aragvi	461161.00 m E 4697401.00 m N
Narvani	461166.00 m E 4711527.00 m N
Baidara	459146.00 m E 4711636.00 m N
Tetri Aragvi	(2016 survey data)
TA1-2017	454573.00 m E 4704256.00 m N
TA2_2017	454692.00 m E 4703914.00 m N

642. During the sampling trout were recorded in the Tetri Aragvi, Khadistskali and Narvani rivers. Although water conditions were found to be good, and freshwater invertebrates were present, no fish were caught in the Baidara river. Presence of trout has been confirmed by local residents/fishermen as well as surveys carried out by the team for other assignment in the same area in 2017. Site survey results and the 2017 survey data are given below:

Table 74: Control Catch Data

River	Species	Qty	Length, m	Weight, g	Gender and maturity stage	Age
Khadistskali	Trout	1	20.5	92	♂ III	3^{+}
Tetri Aragvi	Common roach	2	11.5	18	♀ III	3
			11.0	15	♂ III	3
Tetri Aragvi (2017 data)	Trout	5	17.5	65	♀ V	3+
			18.5	67	♀ V	3+

River	Species	Qty	Length, m	Weight, g	Gender and maturity stage	Age
			19.0	71	♀ V	3+
			13.5	53	♂ V	2+
			15.0	57	♂ V	2+
Tetri Aragvi (2017 data)	Trout	5	15.5	55	♂ VI-II	2+
			17.0	58	♂ VI-II	3+
			25	82	♀ VI-II	3+
			23.5	78	♀ VI-II	3+
			24.0	80	♀ VI-II	3+

Figure 108: Trout species obtained during the control catches in the area

643. A range of Macroinvertebrates were also found to be presented including the daphnia species D. pulex, D. longispina, D. Magna, and D. Lumholtzi. Other species recorded were:

- ENTOMOSTRACA – Ostracoda; Ostracoda, Eucypris inflata;
- MALACOSTRACA – Amphipoda.
- Aquatic plants Ulotrix zonata, Enteromorpha prolifera, Cladophora sp.
- Musci were found.

Analysis of the Presence of Critical Habitat / Priority Biodiversity Features

644. Critical Habitat is considered the most sensitive biodiversity features and comprises of one or more of the following: (i) highly threatened or unique ecosystems; (ii) habitats of significant importance to endangered or critically endangered species; (iii) habitats of significant importance to endemic or geographically restricted species; (iv) habitats supporting globally significant migratory or congregatory species; (iv) areas associated with key evolutionary processes; or (v) ecological functions that are vital to maintaining the viability of biodiversity features described in this paragraph.

645. Priority Biodiversity Features are considered particularly irreplaceable or vulnerable, but at a lower priority level than critical habitats. They include: (i) threatened habitats; (ii) vulnerable species; (iii) significant biodiversity features identified by a broad set of stakeholders or

governments (such as Key Biodiversity Areas or Important Bird Areas); and (iv) ecological structure and functions needed to maintain the viability of priority biodiversity features described in this paragraph.

646. **A stand alone "Critical Habitat Assessment and Appropriate Assessment Screening" study has been completed as part of this EIA and is provided as an Appendix to this document (Appendix V). The results of this are summarized below.**

647. **Critical Habitat / PBF Arising from site level designations** – The northern end of the project and northern portal of Tunnel 5 are located under or within the edge of the proposed Kazbegi Key Biodiversity Area and Important Bird Area. These areas are designated for breeding birds (especially black grouse, snowcock and corncrake), birds of prey (breeding and migratory) and (for the KBA) 5 mammal species and have the potential to trigger CH or PBF. The Appropriate Assessment study (**Appendix V**) has been undertaken of the sites and the project is not expected to have any material long-term effects on the reasons for which these sites are designated.

648. A small section of one of the Emerald site locations that form the boundaries of Kazbegi National Park (pre-2018 expansion approval) is also passed under at a depth of over 200m at the northern end of the project. [72] The site has a historic designation as forested land and consultation with the National Parks Authority indicate that it is not required to be considered in the context of CH or PBF. Given the tunnel depth no impacts will occur to the integrity or conservation value of this site.

649. **Critical Habitat / PBF arising from habitats present –** Two habitats have been identified within the Project area as being of potentially greater biodiversity and conservation value namely:

- Sub-alpine birch krummholz (9BF-GE), a forested area of tall birch trees with closed canopies located near the northern portal of Tunnel 5. Some 2.5ha of this habitat have been identified within the Project area but >0.1ha are expected to be directly affected by the scheme
- Low grass marshes (70GE03) with horse tail communities which have been recorded on the plateau near Zakatkari. None are expected to be lost to the main scheme.

650. Both of these habitats are considered natural, although consultation with national specialists indicates that neither is considered unique or threatened enough to trigger CH they are considered as PBF, and specific care will be taken to minimize impacts to these habitats and recreate any habitat damaged. Specific action plans have been developed for these habitats and are provided in the Project **Biodiversity Action Plan.**

651. **Critical Habitat / PBF arising from species present** - The CHA study (**Appendix V**) and its associated Autumn Ecological Surveys (**Appendix W**) have identified the potential for one species (Black Vulture) to trigger critical habitat. This species will not be materially affected by the project however, so no Action Plan is proposed.

652. The study has also highlighted the potential within the broader area for a number of other species to trigger Priority Biodiversity Criteria. Where these species are present (or potentially present) and there is the potential for significant residual impact (see later), specific Biodiversity Action Plans have been proposed. The following are considered potential PBF triggers:

- **Birds: Egyptian, Bearded and Griffon Vultures, Golden Eagle, Caucasian Black Grouse, Corncrake, Greater Rosefinch**
- **Mammals: Caucasian Chamois, Otter, Bats (all species), brown bear, Eurasian lynx, Kazbegi birch mouse.**

[72] The Critical Habitat Assessment and Appropriate Assessment Screening study (Appendix V) includes the assessment of the Emerald site.

- **Other: Dinniks Viper, Trout**

653. The potential for significant residual impacts to these species, and hence the need for species-specific biodiversity action plans, is addressed further in the CHA (**Appendix V**) and the standalone **Project Biodiversity Action Plan** (BAP).

E.2.5 State Forest Fund

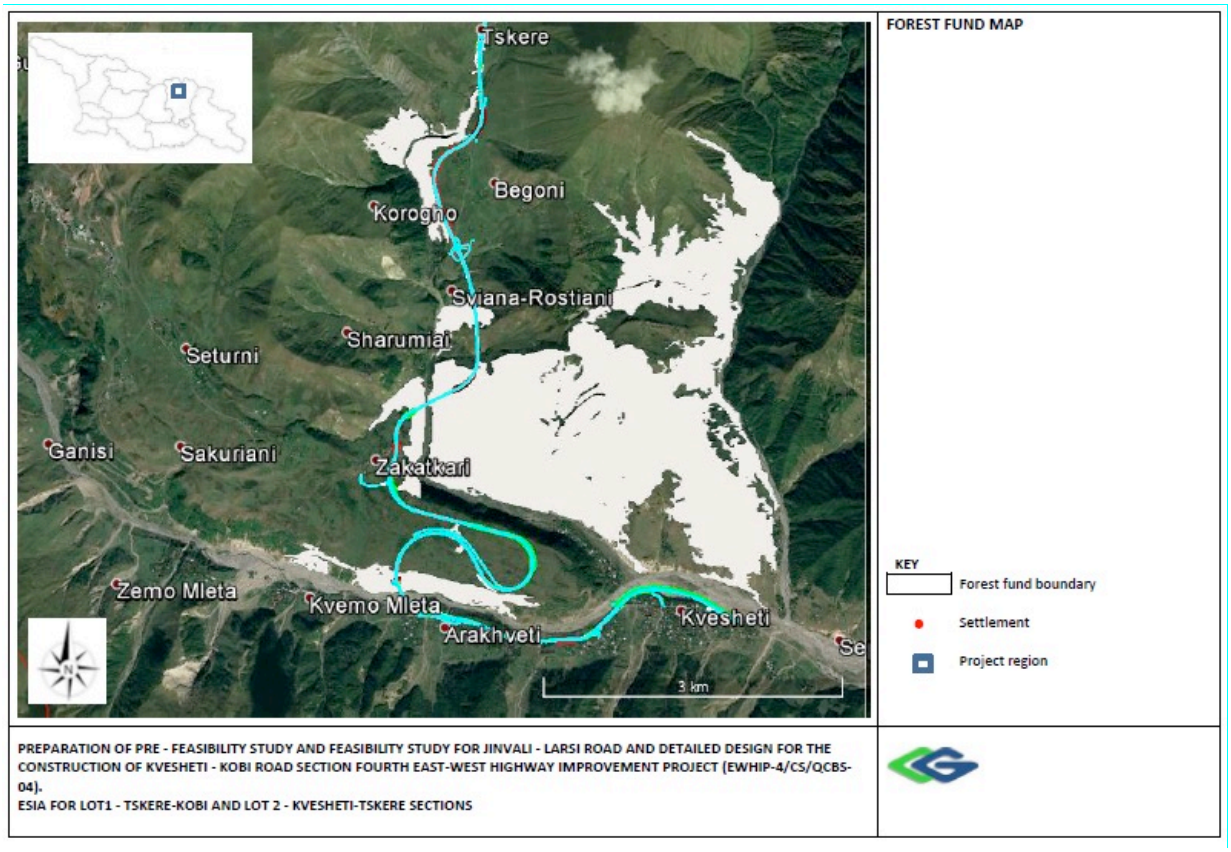
654. The State Forest Fund (SFF) is a state-managed/controlled forest area under the management of the MoEPA but is not a protected area. Though it is not protected, for the purpose of controlling its use, the MoEPA requires all trees to be taken off the SFF registration or "de-listed" before they can be cut.

655. The Project buffer has been surveyed to determine the extent of the SFF that will be affected by the Project. 14 plots have been studied. The list of species by plots is listed in Table 75.

656. In total 20 species have been registered. *Populus tremula, Alnus incana, Corylus 244iltshir* dominate the inventory. No protected species have been registered.

657. Along with other species in the Mtiuletis Aragvi and Khada valley, spruce – *Picea orientalis* (individual trees and small patches) can be found. These trees are met on the south slope of the Greater Caucasus. The area represents the edge periphery of the habitat for this species. The plant population is vulnerable. However, none of these species are in direct impact zone of the Project, e.g. the buffer. The following figure shows the approximate areas of the Forest Fund.

Figure 109: Forest Fund Map



658. Details relating to the financial compensation for tree cutting according to national legislation is included in **Section F**. In addition, ADB and EBRD requirements will be applied to ensure 'no net loss' of habitat as outlined in **Section F**.

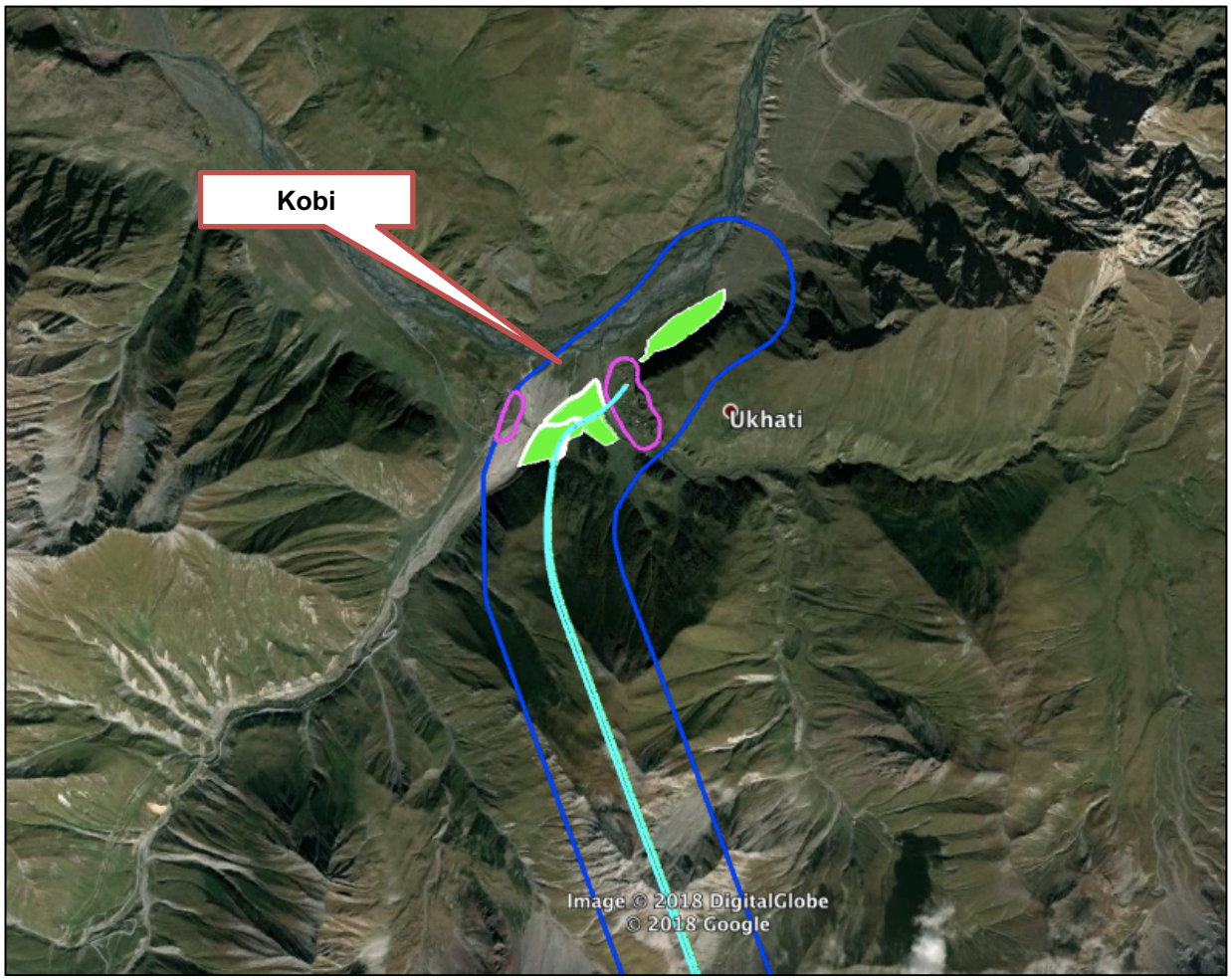
Table 75: Summary of State Forest Fund Inventory

#	Common name	Latin name	Plot #													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Common medlar	*Mespilus germanica*	1		1		7	3								
2	Common hazel	*Corylus avellana*	998	15	14		1026	1563		114	4	4	8	2		3
3	European ash	*Fraxinus excelsior;Fraxinus americana*	15	1			35	1					2			
4	Hawthorn	*Crataegus kyrtostyla*	11	2			22	6								
5	Litwinow's birch	*Betula litwinowii*	5		1			14			2	1	1			3
6	European aspen	*Populus tremula*	23			1	82	33			1		1	55		
7	Grey alder	*Alnus incana*	26	2	51			422	146	73		3				
8	Caucasian pear	*Pyrus caucasica*	6	3	3		13	4		5				6		
9	Common hornbeam	*Carpinus caucasica*	7	1			12	6								
10	Cherry plum	*Prunus divaricata*	1	2			10	2				1	1	2		
11	Georgian oak	*Quercus iberica*	4					1			1	1	1			
12	Red dogwood	*Thelycrania australis*	2													
13	Field maple	*Acer campestre*	27				46	10								
14	Alder buckthorn	*Frangula alnus*	1													
15	Rowan-tree	*Sorbus caucasigena*		4	2						3	1	3			1
16	Sweet cherry	*Cerasus silvestris*			1	1	8	2					1			
17	Caucasian maple	*Acer laetum*				2										
18	Oriental beech	*Fagus orientalis*						72					1			
19	Goat willow	*Salix caprea*								43	13	6	14	37	4	9
20	Sycamore maple	*Acer pseudoplatanus*								9			1	2		
	Total		**1127**	**29**	**73**	**5**	**1261**	**2139**	**146**	**244**	**24**	**17**	**34**	**104**	**4**	**16**

E.3 Economic Environment

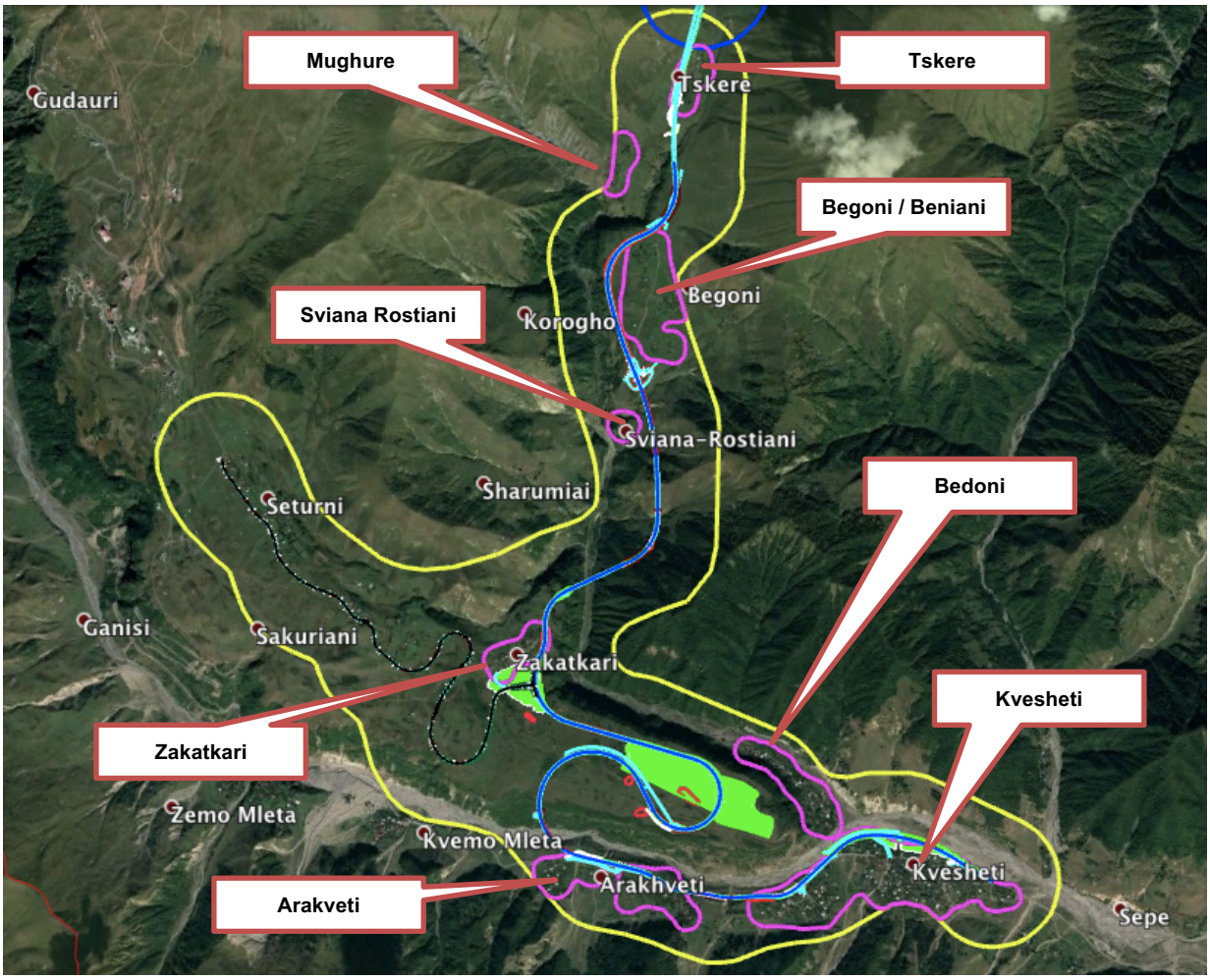
659. This section describes the existing economic environment status of the Project area. It has been developed through a combination of stakeholder engagement and primary and secondary data gathering and analysis, including household surveys, focus group discussions and key informant interviews in the Project Area. This includes research relevant to: (1) the national level; (2) the region Mtskheta-Mtianeti; (3) the municipalities Dusheti and Kazbegi; and (4) with affected villages. Further information on the methodology and people involved in the work is provided in **Appendix H** to this EIA. The following maps show the villages in the Project area (with a 100-meter buffer). These villages, are also mapped in more detail as **Appendix U**.

Figure 110: Villages in the Project Area (Lot 1)



Key: Blue line: Lot 1 General Project Area / Turquoise line: Project road / Purple line: Village / Green area: Spoil disposal site
Note: Kobi refers to both identified village areas.

Figure 111: Villages in the Project Area (Lot 2)



Key: Yellow line: Lot 2 General Project Area / Turquoise line: Project road / Purple line: Village / Green area: Spoil disposal site / Black line: Gudauri Access road
Note: Although Gudauri access road is included in the General Project Area it has not been studied in detail as part of this version of the EIA, and as such the villages in this area have not been assessed to date.

E.3.1 Local Economy

660. Georgia has a GDP of USD $14.2 billion, or GDP per capita of USD $3,842.40, and ranks 67th of 137 on the Global Competitiveness Index (2017-18)73. In 2006-07, the national economy was strengthened with inflows of foreign investment, remittances and government spending, however slowed after both the 2008 conflict with Russia and 2009 global financial crisis. Foreign direct investment was renewed from 2010-17, however the country's economic position has not fully recovered to pre-2008 levels. Unemployment remains high. Georgia meets the majority of its electricity needs through domestic hydropower supplies, however imports almost all of its natural gas and oil products now via Azerbaijan rather than relying only on Russian imports. Using its strategic location between Europe and Asia, Georgia's strategy is to develop as a hub for goods transit. Also, it intends to build up infrastructure and international trade, establishing the supporting conditions for private sector development and entrepreneurship, while also providing for basic social guarantees and reducing unemployment, with a focus on transportation projects, tourism, hydropower, and agriculture.[74]

[73] World Economic Forum, Global Competitiveness Index (2017-18)
[74] "Georgia 2020" Social-economic Development Strategy of Georgia, Government of Georgia (2014)

661. Nationally, Georgia's GDP composition by sector (2017 estimates) is comprised of: agriculture: 9.6%; industry: 23.4%; and services: 66.2%. Agricultural products include citrus, grapes, tea, hazelnuts, vegetables; and livestock, while industries of significance to the national economy include: steel, machine tools, electrical appliances, mining (manganese, copper, gold), chemicals, wood products, and wine. The estimated 2017 industrial production growth rate was 7%.[75]

662. In 2016 in Mtskheta-Mtianeti region there were 2,738 active business enterprises (of 158,173 nationally, i.e. contributing just less than 2%). Regional enterprises were registered as employing 6,034 people, or 1% of the 601,905 people employed by enterprises nationally. Enterprise birth rate in the Mtskheta-Mtianeti region is slightly higher than the national average of 20.2%, at 22.2% annually. Further, the region is losing businesses at a lower rate than the national average, with an enterprise death rate of 13.0% compared to the national 14.1% per annum.[76] There has been no analysis for the reasons for this however it may be due to tourism potential in this region. The economic centers closest to the Project are: Stephantsminda (the capital city of Kazbegi region) and Dusheti (the capital city of Dusheti region).

E.3.1.1 Agriculture, Livestock and Apiary

663. Kazbegi municipality is a cold-climate region, shaping the local agricultural opportunities. Traditional branches of agriculture in Kazbegi municipality are sheep/cattle farming and potato production. However, due to the climate and limited land for cultivation, agriculture is less developed than in other areas of the country and further, it lacks processing enterprises such as dairy processing.

664. Cattle breeding remains a dominant agricultural activity despite low productivity, and is conducted according to traditional, nomadic practices[77].

665. Georgian pastures are owned by the state and are pastured under a regime of free access, and in most regions of Georgia, pasture-based activities oriented at self-sufficiency rather than at cash generation. In regions of Georgia in which production alternatives for pasturelands are scarce, livestock farming remains of high economic importance for the regional economy. As the physical environment in the high mountain areas (of Kazbegi and Dusheti municipalities) do not lend themselves to cropping, livestock husbandry remains the most important economic activity for households, however does not generate significant cash for household, therefore limiting potential to invest in pastureland management/other livestock improvement measures[78]. Formerly, sheep breeding was also significant however due to limited areas of pasture, the number of sheep has declined with now only approximately 10% of households keeping sheep. Other livestock in the municipality include poultry (kept by 58% of households), and pigs, while apiary (bee-keeping) is a niche occupation in rural Kazbegi providing a high financial efficiency due to a higher return for honey products.

666. The average household plot size in Kazbegi is 0.43 ha., and the majority of households cultivate potatoes (85–90%), almost half of the households cultivate herbs and a few cultivate vegetables (beans, cucumbers, tomatoes). The produce is reported by households to be predominantly for subsistence/household consumption, with excess sold for income generation when excess is available. Wheat, oat and other grain are seldom produced.

[75] CIA World Fact Book Georgia https://www.cia.gov/library/publications/the-world-factbook/geos/gg.html (last updated: 12 June 2018)
[76] CIA World Fact Book Georgia https://www.cia.gov/library/publications/the-world-factbook/geos/gg.html (last updated: 12 June 2018)
[77] It should be noted that there are differing views on nomadism in Georgia, with some commentators considering that there are very few truly nomadic families in Georgia, rather, that shepherds participating in annual transhumance are not nomadic but instead employees of the process. Ref: Raaflaub and Dobry, Pasture Management in Georgia, Swiss Agency for Development Cooperation (2015).
[78] Raaflaub and Dobry, Pasture Management in Georgia, Swiss Agency for Development Cooperation (2015)

667. The region is known for its numerous herbs, plants and berries of medicinal and kitchen value. Medical plants are being used in traditional medicine and rarely marketed. Kitchen herbs are used for household consumption only.

668. In contrast, the agricultural lands of Dusheti municipality are mainly located in lower elevation areas. Crops are typically grown in the lower zones of Dusheti, while higher elevation areas support cattle breeding.

669. According to consultations undertaken as part of the FGDs products are sold in different areas. In Kobi and Khada hotels in Gudauri are buying their goods and in some cases people sends products to Tbilisi for sale.

670. Households engaged in the Project area indicated that agriculture, livestock and apiary are all activities in which they are engaged. Focus group discussions indicated that livestock is the primary financial source for households, while agricultural and apiary activities are generally undertaken for subsistence with excess produce sold for profit. The results of the household survey are shown in the following tables, with Table 76 indicating the number of households growing crops:

Table 76: Crops

Name of Villages	Interviewed Families	Corn	Fruit	Potatoes	Vegetables	Walnut / hazelnut	Grapes	Hay	Other
Arakveti	23	0	13	21	11	2	0	0	0
Begoni	6	1	1	6	5	1	1	1	0
Benian	9	0	0	10	2	0	0	8	0
Gomurni	1	0	0	1	0	0	0	0	0
Zakatkari	13	0	0	13	11	0	0	0	0
Iukho	1	0	0	1	0	0	0	0	0
Kobi	3	0	0	2	0	0	0	0	0
Sviana-Rostiani	3	0	0	0	0	0	0	0	0
Seturni	6	0	1	4	2	0	0	0	0
Kvemo Mleta	14	0	3	9	8	0	0	0	0
Kvesheti	44	2	4	32	22	2	2	0	0
Gudauri (kumliscikhe)	6	0	4	3	1	0	0	0	0
Tskere	7	0	0	7	1	0	0	1	0

671. Below in Table 77 is given information about the number of households that own livestock.

Table 77: Livestock

Name of Villages	Interviewed Families	Livestock					
		Cow / Ox , Buffalo	Horse / donkey	Pigs	Sheep	Chicken / turkey	Other
Arakveti	23	22	0	0	0	52	0
Begoni	6	11	0	0	0	62	0
Benian	9	19	0	0	0	2	0
Gomurni	1	2	0	0	0	0	0
Zakatkari	13	26	1	0	0	13	0
Iukho	1	0	0	0	0	0	0
Kobi	3	12	0	0	0	0	0

Name of Villages	Interviewed Families	Livestock					
		Cow / Ox , Buffalo	Horse / donkey	Pigs	Sheep	Chicken / turkey	Other
Sviana-Rostiani	3	0	0	0	0	0	0
Seturni	6	4	0	0	0	4	0
Kvemo Mleta	14	12	0	0	0	60	0
Kvesheti	44	24	0	6	0	156	0
Gudauri (kumliscikhe)	6	10	0	0	0	15	0
Tskere	7	1	0	0	0	3	0

672. Table 78 provides responses from families in the Project Area who sell products. Despite none of the families indicating agriculture as source of income, 19 families (14%) are selling at least one of the products listed below.

Table 78: Selling of products

Name of Villages	Interviewed Families	Product Sell							
		Dairy product	Honey	Handmade items	Fruits	Vegetable	Flour	hay	sheep
Arakveti	23	0	0	0	0	0	0	0	0
Begoni	6	1	0	0	0	0	1	1	1
Beniani	9	0	0	0	0	0	0	8	0
Gomurni	1	0	0	0	0	0	0	0	0
Zakatkari	13	1	0	0	0	1	0	0	0
Iukho	1	0	0	0	0	0	0	0	0
Kobi	3	0	0	0	0	0	0	0	0
Sviana-Rostiani	3	0	0	0	0	0	0	0	0
Seturni	6	0	0	0	0	0	0	0	0
Kvemo Mleta	14	0	0	0	0	0	0	0	0
Kvesheti	44	0	2	1	0	0	0	0	0
Gudauri (kumliscikhe)	6	1	0	0	0	0	0	0	0
Tskere	7	0	0	0	0	0	0	1	0
Total	**136**	**3**	**2**	**1**	**0**	**1**	**1**	**10**	**1**

673. It was reported by stakeholders that cattle and other livestock crossing points are currently not managed; shepherds are not necessarily present to ensure safe crossing points. There are no specific crossing sites or underpasses on the current road. The community maps generated through baseline Focus Group Discussions indicate areas of grazing and some of the preferred areas for crossing, i.e. where bridges make river crossings possible.

674. The main crossing point to access the river in Kvesheti is located at the end of a small dirt road running from the existing main road through the village (past the St George niche). Other crossing points are reported to be less formal as they do not specifically link to any other infrastructure (e.g. bridges).

675. The focus group discussions with communities carried out during the consultation process included the preparation of Community Maps. During these facilitated discussions, participants were asked to indicate on the maps key features associated with their villages. These included features such as pasture/grazing areas, water catchment areas, areas for collection of natural resources, significant local social structures (e.g. cemeteries or monuments), and other infrastructure (such as gas pipelines, or spring water supply pipes). These maps have been digitised and are presented below, see Figure 113 and Figure 114 (originals provided by **Appendix J**).

Figure 112: Community Mapping

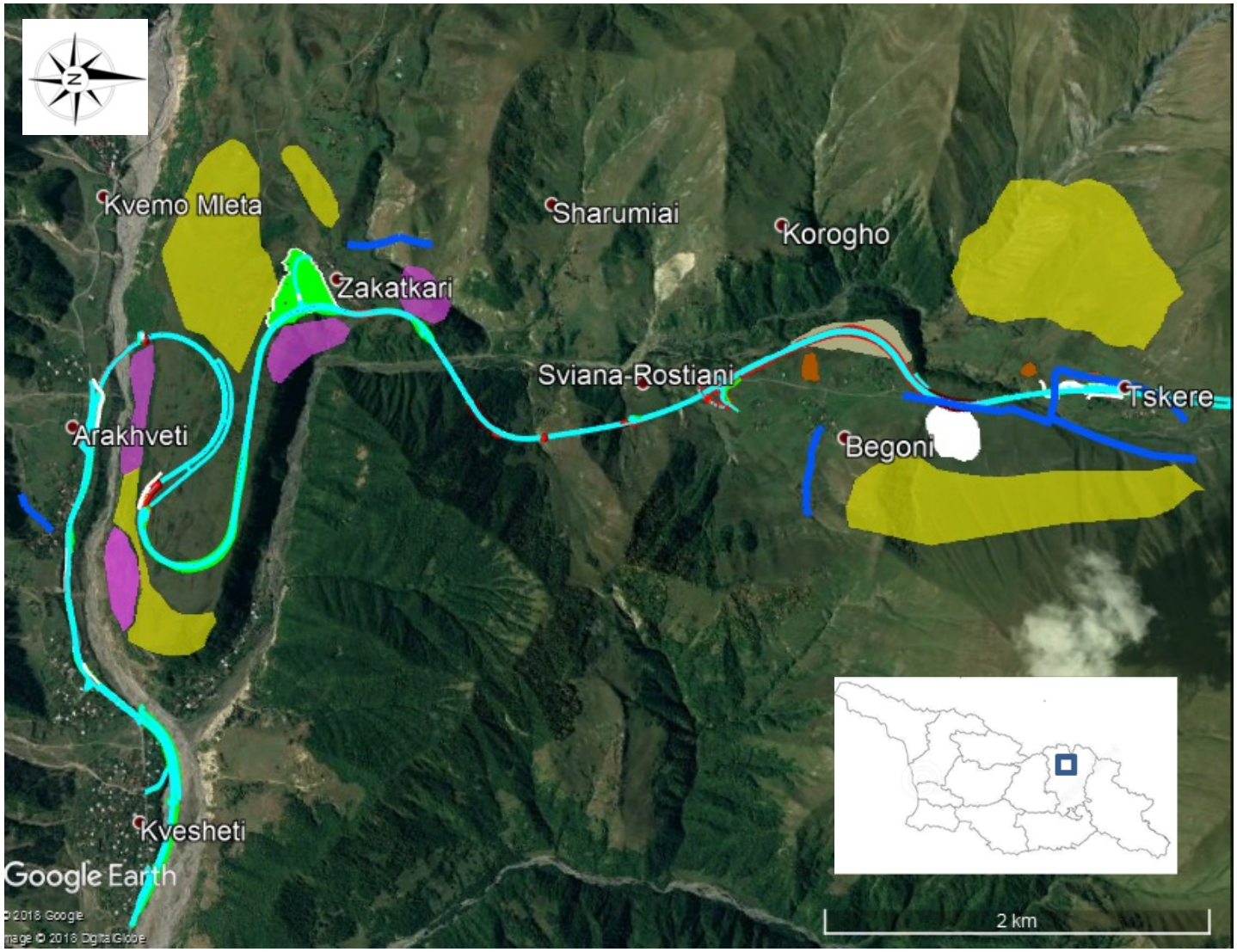
676. Grazing areas were described in each of the Community Mapping processes. In Kvesheti, the grazing areas are located to the west, at higher elevations above the village. Additionally, grazing is carried out on the opposite bank of the river, accessed via the existing bridge to the north-east of the village.

677. According to the original community maps in **Appendix J** (although not visible on the maps above) in the Arakveti-Zakatkari map, an existing small bridge can be seen that crosses the river east to the Arakveti village's pasture area. A track for movement of livestock and people from the bridge rises up (above the Bedoni village) to the plateau, used for grazing. The Zakatkari grazing area is located surrounding the village, to the west, north and east of that village.

678. The Bedoni community map additionally indicates that their grazing area is located above the forested area on the plateau. The Beniani-Begoni Plateau community map indicates the grazing area is elevated behind Beniani-Begoni, a steeper area above that which historically had been arable land adjacent to the existing road. Hay areas are located on the flatter land of the plateau, between the village and the gorge/river.

679. For Tskere and Mughere, the grazing area is on the north-west side of the proposed road, at elevations higher than the villages. For Kobi, the grazing areas are located in the valley alongside the tributary, south of the village.

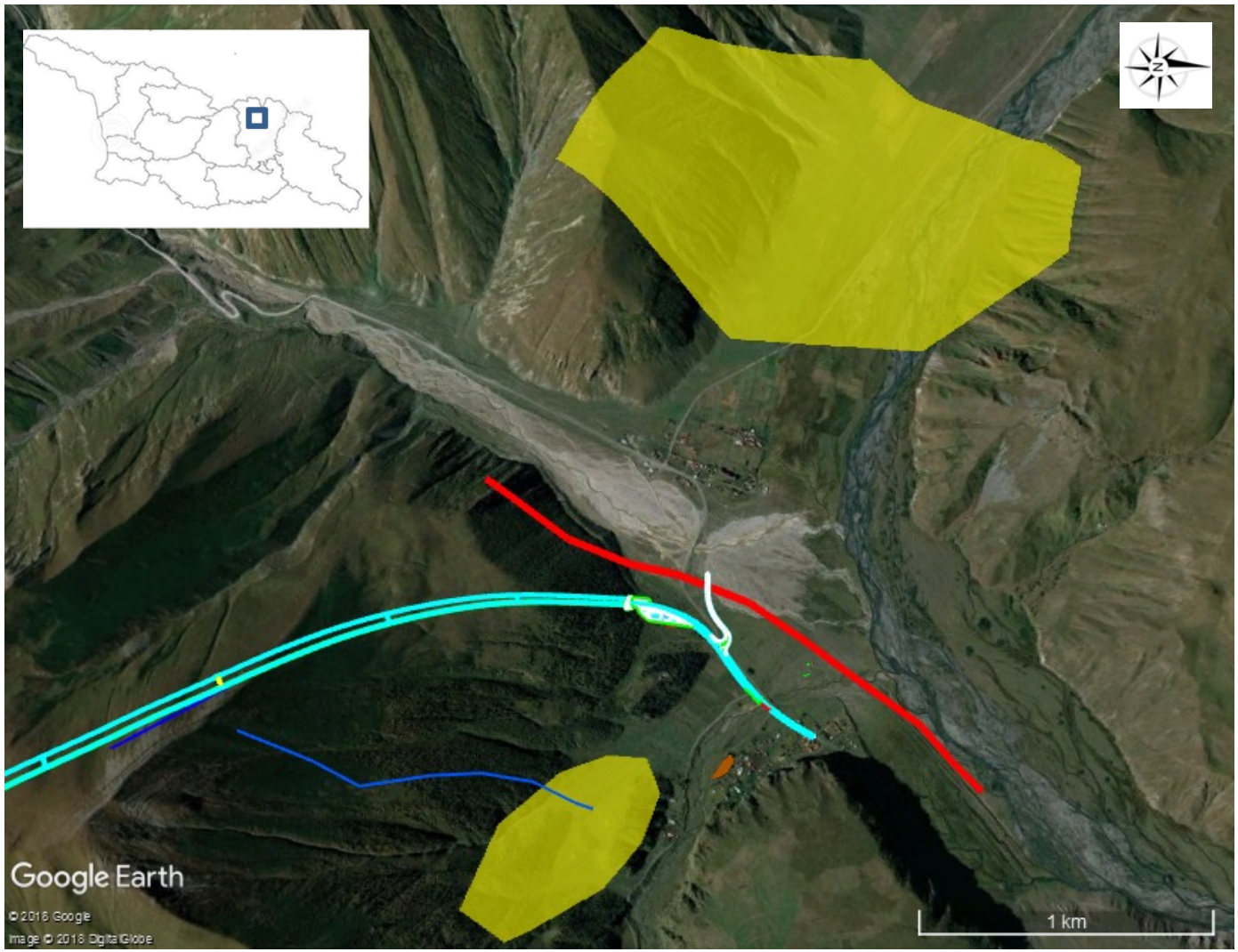
Figure 113: Community Map (Lot 2)



KEY

- Pastures
- Fruit, hazelnut collection areas
- Mowing area
- Avalanche area
- Cemetery
- Water pipe
- Project Road

Figure 114: Community Map (Lot 1)



KEY

- Pastures
- Cemetery
- Water pipe
- Gas pipeline
- Project Road

680. As noted in the community maps, Zakatkari will be cut off from the Khadistskali river below the village and the fruit and nut trees that are harvested in the area between the river and the village. According to the design there is no access to this area from the village planned, the only alternative route being a 2km walk around down into the valley and back under the arch bridge.

E.3.1.2 Industry

681. The value of exports nationally in Georgia nationally have been increasing, from $2.831 billion (2016 est.) to $3.533 billion (2017 est.), ranking the nation at 121st in the world for export value. Commodities exported include vehicles, ferro-alloys, fertilizers, nuts, scrap metal, gold, and copper ores, and based on 2016 data, Georgia's export partners are predominantly neighbors Russia (9.8% of export value) and Turkey (8.2%), followed by China (8.1%), Bulgaria (7.3%), Azerbaijan (7.3%), Armenia (7.2%), and Germany (4.1%).

682. Imports values eclipse export values, and are also increasing from $6.64 billion (2016 est.) to $7.846 billion (2017 est.), placing Georgia at 108th in the world for value of imports. Imported commodities include fuels, vehicles, machinery and parts, grain and other foods, and pharmaceuticals. Import partners are similar to those with whom Georgia maintains export relationships, with the exception of Canada, whose contribution dominates at 18.6% of the total value of imports. Based on 2016 data, other import partners are Turkey (14%), Russia (7%), Ireland (6.5%), China (5.7%), Azerbaijan (5.1%), Germany (4.4%) and the Ukraine (4.3%)[79].

683. At the local level, the industrial sectors in Dusheti and Kazbegi are not developed.

E.3.1.3 Tourism and Service sector

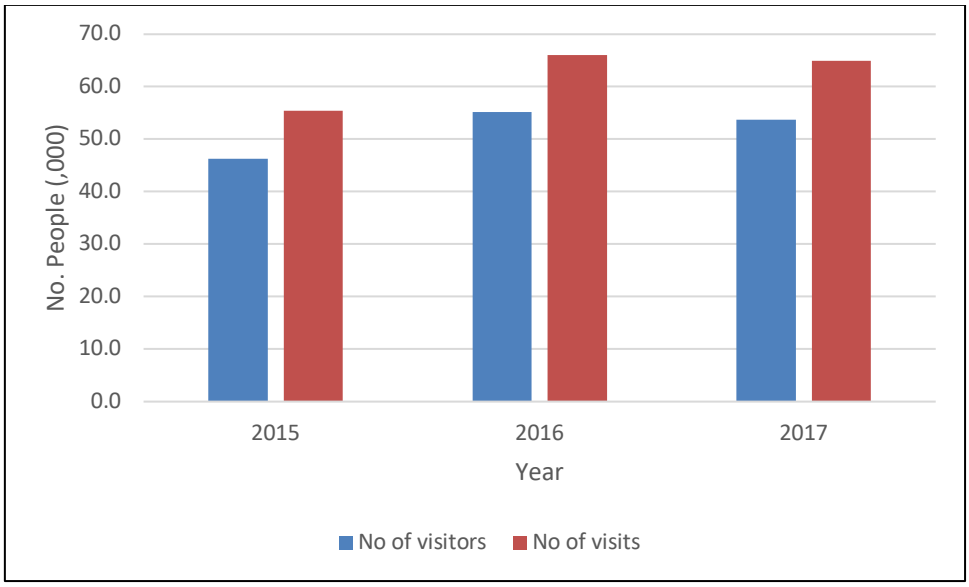
684. At the national level, tourism in 2017 performed better than in previous years, with a 27% spike in the sector's contribution to GDP[80]. Travel and tourism in 2016 contributed direct GDP growth of 3.1% and supported 6 million net additional jobs in the sector[81].

685. According to official statistics [82] 50% of international trips were to the capital city of Georgia, followed by 29.7% of trips to Batumi. Other destinations had a lower number of visits. Among the most popular destinations were Marneuli (13.5%) and Kazbegi (7.5%). Other destinations included: Mtskheta (6.6%), Gudauri (5.5%), Kutaisi (5.1%), Signagi (4.5%), Borjomi (4.2%) and Kobuleti (3.6%). The number of visitors registered in protected areas in 2017 was 954,692. Compared to the previous year, this was a growth rate 29.9%. Out of the total number of visitors, 43.2% were foreigners. The number of foreign visitors in protected areas compared to the previous year was a growth rate of 32.9%. The majority of international visitors were Russians – 28.7%, Israeli – 13.6%, Polish – 7.5%, Ukrainian – 6.4%, and Germans – 4.5%. In 2017, income from tourism services in protected areas was 4,504,473 Gel, a growth rate of 94.7%. Kazbegi National Park ranked second with 154,085 (16.1%) visitors.

686. Domestic tourism increased in the Mtskheta-Mtianeti Region between 2015 and 2016, but slowed down slightly between 2016 and 2017.

[79] CIA World Fact Book Georgia https://www.cia.gov/library/publications/the-world-factbook/geos/gg.html (last updated: 12 June 2018)
[80] World Bank, Georgia (http://www.worldbank.org/en/country/georgia/overview#3, last updated: Apr 17, 2018)
[81] https://www.wttc.org/-/media/files/reports/economic-impact-research/countries-2017/georgia2017.pdf
[82] Georgian National Tourism Administration yearbook, 2017

Figure 115: Domestic Tourism in Mtskheta-Mtianeti Region



Source: Geostat (2018)

687. In particular, the region describes the mountainous territories and foothills of Mtskheta-Mtianeti as areas of interest for, and potential further development of, the tourism industry. Development of different kinds of tourism are proposed, including: cultural, pilgrim, archaeological, adventure, ecotourism, agritourism, mountain-skiing, business tourism, educational tourism, and extreme tourism. Infrastructure development is identified as a condition for further tourism enhancement[83].

688. The Kazbegi municipality is one of the more developed and popular tourist destinations in Georgia, for both domestic and international tourism. Destinations of interest include the Gudauri winter resort, located within the Project area, along with Kazbegi National Park, Kazbegi travertines and natural monuments, Mount Kazbegi, Gergeti Church of Holy Trinity, and a number of other natural features of interest for outdoor recreation such as horse riding and hiking.

689. In the Dusheti municipality there are several resorts and tourism sites including Pasanauri, Chargali, Ananuri, and Bazaleti, while the Aragvi River between Aragvi and Manaseuri is used for rafting in periods of lower flow.

690. It was reported during stakeholder engagement that roadside markets provide some economic opportunities for local people, for example through selling handcrafts, wild produce and honey. In the past, there had been a requirement for SME registration, however this is not strictly required currently. There is an interest from local authorities to strengthen formalization of market activities, particularly in the case where food products are sold. There are no specific market areas along the existing alignment through the Khada Valley. Residents in Kobi reported an interest in establishing a market area beside the road. The existing alignment coming into the village is elevated, which residents reported made it difficult to encourage traffic to stop in the town to use any facilities or shops. Residents in the Focus Group Discussion cited an interest in using spoil to level an area beside the road which could be used for creating a market area.

E.3.1.4 Household income and expenditure

691. The average monthly salary in Georgia was 999.1 GEL in in 2017. Georgia's top three highest-paying occupations were in the fields of financial intermediation (1,405 GEL), mining and quarrying (1,310.2 GEL) and production and distribution of electricity, gas, and water (1,295

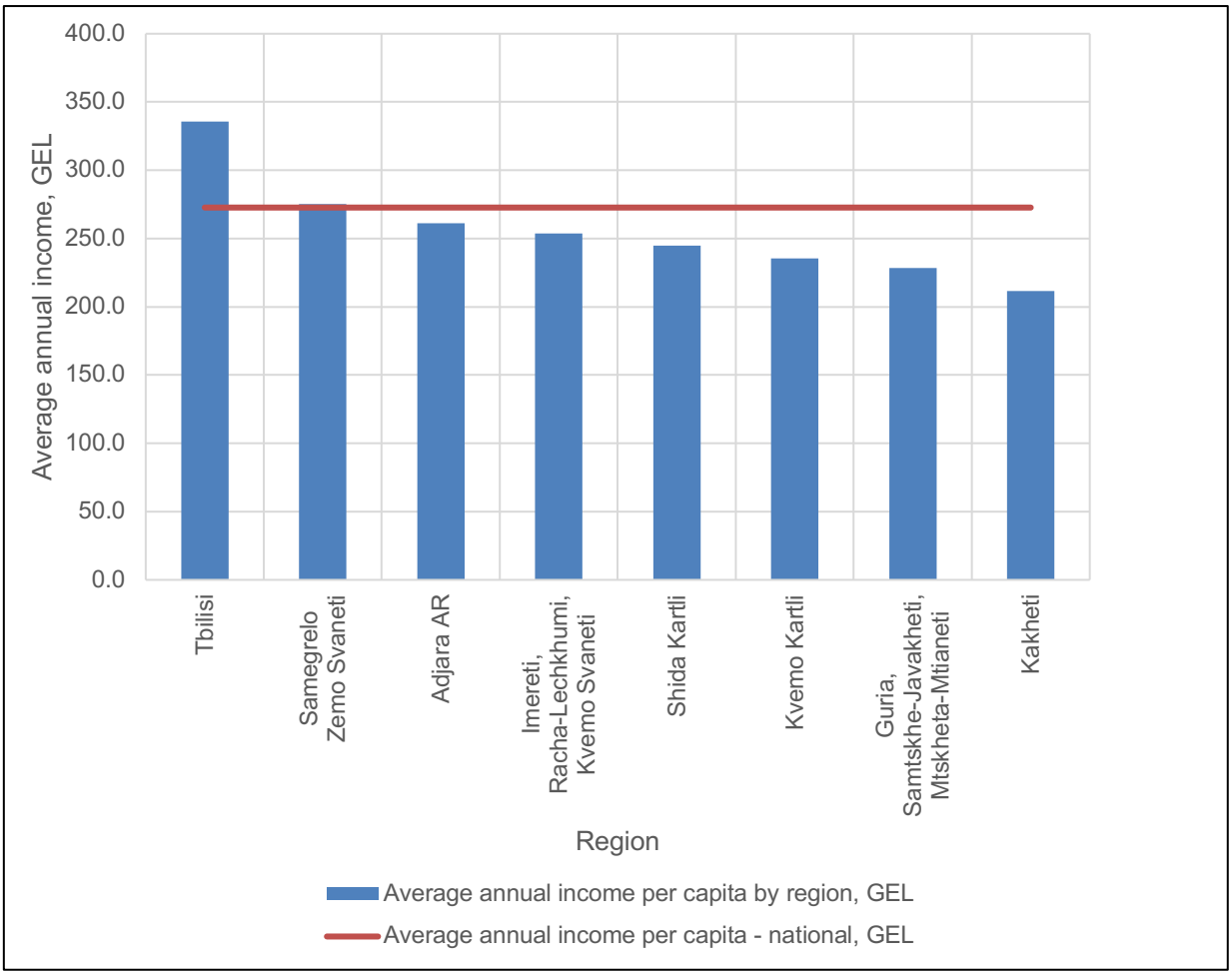
[83] State Representative - Governor of Mtskheta-Mtianeti (2018) (http://www.mtskheta-mtianeti.gov.ge/page/full/18/Economics)

GEL). The minimum subsistence level for a working age male in November 2017 was 175.7 GEL. (Source: Geostat)

692. Average monthly income per household in Georgia and Mtskheta-Mtianeti region in 2017 was 954.8 GEL and 964.8 GEL, whereas expenses per household were 807.8 and 677.3 respectively.

693. A household survey was undertaken during the course of social baseline studies. This revealed that the majority of income in the Project area comes from pensions, particularly in the Khada Valley (pensions being the main source of income for 52% of respondents), followed by wages from salaries, particularly in villages located along the existing road (the main income source for 43% of respondents). Average monthly income is lower compared to the average national. The regions is ranked seventh by per capita monthly income (see Figure 116)

Figure 116: Average annual per capita income by regions



694. Table 79 below shows sources of income indicated by interviewed households. All data is self-reported by household participants during the surveys. Despite as shown in Table 79: Source of Income, where households reported the sale of agricultural products, during Focus Group Discussions, households indicated that they do not consider the bartering or small exchanges of money for agricultural products between family and neighbors as 'income', hence no reported income for Agriculture in Table 79. As part of the focus group discussions one participant claimed that he let out his river facing yard to backpackers for camping. No information about income from this activity was provided.

Table 79: Source of Income

Name of Village	Source of Income							
	Wage salary	From Rent	Self-employment	Agriculture	Remittance	Pensions	Money Borrowing	Other
Arakveti	15	0	0	0	1	13	0	0
Begoni	2	0	0	0	0	4	0	0
Beniani	2	0	2	0	0	4	0	0
Gomurni	0	0	0	0	0	1	0	0
Zakatkari	7	0	1	0	0	5	0	0
Iukho	0	0	0	0	0	0	0	0
Kobi	1	0	0	0	0	3	0	0
Sviana-Rostiani	0	0	0	0	0	2	0	0
Seturni	4	0	0	0	0	2	0	0
Kvemo Mleta	5	0	1	0	0	9	0	0
Kvesheti	62	0	5	0	2	72	0	0
Gudauri (Kumliscikhe)	3	0	0	0	0	1	0	0
Tskere	0	0	0	0	0	6	0	0
Total	**101**	**0**	**9**	**0**	**3**	**122**	**0**	**0**

695. Table 80 shows the class of income and reveals that 70% of survey respondents receive less than 600 GEL per month. Higher classes of income greater than 1000 GEL per month are received only in Kvesheti and Arakveti (6% of survey respondents), rather than in the Khada Valley (none of the survey respondents).

Table 80: Class of Income

Name of village	Total number of Households	Class of Monthly income			
		UP to 300 GEL	From 305 to 600	From 605 to 1000	from 1005 over
Arakveti	23	2	5	6	3
Begoni	6	1	2	1	0
Beniani	9	4	3	0	0
Gomurni	1	1	0	0	0
Zakatkari	13	4	3	3	0
Iukho	1	0	0	0	0
Kobi	3	0	1	1	0
Sviana-Rostiani	3	1	1	0	0
Seturni	6	3	1	1	0
Kvemo Mleta	14	5	3	3	0
Kvesheti	44	13	13	9	3
Gudauri	6	0	2	2	0
Tskere	7	4	2	0	0
Total	**136**	**38**	**36**	**26**	**6**

696. Of the interviewed households, 27 of 136 have a loan, with 18% from banks and 2% from microfinance organizations. These are the only loan sources disclosed by survey participants. Detailed information is shown in Table 80 below.

Table 81: Sources of household loans

Name of the village	Bank	Microfinance Organization	Other
Arakveti	7	1	0
Begoni	0	0	0
Beniani	0	0	0
Gomurni	0	0	0
Zakatkari	5	0	0
Iukho	0	0	0
Kobi	0	0	0
Sviana-Rostiani	0	0	0
Seturni	1	0	0
Kvemo Mleta	1	1	0
Kvesheti	6	1	0
Gudauri (kumliscikhe)	4	0	0
Tskere	0	0	0
Total	**24**	**3**	**0**

E.3.2 Employment and Livelihoods

E.3.2.1 Labor Participation

697. The Georgian national labor force was estimates in 2018 as 3012.3 thousand. By occupation, the top 5 sectors include agriculture and fisheries (43.1%), trade and maintenance (10%), education (9.16%), industry (8.3%), administration, defense and social care (5.18%). Unemployment rate in 2017 was estimated as 13.9% slightly down from the 2016 estimate 14%. In Mtskheta Mtianeti decrease in unemployment was the least (0.4%) compared to other regions.

698. In urban areas employment level, compared to 2016, decreased by 1.5%, whereas in rural settlements an increase by 0.8% was registered. The share of self-employed that traditionally was high is gradually reducing. In 2017 the percentage of self-employed population was 51.7%, 15% lower against the previous year.

699. Traditionally unemployment is higher among men. In 2017 the unemployment rate for men was 2.3% higher compared to women. [84]

700. The World Economic Forum reports that challenges in doing business in Georgia include sourcing an adequately educated workforce.[85] Feedback from key informant interviews with local government representatives [86] is that there is a strong interest to secure work for local people in the Project.

E.3.2.2 Household Members' Employment

701. In comparison with other nations in the Europe and Central Asia region, unemployment rates remain high in Georgia since a period of stagnation from 2016. According to a national household survey covering both the formal and informal sectors, the overall unemployment rate declined from 14.6% in 2013 to 11.8% in 2016. The decline in job creation since 2016 has had a negative effect on poverty reduction. Inequality, as measured by the Gini coefficient, has

[84] Geostat, http://www.geostat.ge

85 World Economic Forum, Executive Opinion Survey (2017), in Global Competitiveness Ranking (2017-18), where Georgia ranked 17.3 out of 20 for most problematic factor.

86 Refer also to stakeholder engagement notes in Section H; interviews with Dusheti and Kazbegi deputy mayors.

fallen only marginally from a peak of 42 points in 2010 to close to 39 in 2016 (using the consumption aggregate used for international poverty comparison).[87]

702. In a survey undertaken at the municipal level in 2015, 57% of the Kazbegi population consider themselves unemployed, while a large number are employed in the public sector, and the remainder self-employed. Self-employment was reported to be thriving: in Stephantsminda, 36% of households said that they have a local business (typically a guest-house or a driver service). In addition, 46% of households reported that they have taken out loans, mostly to expand their businesses, renovating a house or buying a 4x4 vehicle. In contrast, the largest employers in the municipality are schools and kindergartens, special emergency services, hotels, the hydro-electric plant and the border police. The research showed that in Stephantsminda, there are as many private employers as public sector employees[88].

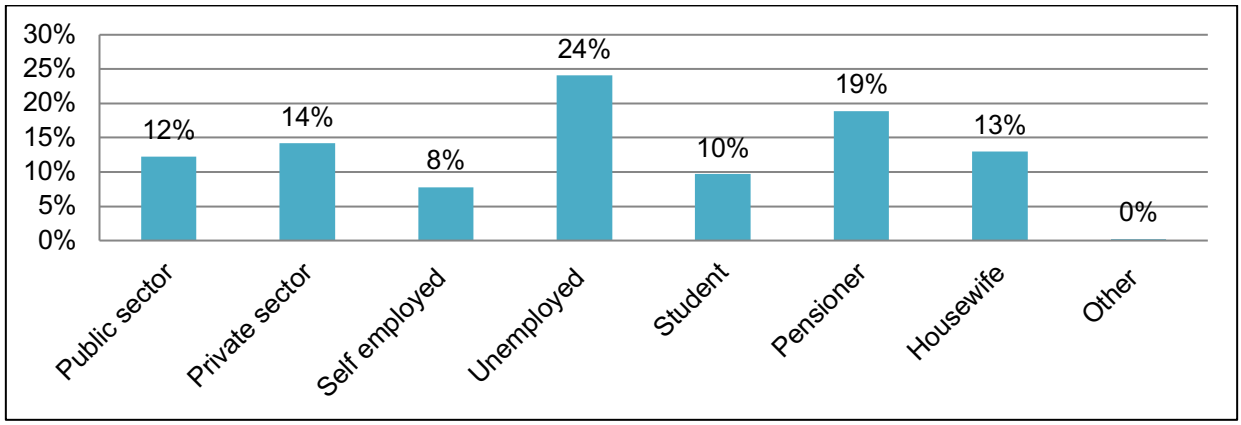
703. In Dusheti municipality, there are 30 enterprises and organizations that employ 215 people, while the majority of the economically active population is self-employed. Approximately one third of households have one source of income, and for most households this is obtained through farming-related activities[89].

704. The Social Services Agency collects data on households receiving benefits. Numbers of households who receive such benefits are described in Section E.4 (Population).

705. Table 79 above indicates that wage-earning salaries are obtained by 43 % of household survey respondents, while just 4% of respondents are self-employed.

706. According to the survey results on employment status collected from households in the Project area during primary research for this study, 26% of surveyed people are employed, almost 24% are unemployed, 13% are housewives [90], 10% are students or pupils, and 19% are pensioners. Figure 117 provides percentage distribution of population according to employment status.

Figure 117: Employment status of Surveyed Household members



E.3.2.3 Youth Employment

707. Results from focus group discussions in the Project area indicated that after their schooling, young men and women leave more remote locations in order to secure work opportunities as these are generally lacking in the Project area, in particular the Khada Valley.

[87] World Bank, Georgia (http://www.worldbank.org/en/country/georgia/overview#3, last updated: Apr 17, 2018)
[88] The Overview of Kazbegi General Development Potential: Baseline Study, People in Need/GeoWel (2016) http://www.kazbegilag.ge/templates/default/widgets/eng/uploads/The%20Overview%20%20of%20Kazbegi%20General%20Development%20Potential.pdf
[89] Pers. Comm., with Dusheti municipality
[90] Women who take care of the running of the household identify as 'housewives' not unemployed.

This migration contributes to the aged population in the Khada Valley, and higher youth employment in the larger centers in the Project Area, such as Kvesheti.

708. According to data collected as part of the FGDs, youth in the Project area who are mostly working in Gudauri. Most work is seasonal, in the summer they are working with tourists as drivers, guides, etc.

E.3.3 Social Infrastructure

E.3.3.1 Accommodation

709. Accommodation in the Project area is typically constructed of stone and/or wood and in villages, co-located with animal shelters, vegetable gardens and other structures. Photos of a sample of houses in the Project area are presented in Figure 118 below.

710. In many villages remain a number of temporarily occupied, or abandoned, houses. In the Kobi area, 4 of 18 villages have permanent occupants (i.e. 78% are abandoned or have semi-permanent occupancy), while in Kvesheti region, 7 of 31 villages are permanently occupied (i.e. 77% are abandoned or have semi-permanent occupancy). This status limits investment in accommodation improvements and social infrastructure support to smaller villages. Village occupancy is described further in the Population section.

Figure 118: Examples of accommodation in the Project Area (Tskere)

711. In the Project area most families have their own residential area, where usually they have two or three buildings. One of which is two-story building, on first floor usually is cattle place and storage and on second floor the residential area. The second building is usually a toilet. According to anecdotal evidence some of these properties serve as dachas for use in the summer.

E.3.3.2 Energy

712. Villages in the Project area are on the central power supply; for the Khada Valley, villages are connected by a power line from Kvesheti, while in Kobi this connection is from Kazbegi municipality. All villages in the Project Area and all surveyed households have access to electricity.

E.3.3.3 Water Supply

713. Across the country and the region, 100% of the population has access to water sources[91]. At the regional level, including in Mtskheta-Mtianeti region, less than half of households have a water supply in their dwelling, as shown in Table 82.

[91] http://geostat.ge/regions/# and CIA World Fact Book https://www.cia.gov/library/publications/the-world-factbook/geos/gg.html (last updated: 12 June 2018)

Table 82: Distribution of the households by the basic supply sources of the drinking water in Shida Kartli, Samtskhe-Javakheti, Adjara A.R., Guria and Mtskheta-Mtianeti regions (%)

Type of drinking water source	2011	2012	2013	2014	2015	2016
The water supply system installed in the dwelling	45.4	45.2	43.8	42.8	45.6	43.1
The water system tap in the yard or in the vicinity	32.8	29.1	24.0	22.1	17.9	17.1
The well in the yard or in the vicinity	13.9	16.0	15.6	18.5	21.7	23.3
Natural spring in the yard or in the vicinity	7.3	9.3	16.0	16.6	14.8	16.5
Other sources	0.6	0.5	0.7	0.0	0.0	0.0

714. In the villages of the Project area, water sources are from (untreated) springs that are then piped to homes or a centralized point or points in each village. All are gravity fed; there are no pumped water supplies. In the Project Area, water sources are all consumed as potable water sources (for human and livestock consumption, as well as any household and vegetable plot irrigation needs). No households in the survey reported that they treat the water prior to use. River water use was reported to be only used as a secondary source for livestock (primary source being the piped spring water), when the animals are grazing in that area.

Table 83: Local water supply – settlements of the Khada Valley

Village	Water source location
Zakatkari	Piped from spring immediately north of and above the village
Tskere	Piped from spring north of and above the village. The source is supplying water to the downstream villages of the Khada valley
Bedoni	Water piped from upstream; pipe located between the river and the road
Beniani-Begoni	Piped from spring located to the east and above the villages
Kobi	Piped from spring located to the south and above the village

E.3.3.4 Waste Management and Sanitation

715. Sanitation facilities in Georgia are better for those residing in urban centers than rural areas. Based on 2015 estimates, improved sanitation [92] facility access is provided to 95.2% of the population in urban areas, while only for 75.9% of the population in rural areas. Unimproved facilities are provided to 4.8% of the urban population and 24.1% of the rural population[93].

716. There are two landfills in the area managed by the Solid Waste Management Company of Georgia. Waste collection is responsibility of municipal utilities. In 2017 under an EBRD funded projects waste management equipment (trucks, containers) have been provided. There are no hazardous waste disposal facilities in the area.

717. Participants in Focus Group Discussions reported that each village has a centralized waste collection point for non-compostable wastes, which is collected weekly by the Solid Waste Management company and deposited in the above referenced landfills. Some households have compost used on vegetable plots. Sanitation is provided through septic tanks.

E.3.3.5 Communication and Postal Services

[92] Improved sanitation includes sanitation facilities that hygienically separate human excreta from human contact (while unimproved sanitation facilities do not).

[93] CIA World Fact Book https://www.cia.gov/library/publications/the-world-factbook/geos/gg.html (last updated: 12 June 2018)

718. Georgia is moderately well connected for telephony, and fixed lines are provided to 833,923 locations, or 17 of 100 inhabitants, as estimated in July 2016. Fixed line networks have limited coverage outside Tbilisi. However, mobile cellular connections are far more prevalent and cover an increasing area of the country, with a total of 5,532,701 mobile phones, and 112 mobile subscriptions per 100 inhabitants.

719. Half of the population has internet access, with 2016 estimations of a total of 2,464,107 users.

720. Three of Georgia's broadcast media are state-funded (the Tbilisi-based Georgian Public Broadcaster (GPB) including Channel 1, Channel 2, as well as the Batumi-based Adjara TV (also a part of GPB)). There are a number of independent commercial TV stations, as well as 26 regional TV broadcasters, distributing regional products through digital media services. There are two GPB radio stations and several dozen private radio stations.[94]

721. In the Project area, internet connectivity is generally good through cellular networks and satellite connections in Stephantsminda and Dusheti, however accessibility decreases with distance from the center. Mobile phone coverage is not reliable in all of the Project area and its village centers. [95] However, the Khada Valley has good cellular network connectivity from towers located in the Gudauri ski area.

722. Both municipalities in the Project Area have Post of Georgia branches, available in administrative centers and close to main road access points.

E.3.3.6 Transport Infrastructure

723. In the Mtskheta-Mtianeti region, there were 1,516km of road in 2016, of which 178.7km was international road and 426.5km was secondary road. There has been an increase in total road lengths of almost 40km since 2011[96].

724. In the Project area, transport infrastructure is limited to motor travel along the existing E11 that connects Tbilisi to the northern border with Russia at Kazbegi National Park/Dariali Gorge, servicing both passenger and freight connections.

725. Motor transport in the area is limited to private vehicles, private and municipal buses and mini buses. Public transport is scarce. There is a local bus in Kazbegi which runs only in the mornings and evenings, and it does not service the Khada Valley. In Kazbegi public transport is also problematic, with one bus once a day that travels from Stephantsminda to neighboring villages. Stephantsminda has a Socar petrol station[97] and Gudauri also has a fuel station. There are none in the Khada valley. Further, it was reported by stakeholders that there is one Tbilisi bus that passes through Kvesheti to Stephantsminda, however these are usually both full when they arrive in Kvesheti, and that it is not typical for people in Kvesheti to have business to undertake in Stephantsminda; usually the administrative point is instead in Dusheti.

726. Roads are in poor condition away from the existing main road and the settlements located along the highway. The traffic flow is seasonal and decreases in winter. Traffic flows from villages to municipality centers are most intensive on market days. Winter traffic flows may be affected by access to ski sport areas in Gudauri.

[94] CIA World Fact Book https://www.cia.gov/library/publications/the-world-factbook/geos/gg.html (last updated: 12 June 2018)

[95] The Overview of Kazbegi General Development Potential: Baseline Study, People in Need/GeoWel (2016) http://www.kazbegilag.ge/templates/default/widgets/eng/uploads/The%20Overview%20%20of%20Kazbegi%20General%20Development%20Potential.pdf

[96] http://geostat.ge/regions/#

[97] http://www.kazbegilag.ge/templates/default/widgets/eng/uploads/The%20Overview%20%20of%20Kazbegi%20General%20Development%20Potential.pdf

727. People in the Khada Valley report that they travel by foot along the road down the valley to get to Kvesheti or try to take the journey with others who may be travelling the route by car (i.e. up to 9km journey from Tskere), however not all vehicles suitable to travel to the higher elevations in the Valley, particularly in winter, on steep and rough terrain.

E.3.3.7 Emergency Services

728. Because of poor accessibility of the high sited villages in the Khada valley, emergency service is not easily available – in particular in winter time when existing road is blocked.

729. In Stephantsminda, most government and other services are available, including a local government, police, hospital, and fire-fighters unit. Recently, the Ministry of Justice also completed the construction of the Justice Hall, making over 200 government services available for the local population in one location, reducing the need to travel to Tbilisi[98].

730. In Kvesheti, it was reported during stakeholder interviews that access to emergency services is limited and is heavily dependent on availability of resources, for example, ambulances. Further, it was described that road accidents happen regularly, but that their severity and wait time for services will determine whether accident victims are transported by road to a nearby health facility, or by helicopter to Tbilisi.

E.3.3.8 Community facilities

731. Leisure facilities in the Project area are limited to the larger centers, such as Stephantsminda, Gudauri and Kvesheti, all of which have hotels/guesthouses, restaurants and other businesses. Stephantsminda has no large supermarkets, while Gudauri has a Smart Supermarket.[99] There are no shops available in remote villages (such as Tskere and other villages in the Khada Valley), while residents report using the small shops in Kvesheti, or travel to Tbilisi or other main centers, to buy goods not locally available.

732. Places of worship include those in the Khada Valley (on the mountain elevated above Tskere; on the mountains above Sviana-Rostiani), and along the existing E11 road (St George Church in Kvemo Mleta; Orthodox Church in Ganisi/Gudauri). Additionally, there are other crosses used as sites of worship in the project area, including in Kobi and Kvesheti. These are described further and mapped in **Section E.4.5 – Physical and Cultural Resources**.

E.3.4 Land Use and Natural Resources

733. Dusheti and Kazbegi are two of four municipalities of the Mtskheta-Mtianeti region.

- Dusheti municipality is the largest administrative units of the Mtskheta-Mtianeti region. Area of municipality is 2981.5 km². 117.8 thousand hectares belongs to the forest fund, of this area only 113 thousand ha is forested. 53% (63,000 ha) of the forest is on steep slopes. Agricultural land in Dusheti municipality totals 136,543 ha (46% of total area of municipality), of them – plough land area is 10,240 ha (7% of agricultural land), perennial plants – 1,481 ha (1%), grasslands and pastures – 124,538 ha (91%). Agricultural lands are mainly located in lower elevation areas. Plant growing is typical mainly for lower zones of the area. In higher sited zone cattle breeding dominates.
- Kazbegi municipality area is 1081.7 km². Forest accounts for around 4% of the total area (4,790 ha). Main part of the forest (3,500ha) is in alpine zone. 4,000ha of the forest is located within the boundaries of protected area. Total area of agricultural land in municipality is 45,828 ha (0.42% of the total area of municipality). In mountain areas, because of the landform the land (42,274ha or 92% of total land resources) is used mainly as grassland

[98] http://www.kazbegilag.ge/templates/default/widgets/eng/uploads/The%20Overview%20%20of%20Kazbegi%20General%20Development%20Potential.pdf

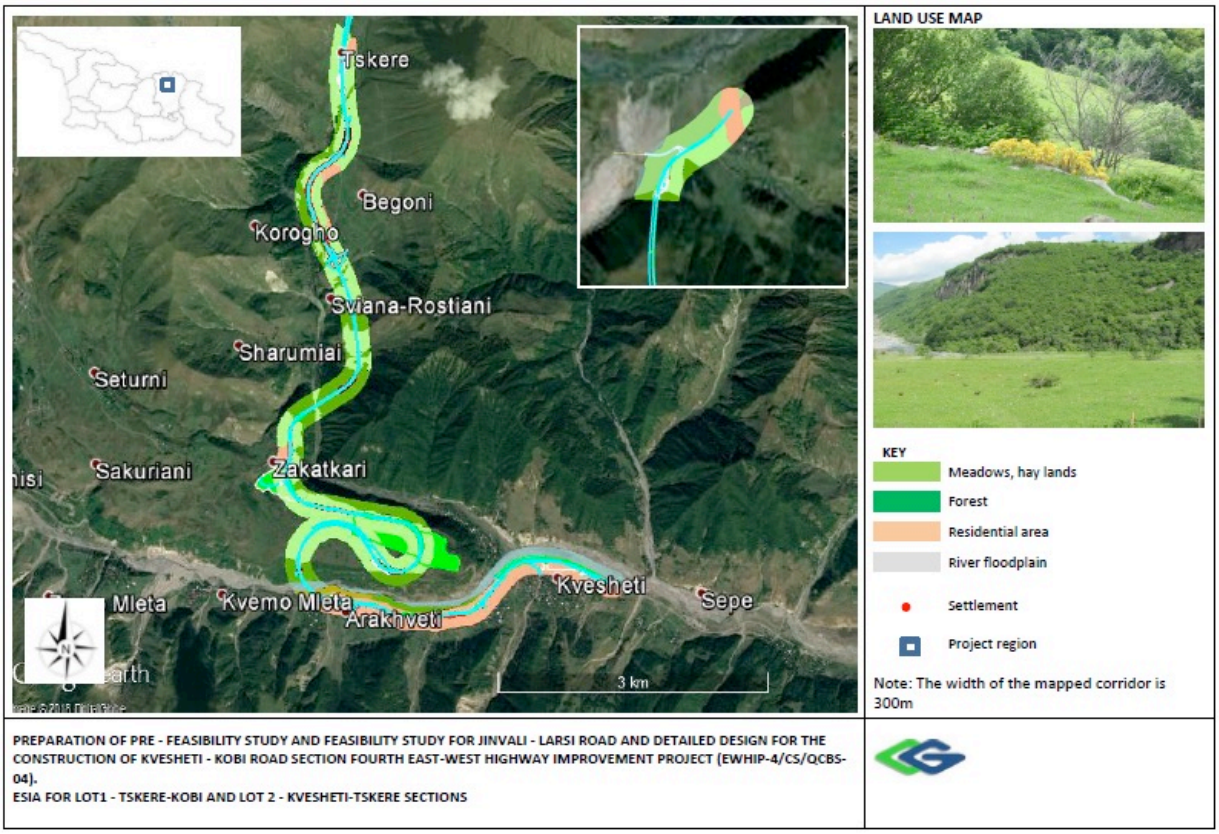
[99] http://www.kazbegilag.ge/templates/default/widgets/eng/uploads/The%20Overview%20%20of%20Kazbegi%20General%20Development%20Potential.pdf

and pasture. Forest takes up 4,790ha (4% of the total area). 3,500ha of forest is in sub-alpine zone, 4,000ha belong to Kazbegi National Park area. The pastures are mostly not fenced. Fenced hay-lands constitute the second largest land use type while arable land only covers a small share of the area.

734. The Project area land uses are broadly consistent with these land uses. Specifically, the Khada Valley is comprised of grasslands and pastures and a small amount of agriculture; the Gudauri area additionally comprises recreational/ski slope land use; and a new ski area is under development at Kobi-Gudauri; and the Gudauri Recreation Area lies partially within the Project Area (see **Appendix L** for a map of the recreation area). Each village has its own pasture area, and their own areas for collecting wild resources.

735. Land use pattern in 300m wide trip along alignment's centerline is shown in Figure 119. Meadows dominate, 2.5 times exceeding the area covered with forest. Forest is presented in patches. The rest of the area – just a small portion of the land is residential.

Figure 119: Land Use Map



736. Natural resources in Mtskheta-Mtianeti include:

- Copper – deposit (known as Devdoraki deposit) is located in Kazbegi municipality, in 10km to Gveleti. The reserve is thought to be significant, but not studied enough.
- Polymetals – small outcrops of lead and zinc deposits are available in the Asa River gorge. In Kazbegi municipality presence of antimony (negligible reserve) is reported.
- Granite, porphyrites, gneiss deposits in poorly accessible areas not suitable for development. Granites (green, brown diabases) are widely met in Kazbegi municipalities: and black granites near Artkhmo.
- Diabase – in Juta and Roshka areas (evaluated reserve 10m m^3). Diabases (Gveleti, Cahukhi, Veshettskaro (above Juta)), grey and violet diabases of Dariali;
- Andesite – deposits are present in the gorges of the River Tergi and its left tributaries (Arsha, Sakutseto, other deposits – total reserve 3638 thou m^3). Black andesites with white dots

(Mna deposit), grew, blue and red andesites Gaiboten-Toto deposit), grey andesites (Donata deposit, foothills of Qabarjini mountain);
- Quartzite – deposits near Stephantsminda, Kazbegi municipality;
- Slates – multiple deposits along the Phav-Khevsureti Aragvi gorges;
- Rock crystal – small deposits near Stephantsminda, Kazbegi municipality;
- Inert material (sand-gravel) deposits – within the Aragvi river system, in particular in Dusheti and Mtskheta municipalities.

737. Other deposits within administrative boundaries of Kazbegi municipality include:

- red dacites (Nookhau deposit);
- grey basalts (Gudauri deposit);
- orange-red (Pansheti deposit) and black tuffs (Kobi).

738. Natural resources of Dusheti municipality are represented by: limestones (Roshka facing stone), sand-gravel, color stones.

739. The region is rich in water resources:

- mineral waters (such as Vazhas Tskaro, Likokhi, Khahmatoi, Chie, Pasanauri, Kitokhi, Ghuli, Kakhati, Khada, Khakhabo and Shatili);
- surface water, including rivers of the Mtkvari (Aragvi river system – Mtiuletis Aragvi, Gudamakris Aragvi, Khevsuretis and Phavis Aragvi and their tributaries) and Caspian basins (Tergi river and its tributaries),
- Jinvali reservoir and lakes.

740. Aragvi, in particular in its lower region is used for irrigation and water supply (Jinvali reservoir). Aragvi and Tergi are used for power generation (Jinvali HPP – Aragvi river; Dariali HPP- Tergi river). As noted above, ground water springs are used for supplying water to the villages in the project area.

741. The list of licensed deposit in Dusheti and Kazbegi municipalities is given in Table 84

Table 84. List of licensed deposits

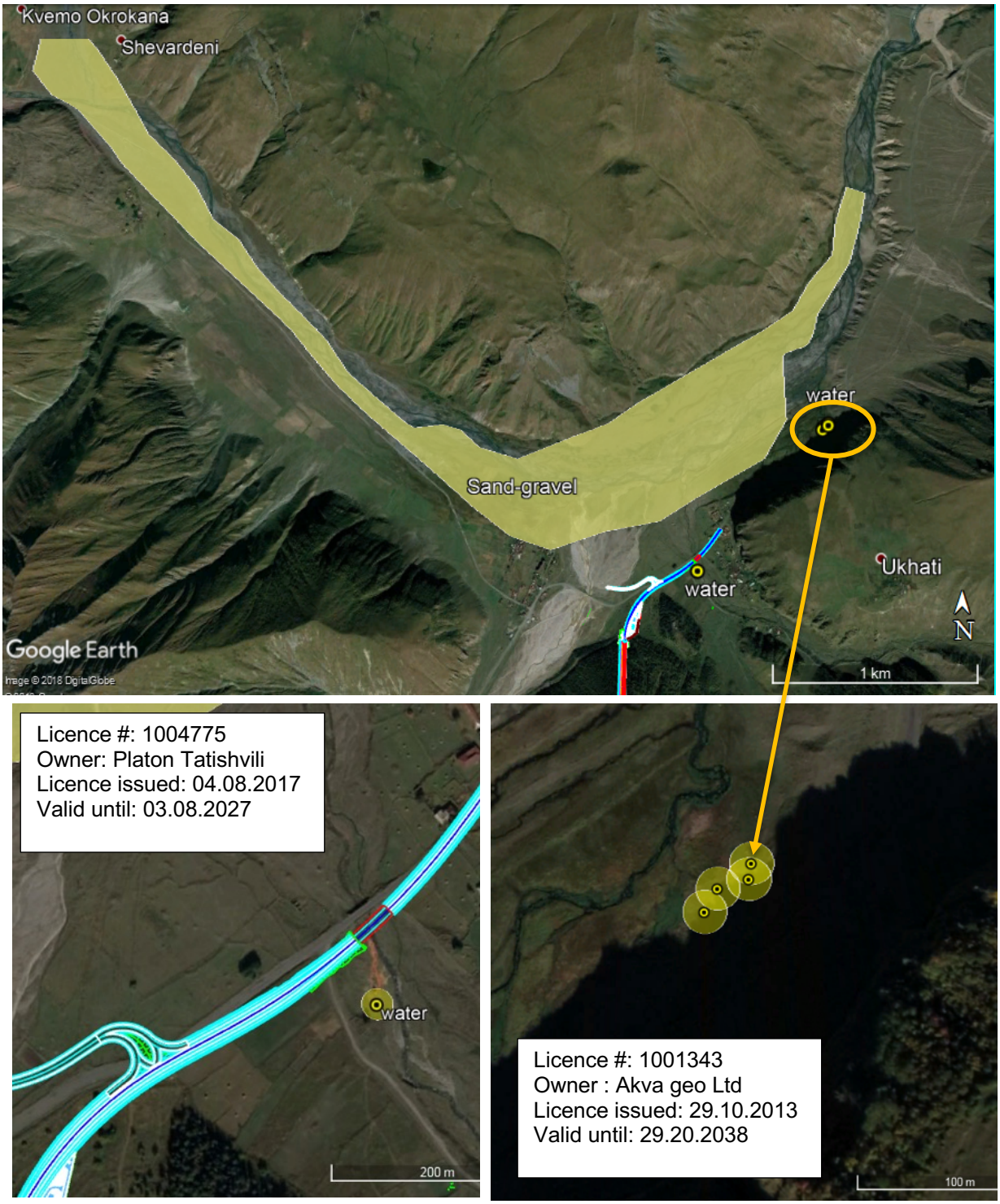
License number	Name of the site	License owner	License registration date and duration/ expiry date	Resource (min, max), m^3/y	Area, ha
00040	Aragvi river, right bank. Pasanauri sand-gravel deposit Chartali I unit (v.Chartali, Dusheti municipality)	Daviti Ltd	06.02.2007 20 years	10000	7.1
00269	Aragvi river, left bank terrace, sand-gravel abstraction (area adjacent to Chartali village)	Daviti Ltd	06.02.2007 20 years	total abstraction 400000 m3	8.86
00042	Aragvi river, right bank terrace, Pasanauri sand-gravel deposit, Muguda unit	Lochini Ltd	10.04.2006 20 years	2000	2
00240 (seizure)	Aragvi riverbed – abstraction of material	p/p Lasha Kldiashvili	21.08.2006 20 years	3000	6.7
00266	Aragvi river bank, near Ananuri, Jinvali reservoir area – abstraction of sand-gravel	Gravi Ltd	11.09.2006 20 years	total abstraction 240000 m3	6.54
00490	Aragvi terrace, sand-gravel abstraction (near Ananuri)	GMG Ltd	27.03.2007 15 years	total abstraction 150000 m3	7.05

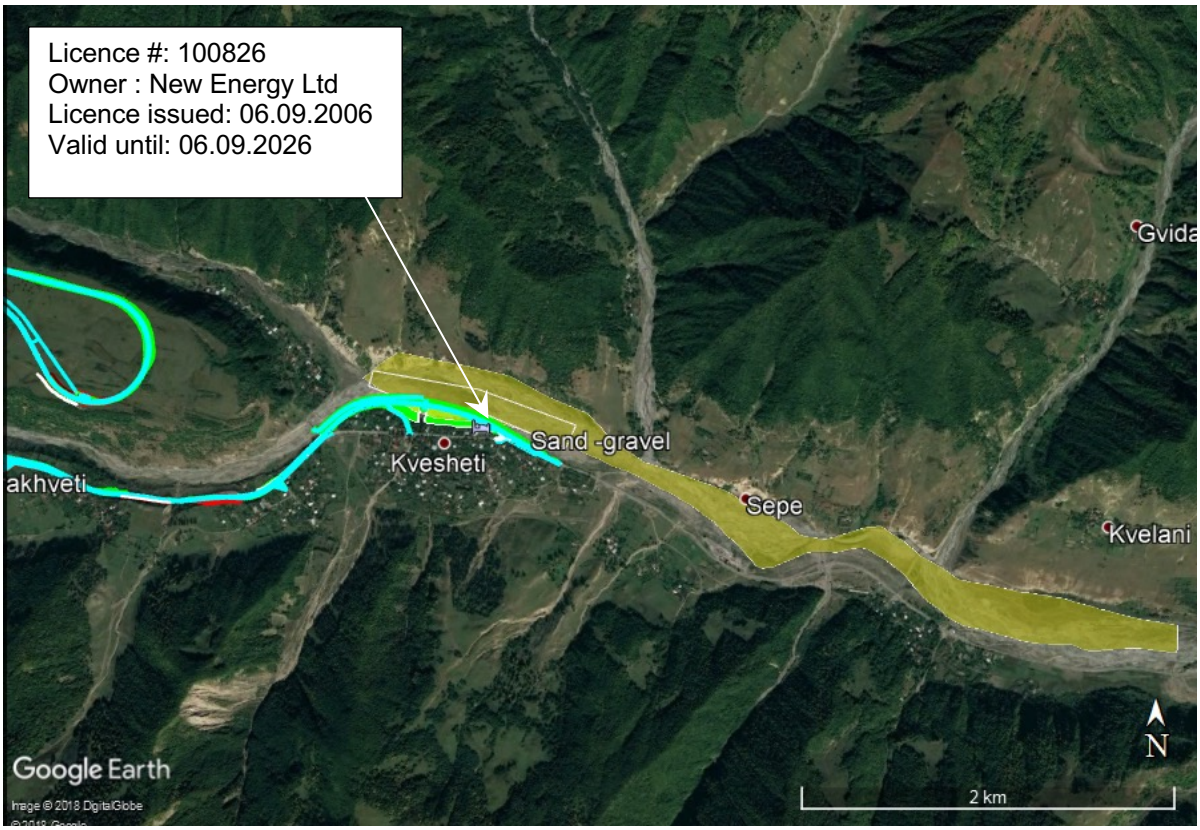
License number	Name of the site	License owner	License registration date and duration/ expiry date	Resource (min, max), m^3/y	Area, ha
100077	Aragvi, left bank, near Tsikhisdziri	Evra Ltd	24.09.2008 07.03.2026	total abstraction 550692 m3	20
100600	Tsikhisdziri depsotit Meneso unit	Mushta Ltd	10.08.2009 24.03.26	total abstraction 80000 m3	4.2
100826	Area adjacent to Kvesheti	New Energy Ltd	06.09.2006 06.09.2026	total abstraction 570000 m3	12.7
1001343	Water	Aqua geo Ltd	29.10.2013 29.20.2038		
1004775	Water	Platon Tatishvili	04.08.2017 03.08.2027		

p/p – physical person; i/e – individual entrepreneur

742. The licensed deposits closest to the project are shown below in Figure 120.

Figure 120: Licensed Deposits in the Project Area





E.4 Social and Cultural Resources

E.4.1 Demography

743. This section describes the existing economic environment status of the Project area. It has been developed through a combination of stakeholder engagement and primary and secondary data gathering and analysis, including household surveys, focus group discussions and key informant interviews in the Project Area. This includes research relevant to: (1) the national level; (2) the region Mtskheta-Mtianeti; (3) the municipalities Dusheti and Kazbegi; and (4) with affected villages. Further information on the methodology and people involved in the work is provided in **Appendix H** to this EIA.

E.4.1.1 Population and Growth

744. The population of Georgia is 3,717,000 (2017)[100], distributed closely coincidental to the central valley, centered on the capital Tbilisi (population 1,077,000 in 2018) and Batumi on the Black Sea coast.

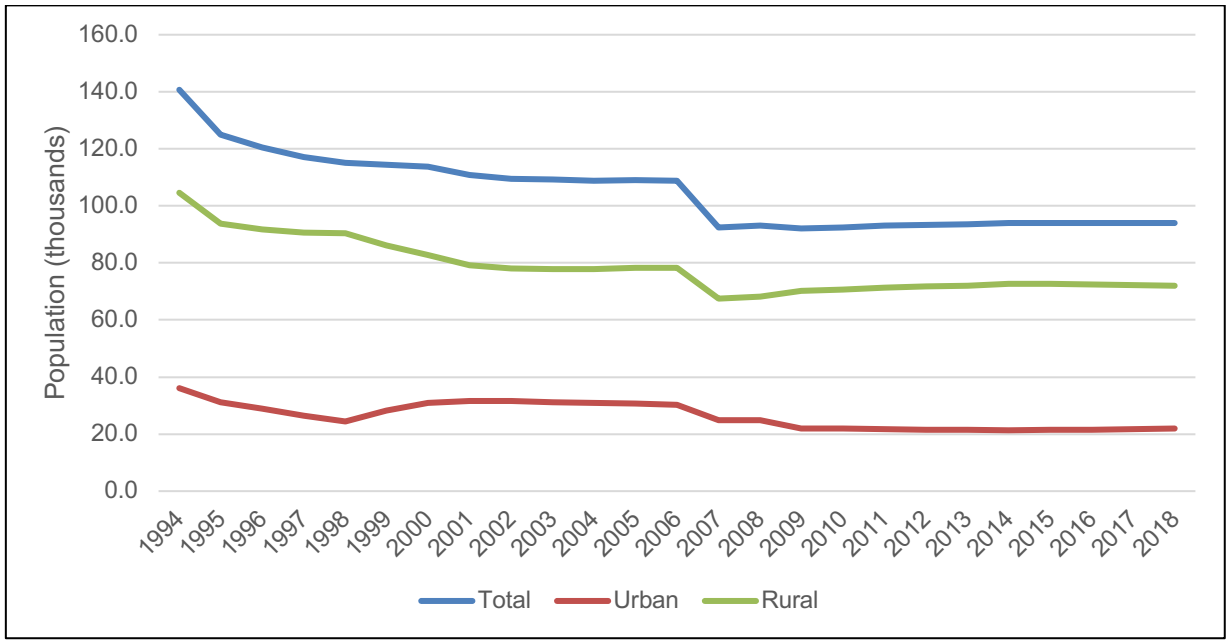
745. The project is planned to be implemented in Dusheti and Kazbegi municipalities, thus facilitating services to the population center, and trade and other economic development links (e.g. support for entrepreneurship, technical assistance, training).

746. Based on the national 2014 census, the population of Dusheti and Kazbegi municipalities were 33,400 and 4,900 respectively. A decrease in the population for various reasons (including for services access and economic opportunities) has been reported between 2014 to 2018, and figures are now estimated as 26,100 and 3,800 respectively[101]. The majority

[100] World Bank.
[101] http://mtskheta-mtianeti.gov.ge/page/full/16/Population

of the population remains rural in the region, currently 75%, as shown in Figure 121 below. The annual rate of urbanization is 0.42% (2015-20 est.)[102].

Figure 121: Population of Mtskheta-Mtianeti region[103]



747. Dusheti is the second-most populated municipality in the region, while Kazbegi is least populated. All municipalities are experiencing population decline, currently 26% decline since 2010, as shown in Table 85 below.

Table 85: Population of Municipalities in Mtskheta-Mtianeti region (thousands), 2010-2018[104]

Muncipality	2010	2011	2012	2013	2014	2015	2016	2017	2018	% of current est. total regional population
Mtskheta	56.9	57.3	57.6	57.3	57.4	46.8	46.7	46.5	46.3	53.7%
Dusheti	33.8	34.0	34.1	33.8	33.6	25.9	25.9	26.0	26.1	30.3%
Tianeti	13.2	13.1	13.1	12.9	12.9	9.7	9.8	9.9	10.0	11.6%
Kazbegi	4.9	4.9	4.9	4.9	4.9	3.9	3.8	3.8	3.8	4.4%
Total	**108.8**				**108.8**				**86.2**	**100.0%**

748. The regional government reports that the area is characterized by a significant number of sparsely populated villages. Only one village has a population greater than 5,000 inhabitants (Mukhrani, Mtskheta municipality), while 50 villages have less than 10 residents. Approximately 60 villages have no remaining inhabitants[105].

749. The population density in Kazbegi municipality was 0.26 individuals/km^2 as at January 2018, while in Dusheti it was denser at 0.78 individuals/km^2. These figures are considerably lower than the national average.

[102] CIA World Fact Book https://www.cia.gov/library/publications/the-world-factbook/geos/gg.html (last updated: 12 June 2018)
[103] http://geostat.ge/regions/#
[104] http://geostat.ge/regions/#
[105] http://mtskheta-mtianeti.gov.ge/page/full/16/Population

750. Kazbegi municipality is divided into 6 *sakrebulos* (city councils): Stephantsminda, Goristsikhe, Sioni, Sno, Kobi and Gudauri. There are officially 47 villages in the municipality, although only 25 of them have permanent residents.

751. Dusheti municipality includes one town (Dusheti), Pasanauri borough and 15 administrative units: Lapannantkari, Jinvali, Kheoba, Mchadijvari, Greniskhevi, Bazaleti, Choporti, Ananuri, Chartali, Kvesheti, Gudamakhari, Magharoskari, Ukanapshavi, Barisakho and Shatili.

752. The two relevant Sakrebulos in the Project area are Kvesheti and Kobi.

Lot 2 Population Data[106]

753. The Lot 2 Project impacts eight villages – Kvesheti, Arakveti, Zakatkari, Beniani, Begoni, Sviana, Rostiani and Mughure. There are 550 people (276 males and 274 females) living in these villages.

Table 86: Population in Affected Persons' Villages

Village	Total	Male	Female	Approximate % of villagers remaining during winter period
Kvesheti	257	122	135	100
Arakveti	205	110	95	100
Zakatkari	57	30	27	60-70
Beniani-Begoni	12	5	7	10
Sviana-Rostiani	18	8	10	10
Mughure	1	1	0	100
Total	**550**	**276**	**274**	

Lot 1 Population Data[107]

754. The Project impacts two villages Kobi village in Kazbegi municipality, and Tskere village (Dusheti municipality).

755. Two households with only three permanent inhabitants were identified in Tskere village during the field visits – one couple and one elderly woman. Due to harsh living conditions during the winter months, most of its people live in other more habitable places such as Kvesheti, Gudauri and Tbilisi. During winter, the two women stay in the village to keep the households and mind the livestock. As the only male in the village works in the Gudauri resort, the two women are alone most of the time.

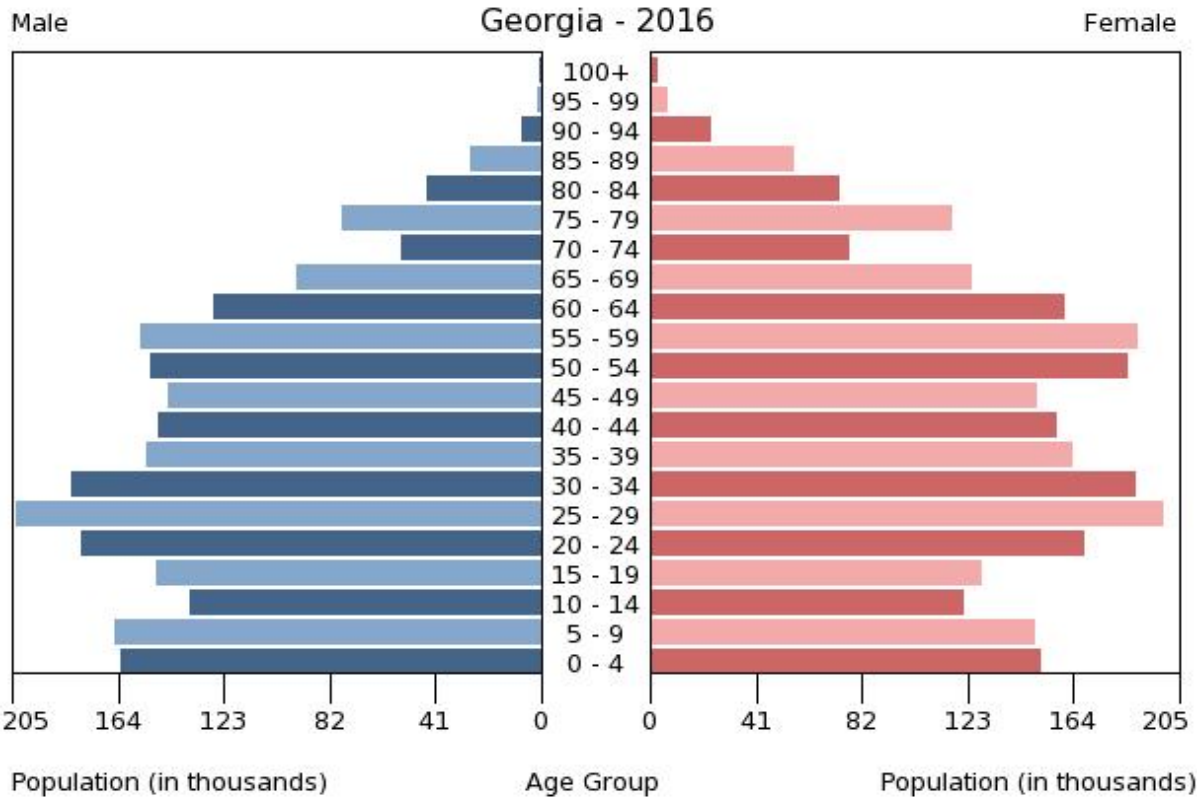
756. Kobi village is located at the other end of Tunnel 5. Official municipality statistics indicate that there are 5 households with 7 people in Kobi village. The Project affects only one household from this village.

E.4.1.2 Age and Gender

757. Estimates from 2017 show that the national population is declining by 0.025 per year, with a net migration of -1.6 migrants per 1,000 population. At the national level, the population is male-dominated up to 25 years, thereafter generally by women. The bulk of the population, 41%, is working age (25-64 years old). The median age for males is 35.3 years and 40.1 years for females. The population pyramid for the nation is shown in Figure 122 [108], below:

[106] Source: Lot 1 Draft LARP
[107] Source: Lo2 2 Draft LARP
[108] CIA World Fact Book Georgia https://www.cia.gov/library/publications/the-world-factbook/geos/gg.html (last updated: 12 June 2018)

Figure 122: Population pyramid for Georgia (2017)



758. The socio-economic household survey interviewed 136 households in total with 425 members; of these, 52% were male and 48% female. Of the 425 interviewed individuals, 36 were identified as vulnerable, 35 of them are below poverty line and one is an internally displaced person.

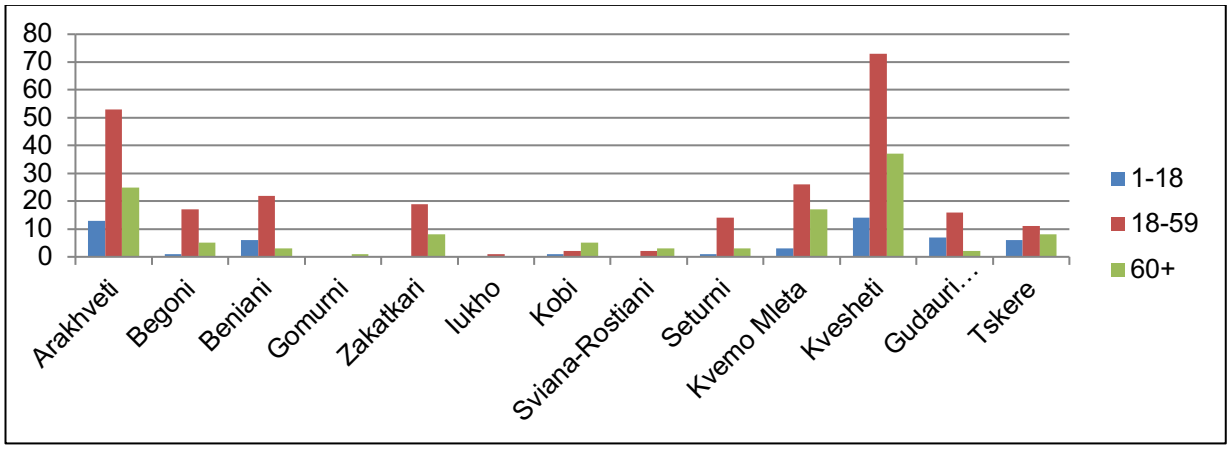
759. As for the age distribution of the households surveyed in the Project Area, 12% of survey respondents are under18 years old, 60% are aged 18 to 59 years, and 28% are 60 years old or more. The age distribution is shown in Table 87 and age distribution by villages is shown in Figure 123.

Table 87: Age Distribution of surveyed Households

	Age		
Range	1-18	18-59	60+
Number	52	256	117
Percent (%)	12	60	28

760. As it is shown in Table 87 and Figure 123, most of the population is between ages of 18 to 60 and notably only 40 people are in the age 18 to 25, caused by the migration of young people to Tbilisi and other larger centers for study and work.

Figure 123: Age Distribution by village, of surveyed households



E.4.1.3 Ethnicity, Religion and Languages

761. Nationally, a 2014 estimate states that Georgians comprise 86.8% of the population, followed by Azeri (6.3%), Armenians (4.5%) and others 2.3% (includes Russian, Ossetian, Yazidi, Ukrainian, Kist, Greek).[109]

762. Further, languages spoken follow ethnicities, with Georgian the official and most prevalent language (87.6%), followed by Azeri (6.2%), Armenian (3.9%), and Russian (1.2%). The official religion is Orthodox, identified as the religion of 83.4% of the population, followed by Muslim (10.7%), and Armenian Apostolic (2.9%).[110]

763. In Mtskheta-Mtianeti region the Georgian ethnicity is dominant, followed by Ossetians, as shown in Table 88: Ethnicity [111].

Table 88: Ethnicity (% of Region Population in brackets)

	Russian	Ossetian	Armenian	Assyrian	Azeri	Greek	Region Population (2002)
Mtskheta	-	834 (1.3%)	204 (0.3%)	1,517 (2.3%)	587 (0.9%)	403 (0.6%)	64,829
Dusheti	-	1,577 (6.1%)	11 (0.0%)	6 (0.0%)	12 (0.0%)	2 (0.0%)	25,659
Tianeti	30 (0.2%)	196 (1.4%)	18 (0.1%)	16 (0.1%)	4 (0.0%)	2 (0.0%)	14,014
Kazbegi	-	60 (1.6%)	5 (0.1%)	-	1 (0.0%)	-	3,795

764. Households interviewed in social baseline research were predominantly Georgian ethnicity, with a minority of Russian ethnicity. This was reported to be irrelevant to village cohesion.

E.4.2 Social Structures

E.4.2.1 Governance Structure

765. Georgia is a semi-presidential republic, with a capital in Tbilisi. Its administrative divisions comprise nine regions (mkharebi), 1 city (kalaki), and 2 autonomous republics (avtomnoy respubliki). These are in detail: Regions: Guria, Imereti, Kakheti, Kvemo Kartli, Mtskheta Mtianeti, Racha-Lechkhumi and Kvemo Svaneti, Samegrelo and Zemo Svaneti,

[109] CIA World Fact Book Georgia https://www.cia.gov/library/publications/the-world-factbook/geos/gg.html (last updated: 12 June 2018)
[110] CIA World Fact Book Georgia https://www.cia.gov/library/publications/the-world-factbook/geos/gg.html (last updated: 12 June 2018)
[111] http://www.mtskheta-mtianeti.gov.ge/page/full/16/Population

Samtskhe-Javakheti, Shida Kartli; (note – the breakaway region of South Ossetia consists of the northern part of Shida Kartli, eastern slivers of the Imereti region and Racha-Lechkhumi and Kvemo Svaneti, and part of western Mtskheta-Mtianeti); City: Tbilisi; and, two autonomous republics: Abkhazia or Ap'khazet'is Avtonomiuri Respublika (Sokhumi), Ajaria or Acharis Avtonomiuri Respublika (Batumi)[112].

766. The regions and autonomous republics are subdivided into 67 municipalities and cities with local government: there is a State representative-governor for Dusheti, Tianeti, Mtskheta, Kazbegi and city Mtskheta municipalities for the Project area. At lower levels of Government (i.e. Dusheti and Kazbegi) additionally have an elected State Representative governor located in the centers of those municipalities, Kvesheti and Stephantsminda, respectively.[113]

Table 89: Georgian Governance Structure

Level	Legislative	Administrative
State and Regional	Parliament is the highest legislative body.	Government of Georgia is executive body responsible for internal and foreign policy. It includes Prime minister and ministers.
		Government appoints Rtmunebuli-Governors in the regions. The Governors and their deputies represent the GoG at regional administrative level.
Municipal	Sakrebulo – is legislative body at local level. It is headed by head of Sakrebulo and deputy, heads of commissions (topic based) and fractions (political).	Mayor's office (city administration) is administrative body at local level – headed by Mayor (Gamgebeli) and deputies. The city administration comprises divisions consisting of sub-units. Responsibilities – defined in the charters. Heads of the divisions are nominated by Mayor.
Local		At village level Village Rtsmunebuli represent admin body. Village Rtmunebuli is nominated by Gamgebeli of municipality.

E.4.2.2 Informal Governance

767. Households that participated in the Focus Group Discussions for this study report equal possibilities between household members to contribute to household-level problem-solving and decision-making. Participants in primary research for baseline data gathering reported that women and men both participate in informal decision-making within the villages.

E.4.2.3 Vulnerable Groups in Society

768. Vulnerable groups in the Georgian context are defined as women-headed households with dependents; pensioners; disabled or other people receiving disability support from the Government, Internally Displaced People (IDPs); or those with another vulnerability who may specifically be affected by the Project. This is a project definition of vulnerability.

769. In 2017, the number of Internally Displaced People (IDPs) across the country was estimated at 289,000. These people were displaced in the 1990s as a result of armed conflict in the breakaway republics of Abkhazia and South Ossetia, or displaced in 2008 by fighting between Georgia and Russia over South Ossetia[114].

[112] CIA World Fact Book https://www.cia.gov/library/publications/the-world-factbook/geos/gg.html (last updated: 12 June 2018)
[113] http://www.mtskheta-mtianeti.gov.ge/page/full/15/History%20of%20the%20Region
[114] CIA World Fact Book https://www.cia.gov/library/publications/the-world-factbook/geos/gg.html (last updated: 12 June 2018)

770. According to official data (source: Social Service Agency) there is one IDPs person in Kazbegi municipality and 310 in Dusheti municipality.

771. At the national level, the number of people receiving social protection support from the Government has been increasing in the period 2009-2017, with almost 900,000 people receiving pension and social packages (approximately 18% of the total population), as shown in Table 90.

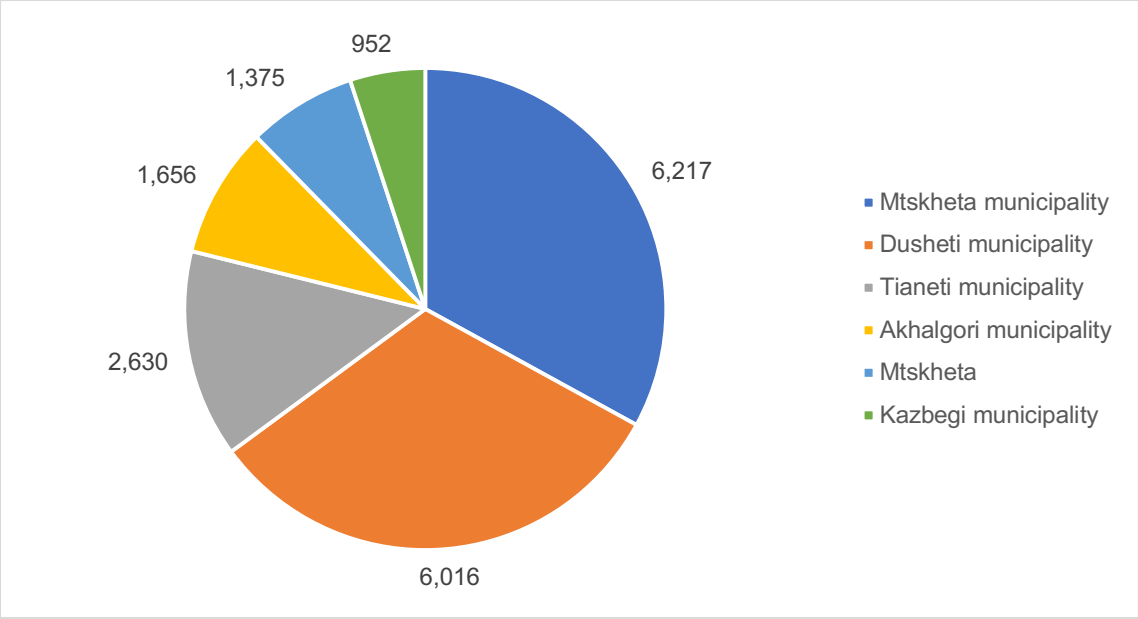
Table 90: Number of individuals receiving pensions and social protection in Georgia (thousands)[115]

Pension type	2009	2010	2011	2012	2013	2014	2015	2016	2017
Persons receiving pension and social packages, total, thousands	838.5	835.9	826.8	857.0	857.0	866.2	874.9	887.3	898.1
Persons receiving pension package (old age), thousands	660.0	662.3	666.4	682.9	686.7	697.2	707.7	720.2	732.1

772. The number of pensioners in the region is higher than the national average. As of January 2018, Kazbegi had a total of 952 pensioners (25% of the municipality's permanent population), while in Dusheti, pensioners comprise 23% of the permanent population.

773. According to the data of the Social Service Agency, by the state of January 2018, there are about 952 pensioners in Kazbegi, which equals approximately 25% of the municipality's permanent population. The number of pensioners in Dusheti is higher (6,016 people), but the percentage is slightly lower, accounting for 23% of the municipality's permanent population. See Figure 124.

Figure 124: Number of pensioners in Mtskheta-Mtianeti region[116]



774. Targeted social allowance distributed in the Project area is approximately 7,268 individuals (or 2,504 households) in Dusheti municipality and 812 individuals (350 households) in Kazbegi municipality, as shown in the table below.

[115] http://geostat.ge/index.php?action=page&p_id=200&lang=eng
[116] Social Service Agency

Table 91: Number of households receiving social aid[117]

Area	Number of households receiving social aid		Share of people receiving social aid in the total population	
	Family	Individuals	Family	Individuals
Akhalgori municipality	-	-	-	-
Dusheti municipality	2,504	7,268	20.8	28.4
Mtskheta	94	263	3.0	2.7
Mtskheta	1,568	5,479	10.8	11.9
Kazbegi municipality	350	812	19.8	21.9
Tianeti Municipality	649	1.852	12.6	19.9
Mtskheta-Mtianeti Region total	**5,165**	**15,674**	**14**	**17**

Note: ^ municipalities in which the Project is located

775. The Government of Georgia specifically provides additional support to residents in the high mountain regions of the country, which includes exemptions from particular taxes and subsidies for power supplies (700m^3/month for gas, which is approximately 7 months of residential gas supplies, and 50% electricity subsidies). In Dusheti municipality, 909 men and 1,695 women, permanent residents of high mountain settlement, are receiving allowance to the state pension. In Kazbegi the support is provided to 267 and 590 for men and women respectively.

776. One IDP was recorded in the project area during household survey for this baseline study. In Lot 1 five affected households have been identified as vulnerable and 25 affected households in Lot 2. **Section F.7.4 – Land Use** provides further information on the vulnerable households and how they will be compensated for any loses according to the LARP.

E.4.3 Education

E.4.3.1 Education System

777. The education system in Georgia provides free and compulsory education for children aged 6 to 17 or 18 years. Primary school participation rates for boys was 95.4% and 96.1% for girls from 2008-12. Secondary school participation was 85.4% for boys and 87.5% for girls over the same period.[118] Literacy in the country is 99.8%, and education expenditure was 3.8% of GDP in 2016 [119].

E.4.3.2 Education Infrastructure

778. In the Mtskheta-Mtianeti region, there are 86 public and 2 private (Mtskheta, Stephantsminda) attended by 11,525 pupils. Infrastructure repair and rehabilitation works have been carried out in almost all public schools of the region, and two new schools have been built in Mtskheta. The majority of schools are equipped with computers and have internet accessibility.

779. There are 59 municipal kindergartens in the region, attended by 2,743 children and taught by 771 teachers and technical staff. Material-technical base of the majority of pre-school

[117] Social Service Agency
[118] UNICEF, https://www.unicef.org/infobycountry/georgia_statistics.html#117 (last updated: 26 December 2013)
[119] CIA World Fact Book https://www.cia.gov/library/publications/the-world-factbook/geos/gg.html (last updated: 12 June 2018)

education organizations is unsatisfactory. There are no public or private institutes of higher or vocational education in the Mtskheta-Mtianeti region.[120]

780. School facilities in the Project area are limited to larger centers and kindergarten and school facilities are typically co-located.

781. In Dusheti municipality, there are 38 public schools in total, with one kindergarten and school in Kvesheti, located on the existing main road (E117) through the town. There are no private schools in Dusheti.

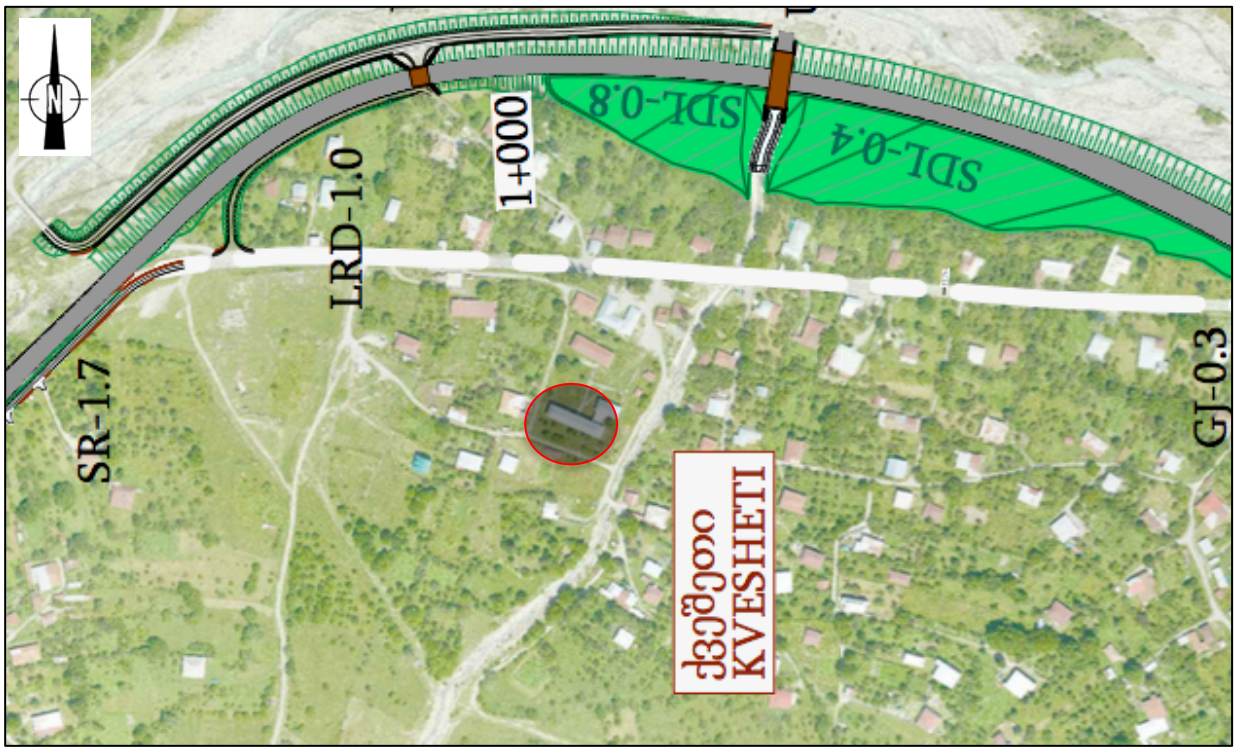
782. There are 7 schools available in Kazbegi municipality, two of which are in Stephantsminda (one public and one private). Both schools have basic computer equipment, sport facilities, and a heating system. In the other schools, wood stoves are used for heating and other facilities are non-existent. There are 7 kindergartens in the municipality, in which 172 children are enrolled. Four villages have libraries.

783. There are only two schools in the Project area [121]:

- Kvesheti School (65 pupils)
- Mleta School (38 pupils)

784. The locations of the schools relevant to the Project road are presented in the figures below.

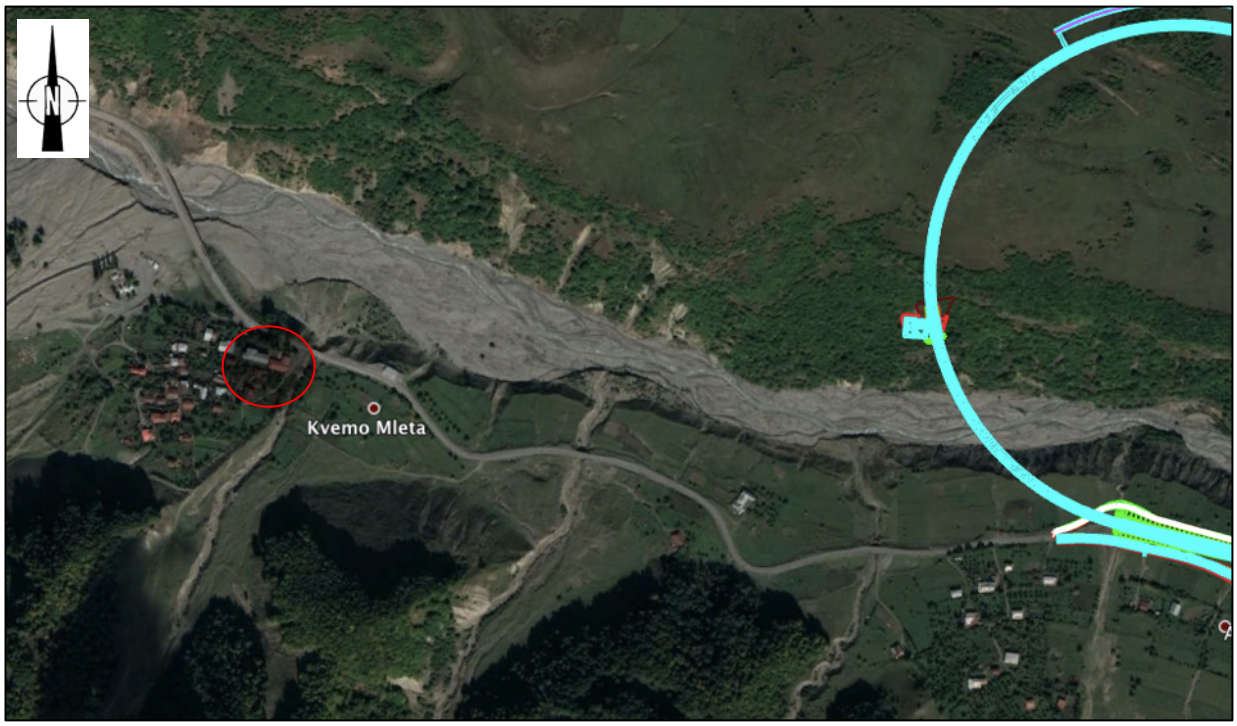
Figure 125: Location of Kvesheti School



Key: Red circle, school

[120] http://www.mtskheta-mtianeti.gov.ge/page/full/19/Social%20sphere
[121] Ministry of Education, Science, Culture and Sport. http://mes.gov.ge/?lang=eng

Figure 126: Location of Mleta School



Key: Red circle, school / Blue line, Project road.

785. Another school is located in Gudauri and according to the LARP social survey children from Zakatkari village are attending this school which is 5-6 kilometres away. However, the school is not within the potential impact zone of the Project.

786. Residents in the Project area report that one of the reasons for migration is to enable children access to better education facilities. In the Khada Valley this includes semi-permanent residence in Kvesheti for women and children to access the school, while male family members remain in the village to undertake agricultural activities. One of the stated reasons why so many people go to Tbilisi during the school year is so that young families can send their children to better schools.

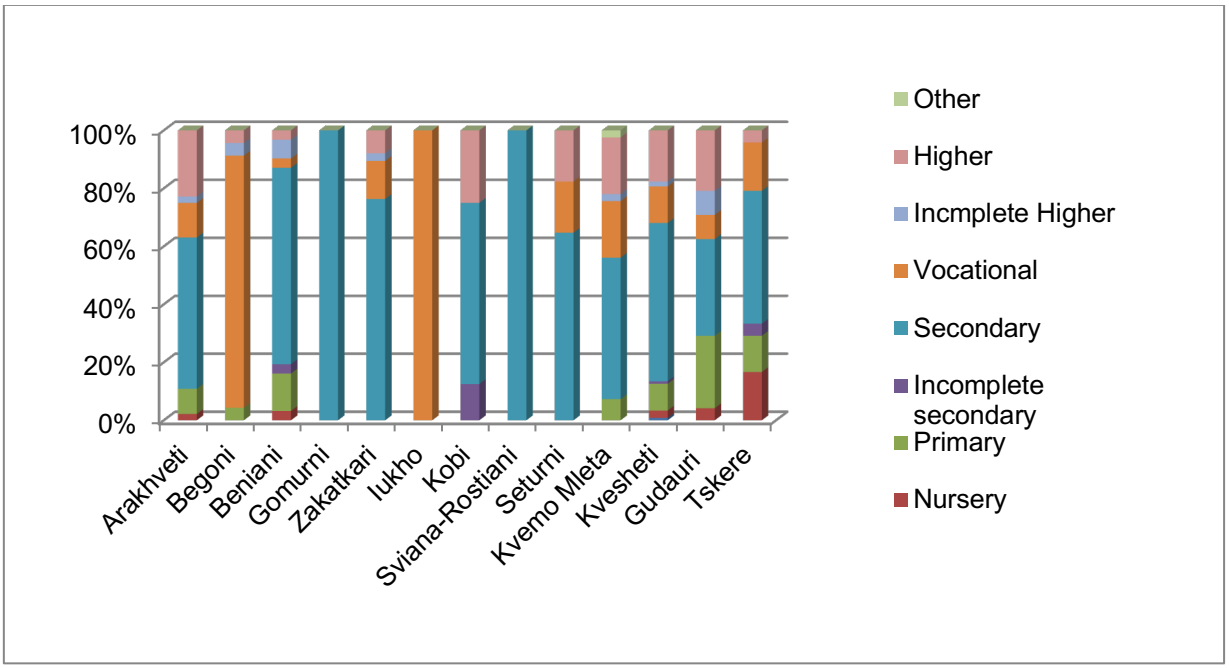
E.4.3.3 Educational Attainment

787. Of the adult population in Kazbegi, 45% have received higher education, while 29% have received vocational education; this means about one quarter lack higher education[122].

788. At the household level, educational attainment is mostly completed secondary education, followed by vocational training, as shown in the figure below. Nursery indicates the population of children currently attending nursery.

[122] http://www.kazbegilag.ge/templates/default/widgets/eng/uploads/The%20Overview%20%20of%20Kazbegi%20General%20Development%20Potential.pdf

Figure 127: Education Level



E.4.4 Community Health and Safety

E.4.4.1 Health Care, Services and Standard

789. The Ministry of Labor, Health and Social Affairs has responsibility for provision of Health expenditure in Georgia and nationally healthcare expenditure was 7.4% of GDP in 2014123. The density of physicians in the country in 2014 was 4.78 physicians/1,000 population, and 2.6 beds/1,000 population (2013) for hospital bed density[124].

790. As a result of the effective initiatives and significant efforts made by the Government of Georgia in the area of maternal and child health, Georgia has achieved the Millennium Development Goal 4 and has reduced the mortality of children under five from 48 (in 1990) to 12 (in 2015) [125]. Following the introduction of the universal health care program, the rapid growth in admissions to both outpatient and inpatient institutions has been recorded, with a 50% increase in hospital service provision for 100,000 population since 2012. Twenty percent of hospitalizations were related to respiratory system disorders, 17% to cardiovascular diseases and 15% to pregnancy, childbearing and postpartum care. In 2015, the number of visits for outpatient services reached 4.0 per capita. [126]

791. Georgia has a Road Safety Strategy (2016).[127] The strategy sets out the key directions recommended by international organizations and global experts for successful and sustainable long-term road safety management in Georgia. The need for the strategy has been conditioned by rising level of registered motor vehicle and necessity to allow Georgia to achieve substantially improved results and sustained success in its road safety activity. The strategy describes

[123] CIA World Fact Book https://www.cia.gov/library/publications/the-world-factbook/geos/gg.html (last updated: 12 June 2018)
[124] CIA World Fact Book https://www.cia.gov/library/publications/the-world-factbook/geos/gg.html (last updated: 12 June 2018)
[125] Data at the national level is reported as the probability of dying between birth and exactly five years of age expressed per 1,000 live births (20 in 2015, according to UNICEF)
[126] National Health Report of population of Georgia 2014-2015 (http://www.moh.gov.ge/uploads/files/2017/angarishebi/moxsenebebi/en/24.102017.pdf)
[127] National Centre for Disease Control, Georgia, 2016 (http://www.ncdc.ge/Handlers/GetFile.ashx?ID=6164d012-744c-4077-bdc8-7943b43fe1f7)

national capacity building and shared responsibility for road safety in the state. Developed through capacity review and in consultation with the key governmental partners and road safety stakeholders, the Strategy sets a new long-term vision and goal for road safety in Georgia, stresses benefits of long-term investment in road safety, mentions measures and targets to address the key road safety problems.

E.4.4.2 Health facilities

792. In the region, there are a range of health facilities with limited capacities. This includes four hospitals, 27 dispensaries and two first aid medical centers in the region. Urgent medical services are provided by 14 ambulances to service the region.[128]

793. Medical services (hospitals) are available in administrative centers (see Table 92 below). Village doctor and assistants (nurses) are not available everywhere, due to shortage of qualified staff and a lack of appropriate infrastructure. In most cases, those seeking medical services go to Tbilisi. The remote village populations have problems in accessing medical facilities, particularly in winter, due to traveling conditions rather than services availability. While State insurance is available to all citizens, private insurance companies are not active in the Project area.

794. The closest medical facility to the Project road is in Gudauri.

Table 92: List of medical establishments in the Region[129]

Medical establishment	No. of medical staff		Location	Municipality
	Physicians	Assistant		
p/p Tamar Kulikhashvili	2	1	Chartali	Dusheti
Shuapkho ambulance station	1	1	Shuapkho	Dusheti
Ananuri Ambulance station Ltd	1	1	Ananuri	Dusheti
Bulachauri ambulance station Ltd	1	1	Bulachauri	Dusheti
Boarding house for persons with disabilities	2	5	Oirmisaantkari	Dusheti
Geohospitals Ltd –multiprofile medical centre	32	27	Dusheti	Dusheti
Mchadijvari ambulance station Ltd	2	3	Mchadijvari	Dusheti
Jinvali ambulance station	2	3	Jinvali	Dusheti
Shatili ambulance station	1	1	Shatili	Dusheti
Aragvis Kheoba Ltd	1	1	Choporti	Dusheti
Gremiskhevi ambulance	1	1	Gremiskhevi	Dusheti
Diagnozi 2010 Ltd (Family medical centre)	7	1	Dusheti	Dusheti
p/p Zaza Kavtaradze, Marina Bantsuri, Ilia Tsiklauri	3	4	Pasanauri	Dusheti
Saaragvo Ltd	1	3	Lapanaantkari	Dusheti
Pasanauri village doctors	4	0	Pasanauri	Dusheti
Bazaleti ambulance station Ltd	2	3	Bazaleti	Dusheti
Barisakho outpatient climic Ltd	1	2	Barisakho	Dusheti
Kvesheti ambulance station Ltd ^	1	2	Kvesheti	Dusheti
Hudamakhari ambulance station Ltd	1	1	Zanduki	Dusheti
Magharoskari ambulance station Ltd	1	1	Magharoskari	Dusheti
Geohospital Ltd – multiprofile medical centre	16	13	Stephantsminda	Dusheti
Regional healthcare center	22	3	Gudauri	Kazbegi

[128] http://www.mtskheta-mtianeti.gov.ge/page/full/19/Social%20sphere
[129] Ministry of Labor, Health and Social Affairs

795. Pharmacies are not available in the villages. For Kobi residents, the nearest medical facilities are located in Stephantsminda, while medical facilities in Kvesheti provide for residents of Tskere, Benian Begoni, Gomurni, Sviana-Rostiani, Zakatkari, Bedoni, Arakveti and Kvesheti.

E.4.4.3 Public Health Profile

796. At the national level, the numbers of beds have increased by 1.4% in the seven years from 2009-16, however the number of physicians has increased by 23%. Numbers of dentists have increased by almost 60%, however the number of paramedics has decreased by 6%. The overall number of outpatients has increased by almost half, as shown in Table 93 below.

Table 93: National Healthcare indicators[130]

Indicator	2009	2010	2011	2012	2013	2014	2015	2016
Number of hospital beds, thousands	13.6	12.1	12.8	11.3	11.6	11.7	12.8	13.8
Number of physicians, thousands	20.6	21.2	21.8	19.4	22.4	22.9	24.3	26.6
of which are dentists	1.0	1.0	1.3	1.5	1.9	1.8	2.1	2.4
Number of paramedical personnel, thousands	18.6	19.3	17.9	14.1	15.5	15.6	16.4	17.6
Out-patient visits, thousands	7,073.7	7,623.3	7,705.9	9,494.7	10,974.5	11,881.1	13,243.9	13,079.0

797. Locally available medicinal plants are used in traditional medicine.

E.4.5 Physical and Cultural Resources (PCR)

E.4.5.1 PCR Context

798. Georgia is a land of ancient culture, with a strong literary tradition based on the Georgian language and alphabet that dates to the 5th century AD. The ancient culture is reflected in the large number of architectural monuments, including many monasteries and churches, which also contributed to the development of the Byzantine style. Fine metalwork is also a cultural tradition, including icons made by Georgian goldsmiths between the 10th and 13th centuries AD. Modern cultural life continues to reflect the language history, with a number of newspapers and periodicals are published, most of them in Georgian. Radio programs are broadcast in Georgian and in several minority languages, and television programs are broadcast in Georgian and Russian.[131]

799. There are three properties in Georgia inscribed on the World Heritage list[132]. These are the Gelati Monastery (1994,2017); the Historical Monuments of Mtskheta (1994), located to the south of the project area; and Upper Svaneti (1996). There are 15 sites additionally on the tentative list.

[130] Geostat, 2017, http://geostat.ge/index.php?action=page&p_id=197&lang=eng
[131] https://www.britannica.com/place/Georgia/Cultural-life (last updated: 25 June 2018)
[132] http://whc.unesco.org/en/statesparties/ge

800. In the region there are a number of cultural centers of importance. In Kazbegi municipality, these include the Stephantsminda Historical Museum, the Vazha Phavela house-museum, and the Korsha ethnographic museum. Folk traditions are practiced at the House of Culture of Kazbegi through the Women's ensemble "Didebai", the young men's ensemble "Eroba", the young men's vocal ensemble and the children's folk ensemble of musical instruments.

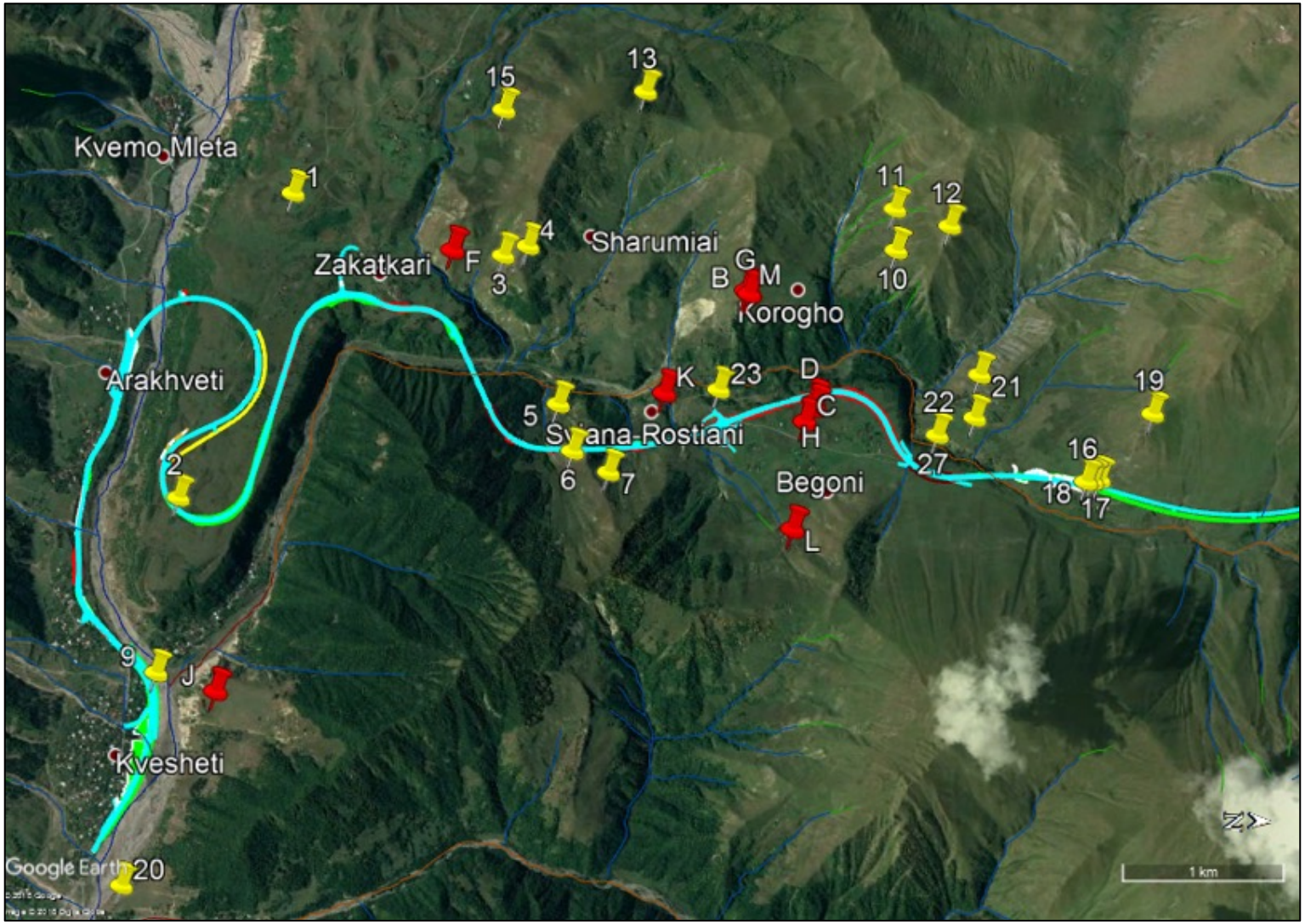
801. In Dusheti, there is one theatre and several museums, including the Dusheti Local Museum, and the Mutso Museum Reserve. Additionally, prominent houses now museums are in the municipality, being that of Vazha-Pshavela, Khitilishvili, David and Giorgi Eristavi, and Daniel Chonkhadze. Dusheti is rich in architectural monuments. There are around 100 churches, particularly the early medieval churches (basilica) Nunisi, Lapanaantkari and Davati; the Ananuri castle and church, the Bodorna and Mchadijvari churches, and the towers and residences in Pshav-Khevsureti and Mtiuleti villages. Monuments dating to the Neolithic period are present in the Aragvi Gorge, and paleolithic age tools have also been found. The area has an ancient history of being populated; archaeological objects unearthed in Jinvali provide evidence that in the mid-flow of the river there had in ancient times settlements or towns at that site.

E.4.5.2 PCR Baseline

802. Despite the Project area's historical role and importance as described in the above Heritage Context paragraphs, the archaeology of the area has not been extensively studied. The Khadistskali Gorge is often referred to as the Gorge of 60 Towers.

803. Accordingly, an assessment of physical cultural heritage through a survey in the area has been undertaken by national specialists (Specialists qualifications can be noted in **Appendix T**). Figure 129 to Figure 133 maps cultural monuments in the Project area. This is followed by a discussion of the most relevant PCR in the Project corridor which was also discussed with Stakeholders during community meetings.

Figure 128: Overview of Tskere – Kvesheti Section



Key: Red pins: monuments with registered status / Yellow pins: heritage sites with no registered status.

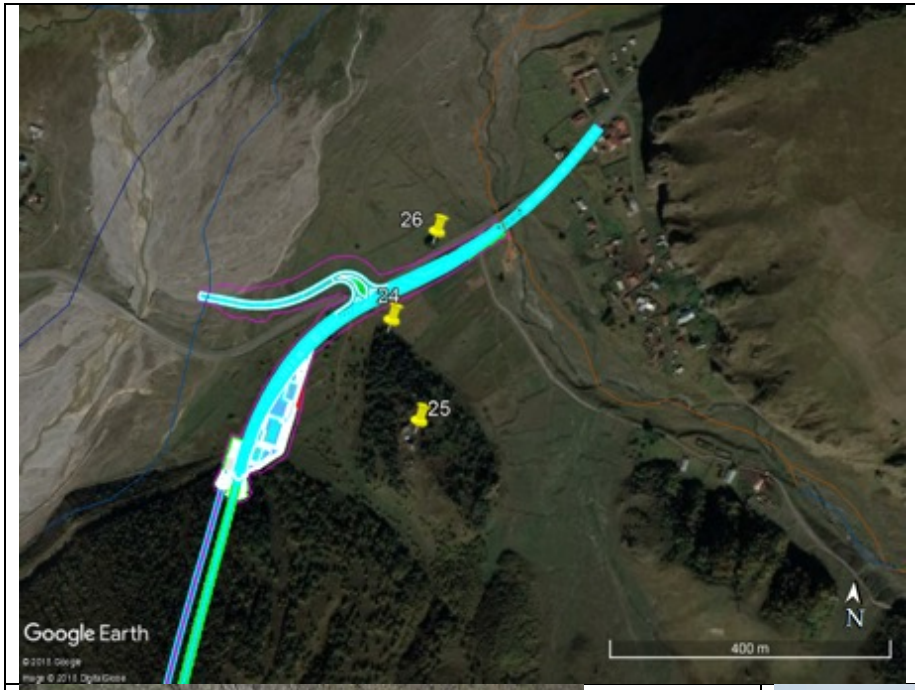


Figure 129: Kobi Section

#		Status	Category	Distance from Project road (m)
24	Niche (Jvarkhati)*	None	None	45
25	Giorgitsminda	None	None	179
26	War monument*	None	None	22

* the new alignment coinsides with existing road

#24 Jvarkhati (niche)

#25 Gorijvari complex

#26 War monument

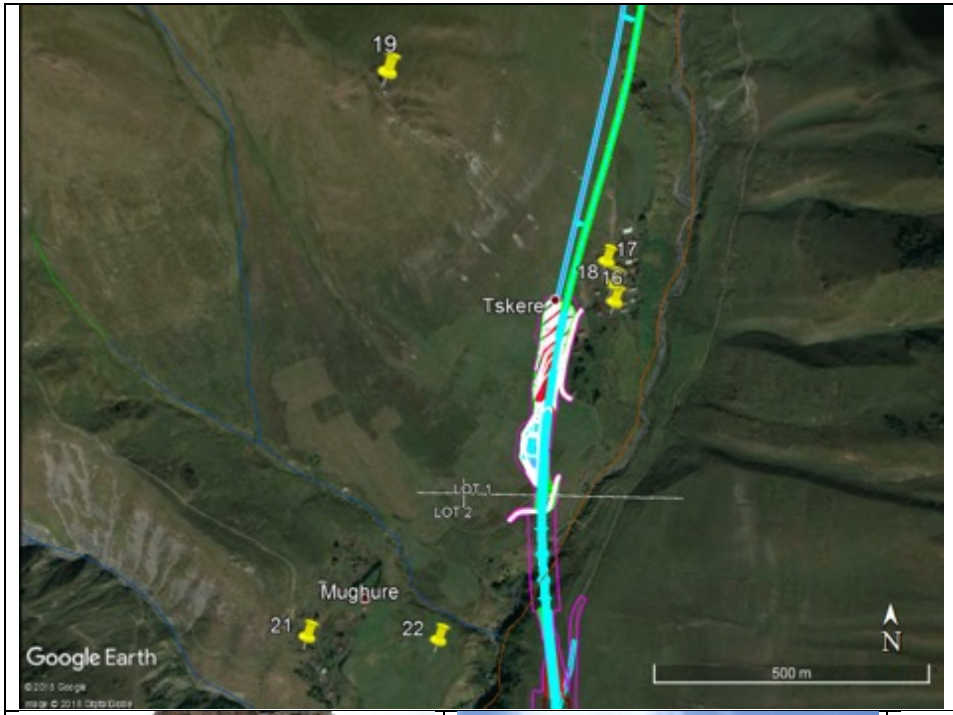


Figure 130: Kobi Section

#		Status	Category	Distance from Project road (m)
16	Naraidze tower	None	None	89
17	Zakaidze tower	None	None	57
18	All saint church, Tskere	None	None	79
19	Church	None	None	399
21	Tower	None	None	463
22	Tower	None	None	235

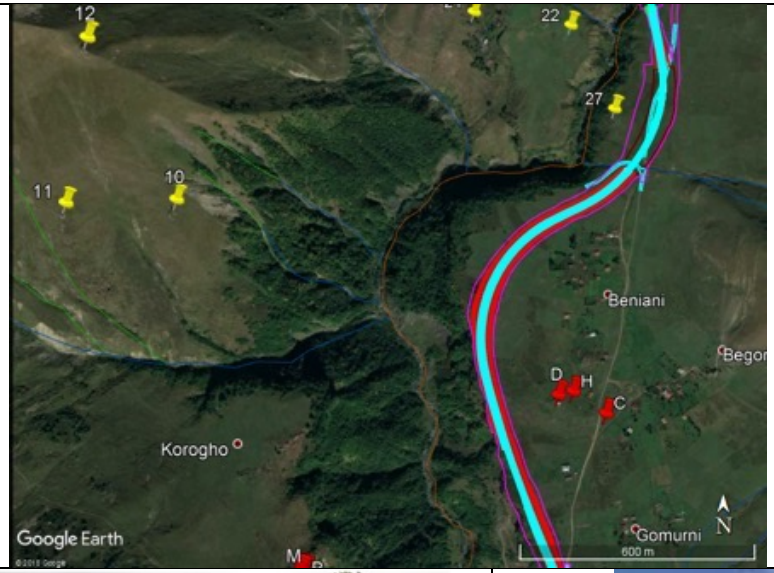
#21 Tower

#16 Tower

#17 Zakaidze tower

#18 Church

#19 Church



Begoni Section

#		Status	Category	Distance from Project road (m)
10	Tower	None	None	793
11	Tower	None	None	1037
12	Tower	None	None	1069
27	Remains of a tower	None	None	103
D,H,C	Archangel church	Cultural heritage monument [133]	None	167,

#27 Remains of a tower

C, D, H – Archangel church

#10, 11, 12 Tower

[133] i) an object of cultural heritage (cultural property):
i.a.) immovable or movable objects of cultural heritage (immovable or movable items defined by the Civil Code of Georgia), which have been granted cultural property status in accordance with the procedures established by this Law;
i.b) a complex type property - a collection of physically, functionally, historically or territorially interconnected objects of cultural heritage , which is a topographically identifiable unit and which has been granted cultural property status in accordance with the procedures established by this Law;

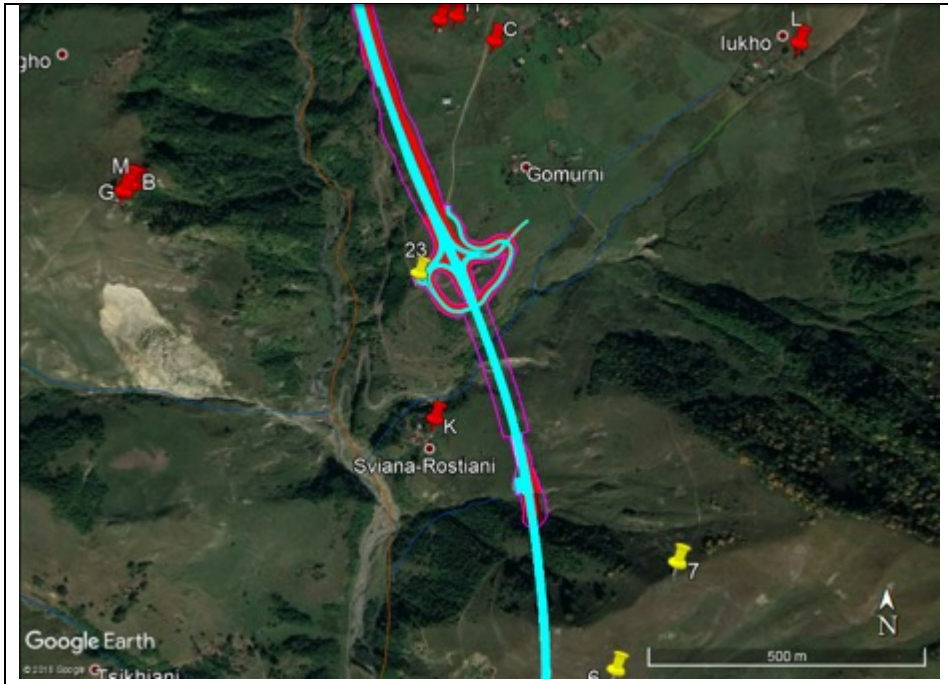


Figure 131: Gomurni Section

#		Status	Category	Distance from Project road (m)
6	Tower	None	None	129
7	Tower	None	None	257
23	Remains of a tower	None	None	95 to main road section, 2 meters to access road.
GMB	St.Mary church. Khorogo	Cultural heritage monument	National	593
L	Iriauli tower, Iuho	Cultural heritage monument	None	847
K	Svianadze complex	Cultural heritage monument	None	183

GMB- St Mary church

#6 Tower

#7 Tower

#23 – remains of a tower

L- Iukho tower

Figure 132: Zakatkari Section

#		Status	Category	Distance from Project road (m)
3	Tower	None	None	414
4	Tower	None	None	558
5	Tower	None	None	148
15	Tower	None	None	1183
F	Makharobliant Tsikhe. Zakatkari	Cultural heritage monument	None	266

#3 – Tower

#4 – Tower

#5 – Tower

#15 Tower

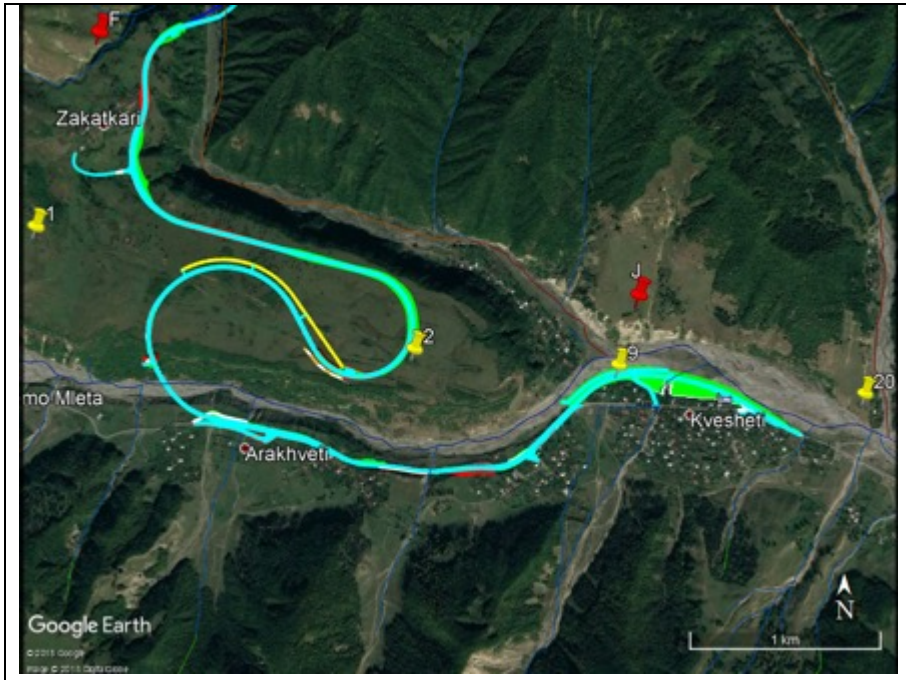


Figure 133: Kvesheti Section

#		Status	Category	Distance from Project road (m)
20	Tower	None	None	331
9	Cross	None	None	0
2	Tower	None	None	50
1	Tower	None	None	683
J	All saint shurch, Bedoni	Cultural heritage monument	None	334

J-All saint church, Bedoni

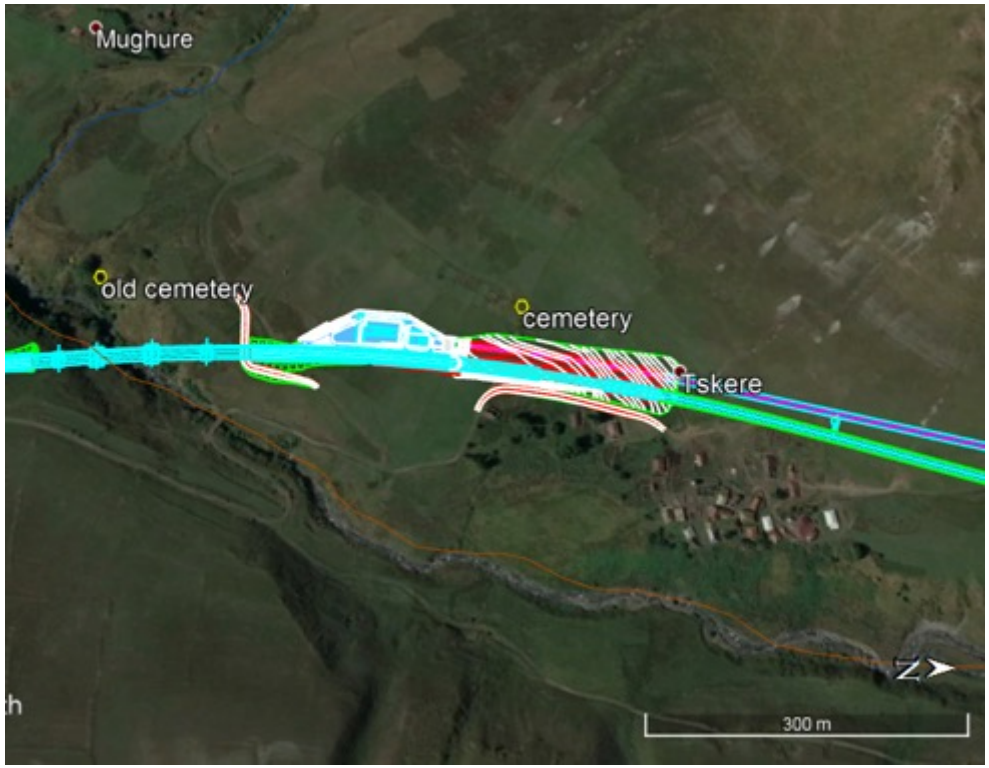
#1 - Tower

#2 - Tower

#9 – Cross

#20 – Tower

Figure 134: Kvesheti Section: Other sensitive locations (cemeteries)



#		Distance from Project road (m)	
1	Cemetery (Kobi)	45	In this section new alignment follows the existing road so impacts will not be significant.
2	Old cemetery (Tskere)	72	Is located outside of the construction zone. Impacts are likely yo be minimal. Access to the site is maintaned by the access road.
3	Cemetery (Tskere)	adjacent	In this section C&C is planned. Special protection measures will be provided to ensure protection of the west side of the cut. Access to the site is maintaned by the access road.

804. In Kvesheti, the proposed alignment coincides with a St. George niche (see #9, Figure 133, Figure 134). Stakeholder consultation revealed that this cross had been built by a local man after a church in Kvesheti had ceased activity; there has already been discussion about construction of a new church in Kvesheti, and the proposal to re-home this monument within its site. Additional engagement will be required between the RD and the Contractor prior to the start of construction to confirm relocation options.

805. Continuing along the alignment, there have been a number of towers registered. This includes a tower and the potential remains of the stone structure, which have been registered in the plateau near Kvesheti (#2, Figure 133). Around the tower, traces of walls are observed (Figure 135). The significance of the site is reported to be locally important; the niche was made by a local person to provide an alternative and local place of worship when the former church was relocated. East of the tower are the small mound of remains of the stone structure. In the same area, remains of stone masonry are registered in several locations.

Figure 135: Traces of walls

806. Surveys carried out in the area in 1989 and 2010 revealed some early and middle Bronze Age objects. In Sviana-Rostiani area near the mineral water outcrop, late Mtkvari-Arax and Bedeni culture ceramics, bronze jewelry and bone tools have been found in addition to middle bronze age Trialeti ceramics and bronze objects have been unearthed (see Figure 136). These artefacts are housed in the archaeological collection of the State Museum in Dusheti. Information about these finds were published in 1989 -1992 and 2010 reports, which have been preserved in the archives of the Cultural Heritage Preservation Agency of Georgia.

Figure 136: Artefacts unearthed near Sviana-Rostiani

Source – report of archaeologist. 1989 -1992 and 2010 reports, preserved in the archives of the Cultural Heritage Preservation Agency of Georgia.

807. The mineral outcrop itself is considered to be important in terms of cultural heritage and is located almost adjacent to the access road up the Khada valley (Path 1 - Figure 48: Lot 2 Work Sites).

808. In the interchange area near Zakatkari, cyclopean masonry structure was registered. It is currently used as a place of worship (see #23, Figure 131). Registered to the south of this site on the left bank is a river terrace built of cycloptic stones. The stone masonry differs from that of the medieval structures, indicating antiquity of the structure. However, without further archaeological study, the age and the purpose of this structure cannot yet be determined. There is the possibility of presence of burials and or other archaeological objects in this area, and, as the site is located in close proximity to the alignment, additional archaeological investigation is required prior to the commencement of works in the area. Approximately one kilometer from the mentioned site, near the village of Beniani, is a mound. This has been registered as the potential remains of a settlement.

809. Further cyclopean masonry towers have also been located further in the Khada Valley. Cyclopean masonry towers with two terraces have been registered between villages Beniani and Tskere (see #27, Figure 131). The road is proposed to be located approximately 80m from this site; further archaeological survey work is required prior to commencement of work. Similarly, from archaeological perspective, the area to the west of Tskere on the right bank of the river requires additional investigation prior to construction works. This area is proposed to comprise the section from the bridge at Begoni, to the Tunnel 5 portal.

810. The road in Tskere area runs along the old and the new cemeteries, which are currently accessed from the south side of the plot. The proposed alignment is close to this area but does not directly interfere with the cemetery. As noted in **Section B.4.2**, consultations with villagers in Tskere have led to design changes to protect the cemetery through reinforcement of cut slopes and modifications to their location and slope. Also, temporary accesses to the cemetery during the construction time have been adopted at the design.

Figure 137: Location of Cemetery in Relation to the Project Buffer, Tskere

Key: Purple Line – Project Buffer / Red Line – Cemetery

811. In the Tskere section of the road, the alignment is proposed to bypass the village on the north side. This section runs close to the riverbed. It is not expected that there will be archaeological objects in the area; interviews with the local residents and owners of the land plots located in this section indicated that no archaeological finds have been made in this area.

812. Near Kobi, at the proposed Tunnel 5 portal at the northernmost end of the road alignment, additional cultural heritage sites have been registered. At the tunnel portal site is a small hill with the Giorgitsminda church is located (see #25, Figure 129). The church on the top of the hill and the remains are assumed to belong to the late medieval age. In the same area, several stone mounds and a niche (Jvarkhati) have been observed (see #24, Figure 129). Another monument (memorial) is located in the area identified for potential spoil disposal in Kobi (see #26, Figure 129).

E.4.6 Noise & Vibration

General

813. Elevated noise in the Project area are only a result of vehicle movements along existing main roads in Kvesheti and Kobi.

814. No point sources of noise have been identified within the Project corridor. Within the gorge area only small tracks are present allowing limited movement of local vehicles to and from the small villages doted around the valley. Accordingly, noise levels in this area are very low, with only wind and birdsong generating any kind of noise. Accordingly, no baseline noise monitoring has been undertaken in these areas.

815. Vibration levels are likely to be very low in the Project area given the fact that vehicle traffic does not have significant impacts upon vibration and most of the road is located in uninhabited areas.

Noise Monitoring

816. From June 28 through July 3, 2018, independent monitoring consultants measured the baseline noise level in 4 points of the project area. The monitoring methodology is outlined in **Appendix H**.

Figure 138: Noise Monitoring Locations – Kvesheti and Arakveti

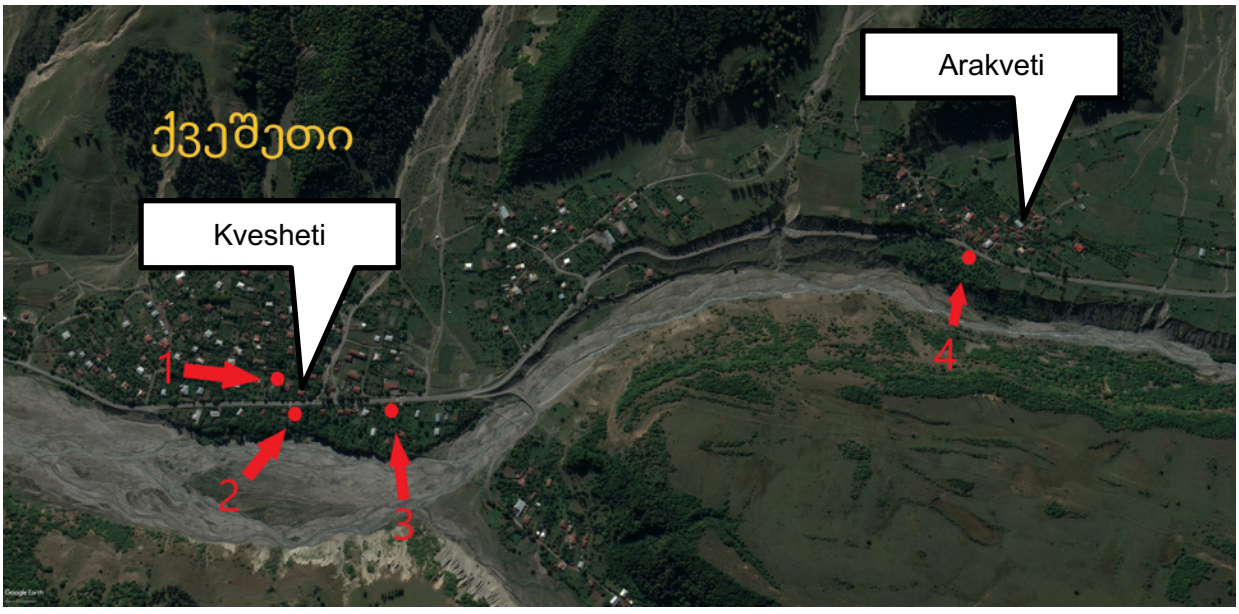


Figure 139: Noise Monitoring Locations - Kobi

817. Table 94 shows the averaged index of the data taken at 4 points of the project zone in a 24-hour continuous mode in every 3 hours.

Table 94: Average noise indicator with 3-hour intervals

#	Date	Coordinates / Location	Average indicator of noise (dBA)							
			21:00 – 24:00	00:00 – 03:00	03:00 – 06:00	06:00 – 09:00	09:00 – 12:00	12:00 – 15:00	15:00 – 18:00	18:00 – 21:00
1	28.06.2018 – 29.06.2018	42°25'36.57"N 44°33'26.37"E	53.6	51.1	52	52.3	53.8	54.4	53.8	53.2
2	29.06.2018 – 30.06.2018	42°25'38.32"N 44°33'24.29"E	54.5	53.9	52.3	53.9	55.2	58.6	55.9	55.9
3	30.06.2018 – 01.07.2018	42°25'38.57"N 44°33'13.58"E	46	43.4	46.1	45.6	49	50.9	49.7	50.1
4	02.07.2018 – 03.07.2018	42°25'30.07"N 44°32'7.42"E	53.1	52.6	53.9	51.6	54.3	57.7	50.3	53.7

5	01.10.2018 – 02.10.2018	42°33'22.23"N 44°29'59.21"E	52.4	52.1	53.1	50.4	52.9	54.1	52.1	52.8

818. The table shows that noise levels are generally above IFC nighttime limits (45 dBA, exceedance is shown in red) and within IFC daytime limits (green cells). The column with no shading overlaps IFC daytime and nighttime periods, so compliance with either standard cannot be shown.

819. Noise levels are quite constant throughout the day. This is caused by the fact that the major noise sources, the heavy goods vehicles, move along the given road section both, during the day and at night (many of them prefer traveling at night along the less loaded road).

820. As part of the impact assessment a model of the baseline noise levels in the Project area was also prepared using the baseline noise monitoring results to ensure consistency with the model. The results of the baseline model, which include all sections of the proposed new alignment, including Kvesheti and Kobi, as well as the Khada Valley, can be seen in **Section F.8.5 – Noise**.

Vibration Monitoring

821. Measurements of the existing vibration level were undertaken at four locations in two villages – Kvesheti and Arakveti. The measurements were done at four points in the buildings near which the existing noise levels were measured. The vibration was measured in a 24-hour continuous mode. Samples were taken in every 1 second, with total 1440 samples taken at each point. The monitoring methodology is provided in **Appendix H** and the detailed results of the measurements are given in **Appendix P.**

822. The results of measurements show, in all buildings where the vibration was measured, the existing vibration level for both long-term and short-term impacts is 2 to 3 times less the acceptable limits on average for Category 2 buildings.

F. Environmental Impacts and Mitigation Measures

F.1 Introduction

823. During the initial stage of the EIA process, several potential environmental and social impacts of the project were identified. The baseline surveys were conducted keeping in consideration the potential impacts. In this chapter, the potential environmental and social impacts are evaluated. The impacts have been identified based on consideration of the information presented in previous chapters. To avoid unnecessary repetition of supporting information, cross referencing to previous sections is given where necessary. Following the impact assessment, the mitigation measures related to each impact category is presented.

F.2 Impact Assessment Methodology

824. The general methodology used for impact assessment is described in this section. It describes the process of impact identification and definition, significance rating, the mitigation, management and good practice measures. This methodology follows the same format as two recently prepared ADB funded Category A EIAs in Georgia (Batumi Bypass and Khevi – Ubisa).

F.2.1 Identification of Significant Environmental Aspects

825. The significance of an impact is determined based on the product of the consequence of the impact and the probability of its occurrence. The consequence of an impact, in turn, is a function primarily of three impact characteristics:

a) magnitude
b) spatial scale
c) timeframe

826. Magnitude is determined from quantitative or qualitative evaluation of a number of criteria including:

(i) Sensitivity of existing or reasonably foreseeable future receptors.
(ii) Importance value of existing or reasonably foreseeable future receptors, described using the following:
    (a) inclusion in government policy.
    (b) level of public concern.
    (c) number of receptors affected.
    (d) intrinsic or perceived value placed on the receiving environment by stakeholders.
    (e) economic value to stakeholders.
(iii) Severity or degree of change to the receptor due to impact, measured qualitatively or quantitatively, and through comparison with relevant thresholds:
    (a) legal thresholds—established by law or regulation
    (b) functional thresholds if exceeded, the impacts will disrupt the functioning of an ecosystem sufficiently to destroy resources important to the nation or biosphere irreversibly and/or irretrievably
    (c) normative thresholds – established by social norms, usually at the local or regional level and often tied to social or economic concerns
    (d) preference thresholds—preferences for individuals, groups or organizations only, as distinct from society at large
    (e) reputational thresholds—the level of risk a company is willing to take when approaching or exceeding the above thresholds

827. Spatial scale is another impact characteristic affecting impact consequence. The spatial scale of impacts can range from localized (confined to the proposed Project Site) to extensive

(national or international extent). They also may vary depending on the component being considered.

828. The impact timeframe is the third principal impact characteristic defining impact consequence and relates to either its duration or its frequency (when the impact is intermittent). Impact duration can range from relatively short (less than four years) to long (beyond the life of the Project). Frequency ranges from high (more than 10 times a year) to low (less than once a year). These timeframes will need to be established for each Project based on its specific characteristics and those of the surrounding environment.

829. Once the impact consequence is described on the basis of the above impact characteristics, the probability of impact occurrence is factored in to derive the overall impact significance. The probability relates to the likelihood of the impact occurring, not the probability that the source of the impact occurs. For example, a continuous Project activity may have an unlikely probability of impact if there are no receptors within the area influenced by that activity.

830. The characteristics are outlined in the table below.

Table 95: Characteristics Used to Describe Impact

Characteristic	Sub-components	Terms Used to Describe the Impact
Type		Positive (a benefit), negative (a cost) or neutral
Nature		Biophysical, social, cultural, health or economic Direct, indirect or cumulative or induced
Phase of the Project		Construction and operation.
Magnitude	Sensitivity of Receptor	High, medium or low capacity to accommodate change High, medium or low conservation importance Vulnerable or threatened Rare, common, unique, endemic
	Importance or value of receptor	High, medium or low concern to some or all stakeholders High, medium or low value to some or all stakeholders (for example, for cultural beliefs) Locally, nationally or internationally important Protected by legislation or policy
	Severity or degree of change to the receptor	Gravity or seriousness of the change to the environment Intensity, influence, power or strength of the change Never, occasionally or always exceeds

Characteristic	Sub-components	Terms Used to Describe the Impact
		relevant thresholds
Spatial Scale	Area affected by impact – boundaries at local and regional extents will be different for biophysical and social impacts	Area or Volume covered Distribution Local, regional, transboundary or global
Timeframe	Length of time over which an environmental impact occurs or frequency of impact when intermittent	Short term or long term Intermittent (what frequency) or continuous Temporary or permanent Immediate effect (impact experienced immediately after causative project aspect) or delayed effect (effect of the impact is delayed for a period following the causative project aspect)
Probability – likelihood or chance an impact will occur		Definite (impact will occur with high likelihood of probability) Possible (impact may occur but could be influenced by either natural or project related factors) Unlikely (impact unlikely unless specific natural or Project related circumstances occur)

F.2.2 Impact Significance Rating

831. The impact significance rating process serves two purposes: firstly, it helps to highlight the critical impacts requiring consideration in the approval process; secondly, it serves to show the primary impact characteristics, as defined above, used to evaluate impact significance. The impact significance rating system is presented in Table 96 and described as follows:

(i) **Part A**: Define impact consequence using the three primary impact characteristics of magnitude, spatial scale and duration.
(ii) **Part B**: Use the matrix to determine a rating for impact consequence based on the definitions identified in Part A; and
(iii) **Part C**: Use the matrix to determine the impact significance rating, which is a function of the impact consequence rating (from Part B) and the probability of occurrence.

832. Using the matrix, the significance of each described impact is rated.

Table 96: Method for Rating Significance

PART A: DEFINING CONSEQUENCE IN TERMS OF MAGNITUDE, DURATION AND SPATIAL SCALE			
Definition		Criteria	
MAGNITUDE		Negative	Positive
	Major	• Large number of receptors affected • Receptors highly sensitive and/or are of conservation importance • Substantial deterioration, nuisance or harm to receptors expected • Relevant thresholds often exceeded • Significant public concern expressed during stakeholder consultation • Receiving environment has an inherent value to stakeholders	• Large number of receptors affected • Receptors highly amenable to positive change • Receptors likely to experience a big improvement in their situation • Relevant positive thresholds often exceeded
	Moderate	• Some receptors affected • Receptors slightly sensitive and/or of moderate conservation importance • Measurable deterioration, nuisance or harm to receptors • Relevant thresholds occasionally exceeded • Limited public concern expressed during stakeholder consultation • Limited value attached to the environment	• Some receptors affected • Receptors likely to experience some improvement in their situation • Relevant positive thresholds occasionally exceeded
	Minor	• No or limited receptors within the zone of impact • Receptors not sensitive to change • Minor deterioration, nuisance or harm to receptors • Change not measurable or relevant thresholds never exceeded • Stakeholders have not expressed concerns regarding the receiving environment	• No or limited receptors affected • Receptors not sensitive to change • Minor or no improvement in current situation • Change not measurable • Relevant positive thresholds never exceeded No stakeholder comment expected

TIMEFRAME		Duration of Continuous Aspects	Frequency of Intermittent Aspects
	Short term / low frequency	• Less than 4 years from onset of impact	• Occurs less than once a year
	Medium term / medium frequency	• More than 4 years from onset of impact up to end of life of project (approximately 30 years)	• Occurs less than 10 times a year but more than once a year
	Long term / high frequency	• Impact is experienced during and beyond the life of the project (greater than 30 years)	• Occurs more than 10 times a year
SPATIAL SCALE		Biophysical	Socio-economic
	Small	• Within the defined 'Project area'	• Within the defined 'Project area
	Intermediate	• Within the district in which is the facilities are located	• Within the municipality in which the activity occurs
	Extensive	• Beyond the district in which the facilities are located	• Beyond the municipality in which the activity occurs

PART B: DETERMINING CONSEQUENCE RATING				
MAGNITUDE	TIMEFRAME	SPATIAL SCALE		
		Small	Intermediate	Extensive
Minor	Short term / low frequency	Low	Low	Medium
	Medium term / medium frequency	Low	Low	Medium
	Long term / high frequency	Medium	Medium	Medium
Moderate	Short term / low frequency	Low	Medium	Medium
	Medium term / medium frequency	Medium	Medium	High
	Long term / high frequency	Medium	High	High
Major	Short term / low frequency	Medium	Medium	High
	Medium term / medium frequency	Medium	Medium	High
	Long term / high frequency	High	High	High

PART C: DETERMINING SIGNIFICANCE RATING				
		CONSEQUENCE		
		Low	Medium	High
PROBABILITY (of exposure to impacts)	Definite	Low	Medium	High
	Possible	Low	Medium	High
	Unlikely	Low	Low	Medium

F.3 Mitigation, Management and Good Practice Measures

833. Wherever the Project is likely to result in unacceptable impact on the environment, mitigation measures are proposed (over and above the inherent design measures included in the Project description). In addition, good practice measures may be proposed however these are unlikely to change the impact significance. In the case of positive impacts, management measures are suggested to optimize the benefits to be gained. Where mitigation measures are required the impact will be rated again to show the residual impact after implementation of management controls.

F.4 Mitigation Hierarchy

834. The following mitigation hierarchy will be utilized in selecting practical mitigation measures for unacceptable impacts as follows (in order of preference):

(i) Avoid the impact wherever possible by removing the cause(s).
(ii) Reduce the impact as far as possible by limiting the cause(s).
(iii) Ameliorate the impact by protecting the receptor from the cause(s) of the impact.
(iv) Providing compensatory measures to offset the impact, particularly where an impact is of high significance and none of the above are appropriate.

F.5 Physical Resources

F.5.1 Air quality

Potential Air Quality Impacts

835. The following table summarizes the key potential air quality impacts and indicates potential impact significance using the methodology outlined in **Section F.2**.

Table 97: Impact Screening – Air Quality

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	Dust from stationary sources	Nearby communities	L	M	M	M	MOD	H/F	SMALL	MED	DEF	M
C	Exhaust Emissions from construction vehicles and generators	Nearby communities	L	L	L	M	MIN	H/F	SMALL	MED	DEF	M
C	Dust from the movement of vehicles, stockpiles, etc.	Nearby communities / Agric. Crops	L	M	M	M	MOD	H/F	SMALL	MED	DEF	M
O	Vehicle Emissions from traffic using the road.	Nearby communities	L	M	M	M	MOD	LT	SMALL	MED	DEF	M

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely
Cells shaded in blue are positive impacts.

836. These key potential impacts and other minor impacts are described in more detail below.

Pre-construction & Construction Phase

837. Deterioration of air quality during pre-construction and construction works can be due to the following:

- Dust emissions during earthwork and from stockpiles;
- Dust from loading, transportation and unloading of soil and other friable materials;
- Dust from the demolition of the houses subject to acquisition;
- Emissions from operation of construction machinery, asphalt plant, concrete batching plant, etc.;
- Dust and emissions from onsite and offsite traffic, vehicles moving across unpaved or dusty surfaces.

838. Dust is the major air quality problem from construction sites. Dust is a problem for a variety of reasons, as outlined below:

(i) Inconvenience to local people. For example, people may have to re-wash laundry that has been put outdoors to dry, and wash windows, curtains and vehicles. Dust can contaminate meat hanging up in open-air butchers and other food that is exposed to it in homes, shops and open-air restaurants, giving food a gritty texture.
(ii) Health and safety problems. Dust may affect health by irritating eyes and worsening the health of people with asthma. Dust can reduce visibility for drivers on roads. It can also be blown for long distances by wind.
(iii) Crop damage. Even low concentrations of dust can affect plant and fruit growth as far away as one kilometer from a construction site. Plant growth is particularly susceptible to dusts that are highly alkaline, for example limestone and cement dust. Dust deposited during light rainfall can cause the soil surface to form a crust increasing run-off.
(iv) Impact on ecology. Dust blowing onto watercourses may damage ecology by increasing sedimentation, reducing sunlight and suffocating fish. It may also affect plant growth and change the species of plants growing in an area. Dust may also damage trees and other vegetation planted as part of the construction contract.
(v) Impacts to businesses. Bee keeping is noted as one of the economic activities within the Project area. Dust could impact upon this activity if sources of dust are not adequately controlled or construction facilities are incorrectly sited.
(vi) Damage to plant and equipment. Within the construction site, dust can cause mechanical or electrical problems in sensitive equipment such as computers. It can also increase abrasion of moving parts in equipment and clogging of air filters.

839. Potential impacts will be particularly notable in the sections running close to the residential areas such as Kvesheti, Arakveti, Zakatkari, Gomurni, Benian-Begoni, Tskere and Kobi.

840. It is very difficult to accurately quantify dust emissions arising from construction activities. It is thus not possible to easily predict changes to levels of dust or PM10/PM2.5 concentrations. The amounts of vehicle-emitted pollutants will depend on the technical condition of the Contractors vehicles, fuel quality and travel speed. Older vehicles usually have lower fuel consumption efficiency and cause higher emissions of combustion by-products. Increasing speed of the vehicle demands higher fuel supply and therefore results in larger amounts of emitted pollutants. Keeping that in mind attention should be paid to the age and status of technical maintenance of vehicles/machinery used by contractor during construction. Where feasible, preference shall be given to electric equipment.

841. As mentioned earlier there are no industrial sources of air pollution in the area except for the traffic along the existing road and an asphalt plant near Kobi.

842. The scale of dust and exhaust emissions related impacts will depend on the prevailing wind direction in the Project area, traffic speed and the status of technical maintenance of the vehicles/machinery and organization of works.

843. It should also be considered that location of the camp and laydown sites (including topsoil, spoil disposal areas) is not yet known. The location, layout and technical parameters will be defined by the Contractor. Several areas have been proposed by the Design team for spoil disposal (see **Section B.5.7**). The final locations of the temporary (camp, laydown areas) and permanent (spoil disposal) sites will be specified by the Contractor with consideration of the recommendations provided in the EIA. Locations will be agreed with MoEPA and approved by the Lenders. The location of the spoil disposal sites will be subject to separate assessment (Spoil Disposal Plan – **Appendix F**) that will require review and approval from RD, the Engineer, ADB and EBRD in advance of any works. The Contractor will also be responsible for preparing a brief environmental assessment for each spoil disposal site to be submitted to MoEPA.

Operational Phase

The main source of air pollution during the operational phase will be vehicles moving on the highway. The main pollutants are: Carbon Monoxide (CO); Nitrogen Dioxide (NO_2); Sulfur Dioxide (SO_2), and particulate matter (PM).

844. An assessment of impact on air quality during operation of the highway was carried out using software referred to in the text below. Traffic data provided by the ADB was used as a basis for calculation. The model included the effects of emissions from the tunnel portals.

845. Qualitative and quantitative characteristics of emissions were calculated using the software 'Магистраль-город', версия 3.0, Copyright ©1997-2013 ФИРМА «ИНТЕГРАЛ»'. Dispersion of emitted matter was modelled software УПРЗА «ЭКОЛОГ», version 4.50, Copyright © 1990-2018 ФИРМА «ИНТЕГРАЛ». Full details of the software can be found in **Appendix Q**.

846. Modelling dispersion mapping is provided by **Appendix D**.

847. The model shows results using the national one time maximum threshold averaging periods (in light blue) and IFC air quality guideline limit averaging periods (in pink). The model shows that emissions of the pollutants listed above are within allowable national limits with the exception of one reading of NO_2 in Kobi in 2043. The model also shows that air emissions are well below IFC limits for NO_2, PM2.5 and SO_2.

Table 98. Air quality modeling results in selected locations

#	Coordinates	Substance			Georgian Standards					IFC Standards				
		Code	Name		National Limit (one time max. threshold)	Baseline	2024	2030	2043	IFC guidelines (averaging period 24 hrs)	Baseline	2024	2030	2043
1	464085.00 m E 4697141.00 m N	301	Nitrogen dioxide (Nitrogen (IV) oxide)	NO2	200	24	34	58	92	200*	3	5	8	13
		304	Nitrogen (II) monoxide	NO	400	4	5	9	15	n/a	-	-	-	-
		328	PM2.5	PM2.5	150	0.6	0.8	1	2	25	0.1	0.1	0.2	0.3
		330	Sulphur dioxide	SO2	500	0.2	0.2	0.4	0.6	20	0.02	0.03	0.1	0.1
		337	Carbone monoxide	CO	5000	29	43	74	115	n/a	-	-	-	-
2	463547.00 m E 4697329.00 m N	301	Nitrogen dioxide (Nitrogen (IV) oxide)	NO2	200	20	27	47	74	200*	3	4	7	12
		304	Nitrogen (II) monoxide	NO	400	3	4	8	12	n/a	-	-	-	-
		328	PM2.5	PM2.5	150	0.5	0.7	1	2	25	0.1	0.1	0.2	0.3
		330	Sulphur dioxide	SO2	500	0.1	0.2	0.3	0.5	20	0.02	0.03	0.1	0.1
		337	Carbone monoxide	CO	5000	24	34	59	93	n/a	-	-	-	-
3	463175.00 m E 4697397.00 m N	301	Nitrogen dioxide (Nitrogen (IV) oxide)	NO2	200	52	71	125	195	200*	4	5	9	15
		304	Nitrogen (II) monoxide	NO	400	8	12	20	32	n/a	-	-	-	-
		328	PM2.5	PM2.5	150	1	2	3	5	25	0.1	0.1	0.2	0.4

#	Coordinates	Substance			Georgian Standards					IFC Standards				
		Code	Name		National Limit (one time max. threshold)	Baseline	2024	2030	2043	IFC guidelines (averaging period 24 hrs)	Baseline	2024	2030	2043
		330	Sulphur dioxide	SO2	500	0.3	0.5	0.9	1	20	0.02	0.03	0.1	0.1
		337	Carbone monoxide	CO	5000	62	91	156	245	n/a	-	-	-	-
4	462978.00 m E 4697522.00 m N	301	Nitrogen dioxide (Nitrogen (IV) oxide)	NO2	200	21	29	50	79	200*	2	3	5	7
		304	Nitrogen (II) monoxide	NO	400	3	5	8	13	n/a	-	-	-	-
		328	PM2.5	PM2.5	150	0.5	0.7	1	2	25	0.1	0.1	0.1	0.2
		330	Sulphur dioxide	SO2	500	0.1	0.2	0.3	0.5	20	0.01	0.02	0.03	0.05
		337	Carbone monoxide	CO	5000	25	36	63	99	n/a	-	-	-	-
5	462686.00 m E 4696946.00 m N	301	Nitrogen dioxide (Nitrogen (IV) oxide)	NO2	200	49	68	112	186	200*	5	7	10	18
		304	Nitrogen (II) monoxide	NO	400	8	11	18	30	n/a	-	-	-	-
		328	PM2.5	PM2.5	150	1	2	3	5	25	0.1	0.2	0.3	0.5
		330	Sulphur dioxide	SO2	500	0.3	0.5	0.8	1	20	0.03	0.1	0.1	0.1
		337	Carbone monoxide	CO	5000	59	86	141	233	n/a	-	-	-	-
6	462486.00 m E 4696910.00 m N	301	Nitrogen dioxide (Nitrogen (IV) oxide)	NO2	200	45	62	103	170	200*	5	7	12	19
		304	Nitrogen (II) monoxide	NO	400	7	10	17	28	n/a	-	-	-	-

#	Coordinates	Substance			Georgian Standards					IFC Standards				
		Code	Name		National Limit (one time max. threshold)	Baseline	2024	2030	2043	IFC guidelines (averaging period 24 hrs)	Baseline	2024	2030	2043
		328	PM2.5	PM2.5	150	1	2	3	4	25	0.1	0.2	0.3	0.5
		330	Sulphur dioxide	SO2	500	0.3	0.4	0.7	1	20	0.03	0.1	0.1	0.1
		337	Carbone monoxide	CO	5000	54	79	129	213	n/a	-	-	-	-
7	461634.00 m E 4697071.00 m N	301	Nitrogen dioxide (Nitrogen (IV) oxide)	NO2	200	52	72	124	196	200*	4	6	11	17
		304	Nitrogen (II) monoxide	NO	400	8	12	20	32	n/a	-	-	-	-
		328	PM2.5	PM2.5	150	1	2	3	5	25	0.1	0.2	0.3	0.4
		330	Sulphur dioxide	SO2	500	0.4	0.4	0.9	1	20	0.03	0.04	0.1	0.1
		337	Carbone monoxide	CO	5000	63	91	156	246	n/a	-	-	-	-
8	460985.00 m E 4697161.00 m N	301	Nitrogen dioxide (Nitrogen (IV) oxide)	NO2	200	25	34	59	94	200*	1	2	3	5
		304	Nitrogen (II) monoxide	NO	400	4	6	10	15	n/a	-	-	-	-
		328	PM2.5	PM2.5	150	0.6	0.9	1	2	25	0.03	0.04	0.07	0.11
		330	Sulphur dioxide	SO2	500	0.2	0.2	0.4	0.6	20	0.01	0.01	0.02	0.03
		337	Carbone monoxide	CO	5000	30	43	74	117	n/a	-	-	-	-
9	462353.00 m E	301	Nitrogen dioxide (Nitrogen (IV) oxide)	NO2	200	21	29	50	79	200*	2	2	4	7

#	Coordinates	Substance			Georgian Standards					IFC Standards				
		Code	Name		National Limit (one time max. threshold)	Baseline	2024	2030	2043	IFC guidelines (averaging period 24 hrs)	Baseline	2024	2030	2043
	4698075.00 m N	304	Nitrogen (II) monoxide	NO	400	3	5	8	13	n/a	-	-	-	-
		328	PM2.5	PM2.5	150	0.5	0.7	1	2	25	0.05	0.06	0.10	0.17
		330	Sulphur dioxide	SO2	500	0.1	0.2	0.3	0.5	20	0.01	0.02	0.03	0.05
		337	Carbone monoxide	CO	5000	25	37	63	99	n/a	-	-	-	-
10	460744.00 m E 4698884.00 m N	301	Nitrogen dioxide (Nitrogen (IV) oxide)	NO2	200	50	70	122	192	200*	4	6	10	16
		304	Nitrogen (II) monoxide	NO	400	8	11	20	31	n/a	-	-	-	-
		328	PM2.5	PM2.5	150	1	2	3	5	25	0.11	0.14	0.25	0.40
		330	Sulphur dioxide	SO2	500	0.3	0.5	0.8	1	20	0.03	0.04	0.07	0.11
		337	Carbone monoxide	CO	5000	61	89	153	240	n/a	-	-	-	-
11	461374.00 m E 4700520.00 m N	301	Nitrogen dioxide (Nitrogen (IV) oxide)	NO2	200	19	26	46	71	200*	2	3	5	8
		304	Nitrogen (II) monoxide	NO	400	3	4	7	12	n/a	-	-	-	-
		328	PM2.5	PM2.5	150	0.5	0.6	1	2	25	0.06	0.07	0.13	0.20
		330	Sulphur dioxide	SO2	500	0.1	0.2	0.3	0.5	20	0.02	0.02	0.04	0.06
		337	Carbone monoxide	CO	5000	23	33	57	89	n/a	-	-	-	-

#	Coordinates	Substance			Georgian Standards					IFC Standards				
		Code	Name		National Limit (one time max. threshold)	Baseline	2024	2030	2043	IFC guidelines (averaging period 24 hrs)	Baseline	2024	2030	2043
12	461412.00 m E 4701266.00 m N	301	Nitrogen dioxide (Nitrogen (IV) oxide)	NO2	200	23	31	54	85	200*	3	4	7	11
		304	Nitrogen (II) monoxide	NO	400	4	5	9	14	n/a	-	-	-	-
		328	PM2.5	PM2.5	150	0.6	0.8	1	2	25	0.08	0.1	0.18	0.28
		330	Sulphur dioxide	SO2	500	0.2	0.2	0.4	0.6	20	0.02	0.03	0.05	0.08
		337	Carbone monoxide	CO	5000	27	39	68	106	n/a	-	-	-	-
13	461516.00 m E 4701889.00 m N	301	Nitrogen dioxide (Nitrogen (IV) oxide)	NO2	200	33	46	80	125	200*	4	5	9	14
		304	Nitrogen (II) monoxide	NO	400	5	7	13	20	n/a	-	-	-	-
		328	PM2.5	PM2.5	150	0.9	1	2	3	25	0.09	0.12	0.22	0.34
		330	Sulphur dioxide	SO2	500	0.2	0.3	0.6	0.9	20	0.02	0.03	0.06	0.09
		337	Carbone monoxide	CO	5000	40	58	101	157	n/a	-	-	-	-
14	461255.00 m E 4702458.00 m N	301	Nitrogen dioxide (Nitrogen (IV) oxide)	NO2	200	16	22	38	59	200*	1	2	3	5
		304	Nitrogen (II) monoxide	NO	400	3	4	6	10	n/a	-	-	-	-
		328	PM2.5	PM2.5	150	0.4	0.5	0.9	1	25	0.03	0.04	0.08	0.12
		330	Sulphur dioxide	SO2	500	0.1	0.2	0.3	0.4	20	0.01	0.01	0.02	0.03

#	Coordinates	Substance			Georgian Standards					IFC Standards				
		Code	Name		National Limit (one time max. threshold)	Baseline	2024	2030	2043	IFC guidelines (averaging period 24 hrs)	Baseline	2024	2030	2043
		337	Carbone monoxide	CO	5000	19	27	47	74	n/a	-	-	-	-
15	461785.00 m E 4703188.00 m N	301	Nitrogen dioxide (Nitrogen (IV) oxide)	NO2	200	34	47	81	128	200*	1	2	3	5
		304	Nitrogen (II) monoxide	NO	400	5	8	13	21	n/a	-	-	-	-
		328	PM2.5	PM2.5	150	0.9	1	2	3	25	0.03	0.04	0.07	0.12
		330	Sulphur dioxide	SO2	500	0.2	0.3	0.6	0.9	20	0.01	0.01	0.02	0.03
		337	Carbone monoxide	CO	5000	41	59	102	160	n/a	-	-	-	-
16	459928.00 m E 4712084.00 m N	301	Nitrogen dioxide (Nitrogen (IV) oxide)	NO2	200	55	76	133	208	200*	3	5	8	12
		304	Nitrogen (II) monoxide	NO	400	9	12	22	34	n/a	-	-	-	-
		328	PM2.5	PM2.5	150	1	2	3	5	25	0.09	0.11	0.20	0.31
		330	Sulphur dioxide	SO2	500	0.4	0.5	0.9	1	20	0.02	0.03	0.05	0.09
		337	Carbone monoxide	CO	5000	66	99	167	261	n/a	-	-	-	-
17	459879.00 m E 4712103.00 m N	301	Nitrogen dioxide (Nitrogen (IV) oxide)	NO2	200	47	65	113	173	200*	4	5	10	15
		304	Nitrogen (II) monoxide	NO	400	8	11	18	29	n/a	-	-	-	-
		328	PM2.5	PM2.5	150	1	2	3	4	25	0.10	0.14	0.24	0.38

#	Coordinates	Substance			Georgian Standards					IFC Standards				
		Code	Name		National Limit (one time max. threshold)	Baseline	2024	2030	2043	IFC guidelines (averaging period 24 hrs)	Baseline	2024	2030	2043
		330	Sulphur dioxide	SO2	500	0.3	0.5	0.8	1	20	0.03	0.04	0.07	0.10
		337	Carbone monoxide	CO	5000	57	85	142	223	n/a	-	-	-	

* averaging period 1 hour

Management & Mitigation Actions

Planning

848. The Contractor will develop an **Air Quality Management Plan**. The plan shall provide details of mitigation measures, specific location and schedule where such measures shall be implemented to minimize impacts to sensitive receptors due to the presence of the camp, construction works, sourcing and transport of construction materials, and other project-related activities. Prior to commencement of works likely emissions from rock crushers, concrete production facilities and other emissions generating facilities must be calculated and agreed with the MoEPA. A separate plan/schedule for air quality control in the tunnel must be provided as part of the Contractors **Tunnel OHS Plan**.

849. In addition, to help manage impacts to air quality the Contractor shall also prepare, as part of his SEMP:

- **Traffic Management Plan.**
- **Occupational and Community Health and Safety Plan.**
- **Emergency Response Plan.**

850. During the construction phase of the Project, the Contractor will also be responsible for preparing method statements for:

- **Temporary Road Method Statement.**
- **Temporary Storage Area Method Statement.**
- **Temporary River Crossing Method Statement.**

851. These method statements will include sections relating to the management of air quality, including dust control. The method statements shall be reviewed by the Contractors ECoW before submittal to the Engineer and RD for review and approval. All method statements must be prepared and approved before any works can start in the planned areas. The method statements shall also include a record of consultations undertaken with neighboring land users and road users including their agreements for the use of these areas, roads.

Pre-construction / Construction Phase

852. In order to avoid or mitigate impact works the Contractor shall:

- Strictly implement approved Air Quality Management Plan.
- Obtaining environmental impact permit for asphalt plant (if planned to run own facility);
- Ensure that no construction camp, batching plant, asphalt plans or rock crushing plant is located within **1km of any residential property and not within 2 km of any nationally or internationally designated site**.
- Ensure proper state of maintenance of buildings, machinery and vehicles to minimize exhaust emissions. Smoke emitting vehicles and equipment shall not be allowed and shall be repaired or removed from the project.
- Undertake immediate repairs of any malfunctioning construction vehicles and equipment.
- Use construction equipment and vehicles that meet national emission standards.
- Wherever possible, use electrically-powered equipment rather than gas or diesel-powered equipment.
- Give priority to fuel efficient machinery.
- Ensure that all diesel and petrol running machinery use equipped with catalytic convertors.
- Position any stationary emission sources (e.g., portable diesel generators, compressors, etc.) as far as is practical from sensitive receptors.

- Locate support facilities and spoil disposal sites so to reduce trip numbers and distance – as far as feasible.
- Provide truck-washing facilities at tunnel portal and bridge construction sites to prevent truck-out of mud and dust. Above ground option is deemed to be the priority.
- Rock crushing plant equipment shall be fitted with water sprinklers that will run continuously while the plant is operational.
- If the sprinklers stop working, the plant shall also cease operation until the sprinklers are functioning.
- Water run-off from the sprinkler system shall not discharge directly to surface water courses without first passing through a silt trap or any other suitable device to prevent siltation of surface waters.
- Emissions from on-road and off-road vehicles should comply with national or regional programs. In the absence of these, the following should be considered:
- Regardless of the size or type of vehicle, owners / operators should implement the manufacturer recommended engine maintenance programs.
- Drivers should be instructed on a routine basis by the Contractors Health and Safety Specialists on the benefits of driving practices that reduced both the risk of accidents and fuel consumption, including measured acceleration and driving within safe speed limits.
- Implement a regular vehicle maintenance and repair program.
- Conveyor belts (e.g. at batching plants and rock crushing plants) shall be fitted with wind-boards, and conveyor transfer points and hopper discharge areas shall be enclosed to minimize dust emission.
- All trucks used for transporting materials to and from the site will be covered with canvas tarpaulins.
- Carry out watering for dust control at least three times a day: in the morning, at noon, and in the afternoon during dry weather with temperatures of over 25°, or in windy weather. Avoid overwatering as this may make the surrounding muddy.
- Earthwork operation to be suspended when the wind speed exceeds 20 km/h in areas within 500 m of any community.
- Provide vegetation planting along roadsides to limit air quality impacts.

Operational Phase

853. As noted above, the Air Quality Model predicts that air quality during the operational phase of the Project will be below national limits (with the exception of one location in 2043 where levels of NO_2 may be elevated above national standards) and below IFC limits for NO_2, PM2.5 and SO_2.

854. Notwithstanding the above, it is recommended to plant a vegetation barrier along the road (in particular in the sensitive areas such as settlements). Roadside vegetation can help reduce air pollutant concentrations near roads. The presence of a barrier leads to an increase in vertical mixing, resulting in lower behind-barrier concentrations at the ground level. Studies of potential for enhanced capture of PM by vegetation have shown decreases in concentrations of ultrafine and coarse PM, with limited reductions measured for PM2.5 mass. [134] Eventually the vegetation barrier could also help reduce noise limits in residential areas.

855. Mitigation measures suggested for construction stage should also apply to road maintenance works (the measures should be relevant to the type of activity and the scale of impact). This will include proper maintenance of tunnel ventilation system.

Residual Impacts

[134] For reference - see Baldauf, R.W et al, Can Roadway Design be Used to Mitigate Air Quality Impacts from Traffic?; EM August 2009.

Impact Significance before Mitigation	***Assessment of impacts after Mitigation***	***Residual Impact Significance after Mitigation***
Construction Phase		
Medium	*A number of mitigation and management measures are proposed for air quality. In addition, the measures outlined in other sections of this report relating to access roads, camps, plant, etc. shall also reduce the potential for air quality impacts occurring. As such, if the mitigation measures suggested are implemented as per the EMP, the residual impacts of the Project construction phase will be minor.*	***Minor***
Operational Phase		
Medium	*No significant degradation of air quality is anticipated in the operational phase of the Project in most of the Project area. However, as traffic levels increase levels of NO_2 are anticipated to rise in the Kobi area, potentially above allowable national limits in 20 years time. However, by 2043 it is fully expected that the vehicle emissions will be lower than today's levels and as such these elevated levels of NO_2 may not be realized in the long term.*	***Low / Medium***

F.5.2 Climate Change

856. The following table summarizes the key potential climate change impacts and indicates potential impact significance using the methodology outlined in Section F.2.

Table 99: Impact Screening – Climate Change

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	Greenhouse gas emissions	Global community	L	M	M	-	MOD	ST	SMALL	LOW	DEF	L
O	Greenhouse gas emissions	Global community	L	M	M	-	MOD	LT	SMALL	MED	DEF	M
O	Changes in precipitation and temperature	Project infrastructure	L	M	L	-	MIN	LT	SMALL	MED	POSS	M
O	Extreme weather events	Project infrastructure	L	M	L	-	MIN	LT	SMALL	MED	POSS	M

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely
Cells shaded in blue are positive impacts.

857. These potential impacts are described in more detail below.

Potential Impacts Caused by the Project

858. Greenhouse Gas (GHGs) Emissions – The Greenhouse Gas (GHG) emissions resulting from road construction have been estimated to be 1.07 ktCO2/km for a 13m wide

road.[135] Given a road length of 22.7 km, this would result in 24,289 tCO2 of GHG emissions for construction.

859. GHG emissions from traffic using the road have been calculated using the traffic forecasts presented in **Section B.7**. The existing road traffic is estimated to generate around 38 tons of CO_2 per day, or 13,870 tons of CO_2 per annum. Traffic in 2043 (20 years after start of operational period) are estimated to generate 37,000 tons of CO_2 per annum. However, this figure could reduce dramatically over the coming years as the performance of cars improve.

Potential Impacts Upon the Project

860. The transport sector is vulnerable to changes in climate variables, expected changes in the frequency and intensity of extreme weather events, and increased sea level. The following are a few examples of the potential effects:

- Changes in temperature—both a gradual increase in temperature and an increase in extreme temperatures—are likely to impact road pavements (for example, heat-induced heaving and buckling of joints). Changes in temperature will also impact the behavior of permafrost and thus the infrastructure lying on permafrost.
- Changes in precipitation and water levels will impact road foundations.
- Extreme weather events such as stronger and/or more frequent storms will affect the capacity of drainage and overflow systems to deal with stronger or faster velocity of water flows.
- Stronger or faster velocity of water flows will also impact bridge foundations.
- Increased wind loads and storm strengths will impact long span bridges, especially suspension and cable-stayed bridges.
- High levels of precipitation may threaten embankment stability.
- Increase in scouring of roads, bridges, and support structures. [136]

Management Actions

861. Most climate change impacts are projected to occur slowly over a long period of time and as such providing mitigation measure for topics such climate change impacts on pavement design need to be taken over time and cannot be determined in a study like this. Notwithstanding the above a number of simple measures can be taken to ensure that in the short term that extreme precipitation events do not result in significant impacts to the Project, they include:

- Increase ditch and culvert capacity;
- Maintain positive cross slope to facilitate flow of water from surface;
- Increase resistance to rutting;
- Reduce splashing/spray through porous surface mixtures;
- More frequent use of elevated pavement section;
- Improve visibility and pavement marking demarcation; and
- Ensure that all embankments are seeded to help increase stability.

Residual Impacts

Impact Significance before Mitigation	***Assessment of impacts after Mitigation***	***Residual Impact Significance after Mitigation***
Construction Phase		

[135] Methodology based on IEA ETSAP – Technology Brief T14 –August 2011
[136] Climate Proofing ADB Investment in the Transport Sector. ADB, 2014.

Impact Significance before Mitigation	*Assessment of impacts after Mitigation*	*Residual Impact Significance after Mitigation*
Low	*Levels of GHGs emitted during the construction phase are not considered to significantly impact regional or global GHG levels. No significant residual impacts are therefore anticipated during the construction phase.*	***Minor***
Operational Phase		
Medium	*Residual impacts from the generation of GHGs will remain throughout the lifecycle of the Project. This is an unavoidable consequence of the Project, but as noted in other sections of this report, more fuel-efficient cars may, in the future lead to a decrease in the emissions generated on the Project road.*	***Low / Medium***

F.5.3 Soils

Potential Impacts

862. The following table summarizes the key potential impacts to soils and indicates potential impact significance using the methodology outlined in Section F.2.

Table 100: Impact Screening - Soils

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	Soil erosion on unstable slopes caused by poor construction works.	Nearby communities / Water bodies	L	M	M	-	MOD	M/F	SMALL	MED	POSS	M
C	Soil contamination via spills and leaks of hazardous liquids from construction camps.	Soil / Water bodies / Ground water	L	M	L	M	MOD	M/F	SMALL	MED	DEF	M
C	Loss of Topsoil	Nearby communities / Terrestrial wildlife	L	M	M	-	MOD	MT	SMALL	MED	DEF	M
O	Soil erosion caused by poorly designed erosion protection measures, drainage, etc.	Nearby communities / Water bodies	L	M	M	-	MOD	MT	SMALL	MED	POSS	M

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely
Cells shaded in blue are positive impacts.

863. These key potential impacts and other minor impacts are described in more detail below.

Pre-construction / Construction Phase

864. Pre-construction and construction stage impact on the soil will mainly relate to organizing and operating the camps/machinery stationing and operation grounds; fuel/oil spills from vehicles; fuel storage (if available on the camp site/building ground); project related traffic and erosion due to modification of the natural conditions.

865. Potential impacts to soils on pre-construction and construction stages include:

- Damage and/or loss of topsoil – the impact may occur in case the topsoil is not removed; mixed with subsoil and/or other material during and after removal. Impact on topsoil outside the boundaries of the RoW may also happen – the topsoil not subject to removal may be compacted by heavy vehicles, scattered during transportation to temporary stockpiling site as well as lost by wind and water erosion when in stockpiles. The quality of topsoil may deteriorate if the stockpiles are not managed properly.
- Erosion – It is possible, that without adequate protection measures soil erosion could occur on road embankments and bridge embankments. It is also possible, that stockpiles of soil located close to surface waters could infiltrate the water courses during heavy rainfall and cause siltation of the rivers. Erosion may also occur in the section of tunnel water discharge into the river.
- Special borrow pits for materials to build the embankments are initially not foreseen, because the potential reserves from the cuttings and tunnels satisfy the necessary amounts for creating the embankments. However, if they are required, they will need to follow the requirements set out in **Appendix C**.
- Induced changes in the Project Area leading to commercial development are conceivable, thereby decreasing soil availability for agricultural purposes.
- Contamination due to spills or hazardous materials – Potential soil contamination is a possibility resulting from poorly managed fuels, oils and other hazardous liquids used during the project works as well as poorly managed waste (solid and liquid waste streams) in the camps.

866. Some mitigation measures are already considered in the design. These are – transversal and longitudinal drainage systems along the alignment, tunnel drainage and bridge water collection/drainage and treatment systems allowing to avoid pollution and erosion of soil. According to design cuts slopes will be protected (anchored concrete walls, rock walls, etc.) from erosion. The Contractor will be responsible to ensure safe discharge of tunnel water (according to **Tunnel Water Management Plan**, approved by RD and Engineer).

Operational Phase

867. Potential impacts to soils during operation include:

- Soil pollution by heavy metals in a narrow band on either side of the road. Pollutants settling in soil within the RoW may impair vegetation growth and increase the risk of erosion.
- Erosion and flooding caused by blockage of the drainage system.
- Pollution with ice breaking salt. Use of ice breaking salt may lead to increase of sodium and chlorine ions in surface runoff and, respectively, in the soils. This will affect ion exchange process, reduce water permeability and aeration ability and leads to increase of alkalinity.
- Pollution with litter along the road and in the rest areas.

Management & Mitigation Actions

Planning

868. Before the commencement of construction works, land directly affected by the Project will be acquired by the RD according to the **Land Acquisition and Resettlement Plan (LARP).**

869. The Contractor shall prepare, as part of his SEMP, a **Topsoil Management Plan**. The plan shall describe topsoil stripping procedures and rules, topsoil stripping depth and volumes, topsoil stripping supervision, transportation and stockpiling requirements, stockpile location, topsoil stockpile design, stockpile management, erosion hazard and erosion control, runoff drainage/diversion, soil protection measures at the storage area, maintenance of the stockpile and topsoil application procedure.

870. The Contractor, as part of his SEMP shall prepare a **Recultivation/Land Restoration Plan.** This plan will be implemented in combination with the Topsoil Management Plan.

871. In addition, the Contractor shall prepare a **Spill Management Plan.** The plan shall provide details of procedures, responsibilities, resources, documentation and reporting requirements, training provisions for relevant staff, etc. to avoid spills of hazardous substances and to effectively respond to such incidents. Recommendations provided in the EIA must be considered.

872. Other plans, prepared as part of the SEMP which will help reduce impacts to soils include:

- **Construction Camp Management Plan**.
- **Spoil Disposal Plan**.
- **Waste Management Plan**.

873. During the construction phase of the Project, the Contractor will also be responsible for preparing method statements for:

- **Temporary Road Method Statement.**
- **Temporary Storage Area Method Statement.**
- **Temporary River Crossing Method Statement.**

874. These method statements will include sections relating to the protection of soils and management of soil erosion in these areas. The method statements shall be submitted to the Engineer and RD for review and approval. All method statements must be prepared and approved before any works can start in the planned areas. The method statements shall also include a record of consultations undertaken with neighboring land users and road users including their agreements for the use of these areas, roads. The method statement shall also clearing illustrate the conditions of the site prior to its clearing and use, so that it can be re-instated, as far as possible, to its former conditions.

Pre-construction / Construction Phase

875. Topsoil will be stored within the RoW.

876. Sites for temporary storage of the topsoil must be selected prior to commencement of works with due regard to environmental norms and conditions on the sites and approved by local administration, RD, Engineer, MoEPA and the Lenders. The area must be flat, located away from any surface water body, protected from runoff and erosion.

877. In order to avoid or mitigate impact on topsoil and other impacts caused by accidental fuel/oil spills, poor management of waste and/or polluted runoff, the operation ground must be established with consideration of environmental safety measures, as presented below:

- Ground clearance must be minimized;

- Topsoil must be removed from all areas required for permanent and temporary needs of the project;
- To avoid loss of the productive soil layer, all suitable topsoil and other material shall be saved and stockpiled separately for the future re-cultivation of the area;
- Unwanted materials from topsoil such as roots of trees, rubble and waste removed prior to stockpiling;
- Stockpiles of removed topsoil must be properly designed/shaped and managed;[137], – stability of the stockpile will be achieved through preservation of 'safe' slope inclination and diversion of runoff from the area;
- Topsoil and subsoil must be stored separately until reuse;
- To ensure stability, the soil piles shall not be higher than 2 meters. The piles must be placed and managed so as to avoid erosion and washing off. Drainage trenches around the piles must be provided.
- Soil compaction may be reduced by strict keeping to temporary roads, camp/operation ground boundaries;
- Embankments and slopes with disturbed vegetation must be replanted immediately after the construction/disturbance stops – if not covered with gabion baskets and whether the season allows. For replanting native species must be used, placement of fiber mats to encourage vegetation growth and temporary fencing to protect plants from being grazed by cattle.
- Embankments shall be monitored continuously, in particular after a strong rainfall for signs of erosion.
- Any temporary fuel tank (if contractor decided to have small stock of fuel on the site) shall be placed in a covered area with berms or dikes to contain any spills. Capacity of containment must be 110% of capacity of the tank. Any spill shall be immediately contained and cleaned up with absorbent material;
- Areas using bitumen shall be constructed on impervious hardstanding to prevent seepage of oils into the soils. No bitumen drums or containers, full or used, shall be stored on open ground;
- Onsite repairs /maintenance/fueling activities shall be limited. Priority shall be given to offsite commercial facilities. If impossible, a designated area and/or secondary containment for the on-site repair or maintenance activities must be provided;
- On-site vehicles and equipment shall be inspected regularly for leaks and all leaks shall be immediately repaired. Incoming vehicles and equipment shall be checked for leaks. Leaking vehicles/equipment shall not be allowed on-site;

[137] Topsoil management must comply with requirements set in the Government regulations (#424, dated 31 December, 2013) on topsoil removal, storage, use and recultivation. Good management practice experience must be also taken into account. Subsoil pile must have a natural angle of slope of up to 40° depending on texture and moisture content but, if stable stockpiles are to be formed, slope angles will normally need to be smaller. For stockpiles that are to be grass seeded and maintained, a maximum side slope of 1 in 2 (25°) is appropriate. If the soil is to be stockpiled for more than six months, the surface of the stockpiles should be seeded with a grass/clover mix to minimise soil erosion and to help reduce infestation by nuisance weeds that might spread seed onto adjacent land. Sites of temporary storage of excess material will be agreed with the local municipalities.

- Secondary containment devices (drop cloths, drain pans) shall be used to catch leaks or spills while removing or changing fluids from vehicles or equipment. Drip pans or absorbent materials shall be provided. On small spills absorbent materials shall be used;
- All valves and trigger guns shall be resistant to unauthorized interference and vandalism and be turned off and securely locked when not in use;
- The site will be cleaned regularly, littering will be prohibited;
- Waste collection area will be sited so as to avoid receiving a substantial amount of runoff from upland areas and draining directly to a water body;
- In case of the fuel/oil spills risk, an oil trap shall be additionally provided;
- Discharge of effluents into the water bodies is not planned. Only wastewater cleaned up to the established norms (see Table 31 and Table 32) may be discharged to the relief. Receiving area must not be prone to erosion or waterlogging. It is advisable not to drain water to the area where crops are cultivated.
- Contractor will confine operation of heavy equipment within the ROW, as much as possible, to avoid soil compaction and damage to privately owned land. If private lands are disturbed, the contractor should promptly inform the owner and agree on the ways to remedy the situation;
- Adequate training on environmental protection and safety shall be provided to the staff.

Operational Phase

878. Mitigation measures during operation includes:

- Maintenance and clean up the drainage system to prevent impact on erosive sliding of the soil or flooding;
- Monitoring of slopes, in particular after strong rains and snowmelt for identification of possible traces of erosion;
- Implementation of mitigation measures defined for pre-construction/construction works during road repair/maintenance works;
- Analysis of soil for identification of the impact caused by ice breaking salt (after the snow melt – in spring) with subsequent organic amendment and/or amendments to adjust pH or nutrient deficiencies.

Residual Impacts

Impact Significance before Mitigation	***Assessment of impacts after Mitigation***	***Residual Impact Significance after Mitigation***
Construction Phase		
Medium	*If the mitigation measures suggested are implemented, the residual impacts of the Project will be minor.*	***Minor***
Operational Phase		
Medium	*The erosion protection measures outlined above will limit the potential for impacts occurring into the operational phase of the Project.*	***Low***

F.5.4 Hydrology

Potential Impacts

879. The following table summarizes the key potential impacts on hydrology and indicates potential impact significance using the methodology outlined in Section F.2.

Table 101: Impact Screening - Hydrology

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	Flooding caused by blocking existing drainage structures.	Nearby communities	L	L	M	-	MIN	M/F	SMALL	LOW	POSS	L
C	River sedimentation	Nearby communities / Aquatic wildlife	L	M	M	M	MOD	M/F	INTER	MED	POSS	M
C	Water pollution from construction camps, construction waste, etc.	Nearby communities / Water bodies / Aquatic wildlife	L	M	L	M	MOD	M/F	INTER	MED	POSS	M
O	Water pollution from garbage generated from passing vehicles, maintenance, etc.	Water bodies / Nearby communities / Aquatic wildlife	L	M	M	M	MOD	MT	SMALL	LOW	POSS	L
O	River sedimentation	Nearby communities / Aquatic wildlife	L	M	M	M	MOD	MT	INTER	MED	UNLIKE	L
O	Flooding caused by poorly designed drainage structures.	Nearby communities	L	L	M	-	MIN	MT	SMALL	LOW	POSS	L

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely
Cells shaded in blue are positive impacts.

880. These key potential impacts and other minor impacts are described in more detail below.

Pre-construction / Construction Phase

881. Preparation works and works during construction of the road, bridges and tunnels may have impacts on surface and ground water hydrology. Impact on hydrology generally includes:

- Contamination of surface and ground waters, which can be caused by:
  - Accidental leakages of fuel/oil/ lubricants from cars and machinery (including emergency situations);
  - Pollution caused by improper management of construction materials and waste;
  - Increase of turbidity caused by earthworks and construction activities near and/or in the riverbed;
  - Possible pollution with runoff from contaminated areas;

  - Contamination of ground waters by infiltrated contaminated surface water; and
  - Possible pollution of ground water (shallow horizons) during earthworks and construction activities.
- Blockage of streams during construction near/in the waterbed;
- River sedimentation from works around river banks; and
- Impact of availability of water for local community as a result of water 'loss' caused by tunneling.

882. According to the engineering geological survey, the ground water level in the Project area varies from 1.5 to 29m. Thus, the risk of impact on shallow aquifers which are more vulnerable – exists. The shallow ground water level has been registered at around KM 0.6. In sections of the bridges B2, B4, B5 and B6 where pier foundation construction works (arrangement of foundation piles) may have impact on ground water. In the section of the bridge B3 no risk of impact on ground water is expected.

883. Construction in water is not planned.

- Bridge 1 is narrow – no piers in the river;
- Bridge 3 (the arch bridge) is high above the riverbed – construction method excludes works in water.
- According to the detailed design, the piers of other bridges (Bridge 2 – length =435.3m; Bridge 4 – length =147m, Bridge 5 – length =322m; Bridge 6 – length =218m) will not be built in areas located below the 100-year recurrence flow level.

884. However, the bridge construction works will be performed in close proximity of water. During construction, qualitative parameters of the rivers crossed by alignment (Tetri Aragvi, Khadistskali, Narvani) may be affected by accidentally spilled fuel/oil or contaminated surface runoff.

885. In case the sites near Baidara and Tergi rivers proposed by the Design team for spoil disposal are used, the hydrology of the rivers must be taken into account. The riverbed in these sections is wide, but protection structures currently available along the river prove that the water level uses to rise. In case decision is made to use these locations for disposal of tunnel material adequate protection along the spoil disposal area must be provided to avoid washing away of material. The arrangement of the spoil disposal areas will follow the spoil disposal site selection and approval process outlined in **Section F.7.5** of this report.

886. Increase of turbidity caused by the lack of erosion control, and pollution with poorly managed solid construction waste may also occur in river crossing and considered spoil disposal areas.

887. Impacts of tunneling on groundwater are discussed below under **Section F.7.7 - Tunnels**.

Operational Phase

888. Surface and ground water pollution during operation of the highway may occur from regular operational and maintenance, as well as from traffic accidents involving cargo vehicles transporting hazardous substances.

889. Potential impacts on water during operation of the highway will be:

- Sedimentation and pollution of waters with heavy metals and petroleum hydrocarbons (runoff (see Table 102, emergencies);
- Pollution with waste, including during winter maintenance (application of salt, sand and other products posing water quality under threat);

Table 102. Typical pollutants in the runoff

Pollutant	Source
Particulate matter	Pavement wear, vehicles, 'natural' dust, maintenance activities
Rubber	Tire wear
Asbestos	Clutch and brake lining wear
Nitrogen and phosphorus	Air, roadside fertilizer application and sediments
Lead	Leaded gasoline from auto exhaust, tire wear, lubricating oil and grease, bearing wear and atmospheric fallout
Zinc	Tire wear, motor oil and grease
Iron	Auto body rust, steel highway structures such as bridges and guardrails and moving engine parts
Copper	Metal plating, bearing wear, moving engine parts, brake lining wear
Cadmium	Tire wear
Chromium	Metal plating, moving engine parts and brake lining wear
Nickel	Diesel fuel and gasoline, lubricating oil, metal plating, brake lining wear and asphalt paving
Manganese	Moving engine parts
Sulphur	Roadway beds, fuel
Bromide	Exhaust
Petroleum	Spills, leaks, antifreeze and hydraulic fluids, asphalt surface leachate and blow-by motor lubricants
PCB	PCB catalyst in synthetic tires
Pathogen bacteria	Soil litter, bird droppings and trucks hauling livestock/stockyard waste

Source: USEPA. Guidance Specifying Management Measurements for Sources of Non Point Pollution in Coastal Waters, Washington, D.C.: Office of Water 1997 and Federal Highway Administration. Sources and Mitigation of Highway Runoff Pollutants, Washington, D.C.: Federal Highway Administration, 1984

890. Concentration of the mentioned components in the runoff can vary. Since specific quality data for runoff is not available, typical values for highways with less than 30,000 vehicles per day is used for illustrative purposes, see Table 103. Note that even in the 20th year of operation forecasted traffic is anticipated to be less than 14,000 vehicles per day.

Table 103. Concentration of pollutants in highway runoff

Pollutant	Mean concentration (mg/l) for highways with
	<30,000 vehicles/day
Total suspended solids	41
Volatile suspended solids	12
Total organic carbon	8
Chemical oxygen demand	49
Nitrite and nitrate	0.46
Total Kjeldal nitrogen	0.87
Phosphate phosphorus	0.16
Copper	0.022
Lead	0.08
Zinc	0.08

Source: Driscoll, E., Shelley, P., and Strecker, E. Pollutant Loadings and Impacts from Highway Stormwater Runoff, Volume I. Washington, D.C.: Federal Highway Administration, 1990

891. Concentration of contaminants in the runoff cannot be reduced on source and depend on the status of technical maintenance of cars, traffic speed, quality of petrol, etc. Curbs and gutters can trap particulate matter on the highway. Impact caused by the runoff on surface water can be somehow reduced by vegetation along the highway, availability of infiltration trenches, general roadway maintenance and cleanup activities. The baseline quality of water, size and characteristics of receiving stream, potential for dilution, ability of self-cleaning are the critical factors in determining the magnitude of highway runoff on surface water.

892. For bridges, according to general practice, spill and/or runoff direct discharge prevention measures are taken for recipient water bodies of zero tolerance (drinking water reservoir, protected area, etc.). To avoid pollution of water oil interceptors have been included in the design as described in **Section B.4.4**.

893. The project envisages arrangement of water drainage system – both longitudinal and transversal. Capacity of culverts and ditches is calculated with consideration of long-term climate data and maximum surface water flows (100-year recurrence). Water collection in tunnels will consist of two separate lines. One will serve drainage of clean, infiltration water, another will handle polluted water in case of accident, tunnel wash water and fire water. The latter includes 120 m^3 capacity storage tank and treatment unit.

894. In the drainage sections slope protection is considered to avoid erosion of the slope. According to design untreated discharge of contaminated/potentially contaminated water streams and waste water from technical buildings areas will not happen.

895. The impact of road salt or sand for improvement of traffic safety in winter that may affect the quality of water must be mentioned separately. The road salt (sodium chloride), is composed of 40% of sodium ions (Na+) and 60% of chloride ions (Cl-). Other components and impurities account for 5% of the total weight. The salt components make their way into environment through the runoff (rain, melting snow and ice), as well as through splash and spray by vehicles and/or by wind causing impact on environment. Chloride ion is completely soluble and very mobile, toxic to aquatic life and capable to impacts vegetation and wildlife. There is no natural process by which chlorides are broken down, metabolized, taken up, or removed from the environment. The transport of sodium (Na+) in environment is less prominent due to ion exchange. With consideration of the climate use of ice breakers in the project area will be required. Respectively the risk impact on surface water (and soli) will exist.

896. According to the design team, with consideration of the depth of the ground level, the 'load' of the new infrastructure of the ground will not result in change of the ground water level. For the same reason cross contamination of ground water is not expected.

Management & Mitigation Actions

Planning

897. To prevent impacts to surface and groundwater, the Contractor shall prepare the following plans:

- **Ground Water Management Plan** covering water diversion, treatment (settling) and discharge for each tunnel.
- **Waste Water Management Plan** (in case intended to discharge waste water from the camp and/or work area into a surface water body). The plan must provide details on waste water (sewage) volume, disposal scheme, information on capacity and type of waste water treatment facility, location of the discharge point/points with indication of coordinates. A discharge permit will be sought from the MoEPA and Maximum Allowable Discharge Limits (MADLs) will be set which the project must then comply with.
- **Bridge Construction Plan** outlining the schedule of bridge construction and environmental management measures for each bridge location, including protection of biodiversity.
- **Recultivation/Land Restoration Plan.**
- **Waste management Plan.**
- **Spill Management Plan.**
- **Emergency Response Plan.**

898. During the construction phase of the Project, the Contractor will also be responsible for preparing method statements for:

- **Temporary Road Method Statement.**
- **Temporary Storage Area Method Statement.**
- **Temporary River Crossing Method Statement.** The location of temporary river crossings is not currently known. The Contractor will be responsible for preparing and implementing Method Statement which will address any impacts from these activities.

899. These method statements will include sections relating to the management of water quality, including for example items relating to road drainage, stockpile run-off, biodiversity protection, etc. The method statements shall be reviewed by the Contractors ECoW before submittal to the Engineer and RD for review and approval. All method statements must be prepared and approved before any works can start in the planned areas. The method statements shall also include a record of consultations undertaken with neighboring land users and road users including their agreements for the use of these areas, roads. The method statement shall also clearing illustrate the conditions of the site prior to its clearing and use, so that it can be re-instated, as far as possible, to its former conditions.

Pre-construction / Construction Phase

900. During the construction stage, portable toilets shall be provided at all work sites.

901. In order to avoid or mitigate impact during pre-construction and construction activities, works should be performed with due consideration of environmental safety measures:

- Strictly implement approved Spill Management Plan, Tunnel Water Management Plan, Waste Water Management Plan, Spoil Management Plan.
- Should any temporary fuel tank be available, it must be located within at least 100m from the riverbed. The tank must be placed in covered areas with berms or dikes installed to intercept spills, if any. Any spill should be immediately localized and cleaned up with absorbent materials.
- Onsite repairs /maintenance and fueling activities should be limited. Priority should be given to offsite commercial facilities. If impossible, a designated area with secondary containment for possible spills for on-site repair or maintenance activities must be provided. These areas shall be located away from drainage channels and surface water bodies. (distance between the maintenance site and the river should be at least 100m).
- On-site vehicles and equipment shall be inspected regularly for leaks and all leaks shall be immediately repaired. Incoming vehicles and equipment shall be checked for leaks. Leaking vehicles/equipment shall not be allowed on-site.
- Secondary containment devices (drop cloths, drain pans) shall be used to catch leaks or spills while removing or changing oils from vehicles or equipment. For small spills, absorbent materials must be used.
- Discharge of any untreated water into the surface water body must be strictly prohibited. Treated water discharge must comply with the water quality standards outlined in **Section D.6.2**, including IFC standards for effluent discharge, as well as national standards.
- Discharge of cement contaminated water must be avoided as cement pollution results in high alkalinity and raises the pH, which can be toxic to aquatic life.
- Materials and waste must be stockpiled so as to avoid erosion (in stockpiles less than 2 m in height and with a slope gradient of less than 25%) and washing off into the river. Drainage trenches must be established to divert surface runoff from the site.

- Runoff control measures can be installed at the time of road/highway and bridge construction to reduce runoff pollution.
- To prevent runoff contamination, paving should be performed only in dry weather.
- In disturbed soil areas silt fence, fibber rolls, gravel bags, or other approved sediment control must be ensured. At a minimum, bare soil (whether it is an abutment slope or a stockpile) must be protected before it rains. Soil stabilization BMPs such as mulch, soil binders, plastic sheeting or erosion control blankets must be used to protect bare soil;
- Due to the design solution direct discharge of the runoff in surface water is reduced to minimum;
- Management of material and waste will be carried out in compliance with the plan (waste management plan) developed by contractor;
- The area will be cleaned regularly.
- Locate stockpiles away from any watercourse or wetlands, outside drainage lines. Protect stockpiles from erosion.
- Park construction machinery/vehicles at not less than 100m from the riverbed.
- Locate the storage area not less than in 100m from the riverbed.
- Check integrity of fuel/hazardous substances containers for integrity. Undertake necessary repair or replacement if required.
- Store materials in containers suitable for the purpose. Ensure that containers bear clear eligible labels. The same applies to containers for short term storage of used oil.
- Store all materials above flood level.
- Ensure availability of spill cleanup materials (e.g., absorbent pads, etc.) in the areas where accidental spills may occur.
- Place clean up material in easily accessible locations.
- Avoid fueling/maintenance of machinery and vehicles on the bare ground. Only contained areas can be used. Locate the maintenance/fueling sites (if planned to have on the site away from watercourses and wetland areas. Distance of not less than 100m must be preserved.
- Use drip pan beneath equipment likely to leak fuel and/or oil and/or during fueling or changing oil.
- Prohibit discharge of any untreated potentially contaminated effluents.
- Provide septic tanks for the camp sites servicing less than 150 employees. Contract authorized company to remove the liquid waste regularly. For larger sites, provide multiple septic tank facilities, or package waste water treatment plants.
- Keep contract with authorized company responsible for removal of the liquid waste active. If for waste water management, the camp is equipped with a package treatment plant ensure clean-up/sanitation according to manufacturer's instructions and that discharge standards are met for waste water.
- Monitor surface water quality.
- Use of oil-water separators to extract floating oils wherever appropriate.
- Clean up spills or leaks immediately.
- Manage and dispose of the used absorbents, oily rags and other contaminated materials as hazardous waste.

- Provide areas where concrete mixers can wash out leftover concrete without polluting the environment. This may be in the form of a lined settling pond.
- Prior to discharge, alkaline water from the concrete batching area shall be settled and neutralized.
- Arrange settling basins to manage tunnel drainage water. Check quality of drainage water (including pH) from the settling basins prior to discharge into environment.
- Contract authorized company for hazardous waste disposal.
- Prohibit use of herbicides/chemical during vegetation clearance.
- Train construction personnel in soil and water protection measures, handling of fuels, spill control and response procedures and requirements.
- Develop procedures to manage water discharges under degraded conditions (to ensure compliance with water discharges limits at all times.

902. To avoid impact on ground water users the water flow in the springs used by local community for water supply will be monitored. Periodic monitoring of water quality will also be undertaken in the spring water.

903. The following measures shall be applied specifically relating to bridges:

- Strictly implement the **Bridge Construction Plans** for each bridge.
- Prepare method statements for **Temporary Roads and Temporary River Crossings.**
- Provide spill kits in worksites around rivers.
- Ensure no vehicle refueling occurs within 50 meters of any surface water course.
- Divert the water flow near the bridge piers.
- Provide silt fences, sediment barriers or other devices to prevent migration of silt during construction within streams.
- Carry out bridge construction works without interrupting the traffic on existing roads with the provision of suitable diversions.
- Ensure no waste materials are dumped in the river, including re-enforced concrete debris.
- Place generators more than 20 meters from the river.
- Ensure that no concrete waste from concrete mixers is dumped in the river.
- Provide areas where concrete mixers can wash out leftover concrete without polluting the environment. This may be in the form of a lined settling pond at each bridge site. Drivers will be informed of these locations and the requirements to use these settling ponds on a routine basis by the Engineer. Dried waste from the settling ponds can be used as backfill for culverts, etc.
- Carefully collect all polystyrene (from expansion joints) so that it does not litter the local environment.
- Ensure that no hazardous liquids are placed within 10 meters of the river.
- Provide portable toilets at bridge construction sites to prevent defecation by workers into the river.
- Ensure that workers are provided with correct PPE including harnesses.
- In addition, the Contractor, through his Environmental and Social Officer and his Ecological Clerk of Works, will be responsible for consulting with MoEPA to establish the fish

spawning period in relation to the bridge construction works to ensure that all works are undertaken in periods least likely to affect the fish spawning period.

Operational Phase

During the operational phase of the Project the RD shall follow the recommended measures below.

- Ensure clean up and waste removal from carriageway and roadsides.
- In the technical building area store hazardous and potentially contaminating materials (chemicals, fuels, oils, etc.) in area with watertight flooring, roofing, security fencing and access control and drainage/wastewater collection systems.
- Maintain integrity and permeability of storm water drainage system (as described in **Section B.4.4 – Lot 1 and Lot 2 Drainage**) to avoid blockage, overflow and direct discharge of untreated runoff into the rivers.
- Ensure firefighting water is managed according to the requirements of **Section B.4.2** and **Section B.4.3**)
- Control water quality (list of parameters to control include: pH; Suspended Solids; BOD5; COD; Coliforms; Nitrate (NO3); Phosphate (PO4); Oil and Grease) in recipient watercourses seasonally. Collect water samples from upstream and downstream sections of the stream in 50m and 250m distance of the crossing area. The distance may change depending on accessibility of the river for sampling.
- Ensure maintenance and timely clean-up/removal of sediments accumulated in bridge deck runoff treatment facility and tunnel water drainage systems. Disposal of these sediments following the same procedure as set for the management of sediments from treatment unit (settling basin).
- Set, implement and adjust clean-up/maintenance schedule to ensure effective operation of the treatment facilities.
- Check quality of the sediments (list of parameters to control include: heavy metals, petroleum products) prior to making decision on the method of disposal. If contamination detected – use licensed contractor to deal with the waste.
- Maintain contracts with hazardous waste removal companies to ensure timely and safe removal of skimmed oil, other hazardous waste generated at technical buildings.
- Monitor water quality in waste water recipient stream quarterly (50m upstream and 250m downstream the point of discharge).
- Make sure (training) that tunnel operator staff is aware of material and waste management requirements.
- Perform maintenance paving of the road sections and bridge decks only in dry weather to prevent runoff contamination.
- Use staging techniques to reduce the spread of paving materials during the repair of potholes and worn pavement. These can include covering storm drain inlets and manholes during paving operations, using erosion and sediment controls to decrease runoff from repair sites, and using drip pans, absorbent materials and other pollution prevention materials to limit leaks of paving materials and fluids from paving machines.
- Reinstate disturbed areas – if the case.
- At drainage discharge points, including interceptor tanks, reinstatement with native wetland plant species in discharge locations to remediate the water and provide soil stability.

Residual Impacts

Impact Significance before Mitigation	***Assessment of impacts after Mitigation***	***Residual Impact Significance after Mitigation***
Construction Phase		

Impact Significance before Mitigation	***Assessment of impacts after Mitigation***	***Residual Impact Significance after Mitigation***
Low / Medium	*If the mitigation measures suggested are implemented, there will be no significant residual impacts.*	***Minor***
Operational Phase		
Low	*No significant impacts to surface or groundwater are anticipated during the operational phase of the Project other than those resulting from tunnel works and spoil areas, these issues are addressed separately in specific sections below.*	***Low***

F.5.5 Natural Hazards

Potential Impacts

904. The following table summarizes the key potential impacts associated with natural hazards and indicates potential impact significance using the methodology outlined in Section F.2.

Table 104: Impact Screening – Natural Hazards

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	Avalanches	Contractors staff	L	H	L	-	MOD	L\F	SMALL	LOW	UNLIKE	L

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely
Cells shaded in blue are positive impacts.

Pre-construction / Construction Phase

905. It is possible that avalanches could affect work sites during the winter periods of the construction phase, around KM 12.9 to KM 13.0.

Operational Phase

906. Natural hazards in the Project area have been considered in the design. All landslide areas known and/or identified during the site surveys carried out in the area of interest under the project are bypassed. Sections where snow avalanches can be an issue are avoided by arrangement of tunnels/galleries. No significant issues related to hazardous processes have been identified that cannot be managed by incorporation of the design measures envisaged in the project.

907.

908. The project is located in a seismically active area. The Detailed Design Consultants have experience of designing roads in seismically active areas and have ensured that all designs are compliant with the relevant seismic standards of the GoG.

909. Bridges/river crossings are designed with consideration of 100-year recurrence flow. No piers will be placed in the riverbed. The span and elevation of the structures are capable to allow high water/mudflows pass through.

Management & Mitigation Actions

910. Although considered a low probability of occurring, the risk of avalanches shall be continually monitored by the Contractor throughout the construction phase. This can be achieved with coordination between safety officials in Gudauri ski resort. In addition, no camp site shall be located in an area that maybe prone to avalanches, this can be confirmed with consultations between the Contractor and the local community.

Residual Impacts

Impact Significance before Mitigation	***Assessment of impacts after Mitigation***	***Residual Impact Significance after Mitigation***
Construction Phase		
Low	*No significant residual impacts are anticipated if the avalanche areas are continually monitored during the winter months by the Contractor.*	***Minor***
Operational Phase		
None	*No residual impacts are anticipated.*	***Low***

F.6 Biodiversity and Nature Conservation

911. The following table summarizes the key potential impacts to biodiversity and nature conservation and indicates potential impact significance using the methodology outlined in Section F.2.

Table 105: Impact Screening – Biodiversity and Nauture Conservation

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	Degradation/ fragmentation of habitat caused during site clearing (for camps, access roads, etc)	Terrestrial wildlife	M	H	M	-	MAJ	M/F	SMALL	MED	DEF	M
C	Degradation of aquatic habitat	Aquatic species, incl fish	L	H	M	M	MOD	M/F	SMALL	MED	DEF	M
C	Loss of Habitat / Biodiversity	Terrestrial and aquatic wildlife	M	H	H	-	MAJ	MF	SMALL	MED	DEF	M
C	Physical damage (road kills, accident, loss of roosts/nesting sites, etc.)	Terrestrial wildlife – birds, bats, etc	L	H	M	L	MOD	ST	SMALL	MED	POSS	M

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	Poaching	Terrestrial wildlife	L	H	H	M	MAJ	M/F	SMALL	MED	POSS	M
C	Vehicle Movements	Terrestrial wildlife	M	M	H	L	MOD	LT	SMALL	MED	POSS	M
C	Construction noise / light	Terrestrial wildlife	M	M	L	L	MOD	ST	SMALL	MED	DEF	M
C	Spread of non-native / invasive species	Terrestrial Habitats	M	M	L	L	MOD	LT	SMALL	MED	POSS	M
O	Poaching	Terrestrial wildlife	L	H	H	M	MAJ	LT	SMALL	HIGH	POSS	H
O	Physical damage (road kills, accident, loss of roosts/nesting sites, etc.)	Terrestrial wildlife	L	H	H	M	MOD	MT	SMALL	MED	POSS	M
O	Road maintenance	Terrestrial Habitats	L	M	L	L	MOD	LT	SMALL	MED	POSS	M
O	Noise, emissions, light pollution	Terrestrial wildlife	M	H	H	M	MAJ	MT	SMALL	MED	POSS	M

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely
Cells shaded in blue are positive impacts.

912. These key potential impacts and other minor impacts are described in more detail below under the headings of:

- Habitat and General Ecological Impacts; and
- Notable Species.

F.6.1 Habitat and General Ecological Impacts

913. As described in **Section E**, whilst the Project area itself is not particularly unusual in the context of the Greater Caucasus from the perspective of the habitats and species that it supports, it is located within a broader landscape that is of interest for a number of reasons, including its:

- Setting within a global biodiversity hotspot.
- Proximity / overlap within the internationally important KBA, IBA and Kazbegi National Park[138].
- High potential for endemic and endangered species of flora and fauna.
- Regional importance for migrating birds, notably raptors and passerines.

[138] Activities and developments are possible in such sites as long as potential project related impacts have been identified and the mitigation hierarchy applied so that impacts from the project will not compromise the integrity, conservation objectives and/or biodiversity importance of the area. Additional programmes, should also be implemented as appropriate, to promote and enhance the conservation objectives of the protected area

- Importance for feeding (and potentially breeding/overwintering) protected and endangered mammals including large carnivores, ungulates, bats and endemic species.

914. A number of potential sources of impact associated with the construction and operation of the proposed project were identified during the projects scoping study (prepared as part of the National EIA process). These are listed below and discussed in more detail in the following sections.

Table 106: Initial Assessment of Potential Sources of Impact

Source of Impact	Receptors (core)	Potential Impacts and Key Sensitivities
Direct Habitat Loss from Vegetation Clearance (Road corridor & compounds and **Spoil disposal sites**	Terrestrial and riparian habitats Breeding birds; migrant birds; Roosting bats; Mammals (small and large) (breeding and sheltering); Reptiles (breeding and hibernating); Invertebrates; Plants.	Loss of vegetation, fragmentation, disturbance, direct mortality. The clearance of vegetation will remove habitat but more significantly increase fragmentation of existing corridors, this could lead to disturbance of faunal species; and could cause direct mortality, as well as potential loss of notable plant species.
Impacts from vehicle movements (including transport of people and equipment) and use of machinery and equipment	Terrestrial habitats; Mammals including bats; Migrating and breeding birds Endangered Plants (Dust)	Disturbance of fauna due to noise, direct mortality due to Road Traffic Accidents (RTAs) and degradation of habitats due to compaction dust and vegetation destruction or the ingress of non-native invasive species. Currently the receptors are habituated to remote locations with little or no background noise or traffic therefore the additional vehicle traffic has the potential to have a significant effect. This is less likely to have a significant effect on less mobile species such as reptiles, amphibians and notable invertebrates and unlikely to affect riparian areas. Mitigation developed for these core receptors is likely to fulfil mitigation requirements for all receptors.
Impacts from working compounds and camps (including production of wastes and indirect worker pressure).	Terrestrial and riparian habitats; Breeding & migrating birds; Small and large mammals; Reptiles; Amphibians; Fish; Invertebrates	Disturbance of fauna, particularly while breeding, degradation of habitats, direct and indirect pollution of habitats, potential for direct mortality through illegal hunting and fishing. Currently the receptors are habituated to remote locations with little or no human interaction additional numbers of people and their associated

Source of Impact	Receptors (core)	Potential Impacts and Key Sensitivities
		waste has the potential to have a significant effect.
Water crossing construction	Riparian habitats and associated bird; mammals (including otter); amphibians; fish; and invertebrates; Other aquatic receptors Plants. Fauna and flora from adjacent habitats	Indirect and direct pollution due to sedimentation of water courses and construction consumables and waste. Disturbance. Aquatic species are less likely to be affected by general terrestrial construction disturbance but may be affected by pollution and sedimentation during river crossings. Other species impacts will be as for terrestrial habitats.
Water abstraction eg for cement production, dust control	Riparian habitats and associated terrestrial and aquatic species	Potential for degradation to banks and direct mortality to fauna, disturbance while breeding. The abstraction of water for construction purposes such as damping down and cleaning machinery as well as cement manufacture could result in species being abstracted along with the water and during that abstraction habitat may be damaged and local fauna disturbed.
Unplanned events, such as landslides, fires,	All	Potential effects on all receptors Loss of habitat, direct mortality, disturbance effects.
Access Roads	All	Potential effects on all receptors Impacts as above
Cumulative effects	All	There is a potential for other developments to have an effect when assessed in combination with the Project. Increased disturbance or the need for wider infrastructure improvements to facilitate accesses etc. In addition, existing threats to notable habitats and species may be exacerbated.
Operational Issues: Road operation and Maintenance	Habitats Commuting mammals including bats; Wintering and breeding birds; Reptiles.	Disturbance of breeding animals and potential for direct mortality if they have occupied the area in the interim. Habitat fragmentation could make some animals more vulnerable to predation when attempting to cross the gaps or could “sterilize” some areas by preventing commuting.

Generic Impacts and Mitigation

915. The Impact Assessment has addressed a broad Project Area of Interest but has also focused on a direct impact zone of a 300m wide working corridor (150m either side of the proposed route) plus additional elements such as access roads, working areas and spoil disposal sites. Potential receptors (habitats and species) within this corridor have been assessed and the potential for Critical Habitats and/or Priority Biodiversity Features [139] assessed as discussed under baseline conditions and in reports that accompany this EIA (**Appendix V**)

916. Impacts to receptors (habitats and species) of **Moderate/Regional Value level or higher** are considered further below. Impacts to receptors of **Low/Local Value level or lower** will be managed through the implementation of Good Industry Practice (GIP) mitigation. Where mitigation is proposed it has been applied in line with the mitigation hierarchy of: **avoid, minimize, restore and lastly offset** and is presented as follows:

917. **Good International Practice:** generic mitigation to be adhered to throughout the enabling and construction period. This include as standard site supervision by an Ecological Clerk of Works (ECoW) throughout the scheme's construction period, and is included within the construction EMP;

918. **Bespoke Construction Mitigation**: This has been developed for particularly sensitive habitats and/or species by receptor type and will also be included and cross referenced in the Contractors SEMP along with habitat restoration methods

919. **Operational Mitigation**: This will include significant maintenance and monitoring required to ensure that the construction impacts are adequately mitigated and that the maintenance for the road is carried out appropriately.

920. As per Table 106, the following generic impacts and sources of impact have been identified:

Table 107: Generic Impacts and Sources

Direct Impacts	Construction Sources	Operational Sources
• Habitat loss; degradation and simplification • Habitat Fragmentation • Changes in water conditions (hydrological impacts) • Habitat pollution • Direct mortality • Disturbance to species • Spread of non-native or invasive species	• Vehicle mobilization, including transport of people and equipment within the works area • Compounds working camps construction and operation, including wastes and indirect pressure of workers presence • Working corridor vegetation clearance and topsoil removal; • Construction activities including disturbance of soils & pollution from construction, including river crossings • Water abstraction • Unplanned Events	• Increase in hunting or predation utilising the road for access • Spread of non-native invasive species along the road • Impacts upon habitats and species directly resulting from the road maintenance • Increased disturbance due to increased accessibility • Visual, noise and air quality issues related to the operation of the road and associated areas • Impacts from habitat severance

[139] This concept replaces the previous definition of natural habitat used by the EBRD and adopts the criterion-based approach already used for definition of critical habitat. Priority in all EBRD definitions combines consideration of irreplaceability (the limited number of places in which the feature is found) and vulnerability (the risk of the feature being lost over time). Priority biodiversity features have a high, but not the highest, degree of irreplaceability and/or vulnerability. Although a level below critical habitat in sensitivity, they still require careful consideration during project assessment and impact mitigation

921. For each of these potential generic impacts, the following table identifies potential construction sources of impact, proposed generic mitigation to avoid or reduce the impact and the potential for residual significant adverse effects to important ecological receptors. More detailed receptor-specific assessments, including impacts associated with operation of the road, are provided in the tables that follow.

Table 108: Generic Habitat Impacts and Mitigation

Impact	Effect	Proposed Mitigation	Significance (post mitigation)
Habitat loss; degradation and simplification	Vegetation clearance for the preparation of the working corridor, and supporting infrastructure (construction camps, laydown areas, spoil disposal etc). Degradation from soil compaction and erosion, dust and temporary roads and access areas	Land outside of the direct project footprint will be restored as soon as practical following construction, so most impacts are expected to be short-term only. Areas with permanent habitat loss will be primarily in areas of limited ecological value (agricultural land & pasture) with the exception of sub-alpine birch krummholz (>0.1 ha to be lost at the north portal), Alpine rivers and their ligneous vegetation (~1.4ha); Alluvial forest (with alder and ash) (~ 0.7ha) and Hornbeam forest (~ 0.3 ha at the Tergi gorge crossing). These are described further later.	Low-moderate.
Habitat Fragmentation	Disruption to general fauna movement through the landscape (physical and disturbance).	The extensive use of tunnelling means that such effects are likely to be largely temporary and restricted in area and are therefore unlikely to result in a significant effect on populations. Specific mitigation for notable species is included later.	Low – moderate
Changes in surface & ground water conditions	Impacts to aquatic species (surface waters) and species dependent upon using shallow groundwater/ infiltration.	Project routing seeks to avoid any major hydrological issues. Whilst large amounts of groundwater will need to be removed from the main tunnel, this is not expected to affect the surrounding habitats and water will be treated prior to discharge (see water section).	Low-moderate. See water section
Habitat pollution; including deposition and runoff	N**itrogen deposition** from vehicles can affect sensitive habitats (woodland, alpine grasslands and riparian areas). **Dust** can impact on vegetation and affect productivity and/or change local soil PH levels. Pollution (including salt) from road run off and **de-icing** may affect habitats and can create surface water films.	GIP mitigation will ensure that there are no significant impacts from run off. For particularly sensitive areas near watercourses bespoke mitigation and monitoring by the Ecological Clerk of Works (ECoWs) will be used to minimise the risk of significant effects. Effects from dust are expected to be limited to up to 50m from the source (25m with the application of GIP) and are unlikely to be significant. ECoW should advise on particularly sensitive areas deposition and salt spray should be monitored.	Low-moderate

Impact	Effect	Proposed Mitigation	Significance (post mitigation)
Direct mortality may arise of notable species	Notable species may be affected by collisions with vehicles, habitat clearance, hunting and other sources of direct mortality.	**Pre-clearance site surveys** will map sensitive areas and apply additional mitigation where required. Construction camps will be located away from sensitive areas. A hunting ban will be in force for construction workers. Speed limits on vehicles and restriction to existing and/or dedicated haul routes will prevent direct mortality and disturbance from vehicles during construction. Pre-clearance site surveys and the movement of animals out of the working corridor by the ECoW, combined with timing of works in sensitive areas will prevent direct mortality. Some low level unavoidable direct mortality may still happen but this would not be significant in the short or long term.	Low – moderate
Disturbance (including visual and noise)	Construction noise and visual disturbance can result in short term, localised effects, although many animals will become habituated to the noise. Birds are amongst the best studied animal receptors in response to noise and only noise levels in excess of 65dB long term or spikes over 70dBs are likely to have an adverse effect[140].	Construction noise and visual disturbance will result in short term, localised effects, although many animals will become habituated to the noise. The nosiest activities will be associated with any drilling and blasting required for the tunnels (see noise chapter) which could result in temporary abandonment of nearby areas and this will result in short-term adverse effects. In the most sensitive habitats and species, works will be confined to the least sensitive timeframes. Monitoring by ECoWs will also ensure that should valuable species be breeding in an area, works do not take place during these sensitive times i.e. for birds that the young have successfully fledged or that fish have successfully spawned.	Low
Spread of non-native / invasive species	Spread of non-native invasive species will reduce the ecological value of an area.	**Pre-clearance site surveys** combined with the demarcation and treatment of non-native species will prevent their spread. Monitoring post-construction will ensure that newly restored areas are not colonised by non-native species from adjacent areas.	Low

Specific Impacts and Mitigation

922. Overall, it is expected that the majority of impacts associated with the project will be of only low ecological significance. The road generally passes through habitats of relatively low intrinsic ecological value that are common within the area, primarily grazed pasture, agricultural land and small areas of villages and gardens. Areas of sub-alpine grassland, including those passed beneath by Tunnel 5 within the Kazbegi National Park, are also locally common and of only limited ecological value, primarily as a result of overgrazing. (Potential

[140] Dooling RJ, Popper AN, (2007). The effects of highway noise on birds. Environmental BioAcoustics LLC for the California Department of Transportation, Division of Environmental Analysis.

importance for large mammals and birds is addressed later.) More valuable habitats include areas of natural woodland, riparian and wetland areas, and these are discussed further in the sections below. A summary of key potential impacts to specific receptors is provided in the following table.

Table 109: Summary of Potential Impacts by Receptor Type

Receptor	Construction Impacts	Operational Impacts
Designated Sites	The route directly crosses under a fragment of the Kazbegi National Park at a depth of more than 200m. It also overlaps a small part of the Kazbegi IBA and KBA. None of the features for which any of these sites have been designated will be affected and direct impacts in general have been limited through appropriate route selection and tunnelling. The remaining areas to be affected by the project do not support the specific receptors for which the sites are designated. Impacts will be further reduced by sensitive timings of works, and appropriate working methodologies (including noise reduction and pollution control) as well as habitat restoration. Details of these control measures are included in the project EMP. Mitigation for residual impacts to receptors considered PBF (e.g. arising from permanent habitat loss, fragmentation or disturbance) is outlined further below	During the operation of the road there will be some ongoing impacts arising from operational and maintenance activities. These include the potential for road traffic accidents, habitat fragmentation, disturbance and lighting. Mitigation for these is discussed further below.
Notable Habitats	The route has been selected to avoid impacts to notable habitats. Small areas of wet grass marshland and sub alpine birch will be affected but this will be minimized by the use of the ECoW. None of these areas however, will be used for spoil disposal. Some small areas of natural habitat are affected mitigation proposed includes reduction in working corridor widths the and use of TBMs rather than cut and cover wherever practical. Post-construction habitat restoration will be carried out in all areas. Areas of each habitat for which appropriate offsetting is required are shown in the table below ().	Minimal impacts to notable habitats are expected to result from the operation of the proposed road once habitat restoration has been completed. Specific mitigation is proposed to manage road run-off, dust deposition and disturbance effects No significant residual effects are anticipated to these habitats
Notable Species	A large number of species are present within the broader project area. None of these are expected to trigger Critical Habitat or Priority Biodiversity Features in line with PR6. Potential impacts to notable species include direct mortality, fragmentation of habitats, visual and noise disturbance and impacts from pollution. Further details and proposed mitigation are presented later in this document.	Potential impacts include habitat fragmentation, road traffic accidents, lighting and nose disturbance and the potential for increased hunting as accessibility is increased. Proposed mitigation for these impacts is presented by species later in this document

923. Given the proposed mitigation outlined above, the majority of residual effects are expected to be of low-moderate significance and short term only. The main impact of habitat loss and degradation will be addressed through appropriate habitat restoration (with a ration of 3:1 for Natural Habitat). Full details of forestry restoration are detailed later but as a minimum this will involve the creation of around 0.3 ha of sub-alpine birch krummholz near the

northern portal, 4.2 ha of riverine habitat, 2.1ha of alluvial forest with alder and ash and 2.1 ha of hornbeam forest.

Table 110: Areas of Offset required for Notable and Natural Habitats

Code	Habitat	Direct Impact	Disposal sites	Proposed Offset	Where	Status
61GE02	Sub-alpine meadows	Under main tunnel area – no direct impact				Modified
9BF-GE	Sub-alpine birch krummholz	>0.1ha	0ha	0.3ha and avoid	Northern Portal	Notable
323GE	Alpine rivers and their ligneous vegetation	1.4ha	15.7ha subject to assessment	4.2ha for the direct impacts and restore	Both portals	Natural
70GE03	Low grass marshes	0	0ha	avoid	Zakatkari plateau	Notable
91E0 *[141]	Alluvial forests/ Alluvial forest with Alder and ash	0.7ha	0ha	2.1ha	Both lots	Natural
91CB-GE	Hornbeam forest (Carpinus betulus)	0.3	0.8 subject to assessment	2.1ha and avoid	Gorge crossings	Natural

924. The precise locations of these restoration areas will be confirmed and managed under the supervision of the ECoW. The ECoW will also advise on any requirements for further mitigation should habitat loss on disposal sites be unavoidable, but at this stage avoidance of this impact is the preferred option.

Residual Impacts

Impact Significance before Mitigation	***Assessment of impacts after Mitigation***	***Residual Impact Significance after Mitigation***
Construction Phase		
Medium	*Given the above, residual impacts on notable habits are expected to be minor / moderate. Whilst some habitats will be lost, use of an ECoW to avoid notable habitats wherever possible, aligned with sensitive routing, use of TBM, habitat restoration and offsets will reduce such impacts to acceptable levels.*	***Minor / Moderate***
Operational Phase		
Medium	*Impacts to notable habitats during operation of the road will result from disturbance, potential pollution and increased access to habitats. Given the proposed mitigation impacts to habitats per se are expected to be of only low/medium significance. Impacts to fauna are discussed further below.*	***Low / Medium***

F.6.2 Notable Species

General Impacts and Mitigation

[141] Equivalent to United Kingdom classification: "W5 Alnus glutinosa-Carex paniculata woodland", "W6 Alnus glutinosa-Urtica dioica woodland)" and "W7 Alnus glutinosa-Fraxinus excelsior Lysimachia nemorum woodland".

925. The Project has the potential to impact on notable species as described above. Although these will be reduced where practical through the application of construction good industrial practice (GIP), such impacts will include the following:

Table 111: Generic Issues that may Affect Notable Species

Issue	Description
Habitat loss, conversion, degradation and simplification	Permanent land-take will affect habitats used for breeding, feeding and other activities by notable species. For areas of temporary land-take, pre-works surveys will be used to confirm baseline conditions to which habitats should be restored post construction. Whilst this will minimize long term impacts, some short-term degradation and disturbance will be inevitable whilst mid-term loss will occur in areas that, once replanted, take time to matures (e.g. forest). Additional mitigation may be needed to compensate for this
Fragmentation	The construction and operation of the road has the potential to cause fragmentation of habitats used by notable species including large carnivores and bats. Whilst the use of tunnels will reduce this, additional mitigation may be required for some species as discussed later in this chapter.
Changes in water conditions (hydrological impacts)	The proposed scheme requires a limited number of water crossings. Appropriate pollution prevention measures will be put in place at each crossing and vegetation cover will be retained on the banks where possible to retain habitat and minimize soil exposure. Silt fences will be used to prevent silt from travelling downstream, and banks will be restored to pre-construction contours to the extent practical using temporary erosion control measures (such as straw bales, silt fence, etc.). Pre-clearance site surveys will map sensitive vegetation for restoration and reinstatement of banks will use mid-term soil stabilization measures (if required) such as willow revetments, gabions and/or geo textiles membranes to retain soil until the vegetation has established.
Habitat pollution including deposition and runoff.	GIP mitigation will be used to minimize impacts from run off. Where there are particularly sensitive watercourses bespoke mitigation and monitoring by the Ecological Clerk of Works will ensure no significant adverse effects. Impacts from dust (with appropriate damping down and other mitigation) are expected to be reduced to a distance of 25m from the works and are unlikely to be significant. Should the ECoW identify any particularly sensitive areas, deposit gauges will monitor the dust and appropriate action taken if required.
Direct mortality	Locating construction camps away from sensitive areas and enforcing a hunting ban of construction workers will help ensure that there are no significant adverse effects. Good site practice regarding the storage of waste and food will be implemented. Speed limits on vehicles and restrictions to existing and/or dedicated haul routes will prevent direct mortality and disturbance from vehicles. Direct mortality will be reduced through the use of pre-clearance site surveys. The movement of animals out of the working corridor by the ECoW, and appropriate timing of works in sensitive areas.
Disturbance to species including visual and noise disturbance	Construction noise and visual disturbance will result in short term, localized effects, although many animals will become habituated to the noise. Noisy activities (e.g. from static plant use) may result in abandonment of areas closest to construction sites by some species. Impacts to the most sensitive habitats and species will be reduced by confining works to the least sensitive timeframes. Monitoring by the ECoW will also ensure that should valuable species be breeding in an area, works do not take place during these sensitive times.
Spread of non-native or invasive species.	Pre-clearance surveys combined with the demarcation and treatment of non-native species will prevent their spread. Monitoring post-construction will ensure that newly restored areas are not inundated with non-native species from adjacent areas.

926. Overall, the Project proposes to adopt the **mitigation hierarchy** to avoid impacts to notable species through a sequential approach of impact avoidance, mitigation, restoration and finally offsetting if no other approach is effective. The project has sought to avoid impacts to notable species from the outset through design of the route to avoid sensitive habitats. Wherever practical already degraded habitats (e.g. existing roads) are used or habitats of low biodiversity value (e.g. overgrazed pasture), and the use of tunnels will also avoid many impacts. Construction works will employ GIP (Good International Practice) to further prevent or reduce impacts wherever practical. This includes avoidance measures during construction such as seasonal timings of works (for example to avoid impacts to nesting birds or roosting bats as determined by the ECoW – see below) as well as other generic mitigation measures as elaborated in the table below.

927. **Ecological Clerk of Works (ECoW) –** The Project proposes to proactively further reduce residual impacts and risks through the use of an Ecological Clerk of Works (ECoW) who will ensure that detailed pre-construction/pre-clearance surveys are undertaken and will ensure that commitments in the Projects **Biodiversity Management Plan** (part of the SEMP) are delivered in accordance with Project commitments. The ECoW will be well trained in the practical elements of protected species including handling of species that they may have to move and the recognition of sensitive habitats. They will also have a working understanding of wider environmental issues and the construction/engineering process. The Biodiversity elements of the SEMP will be updated once the habitats and species within the Project area have been further mapped under the guidance of the ECoW prior to and during the construction[143].

Table 112: Generic Construction Mitigation (GIP) to Minimize Impacts to Notable Species

Impact	Mitigation
Impacts due to scarcity of data	Ahead of all works, sensitive habitats and notable species will be identified and mapped in 'pre-works surveys' (details below) by the ECoW. Bespoke mitigation will be applied in all areas where sensitive habitats and notable species are identified. This will allow suitable mitigation to be identified and the success of any remediation to be monitored. A monitoring report and hazard map will be prepared of sensitive locations by the ECoW and shard with workers so that sensitive areas can be avoided or bespoke mitigation implemented. The ECoW will ensure that habitat degradation is minimized and baseline data for the species **BAPs (Biodiversity Action Plans)** is obtained. Prior to any enabling works site survey, mapping and/or demarcation of non-native invasive species will also be required.
General impacts from works and operation – avoidance	The works footprint will be reduced as far as possible e.g. through the use of a single vehicle track policies and use of low-impact vehicles where practical. Vehicles will be driven at designated speed limits. Off-road travel will be prohibited where practical. Laydown areas and compounds will be sited to avoid unnecessary clearance of vegetation. Natural breaks in vegetation will be used as preferred access routes where possible. The workforce will adhere to working corridors. All staff will be provided with environmental awareness training. The workforce will not deviate from approved clearance areas. Workforce hunting and fishing bans will be enforced and cutting of wood by workers will be prohibited. Fencing will be minimized to ensure that areas vital for wildlife are not isolated by workforce activities, unless this is for species protection measures. Temporary barriers will be used to prevent wildlife from accessing waste disposal areas and similar areas.
Habitat Restoration	Any reseeding or replanting of selected areas to be restored will use locally collected seed mixes and saplings. A local source of indigenous saplings suitable for replanting programs will be identified in advance to facilitate restoration. All efforts will be made to minimise removal of mature/significant trees and maintain connectivity between

[143] This will specify the baseline condition of each habitat and species, the target condition and the recommended actions required to achieve this restoration.

Impact	Mitigation
	areas of forest habitats. Soils will be removed as subsoil and top soil and these will be stored separately as per good working practice for subsequent restoration. Workforce will be educated on preventing bush fires and this will not be used as a land clearance method.
Forest habitats	Mitigation will include limiting working RoW within forest habitats, avoiding the felling of mature trees wherever possible and restricting working hours to daytime preventing noise pollution during twilight (dusk and sunrise).
Riparian Habitats	Works will be minimised within riparian areas to safeguard aquatic organisms. Crossing points across rivers will be conducted where there is clear access to the banks and vegetation clearance is minimised. The ECoW will determine for which riparian works a site-specific method statement is required. Standard pollution control measures will be implemented in all sites (e.g. to prevent silt contamination water will be kept out of the works area using appropriate isolation techniques, such as coffer dams, silt fences and by-pass channels). Demarcation and offsets for camp and storage locations and field activities will be at least 50m from watercourses where practical. Erosion control using 'polders', pads of plants and geo-nets will be implemented. Where trees have to be removed to facilitate the crossing, these will be replanted with a similar species composition.
New Habitats	New habitat features will include boulder piles, dead wood piles and brash, and creation of appropriate ponds.
Habitat pollution	Standard pollution control measures will be implemented. The ECoW will determine when further monitoring (e.g. for turbidity) and/or bespoke mitigation are required. Dust emissions due to road travel will be minimized by regulating vehicle speed and watering roads (where required). Spill kits will be available and standard industry refuelling protocols will be followed, e.g. use of drip trays. Erosion control will be implemented as appropriate.
Direct mortality of notable species	All food and food waste will be stored securely to deter opportunistic species and minimize interactions between humans and animals. The location of sensitive species identified by the ECoW will be reported to the workforce appropriately. The ECoW will be present during commencement of all works to conduct pre-construction checks and prevent animals present within the working area being killed or injured during the works. Checks will be for all vertebrate species including ground nesting birds, reptiles, amphibians and bats, amongst others. Checks will include within hollow trees and other places of shelter. As far as possible tree and scrub clearance will not be undertaken during the breeding bird season (March to August inclusive). Should clearance during this time be necessary a pre-clearance nesting bird check of the vegetation to be cleared will be undertaken by the ECoW and a decision on whether to move the nest or defer the clearance will be made by the ECoW.
Lighting	Works will not be lit where this is practical. Where lighting is required it will be directional and the lighting strategy will be designed with the input of the ECoW. Only non-UV lighting sources will be employed.
Excavations	Pits and excavations will be filled in as soon as possible following works. Trenches and pits to be created for longer than 48h periods will have 45^{O} ground ramps to allow escape by fauna should they fall in. A pre-start check for fauna will be completed prior to works commencing in the morning if trenches are left open overnight. Regular crossing points will be installed to ensure wildlife can cross excavations, berms and drainage channels.
Noise	Noise is likely to be highly localised and most receptors will likely avoid the noisiest areas or become habituated to certain noise. Some species may be particularly vulnerable and additional mitigation measures will be implemented as appropriate, eg by altering timing of works, using less noisy machinery where appropriate. Noise barriers will be considered for use around static equipment.

Impact	Mitigation
Non-native or invasive species	Native plants that are locally sourced will be used for re-planting. A site wide ban will be placed on workers bringing vegetation or soil from outside the site area to prevent dispersion of non-native invasive species. Minimize topsoil movements. Wash down of all vehicles and equipment before entering the sensitive sites. Follow species specific mitigation regarding invasive species which includes demarcation and avoidance.
Unplanned events	Mitigation for unplanned events will include training of staff in: 1) the sensitivities of the habitats and species in the area via toolbox talks including health and safety recommendations regarding poisonous or otherwise dangerous plants or animals, provided by the ECoW 2) Prevention of accidents by adhering to good practice behaviour throughout the works 3) Delegating authority to a ECoW whose job it is to ensure compliance of the required mitigation 4) Training in immediate response to bush fire, spillages etc.5) Emergency numbers provided for ECoW should protected species be found on site in the absence of site supervision. The ECoW will be present at all times if works need to take place in particularly sensitive areas.

928. **Pre-works surveys** – Prior to works starting, the proposed route will be further surveyed by suitably qualified ecologists to map up-to-date baseline conditions. The work will focus on the presence / potential presence of notable species, as discussed earlier in this document. It will:

- Consider all vertebrates (mammals, birds, reptiles, amphibians, fish).
- Employ survey techniques that are fully auditable, repeatable and in line with good practice guidance and undertaken by a suitably qualified professional.
- Be conducted at a suitable time of year for the target habitats and species (likely spring and autumn but to be confirmed for each receptor by the ECoW).
- Be used to update the **Biodiversity Management Plan (BMP)** from which the success of the species and habitat restoration can be compared to the BMP targets.

929. The ECoW will be responsible for confirming that adequate information has been collected to ensure that there is an appropriate baseline to inform the bespoke mitigation and monitoring.

930. The ECoW will also reassess the Project RoW ahead of the works through a 'walkthrough' to be conducted ideally one to two days ahead of the works to obtain up to date information on the presence of flooded areas; nesting birds etc.

931. These two types of surveys can be summarized as follows:

- Pre-commencement detailed baseline data collection – To be undertaken well in advance of enabling works: These will allow habitat and species distribution to be accurately mapped in order to inform mitigation, confirm baselines and therefore targets for offsetting and KPIs for monitoring. To take place no later than 2 weeks and no more than 6 months before work commences. To be conducted by an appropriately qualified Biodiversity Specialist in Spring / to Autumn and focus on notable habitats and species.
- Pre-commencement walkthrough (rapid assessment) – To be undertaken just before enabling works to identify presence of sensitive receptors such as nesting birds, roosting bats and sheltering reptiles etc. Expected to take place no later than 1 day and no more than 2 weeks before work commences. To be conducted by an appropriately qualified Biodiversity Specialist and focus on notable habitats and species.

Specific Notable Species Impacts and Mitigation

932. Despite this overall approach to mitigation, the project still has the potential to impact on a number of notable species for which the use of species-specific biodiversity action plans are proposed (see standalone **Biodiversity Action Plan**) to help ensure that no net loss (and ideally "net conservation gain") is achieved. These species include the following potential triggers of PBF:

- **Birds: Egyptian, Bearded and Griffon Vultures, Golden Eagle, Caucasian Black Grouse, Corncrake, Greater Rosefinch**
- **Mammals: Caucasion Chamois, Otter, Bats (all species), brown bear, Eurasian lynx, Kazbegi birch mouse.**
- **Other: Dinniks Viper, Trout**

933. **The potential for significant residual impacts to these species, and hence the need for species-specific BAPs, is addressed further in the CHA (Appendix V) and standalone BAP documents, and summarized at the end of this section.**

934. Where available, for each of these groups, species-specific mitigation is outlined below. Where this is lacking it will be developed as part of the broader Project **Biodiversity Management Plan**.

- **Caucasian Black Grouse** (*Tetrao mlokosiewiczi* – IUCN: NT GRL: VU) **–** The proposed scheme will increase access to the Tereg valley and there is the potential for both habitat fragmentation and increased hunting. No known leks will be affected. Opportunities will be identified during landscaping for replanting of suitable areas with key winter food species, including *Betula litwinowii, Quercus macranthera, Fagus orientalis, Juniperus and Rosa* spp. No long-term impacts are expected to this species from the scheme, but since the scheme increases access to the Tereg valley, further surveys of use of the valley by this species will be undertaken and additional conservation actions may be developed as a result.
- **Kazbegi Birch Mouse (*Sicista kazbegica* IUCN: EN GRL: VU)** – Whilst populations of small mammals can become genetically separated as a result of habitat fragmentation due to road schemes, the route selection and proposed tunnel approach, should minimize this. No specific actions apart from application of GIP are proposed and it is considered unlikely that the project is going to have any significant residual impact on this species.
- **Dinnik's Viper (*Vipera dinniki* IUCN: VU) –** The viper is found in a wide variety of habitats and it is considered unlikely that the project will have a significant impact on this species. Further surveys for this particular species will be undertaken, but no specific actions apart from application of GIP are proposed. It is considered unlikely that the project will have any significant residual impact on this species.
- **Corncrake (Crex crex IUCN: LC GRL: VU)** – No areas of tall grass meadows are expected to be affected by the project, although this needs to be confirmed by the ECoW especially near the Begoni Plateau and proposed Kobi area spoil disposal sites. Further information is required for this particular species from the ECoW to determine the extent to which a **species-specific BAP is required to mitigate impacts.**
- **Eurasien Otter (Lutra Lutra IUCN: NT GRL: VU) –** The species is known to be present and is currently under threat from a combination of declining wild fish stocks, habitat destruction (e.g. removal of bank side vegetation), and persecution due to perceived predation on fish. Pollution from organochlorines, polychlorinated biphenyls and mercury is also a major threat as are drowning in culverts and road kills.

  Construction and operation of the road could result in direct mortality of otters as well as loss and fragmentation of habitat, disturbance, pollution and other indirect effects, discussed further in the table below. Mitigation will be implemented in all likely habitats where there is not sufficient evidence to discount the presence of otters.

Otter habitats and lying-up sites are subject to change over time and further surveys will be conducted, including immediately prior to the start of construction. This will involve surveys of all watercourses within 100m of the alignment for signs of otters including holts and couches. If any otter lying-up sites are found, mitigation will be adjusted as required. If any holts or couches being used for breeding are found all works in that area will need to be suspended until the cubs have left the holt/couch. Where otters are confirmed to be present, annual post-construction monitoring is proposed for five years to confirm whether the mitigation measures have been effective or if any alterations and/or enhancements are necessary.

Immediately prior to construction, for every river crossing or activity within a river there will be a **pre-enabling dedicated survey** to confirm absence of holts or other resting features within the direct zone of impact of the works. If features are found, exclusion of the features will be ensured prior to works commencing. During works within rivers, movement through the works area by Otters will be permitted over the banks. Searching for holt and couch signs within areas to be impacted by river crossings.

If the above mitigation is implemented the project is expected to have no residual impacts on this species.

Table 113: Otter Mitigation Strategy

Sources of Impact	GIP Construction Mitigation	Bespoke Construction Mitigation	Design and Operational Mitigation
Direct Mortality			
Otters are inquisitive animals and may be attracted onto construction sites to investigate machinery or spoil heaps. As a result they can become trapped in pits, piping, chemical containers wire mesh etc. As nocturnal animals they can also be particularly susceptible to night time accidents. They are also particularly susceptible to RTAs during project operation.	Holes/pits will be covered at night or mammal ramps positioned to allow any trapped animals to escape. Night working will not be permitted where the proposed scheme comes within 30m of any watercourse where otters may be present to reduce the risk of otter being run over by construction traffic.	Otters to be excluded from dangerous areas by erecting temporary otter proof fencing where they are present (whilst avoiding otter commuting routes). Fencing may be e.g. chestnut paling fence with stakes at 25mm gaps or stiff plastic mesh that otters cannot scale. Temporary fencing to be positioned to guide otter to safe routes through the working areas. This may include underpasses for site access and haul roads, (min internal diameter > 600mm)	Construct watercourse crossings to enable safe passage of otters. All bridges or buried structures will have sufficient space between the abutments and the watercourse to enable otter to pass safely during high water levels. Provision will be made for otters to gain access to the water at such structures and ledges will be incorporated in the bridge design as appropriate. The proposed scheme is not expected to cross any smaller watercourses at grade. Should this change, and otters be considered likely to be present continued, access along the water course would be maintained through the use of appropriate culverts[144].
Habitat Loss and Fragmentation			
Otters are secretive, and holts and couches are particularly important. Each otter knows where shelter is available in its home range. Loss of holts and other lying-up sites requires animals to travel further to find suitable cover. Habitat loss results from direct landtake siting of works compounds and material (including spoil) excavation of	Compounds etc to be sited at least 30m away from watercourses and to avoid nearby areas of woodland, dense scrub and/or wetland. After temporary loss habitat to be returned to its former quality or better (habitat creation for other species	Consider planting of trees such as willow, oak and ash along riverbanks and encouraging dense scrub nearby. Fence off overgrazed areas of land near watercourses to encourage vegetation growth. Where mature trees along riverbanks need to be removed, retain the root systems where practical to provide potential holt sites. Where works result in damage to river and stream banks, protected them eg by	Construct bridges and culverts where the road dissects watercourses to allow safe passage of otters during spate conditions, (presence to be confirmed by the ECoW). Should extensive stretches of road be fenced, install dry underpasses to enable otter to move between habitats.

[144] depressed invert box culverts are typically used as they do not fill as rapidly as cylindrical culverts which helps swimming otters. Culverts should be fitted with dry ledges that are accessible during high water levels. These should be made of solid concrete and integral with the culvert, 500mm wide and accessible both from the bank and the water by the provision of ramps or groups of large boulders. Ledges should be sited at least 150mm above the appropriate high flood level, allowing 600mm headroom. Where appropriate otters can be guided to the ledge by planting dense scrub on the opposite bank or providing the ledge on the appropriate side of the culvert. Further surveys will be undertaken prior to the construction of culverts should they be needed.

Sources of Impact	GIP Construction Mitigation	Bespoke Construction Mitigation	Design and Operational Mitigation
cuttings, construction of embankments and access roads, and building of bridges and culverts. Impacts will be greatest where construction requires diversion and re-alignment of watercourses.	groups will also support otter where close to waterbodies). Reinstate any realigned sections of watercourses to as near as natural as possible or create new channels with meanders and riparian planting	piling large concrete blocks to create attractive cavities for otter (in areas where the safety of otter can be assured by restricting their access to the carriageway).	
Habitat Fragmentation			
Works/the road may prevent otter from moving freely within and between existing areas of habitat, Culverts may act as a barrier to migratory fish movements and this could affect eg salmonid populations. The scheme could divide otter home ranges, leading them to either abandon parts or make frequent road crossings, with associated risk of accident. Severance of an otter's home range can also place it in direct competition with other otter, and otter are capable of inflicting serious and potentially fatal injuries on each other during disputes over territory.		Install temporary or permanent otter underpasses if required (eg under access roads). During construction of bridges and other structures one side of the river or stream being bridged will remain intact for as long as possible to provide safe access, and the area around the water course to be disturbed will be minimised by the provision of temporary barriers and safe working areas. In addition, if lighting is used it should be shone away from the river during construction at dusk or in the morning. Or if needed in the river it should use shrouding to ensure that not all the river is lit up and passage along it is still possible in unlit locations.	
Disturbance			
Includes physical disturbance, noise and light as well as possible obstruction of holts and otter pathways.	Appropriate siting of construction compounds and/or storage sites to minimise such impact.	Provide relevant contractors with an overview of otter ecology prior to works commencing. Any holts and couches to be identified to contractors in confidence to ensure that they are not accidentally disturbed and marked so that contractors must not enter. Site clearance must be preceded by a thorough survey of the area for holts, couches and otter, and once completed working areas in suitable habitat must be fenced to prevent otter returning. If a holt or couch is discovered during construction, an exclusion zone of 30m must be established and all works	During the operational phase, otter would be likely to suffer disturbance from traffic noise as well as from road lighting. Otter may become accustomed to these impacts over time but could abandon any holts or couches in the immediate vicinity of the scheme. Potential disturbance caused by the operation of the scheme will be partially mitigated for through the planting of natural screens along the scheme which will reduce noise and light disturbance to otter. Areas of lighting should be low where the operational scheme crosses or runs parallel to watercourses thus reducing disturbance to otters.

Sources of Impact	GIP Construction Mitigation	Bespoke Construction Mitigation	Design and Operational Mitigation
		suspended. If an occupied breeding site is found, it may lead to the cessation of work for up to 10 weeks until cubs are mobile and able to leave the area. Night working (one hour after sunset to one hour before sunrise) will not be permitted where the scheme comes within 30m of a holt/couch or watercourse in order to prevent disturbance to otter and their routines.	
Pollution and Other Indirect Impacts			
Water pollution could create long-term damage to the productivity and diversity of nearby habitats, affecting both otters and their food supply. Local rivers already have seasonally high sediment loadings but construction works (including gravel extraction and in-river works) can result in sediment deposition downstream. This can impact on both aquatic invertebrates and fish populations (and fish fry) which in turn would affect otter prey availability. Accidental spillages, e.g. from oil and diesel drums would also impact on prey, and if chronic could lead to bio-accumulation of contaminants which could result in otter mortality. Pollutants such as oil and diesel can also affect 345iltshi-regulation qualities of an otter's coat and cause mortality.	Contractors to adhere to pollution prevention GIP, as outlined in relevant guidelines on eg: Prevention of Water Pollution; Use and Design of Oil Separators; Works In, Near, or Liable to Affect Watercourses etc. Any chemical and oil storage tanks will be set back at least 10m from any watercourse and secondary containment must be provided. Construction vehicles will be prohibited from crossing watercourses used as breeding grounds by salmonid fish and silt traps will be installed as appropriate. Disturbance to streambeds will generally be kept to a minimum to prevent erosion and siltation. During both construction and operation pollution control measures will include installation of drainage systems to divert runoff into drains, soak-aways and detention basins to avoid contamination of watercourses. Detention basins should be fenced for health and safety purposes which would also act to deter otters from gaining access and becoming trapped. Drainage systems should be grilled to prevent otter entering and becoming trapped.		Pollution from the operational road can be worst following storm water runoff or accidental spillage. Runoff may contain toxic compounds used in the manufacture of cars, including zinc, cadmium and copper, as well as PCBs. Spillages occurring during the operational phase would have impacts similar to those from construction.

935. **Bats** – Further bat survey work is to be undertaken to confirm bat species present within the Project area. Road construction has the potential to result in impacts to bats as a result of habitat loss and disturbance and direct mortality amongst others. These will generally be mitigated through the use of the ECoW as outlined earlier.

936. Operational roads can also have a number of significant effects on bat populations including those outlined further in the table below. Many effects of roads on bats are species-specific. Larger, fast-flying species, adapted to foraging in the open, appear to be less affected by roads since they typically fly high above the ground and their greater flight efficiency and speed mean that even if diverted, the consequences are less likely to be important. Smaller, slower flying, woodland adapted species are more maneuverable but less efficient flyers. Woodland species are also more reluctant to fly in the open and tend to commute along linear features in the landscape such as tree lines, waterways, and woodland edges. These features provide protection from weather and predators, are sources of insect prey, and provide conspicuous acoustic and visual landmarks for orientation. The species most likely to be affected by roads are the slow-flying, woodland-adapted bats, such as Rhinolophus and some Myotis species, and these are also those that have suffered most from habitat loss.

937. Further work is required to determine the species of bat actually present around the proposed route and therefore what mitigation is appropriate. The detrimental effects of artificial lighting will however be reduced where practical by limiting unnecessary installations and using cut-off lighting. This is considered particularly important in areas commonly used by light-averse bats to forage, commute or roost during key times such as reproduction. Bats are also particularly faithful to maternity roosts due to the specific conditions they provide, and so conserving them is important for maintaining bat populations.

938. Proposed mitigation includes the following:

- Any tree above 100mm in diameter to be checked by the ECoW for the potential of roosting bats prior to removal. If bats are found, the roost will be left undisturbed until vacated by bats.
- All felled trees with potential to support bats (i.e. with suitable cavities) to be left in situ (on the ground) for 24 hours to allow any bats to move.
- Where practical avoid felling trees between April-August.
- Use of non-UV sources of lighting at working sites, deposits and permanent facilities to avoid attracting nocturnal insects and the bats that feed on them.
- Installing of bat boxes within appropriate habitat to mitigate for loss of roost sites.
- If any habitat corridors are found to be severed, identify key locations for replanting to retain commuting routes and if appropriate raise the height of the planting so that crossings are above traffic.
- If routes are near cuttings provide appropriate infrastructure across the cutting where practical to ensure bats avoid the cut area and being hit.
- Use down lighters as standard given the very undeveloped nature of the project area.

939. Further information is required as a priority for bat species from the ECoW to determine the extent to which **species-specific BAPs** are required to mitigate impacts.

Table 114: Impacts of Operational Roads on Bats

Issue	Effect
Habitat Loss	The proposed road development will involve the removal of trees and buildings that hold potential or actual bat roosts. The removal of trees, hedges, scrub, water bodies and unimproved ('natural') grassland also reduces available foraging habitat[145].
The Barrier Effect	Roads are potential barriers to flight between roosts and foraging sites and between summer, mating and winter roosts. Bats have been shown to make major detours (with associated energy costs) to avoid roads or to find appropriate crossing points. This can also deny bats access to parts of their habitat which can reduce home range size and quality and restrict migration. Roads may act as barriers because they interrupt existing linear flight lines, because some species are reluctant to cross open ground, because some species avoid lit areas (road and vehicle lights) and, at least initially, because they represent sudden changes in the bats' familiar landscape. Roads may also fragment habitat, decreasing its area and quality. Impacts are however species specific. Studies in Germany have shown that Bechstein's bats (Myotis bechsteinii) will avoid crossing roads, whilst barbastelle bats, Barbastella barbastellus will fly over roads and Nyctalus species will cross busy roads at heights above 20 m. behaviour that is likely to make them less susceptible to the barrier effects of roads and to collision mortality. Others will use underpasses, if strategically located.
Direct Mortality	Bats that attempt to cross roads also risk collision, and hotspots for mortality have been found where there is favourable habitat for bats and flyways cross roads. Although agile and manoeuvrable in flight, most bat species fly at low speeds (< 20 km/h) and many fly close to the ground (0-4 m) particularly when crossing open spaces. These behavioural traits make bats highly vulnerable to moving vehicles when either foraging along roads or when attempting to cross roads on commuting flights. Being small, bats can probably be pulled easily into the slipstream of passing vehicles.
Light	Lighting tends to deter many bat species, notably slow-flying, woodland-adapted species such as Rhinolophus, Myotis and Plecotus, from approaching roads and probably exacerbates the barrier effect. Both high-pressure sodium and white LED light deter **woodland-adapted** species, even at low intensity.[146] As light intensity drops rapidly away from the source, effects of isolated sources are not likely to be far reaching, but large arrays of high intensity lights will have a significant effect. Light can also attract some bat species, in particular open-air foragers such as Nyctalus and generalists like Pipistrellus, since short wavelength light attracts insect prey, concentrating them around lights and increasing bat foraging efficiency, although they may also be at greater risk of collision with traffic.
Noise	Most insectivorous bats rely on echolocation calls to orientate, detect prey and communicate. Some also locate and capture prey by listening for sounds they generate. (e.g. wing movements or mating calls). Traffic noise may mask all of these sounds and reduce the feeding efficiency of bats (eg Myotis myotis). It is likely that habitats adjacent to noisy roads would be unattractive as feeding areas for such species. Vehicle noise may also exacerbate the barrier effect, although noise effects over unlikely beyond 60m away.
Cumulative effects	Most of the factors discussed above are also cumulative. The effects of each individually need not therefore be great for the combination to have a profound effect on a bat population. Full effects, however. May not be seen for several decades and this has important implications for monitoring the effects of roads and assessing the effectiveness of mitigation. Data[147] indicates that the decline in diversity and abundance of bats extended to at least 1.6 km from a motorway.

[145] Road surfaces alone removes some 7 ha of habitat for every 10 km of 7 m wide, two-lane, single carriageway road. Roadside hard shoulders, verges, junctions, service areas and other structures remove additional potential habitat.
[146] (Stone et al. 2009, 2012).
[147] Berthinussen & Altringham (2012a, 2013

940. **Large Carnivores –** The following large carnivores are likely (bear and wolf) or potentially present (lynx) within the Project area:

Table 115: Large Carnivores Likely or Potentially Present in the Project Area

	Brown Bear Ursus arctos	**Eurasian Lynx Lynx lynx**	**Grey Wolf, *Canis lupus***
	IUCN: LC GRL: EN	IUCN: LC GRL: CR	IUCN: LC GRL: N/A
Status	Present in the study area. Traces of bear sometimes reported by locals near cattle barns and nr mountain birch forests of northern portal.	Anecdotal reports of ”a large cat” in the project area occasionally over last 6 years. Potential resident.	Local reports that wolves are regularly seen in winter/early spring and occasionally attack cattle. Present in Peoject area.
Threats	Forest management practices including loss of fruit trees. Human persecution.	Poaching, persecution, habitat fragmentation	Habitat fragmentation, disturbance and risk of accident are more significant impacts than habitat loss per se. Poisoning and persecution for perceived predation on livestock.

941. Project impacts on these species may include:

- Direct loss/fragmentation/disturbance of breeding and feeding habitat
- Direct mortality arising from road traffic accidents
- Increased persecution as a result of access for hunters to high mountain areas.

942. The extensive use of tunneling means that no requirements for “green infrastructure” such as ecological bridges is envisaged. Instead the main mitigation proposed for these species is as follows:

- Further work to Identify and map areas occupied by these large mammal species (as far as possible) prior to the commencement of the work.
- If animals are believed to be present near works carry out works only during the day to limit disturbance (primarily breeding season of March – June).
- All staff to receive a tool box talk identifying the potential presence of these species and advising upon the correct actions to take should these species be encountered. The need for good housekeeping (i.e. no litter, food stored appropriately) will also be communicated.
- Consideration of the following in species-specific BAPs:
    - Monitoring studies for populations moving through the area (e.g. by tagging),
    - sponsorship of studies into safeguarding measures for large carnivores,
    - support to the Kazbegi national park with the creation of management plans for supporting populations of large carnivores, including obtaining baseline data on the movement of large carnivores through the park.

Potential Indirect Impacts (Primarily Arising from Increased Access)

943. A number of notable species of the high mountains are also found within the Project area. Whilst occasional animals may venture into areas directly affected by construction or operation of the scheme, most will remain in remoter areas and are unlikely to be directly affected by the project. They may however be affected by indirect impacts associated with the following:

- Noise and disturbance during construction.
- Lighting and disturbance from the operational road.

- Increased levels of persecution and hunting as access to the area improves.

944. This includes a range of birds of prey and ungulates as shown in the tables below:

Table 116: Vultures

	Bearded vulture/ Lammergeyer Gypaetus barbatus	**Griffon vulture Gyps fulvus**	**Egyptian vulture Neophron percnopterus**	**Black (Cinerous) Vulture Aegypius monachus**
	IUCN: NT GRL: VU	IUCN:LC GRL: VU	IUCN: EN GRL: VU	IUCN: NT GRL: EN
Status	2-3 pairs breeding on in the NP. Vast home ranges. Likely to forage over pastures in the project area.	15-20 pairs breed in the NP. Likely to forage over pastures in the project area	Breeds in NP and recorded in project area. Likely to forage over pastures and scavenge in villages.	Breeding in NP and likely to forage over the pastures of the project area.
Threats	Poisoning, habitat degradation, disturbance of breeding sites, collision with powerlines	As above although effective protection in areas with a plentiful supply of food has been shown to catalyse impressive recoveries.	Disturbance, lead poisoning (from hunting), direct poisoning, electrocution (by powerlines), collisions with wind turbines, reduced food availability and habitat change.	Degradation of nesting habitats and human persecution

Table 117: Raptors

	Golden eagle Aquila chrysaetos IUCN: LC GRL: VU	**Long-legged Buzzard Buteo rufinus IUCN: LC GRL: VU**
Status	Breeds in Kazbegi NP and likely to forage over the pastures of the project area.	The IUCN range maps: potential breeder in NP likely to forage over meadows in project area.
Breeding	Cliff ledges but also large trees or similar artificial structures.	Cliff ledges and crags

Table 118: Ungulates

	Caucasian Chamois Rupicapra rupicapra (ssp caucasica) IUCN: LC GRL: EN	**Eastern Caucasian or Dahestanian Tur Capra cylindricornis IUCN: NT GRL: EN**
Habitat / Status	Known from the Kazbegi National Park and the slopes of the Truso gorge and Sno valley near northern portal. Not recorded in the project area but may be present in high areas. Declining and has virtually disappeared outside protected areas.	The latest data suggest that there may be around 1500-2000 animals in the National Park
Threats	Hunting and poaching. This species is hunted heavily for food by local human communities Poaching is probably the most significant cause of the recently observed serious declines. Livestock grazing results in competition for resources, especially with domestic sheep and goats. The species is also impacted by habitat loss and degradation preyed upon by wolves and lynxes Human disturbance, particularly as a result of increased tourism and leisure activities in mountain areas, may also be a problem	

945. No specific mitigation is proposed at this stage for any of the above species. However, it the RD should seek to work with the National Park, MoEPA and relevant conservation organizations to support long term conservation planning for species like these indirectly affected by the project and this can be done in conjunction with work to be done on eco-tourism development in the region which is already planned.

Residual Impacts

Impact Significance before Mitigation	***Assessment of impacts after Mitigation***	***Residual Impact Significance after Mitigation***
Construction Phase		
Moderate	*Given the above, residual impacts on notable species are expected to be moderate. Direct impacts will be associated with habitat loss, disturbance and accidental mortality. Indirect impacts could also arise from fragmentation and introduction of people to the valley. The implementation of the proposed mitigation, including the proactive use of the ECoW, and the preparation and implementation of appropriate Biodiversity Action Plans (BAPs) for key species, means that such impacts are, however, expected to be reduced to an acceptable level, although they remain as moderate.*	***Moderate***
Operational Phase		
Medium / High	*The operation of the road will result in direct impacts to notable species from road traffic accidents as well as indirect impacts associated with disturbance, habitat fragmentation, pollution and increased access to habitats. Given the proposed mitigation, including the used of species-specific BAPs, such impacts are expected to be reduced to an acceptable level.*	***Medium***

F.6.3 State Forest Fund

Potential Impacts

946. The following table summarizes the key potential impacts to state forest fund and indicates potential impact significance using the methodology outlined in Section F.2.

Table 119: Impact Screening – State Forest Fund

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	Cutting of trees	Terrestrial wildlife	M	H	H	M	MAJ	M/F	SMALL	MED	DEF	M

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely
Cells shaded in blue are positive impacts.

947. These key potential impacts and other minor impacts are described in more detail below.

Pre-construction / Construction Phase

948. As noted in **Section E.2.5 – State Forest Fund**, approximately 5.9 hectares of state forest fund will be cut to accommodate the Project buffer. None of the trees identified for cutting in the buffer are identified as Georgian red list species.

Mitigation and Management Measures

949. An inventory of the species to be de-listed has been prepared as part of this EIA (**Appendix I**). The RD is responsible for supplying this information to the National Forest Agency in writing in order to complete the de-listing process. The RD will make an appropriate compensation payment for the trees cut as part of the Project based on the criteria of Table 2 of Appendix 7 of The Resolution No.242 of Government of Georgia on Approval of Rules for Forest Use taking into account the area of used land. The payment shall be made before beginning of forest usage. The timber resources obtained as a result of cutting of the trees from the SFF, shall be sorted out according to species by the Contractor and collected at the area indicated by National Forest Agency and transferred to the National Forest Agency by the Contractor to a specified state property land plot.

950. Whilst no compensation in the form of re-planting is required under Georgian legislation unless specified by the MoEPA re-planting, on a 1:3 basis, will be undertaken as an additional compensation measure. The Contractor should coordinate with the National Forest Agency to identify a site, or sites, within the Project area where such trees can be planted. Seedlings will be obtained from suitable local nursery-gardens. Plant maintenance will be carried out by the Contractor for at least two years. If the maintenance period extends after the completion of the Contractors contract period, the RD will be responsible for contracting an operator to maintain the trees for the remaining period. During Construction the ECoW will undertake monthly monitoring of the re-planted areas and report on the success rate of the re-planted trees, which should be above 80%. If the success rate falls below 80% the Contractor will re-plant on a 1:1 basis to compensate for losses. The Contractor will be responsible for paying for any compensational re-planting.

Residual Impacts

Impact Significance before Mitigation	***Assessment of impacts after Mitigation***	***Residual Impact Significance after Mitigation***
Construction Phase		
Medium	*Cutting of the trees during the construction phase will have a negative impact upon habitat and the species in these areas.*	***Minor / Moderate***
Operational Phase		
Medium / High	*Cut trees will be re-placed on a 1:3 basis. No significant residual impacts are anticipated in the operational phase.*	***Negligible***

F.7 Economic Development

F.7.1 Local Economic and Livelihoods Impacts

Potential Impacts

951. The following table summarizes the key potential impacts on the local economy and livelihoods and indicates potential impact significance of the impacts using the methodology outlined in **Section F.2**.

Table 120: Impact Screening – Local Economy and Livelihoods

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	Generation of direct employment	Nearby communities	M	H	H	-	MAJ	ST	INTER	MED	DEF	M
C	Stimulation of indirect employment	Nearby communities	M	H	H	-	MAJ	ST	INTER	MED	DEF	M
O	Reduction of workforce employment	Nearby communities	M	H	M	-	MOD	ST	INTER	MED	DEF	M
O	Creation of new job opportunities and tourism	Nearby communities	L	H	H	-	MOD	LT	SMALL	MED	DEF	M

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely
Cells shaded in blue are positive impacts.

952. The potential local economic and livelihoods impacts arising from the construction and operations phases of the Project are predicted to result from the following:

- Generation of direct employment by the Construction Contractor and contractors engaged in the Project;
- Stimulation of indirect employment by companies and businesses that participate in the Project's supply chain and provision of services to the Project, together with the potential stimulation of the service sector arising from opportunities facilitated by construction of the Project (e.g. through tourism, enhanced trade opportunities, etc.); and
- Losses of land parcels of household's dependent with land-based livelihoods (discussed further below under Land Use).

953. Employment impacts associated with the Project are generally expected to be beneficial, in the context of construction phase activities and during ongoing operations in road management and support services.

Construction phase

954. Direct employment generation will be provided through the construction phase. Construction works are anticipated to be carried out by an internationally recognized Contractor, selected through a transparent, competitive bidding process, with a stipulation on the portion of jobs available to Georgian workers. Work assignments for some of the construction personnel are expected to be short-term and may not require deployment for the full construction period, because different qualifications and abilities will be required at different stages of the construction process: initially earthworks and civil works, followed by specialist tunneling works, electrical installations, and so on.

955. The workforce engaged in construction of the Project, including Georgian workers and expatriate personnel of the contractor, will be accommodated in residential facilities to be determined by the contractor. Selection of the camp sites will be undertaken in consultation with local communities, the RD and the Engineer.

956. The Contractor has the role of determining the number of workers to be engaged during construction. However, it is estimated that a construction workforce of approximately 600 people will be required for 48 months, comprising 58% skilled labor, 20% semi-skilled labor and 22% unskilled labor, however the exact figure will be dependent on the Contractors resourcing design.

957. The construction workforce, at the completion of the works, will be demobilized. The construction workforce will be engaged by the Contractor or subcontractors, and as such, may be re-deployed to other projects and work locations at the end of construction works, however this will be at the discretion of the Contractor or subcontractors.

958. Indirect workforce and business opportunities during construction phase will include for suppliers and service providers to meet the needs of construction team. This will include providing food supplies, security, vehicles, transportation services and fuel, as well as catering, laundry, cleaning and sanitation in workers accommodation.

959. While the enterprise birth rate in the Mtskheta-Mtianeti region is slightly higher than the national average of 20.2%, at 22.2% annually, this suggests that the development of the Project may support or facilitate further economic development opportunities both at construction and operations phases.

960. Demand for various materials and services will support growth and diversification of the local business environment, noting that the availability, quality, quantity, and reliability of supply of the goods and services from within the Project area may be limited by a lack of depth in local business capability. As such, some goods and services for the Project may still need to be sourced from elsewhere in Georgia or internationally as necessary.

Operations Phase

961. Operational phase effects will commence with the rapid reduction of the workforce on completion of construction. The transition phase to ensure that the steady state workforce is well equipped and skilled to manage the tunnel facilities will involve some intermittent inputs for capacity building by the tunnel ventilation/facilities design team. An appropriate training schedule will match commissioning date, and operational demands during commissioning. This will be documented through a transition plan.

962. The workforce during operations will be significantly lower than during construction, with an estimate of 10-30 people working in tunnel services and maintenance during steady state activities, however this will be dependent on the RD and structure of maintenance activities (e.g. contracted or direct employment maintenance crews), to be determined.

963. Indirect business development during the operations phase of the project will be those created by the transport link opportunities that the project itself creates. Significantly, these will include efficiencies associated with improved freight haulage compared to the existing Military Road; and opportunities that are afforded through improved transport links, such as for tourism in the Project area and in enabling residents' better access to existing and new markets.

964. Project operations (i.e. creation of an improved road) will facilitate implementation of the Kazbegi tourism policy/plan, which seeks to draw greater numbers of both local and international tourists to ski areas, and for hiking/other outdoor pursuits.

Mitigation Measures

965. Skilled, semi-skilled and unskilled workers are required for the Project, some of which may be accessed from within the local area where there is almost 24% reported unemployment and 8% self-employment. There are a large number of pensioners in directly affected villages who will not likely be involved in construction work. Thus, identification of potential candidates and readiness for work will need to be assessed by the Contractor prior to appointment of workers with support from the Labor offices of Dusheti and Kazbegi municipalities. This may include opportunities for repatriation to the Project area for local people who have moved to Tbilisi or elsewhere in search of other work opportunities.

966. The contractor should be requested to set targets for local employment based on initial assessment of the labor market for unskilled and semi-skilled work force. As part of this action he shall prepare a **Local Content Management Plan** which will outline measures for local employment and procurement. In addition, for unskilled they should use a 'ballot' system to ensure that employment is fair and not weighted to connected people for unskilled roles. Repatriation of locals through recruitment measures will use online resources such as jobs.ge. A **Retrenchment Plan** will also be developed by the Contractor for use during the end of the project to ensure that local workers are equipped in some capacity for the end of the project.

967. Procurement policies in the EMP will encourage the use of local suppliers. Current capacity may be limited to immediately secure all goods and services from within the directly affected villages, thus the EMP will reflect prioritization of suppliers from within the Dusheti and Kazbegi municipalities.

968. The transition phase to ensure that the steady state workforce is well equipped and skilled to manage the tunnel facilities will involve some intermittent inputs for capacity building by the tunnel ventilation/facilities design team. An appropriate training schedule will match commissioning date, and operational demands during commissioning. This will be documented through a transition plan, which at minimum will include: an operations handover process and the documentation required for handover; training requirements including commissioning and staffing requirements; occupational health and safety requirements and risk management and reporting.

969. The Project will ensure that labor conditions for its workforce (including contractor personnel) comply with all relevant requirements of the Georgian Labor Law, the ILO Conventions ratified by the country, and labor management provisions of Project Lenders.

970. Local business development opportunities associated with the use of the road, or in support of others using the road, include creation of market places. Particular examples include at Kobi near the river-bend, which also creates a beneficial use for spoil, and the interchange at the Begoni Plateau, where a flat marketplace area as a stopping point for tourists also has the potential attraction of creating a lookout point from which to view the main span bridge across the Khada Valley.

971. The potential for new market development will depend on issues such as: number and type of potential market stalls/businesses; the ability to maintain a safe area for stopping/trading within possible market sites; and registration requirements of businesses by local government. It should be noted that registration of local small businesses has varied in recent years and were reported in consultation to not be uniformly required.

972. During project preparation for the Kvesheti Kobi Road, it was identified during consultation with local resident, Kazbegi and Dusheti municipalities, tourism associations, NGOs and other stakeholders in 2018 and 2019 that there is a want and need for sustainable tourism development within the region. The proposed Zakatkari Visitor Centre will be developed to serve this need and will be a flagship from which other sustainable development can be networked into the region. In addition, the centre will also be focused to support local livelihood improvement for residents in the Khada Valley and along the new project road.

973. The exact nature of the visitor centre is yet to be confirmed and will be developed following the completion of a specific study where all relevant stakeholders will be consulted. At present elements that have been tabled include the following:

- Small Scale Agri-market; for residents to sell commodities such as Honey, Fruit, Jam, Cheese etc.
- Visitor Centre; to complement the facility at Stepantsminda, to provide information to tourists,
- Booking hub; for guest house or home stays, trekking trips, cultural heritage walks, horse rides, mountain biking, skiing etc.

- Craft / Cultural Centre; where local artists, can sell their handicrafts and show cultural activities, such as carpet making
- Café / Restaurant / Rest-stop; Where tourist can enjoy local cuisine, have a coffee etc.
- Hub for conservation activities, from which NGOs or the Kazbegi National Park may provide information on the biodiversity of the area, what species can be seen and where and provide a potential base from which surveying or other activities could be carried out in Khada Valley area.

974. **Appendix Z** provides a conceptual illustration of how the visitor center could look.

975. During consultations held on 6th March 2019 in the Kaishaurni Public School participants were asked for their opinion on the proposed tourist hub. The attendees commented that people are happy to have a such centre and that many of them will work there instead going to Gudauri. They also commented that they will use it to sell their products and for other community activities and that it could be a combination of a community centre and a tourist hub.

Residual Impacts

Impact Significance before Mitigation	***Assessment of impacts after Mitigation***	***Residual Impact Significance after Mitigation***
Construction Phase		
Beneficial	*Indirect job generation and procurement opportunities related to Project construction will have a beneficial impact on employment in the Project Area. Opportunities for local and regional suppliers, businesses, and service providers will be created, thus contributing to the positive employment effect as well as indirect job generation and procurement opportunities associated with construction of the Project.*	***Beneficial***
Operational Phase		
Low	*The decline in workforce numbers with the commencement of project operations phase will have a marginal detrimental effect on local and regional communities with regards to worker numbers and direct local livelihoods opportunities. Efforts will be made to maximize Georgian work opportunities in the operations and maintenance positions, and establishment of the Project will enable improved transport links (access to market opportunities) thus the overall impact during operations is expected to be beneficial. Creation of the visitor centre in Zakatkari will also have beneficial impacts to the local economy.*	***Beneficial***

F.7.2 Social Infrastructure (including Utilities)

Potential Impacts

976. The following table summarizes the key potential impacts on social infrastructure and indicates potential impact significance of the impacts using the methodology outlined in Section F.2.

Table 121: Impact Screening – Social Infrastructure

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	Temporary disruption to utilities	Nearby communities	L	M	H	-	MOD	M/F	SMALL	MED	DEF	M
C	Traffic disruptions	Nearby communities / Transiting traffic	M	M	M	-	MOD	M/F	SMALL	MED	DEF	M

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely
Cells shaded in blue are positive impacts.

977. These key potential impacts and other minor impacts are described in more detail below.

Construction Phase

978. The delivery of construction materials, equipment, component parts and key personnel to the site will result in the vehicle movements on existing roads and access roads. The construction phase will include: site clearing works, relocation of existing services, construction activities (tunnel boring of the main and emergency gallery; spoil removal; construction of bridges, culverts, drainage structures, earthworks, asphalt removal). This will require the movement of a large number of pieces of equipment through the Project area, causing congestion through more populous routes in the Project area (e.g. along the existing road through Kvesheti and Arakveti, and along an access road linking Gudauri to Zakatkari).

979. Specifically, in Bedoni, the existing Khada Road passes through the middle of the village, in a narrow section inclusive of location of services (gas pipeline, water pipeline), not conducive to movement of construction vehicle traffic and equipment.

980. Maintenance of critical services to houses (notably, water, electricity, and gas), has been cited by communities during stakeholder consultation as a high concern. In particular, maintenance of access to gas, which is used for heating during the cold months, is reported to be critical especially to homes of the elderly and other vulnerable people. This was reported most frequently in the Khada Valley (i.e. in homes in the villages of the Begoni Plateau, including Tskere and Mughere), where there are isolated, elderly residents, and also in the Kobi area, where relocation of the gas line is a particular concern for local residents.

981. Pressure on social infrastructure due to the presence of the workforce could potentially include demands on health infrastructure. This is addressed under **Section F.8.2 – Workers Right and OHS**.

Operations Phase

982. Social infrastructure will be enhanced during project operations, i.e. in facilitating improved access to services via the new road. Currently residents of the Khada Valley travel to Kvesheti (or on to Tbilisi) to access medical and educational infrastructure via a poor road connection. The road will facilitate safer and faster access to Kvesheti.

983. Gas, water and power infrastructure will remain unchanged by Project operations.

Transport Infrastructure Management and Mitigation Measures

Planning

984. To manage the potential impact of construction traffic the Contractor will prepare and submit a **Traffic Management Plan** (TMP) to local traffic authorities prior to mobilization and include the plan as part of his SEMP. The TMP shall include plans of haul routes and access roads used for construction traffic which will be strictly adhered to with oversight from the Engineer.

985. The volume of construction traffic is considered to be intensive truck traffic and will need to be managed both in terms of surface damage. A **Road Condition Survey** of all roads included in the Contractors TMP will be conducted by the Engineer prior to construction in order to gauge any damage to the road as a result of the intensive heavy traffic during the construction phase. Before completion of the Project the Engineer shall repeat the survey to determine which, if any roads need to be repaired by the Contractor.

Pre-construction / Construction

986. The Contractor shall:
(i) Provide information to the public about the scope and schedule of construction activities and expected disruptions and access restrictions at least 24 hours before the disruptions;
(ii) Allow for adequate traffic flow around construction areas via diversions or temporary access roads;
(iii) If temporary access roads are to be constructed with a gravel surface, they shall be routinely watered by the Contractor during dry weather to reduce dust impacts;
(iv) Provide adequate traffic signs, appropriate lighting, well-designed traffic safety signs, barriers and flag persons for traffic control; and
(v) Access roads for batching plants, etc., should be maintained during the construction phase and rehabilitated at the end of construction.

Utilities Management and Mitigation Measures

Pre-construction / Construction

987. During construction all gas supply and electricity networks in the Project area shall be kept operational, particularly during the winter months. Some lines and pipes may require temporary relocation during the construction phase and as such the Contractor will be responsible for liaising with the relevant utilities operators to ensure they remain operational. Should utilities need relocating in a different location the Contractor will consult with the relevant utilities and local community to ensure that there is no change in supply as a result of these changes. Alternatives must be provided should unreasonable services delays occur (e.g. tanked water, gas bottles). This is particularly important for elderly or other vulnerable households.

988. In Bedoni, to avoid relocation of water and gas services pipelines, as well as nuisance impacts to homes, the mitigation measure is the construction of an alternative access road that circumvents the village center (see **Section F.7.9 – Access and Access Roads**). The access road will instead pass along the banks of the Khada River through two fields used by villagers (see also the LARP); impact to the fields is a relatively lower impact compared to vibration, dust, noise, and temporary cutting of services to all village residents.

Residual Impacts

Impact Significance before Mitigation	***Assessment of impacts after Mitigation***	***Residual Impact Significance after Mitigation***
Construction Phase		

Medium	*No residual impacts are anticipated if the TMP and the other mitigation measures for management of utilities outlined above are implemented correctly.*	***Minor***
Operational Phase		
Medium	*No specific residual impacts are anticipated in the operational phase.*	***Negligible***

F.7.3 Population and In-migration

Potential Impacts

989. The following table summarizes the key potential impacts on population and the effects of in-migration and indicates potential impact significance of the impacts using the methodology outlined in Section F.2.

Table 122: Impact Screening – Population and In-migration

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	Accentuation of cultural and wealth differences	Nearby communities	L	L	L	-	MIN	ST	SMALL	LOW	UNLIKE	L
C	Potential gender imbalance as single male workers	Nearby communities	L	L	L	-	MIN	ST	SMALL	LOW	UNLIKE	L
C/O	Rising pressure on civic infrastructure and utilities	Nearby communities	M	M	M	-	MOD	MT	INTER	MED	POSS	M
O	Population increase within the Project area	Nearby communities	M	M	M	-	MOD	LT	SMALL	MED	POSS	M

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely
Cells shaded in blue are positive impacts.

990. These key potential impacts and other minor impacts are described in more detail below.

Pre-construction / Construction Phase

991. The anticipated impacts include the following potential effects that may result from project construction:

- Population increase within the Project area, and specifically in Kvesheti as the biggest population and services center therein, resulting from the presence of the Project workforce and opportunistic economic in-migrants to the project area (i.e. non-workforce). This is considered a major potential benefit of the Project, as the area has been experiencing a decline in population over recent years;
- Rising pressure on civic infrastructure and utilities, as well as greater demand for civic services (such as supplies of energy, water, sanitation and waste collection, accommodation, public health care and schooling) as a result of the population growth, most

likely in Kvesheti as the largest population center with most services available in the Project area;

- Potential gender imbalance as single male workers, or those not accompanied by their families, are predominantly engaged in project construction works. This may create issues related to the observance of the law and public order, and potentially social ills associated with consumption of alcohol and other substances, and a possible demand for commercial sex services;
- Accentuation of cultural and wealth differences between the host community and foreign workers/non-local migrants, which has the potential to lead to conflict within the community/project area.

992. Potential induced employment is often estimated as 10% of total employment for industrial projects [148]. The project's construction workforce is estimated at approximately 600 people, but not all at the same time, thus induced employment (i.e. in-migrating population servicing the direct and contracted workforce) can be estimated as less than 60 people across the entire Project area. This is less than 10% of the current project area population and so is considered not likely to have a material effect on population.

993. The impact associated with an increased risk of communicable diseases as a result of the in-migration is discussed in **Section F.8.1 – Community and Livestock Safety and Security**. The workforce itself is to be accommodated in a camp, however siting and potential for interaction between the workforce and villagers is under the authority of the Contractor.

Operational Phase

994. It is expected that the potential for negative effects to be felt at the operations phase is unlikely due to demobilization of the construction workforce at the time of the transition into the operations phase. Rather, the anticipated impacts on population and in-migration during the operations phase is expected to be beneficial, because the improvements to the road will facilitate greater trade and other economic opportunities to the Project area. Thus in-migration, according to primary research undertaken during baseline, is considered desirable by the local community, and will be in response to a desire for long-term residence and integration in the area, or repatriation of former residents from other parts of Georgia or abroad to realize economic opportunities.

Mitigation Measures

995. Accommodation for the workforce has the potential to impact negatively on the surrounding villages, thus the EMP will include that an **Accommodation Option Risk assessment** is undertaken prior to finalizing an accommodation option and included as part of the Contractors SEMP. This will include aspects such as: siting of the accommodation camp in low proximity to villages/local community members; and determination whether workers can be accompanied by families or whether rosters will enable locally engaged workers to go home daily or not. Further, the Contractor shall prepare a **Code of Conduct** that outlines camp rules articulating acceptable behaviors of the workforce with local communities. Associated induction training will be provided to ensure rules are well understood and enforced.

996. During the operations phase, the workforce will be significantly lower (circa 30 persons in total), including those with a particular skillset for the operations of the tunnel and its ventilation system, as well as periodic maintenance workers. Maintenance workers are likely to be engaged through the existing RD structure of road maintenance, rather than a new team specific to this Project. Thus, given the low number of potential work opportunities, the potential for in-migration for the purposes of working on or specifically supporting the Project during its operational phase is very low.

[148] Understanding Project-Induced In-Migration (IFC); Socio-Economic Assessment Toolbox (Anglo American).

Residual Impacts

Impact Significance before Mitigation	*Assessment of impacts after Mitigation*	*Residual Impact Significance after Mitigation*
Construction Phase		
Low / Medium	*No significant residual impact are anticipated in the Contractor completes his accommodation options risk assessment and workers abide by the Code of Conduct.*	***Minor***
Operational Phase		
Low	*No specific residual impacts are anticipated in the operational phase.*	***Negligible***

F.7.4 Land Use and Natural Resources

Potential Impacts

997. The following table summarizes the key potential impacts on land use and natural resources and indicates potential impact significance of the impacts using the methodology outlined in Section F.2.

Table 123: Impact Screening – Land Use and Natural Resources

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C/O	Losses of land and property	Nearby communities	H	H	H	H	MAJ	LT	SMALL	HIGH	DEF	H

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely
Cells shaded in blue are positive impacts.

998. The Project road passes through a rural area. Most of alignment goes through tunnels. Construction of six bridges is also planned. However, a number of private properties and land parcels will be impacted many of which are used for agricultural purposes.

999. Draft Resettlement Action Plans for Lot 1 and Lot 2 have been prepared according to Georgian Laws, the ADB SPS (2009) and EBRD environmental and social policy safeguards (2014). Summaries of the LARPs are presented below.

Lot 1

1000. In total 17 households will be impacted as follows:

- 20 agricultural land plots,
- 3 residential land plots,
- 12 fruit trees,
- 3 residential buildings,
- 8 gates and fences,

- vegetables on 5 land plots (3,004 m²), and
- fodder on 18 plots (27,746 m²)

Table 124: Lot 1 Summary of Impacts According to the Draft LARP

Impact Category	No. of Affected Households (Ahs)	No. of Affected Persons (Aps)	Remarks
A. Land			
A1. Agricultural /residential land	3	11	3 land plots
A2 Agricultural land	14	56	20 land plots
Sub-total (A)	**17**	**67**	
B. Crops /Trees			
B1. Crops losses	17	67	All Ahs included in A1/A2
B2. Tree losses	2	12	All Ahs included in A1
Sub-total (B)	**19**		
C. Permanent Structure			
C1. Residential Structure	3	11	All Ahs included in A1
C2. Supporting structures (gates and fences)	8	23	All included under A1 and A2
Sub-Total (C)	**11**	**34**	
D. Vulnerable Ahs	**5**	**21**	All Ahs included in A1/A2
E. Severely affected Ahs			
E1. 1. Losing more than 10% of agricultural/ productive residential land	9	41	All Ahs included in A1/A2
E2. Relocated Ahs	**3**	**11**	All Ahs included in A1
Sub-Total (F)	**12**	**55**	
Grand Total	**17** (without double counting)	**67** (without double counting)	

Affected Household (AH)	All members of a household residing under one roof and operating as a single economic unit, who are adversely affected by the Project. It may consist of a single nuclear family or an extended family group.
Affected People (AP)	Individuals affected by Project-related impacts.
Severely Affected Household	Include those Ahs (i) losing 10% or more than 10% of their productive assets/income generating which is the total land holding of the AH compared to the affected land by the project, (ii) physically displaced HH and (iii) households losing commercial/business establishments.
Informal Settlers	Non-legalizable Ahs losing agricultural land plot, which is the only land plot owned by AH and provides main source of income for AH.
Vulnerable Households	Particularly disadvantaged Households who might suffer disproportionately or face the risk of being marginalized from the effects of land acquisition and resettlement. These are; (i) female-headed households with and/or without dependents; (ii) disabled household heads; (iii) poor households as defined by the official poverty line; (iv) elderly households with no means of support; (v) households without security of tenure; (vi) cultural or ethnic minorities; and (vii) refugees or internally displaced people.

1001. The census identified five Ahs belonging to vulnerable groups. These Ahs will receive a vulnerability allowance equal to three month of the national subsistence minimum for Ahs with five members. At the cut-off-date on 1 April, 2018, the subsistence minimum was GEL 352.5 per month. The vulnerable households will receive 1,057.5 GEL as a vulnerability allowance.

Table 125: Lot 1 Resettlement and Compensation Budget

Type	Unit affected	Unit cost	Total cost (Gel)
Land	31,289 m²	5.6-8.4 Gel/m²	199,516
Structures	3	Various	273,075
Trees	12	Various	2,906
Crop	24,052 m²	Various	6529.7
Gates	8	Various	6,637
Severe impact allowance	15 Ahs	Subsistence minimum for 3 months (352.5x3)	15,862
Relocation/Shifting allowance	3 Ahs	Subsistence minimum for 3 months (352.5x3)+ transportation cost (200 Gel)	3,772.50
Vulnerability allowance	5	Subsistence minimum for 3 months (352.5x3)	5,287.50
External and Internal monitoring		-	60,000
Subtotal			**573,586**
Unexpected costs		10%	57,358.57
Total			**630,944**

Lot 2

1002. In total, 141 households will be affected as follows:

- 241 agricultural land plots
- 21 residential land plots
- 3 commercial land plots
- vegetables on 30,750 m^2 of land
- 2,057 fruit trees
- 8 residential buildings
- 2 commercial buildings
- 17 auxiliary buildings
- 91 gates and fence
- 1 business (4 Aps)
- fodder on 133 plots (199,860m²)
- 127 Ahs (492 Aps) are severely affected
- 25 Ahs (119 Aps) are vulnerable
- 8 Ahs (34 Aps) will be relocate.

Table 126: Lot 2 Summary of Impacts According to the Draft LARP

Impact Category	No. of Ahs	No. of Aps	Remarks
A. Land			
A1. Agricultural	129	497	
A2 Agricultural/residential land	11	50	5 Ahs included in A1
A3. Non-Agricultural	1	2	

Impact Category	No. of Ahs	No. of Aps	Remarks
Sub-total (A)	**141**	**549**	
B. Crops /Trees			
B1. Crops losses	85	309	All Ahs included in A
B2. Tree losses	88	358	All Ahs included in A
Sub-total (B)	**173**	**667**	
C. Permanent Structure			
C1. Residential Structure	6	22	All Ahs included in A
C2. Commercial Structure	2	8	All Ahs included in A
C3. Auxiliary Structure (henhouse, toilet, storage, etc.)	17	40	All Ahs included in A
C4. Supporting structures (gates and fences)	52	293	All Ahs included in A
Sub-Total (C)	**77**	**363**	
D. Businesses	**1**	**4**	Included under C2
E. Severely affected Ahs			
Losing more than 10% of landholding	90	370	All Ahs included in A
Losing more than 10% of affected land plot	33	102	All Ahs included in A
Losing residential building or business	4	20	All Ahs included in A
Sub-Total (D)	**127**	**492**	
F. Vulnerable Ahs	**25**	**119**	All Ahs included in A
Grand Total	**141** (without double counting)	**549** (without double counting)	

1003. The census identified 25 Ahs (119 Aps) belonging to vulnerable groups. These Ahs will receive a vulnerability allowance which is equal to three months of the national subsistence minimum for Ahs with five members. At the Cut-off date on 22 June 2018, the subsistence minimum was GEL 347.4 per month. The vulnerable households will receive 1,034.4.5 GEL as a vulnerability allowance.

1004. The draft LARP estimates the total cost of resettlement and compensation to be around 9m Gel. Table 127 below provides a breakdown of the costs.

Table 127: Lot 2 Resettlement and Compensation Budget

Type	Unit affected	Unit cost (Gel)	Total cost (Gel)	Total cost (USD)
Land	311,132	-	5,210,510	2,126,739
Structures	114	-	1,586,168	647,416
Trees	2057	-	432,522	176,540
Crop	204705		29,952	12,225
Severe impact allowance	126	-	133,084	54,320
Relocation/Shifting allowance	8	Subsistence minimum for 3 months (1,034.4 Gel)+ Transportation cost (200 Gel)	9,875	4,031
Vulnerability allowance	25	Subsistence minimum for 3 months (1,034.4 Gel)	25,860	10,555
External and Internal monitoring	-	-	120,000	48,980
Subtotal			**7,547,971**	**3,080,805**

Type	Unit affected	Unit cost (Gel)	Total cost (Gel)	Total cost (USD)
Unexpected costs		20%	1,509,594	616,161
Total			**9,057,565**	**3,696,965**
Official exchange rate for June 22, 2018 – 1 USD=2.45 GEL				
https://www.nbg.gov.ge/index.php?m=582&lng=geo				

1005. The affected households will be relocated and the all compensation (for any affected asset) is a monetary one. The owner receives the replacement cost of the affected home and other assets and make his home where s/he wants.

1006. The time bound implementation schedule of the LARP has been prepared in consultation with the RD. All activities related to the land acquisition/resettlement have been planned to ensure that compensation is paid prior to displacement and commencement of civil works construction. Payment of compensation and allowances will commence after a number of preparatory tasks are completed. These tasks are:

1. Signing of contracts with Aps.
2. Disclosure and consultation.
3. Grievance resolution.
4. Requisition to ETCIC for payment of compensation and allowances.
5. Transfer of compensation and allowance to Aps' bank account and registration of land in PR on RD name.
6. Relocation of affected structures/ assets.
7. Compliance review and reporting.
8. Notice to proceed for Civil works construction.
9. Monitoring.

1007. The RD is the Executing Agency (EA) and has the lead responsibility for road construction, as well as the implementation of the LARP. In addition to the RD, a number of other government departments and private agents will play an instrumental role in the design, construction and operation of the project. Pursuant to the active legislation, the MoEPA is responsible for environmental issues. The Ministry of Justice is responsible for legal matters regarding land ownership, and National Agency of Public Registry (NAPR) within the Ministry of Justice is in charge of the registration of land ownership and its transfer through purchase agreement from landowners to the RD. The local government at Sakrebulo [149]and village level will also be involved.

1008. Livestock, Agriculture and other Temporary Impacts – In addition to impact on agricultural plots/homestead considered and covered by the LARP, the Project could also result in other impacts to agricultural land during the construction phase, these include:

- Dust related impact on crops.
- Temporary Land Take – Apart from the areas identified in the draft LARP, land for access roads, construction camps and temporary storage areas will also be required.
- Land For spoil disposal sites.

[149] This is the representative body of local self-government. The middle level of local government consists of 67 municipalities and six cities in Georgia: Tbilisi, Kutaisi, Rustavi, Poti, Batumi and Sukhumi. The representative branch of municipality level is the municipality level Local Councils (Municipality Sakrebulo) and the executive branch is represented by Municipality Gamgeoba (Gamgebeli). The self-government level consists of settlements (self-governed cities) or groups of settlements (municipalities). Settlements could be villages, small towns (minimum 3,000 inhabitants) and cities (minimum 5,000 inhabitants). The representative and executive branches of self- government are represented accordingly by Local Council (Sakrebulo) and the Gamgebeli of municipal level. The exclusive responsibilities of self-government include land-use and territorial planning, zoning, construction permits and supervision, housing, and communal infrastructure development.

- Accidents involving livestock – Construction Phase.
- Accidents involving livestock – Operational Phase. In most portions of the road herding of livestock along the road will not be possible as access to these areas will be extremely difficult thereby limiting the potential for accidents involving livestock. In addition, most livestock can be herded either above tunnels, or below bridges in the Khada valley. Two underpasses are also proposed along the route in Kvesheti, one in Arakveti and one on the Zakatkari Plateau which can also be used by livestock. Accordingly, no specific mitigation measures are require required for this phase of the Project
- Blocked access to the areas used by local residents for hazelnut and fruit gathering in Zakatkari.

Management & Mitigation Actions

1009. Land Use (permanent and temporary) - The key mitigation for land use is implementation of the LARP which has been prepared for both Lot 1 and Lot 2 and summarized above. Regarding temporary land take:

- For construction camps and other plant sites – Any temporary impact caused by the use of land for camp or as a temporary disposal area, will be regulated by private agreements between the Contractor and the land owners.
- For temporary Impact on land plot - Temporary land impacts will be compensated based on the productive value of the plot during the period of impact and after their use will be re-established by the EA at the pre- impact productive conditions.

1010. For any other unforeseen impacts during construction, including temporary impacts the impact will be identified and assessed and due compensation paid based on the provisions agreed for this Project and in agreement with requirements of SPS 2009 and EBRD PR 5.

1011. Land for Spoil Disposal Sites – Any permanent impact on land caused by the use of land for permanent disposal of unsuitable material or debris remaining after demolition of existing parts of the road, will be adequately compensated as per the provisions set up in the LARP. In addition, adequate livelihood assistance for loss of hay and grazing grounds, if any, will be assessed and provided during implementation.

1012. Dust - Mitigation suggested involves correct siting of dust producing areas, such as batching plants, away from agricultural land and dampening of stockpiles and access roads during construction. Implementation of the mitigations measures in this EIA relating to facilities such as batching plants, will further reduce the possibility of significant impacts arising.

1013. Accidents Involving Livestock in the Construction Phase – Prior to the start of construction, and as part of his Traffic Management Plan, the Contractor shall consult with local residents to establish key livestock crossing points on the proposed access roads. Flagmen shall be employed at the demarcated crossing points during the day to ensure the safe passage of cattle in these areas.

1014. Access to Fruit and Nuts – Mitigation measures for access to these areas are discussed in **Section F.7.9 – Access and Access Roads**.

Residual Impacts

Impact Significance before Mitigation	***Assessment of impacts after Mitigation / Management Measures Implemented***	***Residual Impact Significance after Mitigation***
Construction Phase		
High	*No significant residual impacts are anticipated if the LARP is implemented correctly. However, there will still be disruption to the local community during the LARP implementation process. A GRM has been prepared to manage complaints received during this process. Other*	***Minor / Moderate***

	temporary impacts during the construction phase will be managed by the LARP as noted above.	
Operational Phase		
High	*No residual impacts are anticipated if the LARP is implemented correctly. Impacts involving livestock are considered unlikely due to the inclusion of specific animal passages and the general layout of the road.*	***None***

F.7.5 Spoil Disposal

Potential Impacts

1015. The following table summarizes the key potential impacts of spoil disposal and indicates potential significance of the impacts using the methodology outlined in Section F.2.

Table 128: Impact Screening – Spoil Disposal

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	Degradation of habitat	Habitat / Terrestrial wildlife	L	H	H	-	MOD	LT	SMALL	MED	DEF	M
C	Natural resources: groundwater availability	Private company	L	H	H	M	MOD	LT	SMALL	MED	DEF	M
C	PCR	Nearby communities	L	H	H	-	MOD	LT	SMALL	MED	DEF	M
C	Disruption of social activities	Rock climbers	L	M	M	-	MOD	ST	SMALL	MED	POSS	M

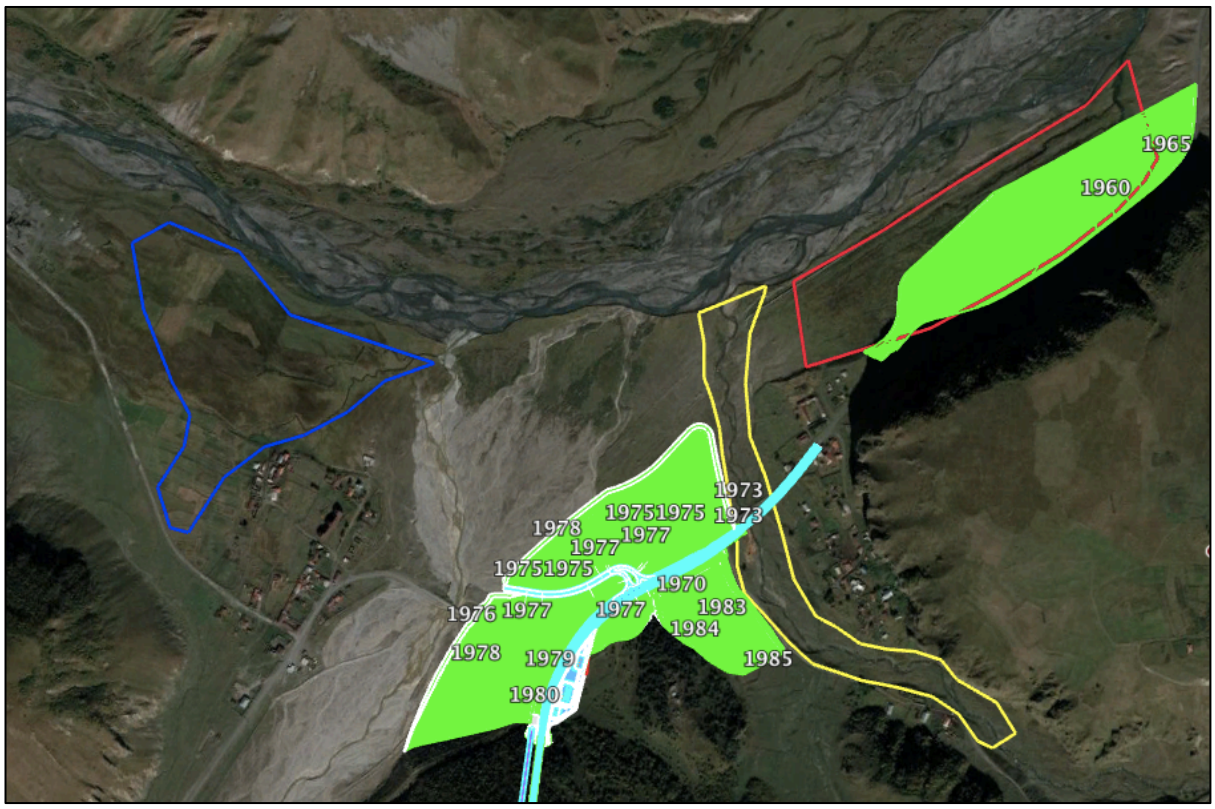
Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely
Cells shaded in blue are positive impacts.

1016. The Detailed Design team has proposed several potential spoil locations sites which have been outlined in **Section B.5.7 – Disposal of Spoil Material,** and **Appendix O**. The following identifies the key issues by Lot.

Lot 1

1017. Biodiversity – A wetland habitat near the natural springs has been identified as important for migrating birds as well as just the habitat itself. Some species (e.g. Wall Creeper) can be found nesting on the crags above the wetland. There are also some wet meadow sites, which whilst not directly affected by the spoil disposal, have potential for Corncrake. Use of the spoil site during construction could disturb some of the species in this area. The Narvana river is also a confirmed site for otters. The river runs parallel to SDL-22.3 and SDR-22.3 and works in the spoil areas could disturb the otters in this area. A small area of Sub-alpine birch Krummholz is also located close to the northern Portal of Tunnel 5.

Figure 140: Lot 1 Spoil Site Biodiversity Constraints

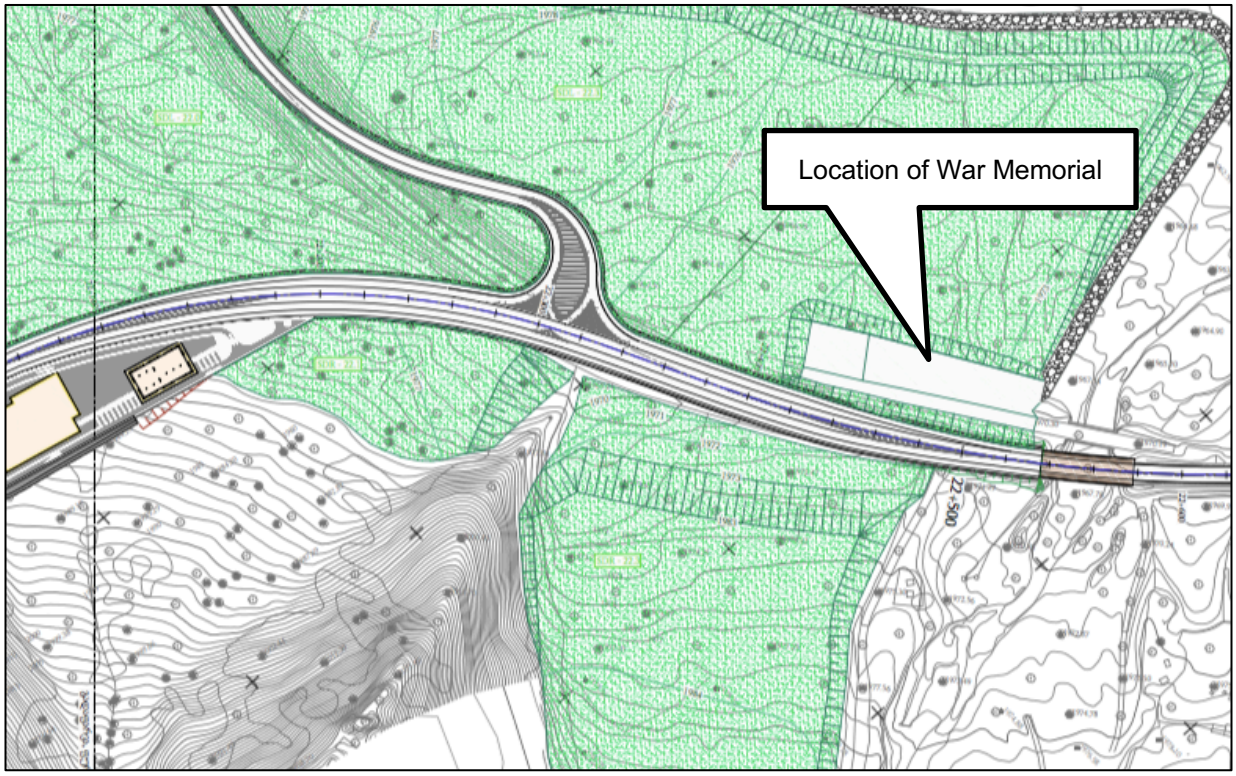


Key:
Green Area: Spoil Sites
Turquoise Line: Project Road
Yellow Area: Otter Habitat
Blue Area: Wet Meadow / Potential Corncrake Habitat
Red Area: Wetland

1018. Natural Resource Constraints – In addition to the biodiversity constraints the Kobi area is also important for its natural resources. Aqua Geo extract mineral water from several boreholes which also overlap with SDL-22.7 (Figure 142). A large portion of the Tergi river is also a licensed borrow area (sand and gravel), however the spoil disposal sites do not overlap with this area. The spoil site would completely cover the boreholes in this area and have a significant impact on Aqua Geo's activities in this area.

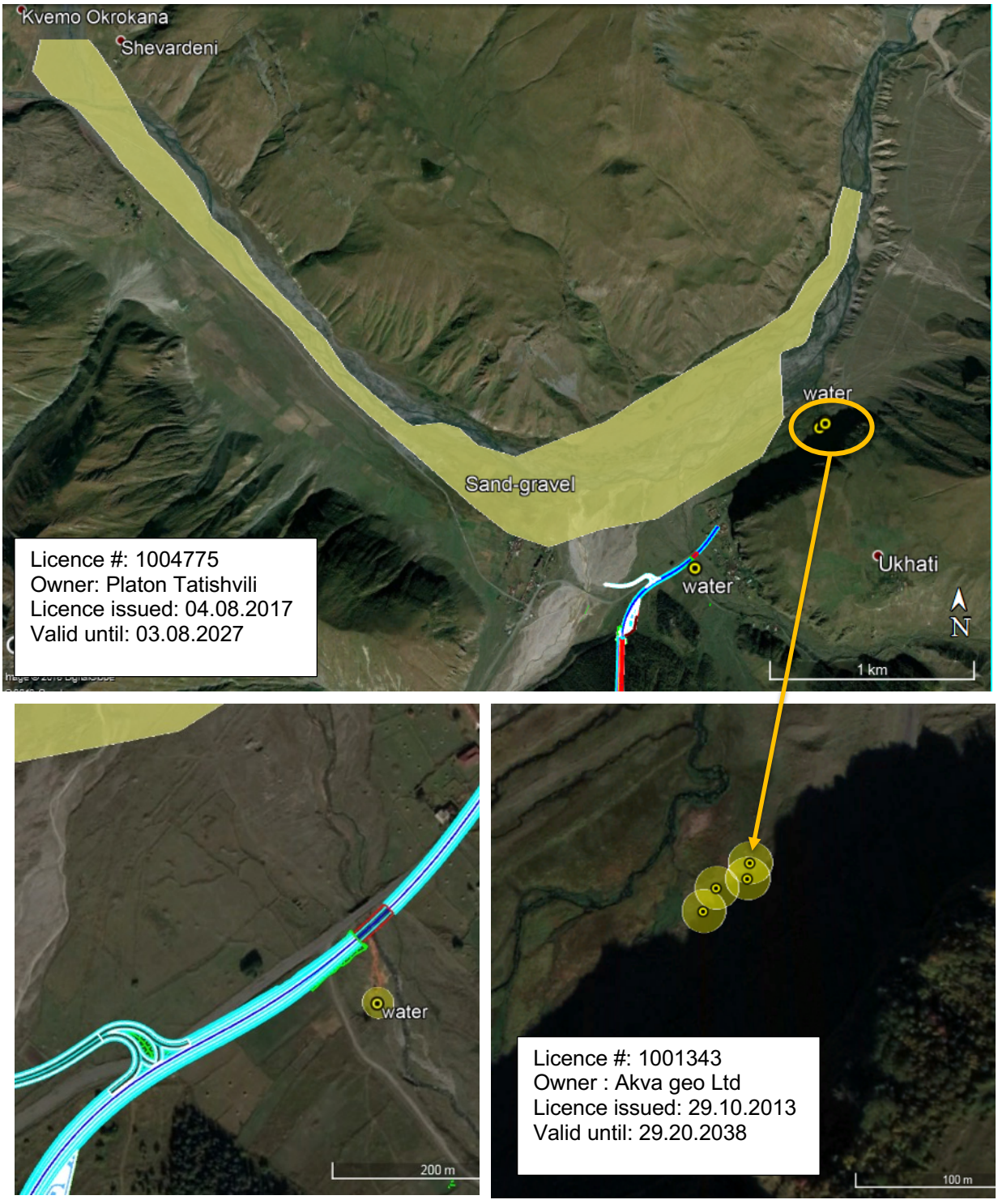
1019. PCR Constraints – As per Figure 129 an important PCR site is located in the area of SDR-22.3 (#24). Consultations have indicated that the use of this area as a spoil disposal site should be strictly prohibited given the cultural importance of this cross. In addition, a war monument (#26) is located close to SDL-22.3, however the design drawings show that the spoil site will be adjacent, but not on this area.

Figure 141: Location of War Memorial



1020. Other Constraints – Consultations also indicate that the crags above SDL-22.7 are bolted routes used by the local rock-climbing club. Using the spoil site in this location could reduce access to this area.

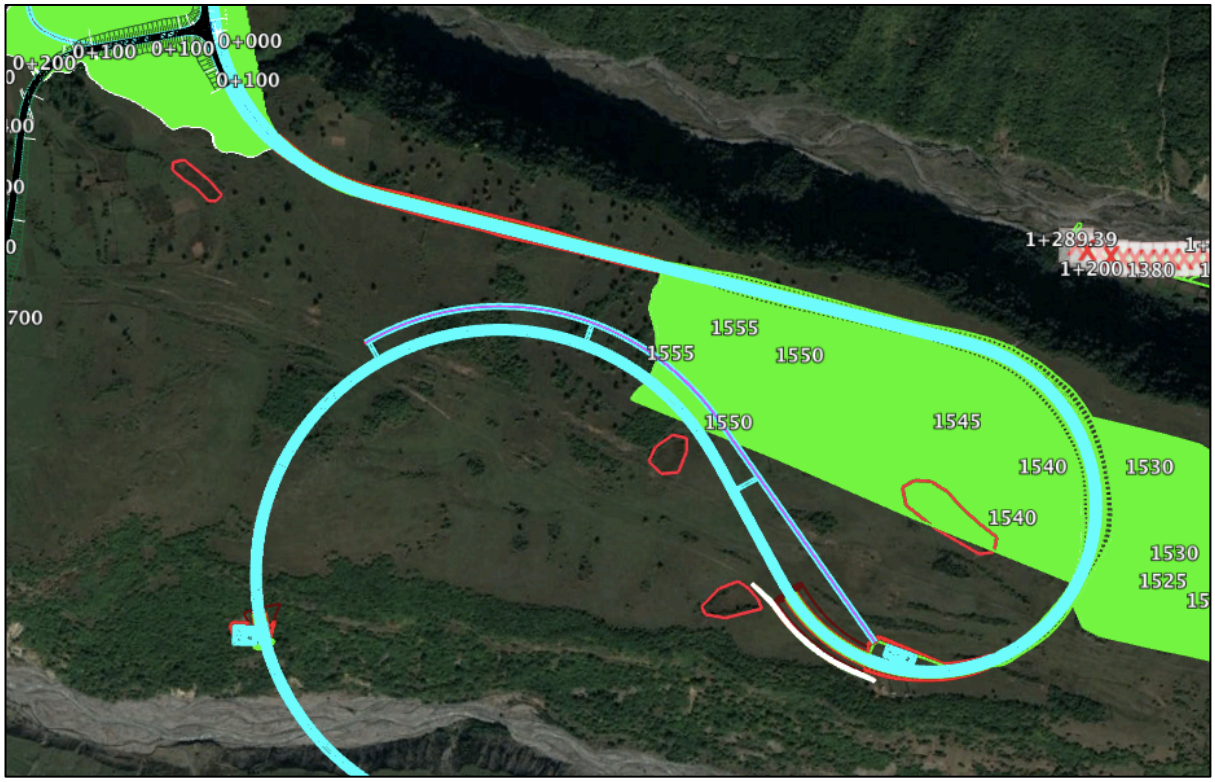
Figure 142: Licensed Deposits in the Project Area



Lot 2

1021. There also several environmental constraints regarding the spoil disposal sites for Lot 2. Four ephemeral wetlands (low grass marshes) can be found on the Plateau in the area of LFR-5.8 and LFL-5.8. These areas are shown in the figure below (Figure 143). The Project avoids most of the wetlands, however the largest would be covered by LFL-5.8 which would result in complete destruction of this wetland area.

Figure 143: Ephemeral Wetlands



Key:
Blue Line: Project Road
Green Area: Spoil Disposal Sites (LFL-5.8 and LFR-5.8)
Red Areas: Ephemeral Wetlands

1022. In addition to the wetlands consultations with Birdlife have indicated that Corncrake may be present on the Plateau (where exactly has not been confirmed) and Egyptian Vultures have been known to nest close to the portals of Tunnel 1, however, the portal areas are not close to the spoil disposal sites.

Mitigation and Management Measures

1023. It is noted that the Detailed Design consultants have outlined a number of potential areas for the disposal of spoil material. Further analysis of these areas has indicated that some sites, or portions of some sites, may not be suitable for use as spoil disposal locations. The following table indicates these sites and the proposed mitigation and management options for these sites.

Table 129: Mitigation / Management Measures for Selected Spoil Disposal Sites

#	Ref.	Issue	Mitigation
1	SDL-22.7	Wetland area important for migrating species / Location of water boreholes / area used for rock climbing.	This site is not recommended for use as a spoil disposal site due to the identified sensitivities. However, the Contractor may propose portions of the spoil area for use if he can demonstrate through his Spoil Disposal Plan and national EIA, that significant impacts to the identified sensitive areas will be avoided or suitably mitigated.
2	SDR-22.3	Site of an important religious cross / Adjacent to otter habitat	This site is not recommended for use as a spoil disposal site due to the identified sensitivities. However, the Contractor may propose portions of the spoil area for use if he can demonstrate through his

			Spoil Disposal Plan and national EIA, that significant impacts to the identified sensitive areas will be avoided or suitably mitigated., e.g. through moving the religious cross to another site with the approval of local stakeholders or by fencing the site and providing suitable and safe access in the construction and operational phases of the Project.
3	SDL-22.3	Adjacent to otter habitat and war memorial.	A 50-meter buffer zone should be placed around the river. This may encroach into the spoil disposal site. The buffer zone shall also be fenced and signposted to prevent machines and workers entering this site. The site will also be inspected weekly by the ECoW to ensure no impacts to this buffer zone. The War Memorial shall be fenced during site works to prevent encroachment into this area by workers and machinery.
4	LFR-5.8	Potential Corncrake habitat	Pre-work surveys shall be undertaken to understand the potential for impacts to Corncrake. If required a specific BAP shall be prepared by the ECoW and implemented by the Contractor.
5	LFL-5.8	Ephemeral wetland / Potential Corncrake habitat	All ephemeral wetlands on the Plateau shall be demarcated and fenced. The spoil disposal site shall not encroach on the wetlands. Weekly inspections of the site shall be undertaken by the ECoW. Pre-work surveys shall be undertaken to understand the potential for impacts to Corncrake. If required a specific BAP shall be prepared by the ECoW and implemented by the Contractor.

1024. It is also stressed that **no spoil site shall be selected** for consideration that is:

- Located within any national park (as per the updated park boundaries of January 2019).
- Located within a low grass marsh habitat.
- Located within a Sub-alpine Birch Krummholz habitat.

1025. The spoil sites mentioned in this assessment are **potential sites** and the table above has recommended that some of these sites not be used, or at least portions of them, namely **SDL-22.7 and SDR-22.3**. It is possible that parts of the proposed sites could be utilized if the Contractor provides suitable mitigation measures as part of any approved **Spoil Disposal Plan** and national environmental assessment requirements (note a full EIA is not required for individual spoil sites under the Conditions of Approval given by MoEPA for the national EIA).

1026. As some portions of these sites are eliminated from further consideration alternative spoil disposal locations will most likely be required on the Kobi side of Tunnel 5. The Contractor will be responsible for identifying the alternative spoil disposal sites if required. However, as noted below, reuse of this material for tourist infrastructure in Kobi is a very real option that should be explored initially by the RD and if workable, implemented by the Contractor.

1027. The final decision regarding the location of spoil disposal sites ultimately rests with the Contractor. If he selects any of the spoil disposal locations listed in Table 129 then the mitigation

measures outlined should be strictly applied including the requirements for the preparation of a **Spoil Disposal Plan** (prepared with input from his Environmental and Social Officer and Ecological Clerk of Works) which will be submitted to ADB, EBRD, RD and the Engineer for review and approval as part of his SEMP before any proposed site can be used. In addition, the Contractor will be required to prepare a simple brief environmental assessment for any spoil disposal site to meet national requirements (approved by MoEPA).

1028. The spoil disposal plan shall follow the format specified in **Appendix F**. The procedure for completing the plan is as follows:

1. Submit the plan to ADB, EBRD and RD for review and approval.
2. Upon approval of the site from ADB, EBRD and RD, in line with the Georgian EIA regulation, the spoil storage areas shall be agreed with the local municipality and MoEPA.
3. As soon as agreements are provided MoEPA will request an EIA for the Project.
4. The Contractor will prepare and submit an EIA to MoEPA for review and approval. The EIA will need to be compliant with the national regulations and will include all necessary studies and surveys to meet this requirement, e.g. biodiversity surveys, archaeological survey, etc.
5. In addition to the EIA, the Contractor shall prepare a Spoil Disposal Plan for Arrangement of Spoil Disposal Area and a Re-cultivation Plan. This plan shall be prepared in accordance with regulation N 424 on Approval the Rules for Removal, Storage and Use of Topsoil and Re-cultivation. The plan shall be based upon the findings and information contained in the Spoil Disposal Site Assessment.
6. The plan will indicate:
    a. The location of disposal area (layout, coordinates etc.).
    b. Agreement with the land owner.
    c. Category of the land.
    d. Distance from the surface water source.
    e. Prepare a route Risk Assessment (Providing information on route of spoil transportation and means of transport (including routes avoiding, where possible, sensitive receptors)).
    f. Schedule of the timing of material transport (excluding night-time transport on local roads (but not the existing E-60) between 10pm and 6am).
    g. Any necessary improvements to local roads to cater for the increased level and types of trucks using the roads.
    h. The measures for stripping and storing of topsoil.
    i. The scheme of dumping.
    j. The maximum height of disposed soil and anti-erosion measures.
    k. Describe re-cultivation of disposal area.
    l. Provide coordinates of the spoil area.
    m. Provide profile drawings of the spoil area.
    n. Provide time stamped photographs of the pre-disposal site conditions.
7. The Plan will also be provided to the RD and the Engineer as part of his SEMP. No spoil storage will be allowed until the RD and the Engineer have approved the plan and all licenses and approvals have been received from MoEPA.

1029. Regarding construction of the spoil sites, they shall be graded to fit in with the surrounding landscape (as proposed by the drawings in **Appendix O** of this EIA). The design documents also propose specifications for side slopes of the spoil disposal areas and they shall be strictly followed to prevent collapse and soil erosion. All spoil sites will be reinstated as per the Contractors **Re-cultivation/Land Restoration Plan**.

1030. In addition to the above, consultations with residents in Kobi and Kazbegi Municipality on 4th February 2019 expressed an interest in using some of the excess spoil material for car parking/cafes/market stalls as part of the Kobi development plan. At present, cars don't stop in the area because they don't see any opportunities to visit the villages. This aspect should be considered further by the RD as part of ongoing stakeholder engagement with the local residents.

Residual Impacts

Impact Significance before Mitigation	*Assessment of impacts after Mitigation / Management Measures Implemented*	*Residual Impact Significance after Mitigation*
Construction Phase		
Medium	*If the proposed mitigation measures are implemented, including for example the buffer zones for Otter protection, impacts should be manageable. In addition, preparation of additional assessment documents, such as the Spoil Disposal Plan further limits the potential for significant impacts occurring.*	***Minor***
Operational Phase		
Medium	*Restoration of any spoil disposal area will take a number of years and as such the residual impacts for the spoil disposal areas are considered low/medium.*	***Low / Medium***

F.7.6 Waste Management

Potential Impacts

1031. The following table summarizes the key potential impacts relating to waste management and indicates the potential significance of any impacts using the methodology outlined in Section F.2.

Table 130: Impact Screening – Waste Management

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	Domestic waste	Nearby communities / Wildlife	L	M	M	-	MOD	H/F	SMALL	MED	DEF	M
C	Construction Waste	Nearby communities / Wildlife	M	M	M	-	MOD	H/F	SMALL	MED	DEF	M
C	Hazardous Waste	Nearby communities / Wildlife	L	H	M	-	MOD	M/F	SMALL	MED	DEF	M
O	All waste types generated during maintenance	Nearby communities / Wildlife	M	H	M	-	MOD	H/F	SMALL	MED	DEF	M

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely
Cells shaded in blue are positive impacts.

1032. These key potential impacts and other minor impacts are described in more detail below.

Pre-construction / Construction Phase

1033. Waste generated during pre-construction and construction will include liquid and solid, inert and hazardous waste streams.

1034. The type and estimated quantity/volume, based on experience from similar projects is expected to be as follows:

Table 131. Description of Waste Material, Category and Approximate Volume of Waste

Code	Waste material	Description	Approximate quantity	Characteristics of hazardous waste
08 01 11*	Waste paints that may contain organic solvents or other hazardous substances	Liquid	1650 -2000kg	H3B – ignitable; H5 – harmful
13 02 08*	Oils and oily lubricants	liquid	120-150 kg	H3B – ignitable; H5 – harmful
15 02 02*	Absorbents, overalls and rugs, contaminated with hazardous matter	solid	50-70 kg	H3-B – ignitable H5 - harmful
16 01 03	Waste tyres	solid	3000 -3500 kg	-
16 01 07*	Oil filters	solid	20-25kg	H5 – harmful; H15
16 01 11*	Brakes that contain asbestos[150]	solid	50-70 kg	H7 – carcinogens
16 06 01*	Lead containing batteries	solid	360-450 kg	H6 – toxic H15
17 04 07	Metals (mix)	solid	500-1000 kg	-
20 03 01	Mixed municipal waste	solid	225 kg	-

1035. The inert waste will include green waste accumulated while clearance of the site, clean and inert demolition waste (bricks, wood), etc. The hazardous waste expected during pre-construction and construction works may contain asbestos (mainly asbestos roofing tiles and/or asbestos containing pipes).

1036. Portions of the existing pavement in Kvesheti and Kobi will also need to be excavated and removed (approximately 3,500 m^2).

1037. The amount of food staff/household waste and wastewater during pre-construction and construction will depend on the number of the staff. Assuming that the quantity of domestic waste generated per capita per year totals 0.7m3, the approximate total amount of the above-mentioned refuse produced during construction will equate 200x0.7=140 m3/year. [151]

1038. Poorly managed solid and/or liquid waste may affect water environment and soil leading to impact on vegetation and wildlife and creating nuisance to local residents. To prevent the impact on environment the waste must be collected and temporarily placed in the pre-selected, agreed area with consideration of requirements applicable to each waste type. All waste must be source-separated in order to ensure proper management and enable reuse. Until removal from the site, domestic waste (food waste, plastic bottles, packaging) must be collected in containers with fitted lid to avoid attraction of scavengers, emanation of odor and scattering by wind. The lids also protect waste from rain and snow.

[150] As far as feasible, asbestos containing brakes should be prohibited for project vehicles

[151] There are two, Dusheti and Kazbegi, landfills in the project area. The landfills are managed by Solid Waste Management Company of Georgia. Dusheti landfill has been operating since 1940. The landfills have been renovated in 2015. The landfill has been equipped with leachate management system. The area was fenced. Checkpoint booth, fire extinguisher stands – were provided. The area has been electrified. Waste is disposed to cells. The waste is regularly covered by soil layer. The landfill in Stepantsminda is managed by Solid Waste Management Company of Georgia sine 2013. The area has been fenced, internal roads, drainage and leachate collection system provided. Waste has been covered by insulating layer. Machinery/toolss required for operation of the landfill have been provided. Vehicle stationing area – arranged. Berm was arranged to protect the landfill fro flooding and protection of the Tergi river from pollution with waste.

1039. The inert waste must be placed so as not to interfere with free movement of machinery and staff, away from surface water (within at least 100m).

1040. Since there are no landfills for hazardous waste available in Georgia, this category waste must be handed over to authorized contractor for utilization. For hazardous waste agreement with company authorized for treatment (deactivation, incineration) or re-use in other technological processes will be signed.

1041. The area allocated for temporary storage of hazardous waste shall have special preventive measures implemented, in particular, containers shall have secondary containment and no mixing of hazardous waste with any other waste shall be allowed. Hazardous waste containers shall be checked for tightness. The staff involved in hazardous waste management shall be trained in waste management and safety issues. The waste shall be removed every 3 days. Treatment, utilization, disposal of waste shall be carried out by an authorized contractor.

1042. Soil polluted with petroleum hydrocarbons because of accidental small-scale fuel/oil spills (leakages) can be remediated onsite (e.g. in situ bioremediation). Larger spills (less likely to be the case from experience with other similar projects) must be localized, contaminated soil removed by authorized contractor for remediation. New, clean soil must be introduced, followed by re-cultivation. It is recommended to involve an authorized company for this service.

1043. To reduce amount of waste, material stock will be managed so to avoid accumulation of surplus on the site.

Operational Phase

1044. During operation of the highway the amount of waste that is currently dumped by the side of the existing road will significantly reduce (especially on the Kobi and Kvesheti sides where trucks queue during the winter). However, roadside litter may still accumulate along the new road and in the rest areas. This type of litter generally comprises food waste, plastic and paper wrappers, plastic water bottles, etc., This roadside litter is extremely unsightly and can become caught up in rivers, trees and bushes making the waste difficult to remove. Uncollected roadside waste may attract vermin, entrap or poison animals in their habitats. Litter is also a road hazard that may occasionally contribute to accidents.

Mitigation Measures

Planning

1045. The following plans will be prepared by the Contractor as part of his SEMP:

1046. **Waste Management Plan.** The plan (which will include all of the requirements of the Waste Management Code (2015), see **Section D.3 Environmental and Social Legislation of Georgia**) shall:

- Describe waste streams and amounts.
- Describe recycling/reuse methods for each material.
- Identify the waste destinations and transport modes, including what materials are being segregated on site for reuse or recycling.
- Specify responsibilities for managing and disposal of waste.
- Describe special measures for material use and handling.
- Describe communication and training to support and encourage participation from everyone on site.

1047. **Spill Response Plan**

1048. **Temporary Road Method Statement.**

1049. **Temporary Storage Area Method Statement.**

1050. **Temporary River Crossing Method Statement.**

1051. These method statements will include sections relating to the management of waste. All method statements must be prepared and approved before any works can start in the planned areas.

Pre-construction / Construction Phase

General

1052. To ensure waste management is adequately controlled during both the construction and operational phase of the Project, the Contractor shall be responsible for ensuring that the waste hierarchy is followed including prevention, minimization, reuse and recycling.

1053. The impact of waste generation on environment during construction can be mitigated by proper storage, maximum reuse and recycling of waste and timely removal of unusable waste to agreed location.

1054. Train staff in waste management issues.

Recycling

1055. Recycling options to be implemented include:

- Crush and reuse waste concrete as fill material.
- Where practical asphalt material should be crushed and re-used for local roads, or as base material if it meets the required technical specifications.
- All other waste (plastic, metal, paper, etc.) will be sorted on source and sent for recycling.

Liquid Waste

1056. Provide septic tanks for the camp sites servicing less than 150 employees. Contract authorized company to remove the liquid waste regularly. For larger sites, provide multiple septic tank facilities, or package waste water treatment plants.

Domestic and Inert Waste

1057. Collect domestic waste in containers fitted with lids to avoid attraction of scavengers, scattering around. The lid will also protect waste from rain and snow.

1058. Remove domestic waste to the nearest landfill under agreement with Solid Waste Management Company of Georgia.

1059. Provide garbage bins and facilities within the project site for temporary storage of domestic solid waste and construction waste.

1060. Waste storage containers shall be covered, tip-proof, weatherproof and scavenger proof.

1061. Ensure that wastes are not haphazardly dumped within the project site and adjacent areas.

Hazardous Waste

1062. On the site allocated for temporary, short term keeping of hazardous wastes ensure compliance with the following safety measures:

- Use containers suitable for each type of waste;
- Prohibit use of damaged containers. Check integrity of containers – regularly;
- Mark containers adequately;
- Provide secondary containment;

- Do not mix various waste streams.

1063. Hire authorized contractor for hazardous waste removal and Keep agreements with hazardous waste management company's active.

1064. Keep copies of waste manifests on site. Keep a record of waste on-site and waste removed.

1065. In case of large-scale spills of hazardous liquids, follow the **Spill Response Plan**.

Asbestos

1066. Survey buildings for presence of asbestos or asbestos containing material before demolition of properties subject to acquisition. If registered, the Contractor shall prepare a **Method Statement for the Safe Management of Asbestos** following international best practices such as HSE-A14. The method statement shall be submitted to the Engineer for approval before any works involving asbestos materials can commence. General requirements include:

- Do not break asbestos/asbestos containing articles when dry.
- Equip staff handling asbestos with protection clothing, goggles, respirators, rubber boots.
- Place material in thick, durable plastic bags (put not more than 40km of asbestos/asbestos containing material per each). Wrap the bags and mark with asbestos warning mark.
- Hire Contractor for removal-disposal of asbestos/asbestos containing material to a licensed waste management facility.

Operational Phase

1067. Management of waste during operation will be responsibility of a contractor identified by the RD. The contractor shall:

- Install waste collection bins in technical buildings area.
- Use garbage bins fitted with lids to avoid scattering around and attraction of scavengers.
- Segregate hazardous, non-hazardous and reusable waste streams.
- Manage and dispose hazardous waste according to the type and the class of hazard. Note: for hazardous waste removal licensed company must be contracted.
- Until removal (temporarily) waste must be stored within secure facilities with weatherproof flooring and roofing.
- Dispose garbage according to agreement with Kazbegi and Dusheti waste management utilities.
- Provide regular clean-up of the area.

Residual Impacts

Impact Significance before Mitigation	***Assessment of impacts after Mitigation / Management Measures Implemented***	***Residual Impact Significance after Mitigation***
Construction Phase		
Medium	*In general, if the mitigation measures suggested are implemented residual impacts will be minor.*	***Minor***
Operational Phase		
Medium	*Implementing the operational measures outlined above will eliminate significant waste impacts.*	***Low***

F.7.7 Tunnels

Potential Impacts

1068. The following table summarizes the key potential impacts resulting from tunneling works and indicates the potential significance of the impacts using the methodology outlined in Section F.2.

Table 132: Impact Screening – Tunnels

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	Health and safety	Contractors staff	L	H	L	M	MOD	M/F	SMALL	MED	POSS	M
C/O	Ground water supply and quality degraded by new tunnels.	Nearby communities	L	H	M	M	MOD	MT	SMALL	MED	POSS	M

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely
Cells shaded in blue are positive impacts.

1069. These key potential impacts and other minor impacts are described in more detail below.

Pre-construction / Construction Phase

1070. The main typical environmental problems linked to the construction of underground works are listed below:

(i) Triggering of surface settlements, structures collapses and slope instabilities.
(ii) Drying up of springs and groundwater alterations.
(iii) Storage and use of excavated materials (Addressed in **Section F.7.6 – Waste Management** above).
(iv) Noise & Vibration (Addressed in **Section F.8.6 – Vibration** and **F.8.5 Noise** below).
(v) Pollution of groundwater, mainly after the realization of stabilization works by injections.

1071. Surface Settlements – The opening of underground works can lead to a deformation of the soils and rocks around the excavation area in some instances. Such deformations may trigger sudden collapses, subsidence and sinking that can damage both the work under construction and pre-existing nearby structures. However, there are no properties located above any of the proposed tunnels and as such any surface settlement will not affect the local properties.

1072. Dewatering – A key aspect of dewatering systems for tunnel and shaft construction is that they will generate water from pumped wells or from sumps and drains within the tunnel. Some of this water, particularly from sumps, will be 'dirty water' and will require some form of treatment (most commonly to remove suspended solids) before it can be disposed of. Some of the water may be 'clean water' (particularly from dewatering wells or tunnel drains) that may require little or no treatment.

1073. Drying up of Groundwater – Site visits were undertaken in the Project area by the LCF to determine what the status of ground water use was in the local community. The results of the

site visits indicated that few groundwater wells are located in the Project area and that most water is supplied to homes and businesses through a piped system which transfers groundwater from several kilometers away further up in the mountains. Accordingly, it appears that tunnel construction is unlikely to have any significant impacts on the local community in terms of groundwater depletion.

1074. Aqua geo Ltd have several boreholes located in the proposed spoil disposal area SDL-22.7. It has been recommended below that this spoil disposal site is not used for this and other reasons, including impacts to biodiversity. However, the tunnelling works for Tunnel 5 may impact upon the quantity and quality of the water in these boreholes.

Management & Mitigation Actions

Planning

1075. The following plans will be prepared by the Contractor as part of his SEMP:

1076. **Groundwater Management Plan** – Although site visits have indicated that there are few wells in the Project area and that most of the community receive water from a piped network it is still considered prudent to monitor the status of groundwater drawdown during the construction phase. The Contractor will be responsible for the development of a ground water management plan for each tunnel which shall be submitted for approval by the Engineer at least four weeks prior to the start of tunneling works. The plan shall include a map of all ground water wells within the Project area that maybe affected by each tunnel.

1077. The Plan shall include routine monitoring of the groundwater levels in wells against baseline water levels (measured by the Contractor before the start of tunnel works) in the Project area which will be undertaken on a weekly basis by the Contractor within the vicinity of each tunnel he is excavating. If drawdown levels in wells are significant the Contractor will provide a temporary source of potable water to the affected persons until the construction works are finished. The Contractor shall continue to monitor the water levels in the affected wells for a period of 12 months after construction is completed at the tunnel sites. If the wells begin to recharge to their pre-construction levels no further actions will be necessary. However, if the water fails to re-charge to pre-construction levels alternative water supply will be provided to the affected parties, this may include for example, increasing the depth of their wells, or piped water from another location, which, as noted above, appears to be a fairly effective option.

1078. The plan shall also include a section relating to the monitoring of the quantity and quality of the water at the Aqua Geo boreholes close to Kobi. This activity should be coordinated between the RD, Contractor and Aqua Geo. Aqua Geo already undertake routine monitoring of the water in these boreholes, so there is sufficient baseline water quality available. If any impacts to water quality and quantity are observed by Aqua Geo during the construction phase (and for a 12-month period after completion of Lot 1 works) the RD will be responsible for negotiating an appropriate compensation package with Aqua Geo for any damages caused to their business.

1079. **Occupational Health and Safety (OHS) Plan for Tunnels** – Specific plans shall be prepared for Tunnel 5 and for Lot 2 tunnels (all included under one plan). The plan shall include sections on air quality and ventilation, plant related risks, visibility, lighting, noise, electrical safety, confined spaces, emergency response, etc.

Construction Phase

1080. Dewatering – The Contractor will pass all drainage water from the tunnel through a settlement tank. Weekly monitoring of the water quality from the tank will be undertaken by the

Contractor to assess for any pollution. If the drainage water meets drinking water standards it can be considered for re-use in any potentially depleted wells during the construction phase.

1081. In addition, the Contract shall:

- Use non-toxic slurry and additives and minimize impact of these materials to reduce risk of impact on ground water quality.
  Ensure that pressure applied to tunneling and ground treatment is controlled to prevent excessive pressure that will drive the slurry out of the desired range increasing the risk of water pollution.

Residual Impacts

Impact Significance before Mitigation	***Assessment of impacts after Mitigation / Management Measures Implemented***	***Residual Impact Significance after Mitigation***
Construction Phase		
Medium	*In general impacts will be minor during the construction phase. However, due to the potential impacts on the Aqua Geo boreholes the residual impacts are upgraded to minor / moderate.*	***Minor / Moderate***
Operational Phase		
Medium	*It is possible that the construction of tunnels could depleted groundwater and affect groundwater users, including Aqua Geo. If this is the case affected villagers will be supplied with an alternative source of potable water and methods to compensate any businesses affected will be applied.*	***Low / Medium***

F.7.8 Construction Camps, Asphalt Plants, Batching Plants & Temporary Facilities

Potential Impacts[152]

1082. Construction camps constitute a temporary land use change and raise issues related to activities such as impacts to air quality; poor sanitation arrangement and improper methods used for disposal of solid wastes and effluent; and transmission of communicable diseases to the local people by the construction workers due to inappropriate health monitoring facilities. Specific issues may arise as a result of the following:

1083. Design and Siting – Improper siting and design of construction camps can have negative impacts to hydrology through inappropriate disposal of liquid waste and spills of hazardous liquids. Poor management of sanitary waste and accidental spills of hazardous liquids from construction camps can also have negative impacts on ground and surface water. Rock crushing plants and concrete batching plants can also have impacts on sensitive receptors located downwind of the sites if the plants are too close to the residential areas.

1084. Concrete Batching Plants – Potential pollutants in batching plant wastewater include cement, sand, aggregates and petroleum products. The main sources of wastewater at batching plants are; contaminated storm water runoff, dust control sprinklers, the agitator washout station, the agitator charging station, the slumping station, and cleaning and washing areas. These substances can adversely affect the environment by:

[152] Note that specific impact screening has not been undertaken for camps, plant and temporary facilities as they are broadly covered under topic specific headings such as air quality, noise, water quality, waste management, etc.

(i) Increasing water pH.
(ii) Increasing the turbidity of waterways (turbidity is a measure of the cloudiness of a suspension).

1085. Asphalt Plants – Several impacts are associated with asphalt plants:

(i) Emissions – including dust from the transport and handling of aggregates and emissions from the combustion process in the dryer.
(ii) Noise – Noise occurs at different places in the process for examples in the conveyor belts, dryer and mixer drum, internal and external traffic. The noise is estimated to be in the range of 90 to 100 dBA (Leq) at a few meters from the equipment.
(iii) Storage of Bitumen – Drums of bitumen will be stored safely and securely to prevent accidents and pollution.
(iv) Storage and Use of Hazardous Materials – Some materials used during asphalt production, such as Kraton, can be explosive or a fire hazard. These materials need to be stored and managed appropriately.
(v) Health and Safety – Asphalt Plants can be very dangerous, accidents may occur at any time. Hence it is important to have a proper policy for the Health and Safety Issues.
(vi) Vehicle Movement – a large number of trucks will be required to transport the hot asphalt from the plant to the work site, this may be a distance of up to 25 kilometers.

1086. Temporary Storage Sites – These areas will be used to store materials and equipment on a temporary basis as an alternative to storing materials at the camp. Materials may also need to be stored close to work sites to allow quick and easy access to these materials, e.g. stockpiles of aggregates, pre-cast culverts, etc. None of the materials stored in these areas will be hazardous materials.

Management & Mitigation Actions

Planning

1087. The following plans will be prepared by the Contractor as part of his SEMP:

1088. **Construction Camp Management Plan** - The plan shall cover such aspects as community relations, restriction of access to camp and facilities, induction briefing on camp rules and local issues/sensitivities, camp rules (such as restrictions on alcohol, drugs use; discipline; noisy activities; community liaison; no poaching; environmental protection measures applicable to the camp site; decommissioning and re-cultivation, etc.); workers welfare. The plan shall also describe power supply methods.

1089. **Construction Camp Layout Plan** – This is to include: layout of the site, including location of temporary storage areas for waste, equipment maintenance areas, lubricant and fuel storage sites with indication of the distance from watercourses; description of sewage management and waste management activities. The plan shall also provide a specific section describing the energy supply sources on site, e.g. mobile generators, connection to the grid, transformer requirements, etc. The EIA includes criteria/recommendations for site selection, requirements and procedures for approval of the site by RD, MoEPA. Camp site as well as any sites considered associated facilities require ADB and EBRD consideration, due diligence and approval. Note: Consultations with local communities before the construction camp is developed are required.

1090. **Asphalt Plant Management Plan** – Describing the layout and management of asphalt plant, including management of bitumen.

1091. **Concrete Batching Plant Management Plan** – Describing the layout and management of concrete batching plant, including waste water discharge, dust management, etc.

1092. Other plans, prepared as part of the SEMP which will help reduce impacts from construction camps include:

- **Labor and Working Conditions Management Plan.**
- **Traffic Management Plan.**
- **Spill Management Plan.**
- **Air Quality Management Plan.**
- **OCHS Plan.**
- **Emergency Response Plan.**
- **Waste Management Plan**.
- **Waste Water Management Plan**.

1093. During the construction phase of the Project, the Contractor will also be responsible for preparing method statements for:

- **Temporary Road Method Statement.**
- **Temporary Storage Area Method Statement.**

1094. The method statements shall be prepared by the Contractor and reviewed by the ECoW and then submitted to the Engineer and RD for approval before any such site can be used. Many of these sites will be located close to rivers, and as such the Contractor will ensure that the method statements include specific measures to ensure no pollution of the rivers, including banning of the storage of hazardous liquids in these areas. The method statement shall also clearing illustrate the conditions of the site prior to its clearing and use, so that it can be fully re-instated to its former conditions. The method statement shall also indicate what type of vegetation has been cleared at the site, and where this has occurred, the Contractor shall be responsible for replanting of any trees cut in these areas on a 1:3 basis.

Construction Phase

1095. **Construction Camps** – The location of construction camps and facilities is not known at this stage of the Project and will be a decision for the Contractor to make based on a range of issues, such as availability of land, cost, access, etc., as well as environmental and social issues. However, a range of good practices measures can be applied to these sites to ensure that they have minimal impacts on the environment and the local communities.

1096. Prior to commencement of works, the Contractor and his Ecological Clerk of Works, must identify the location of the camp and undertake environmental and social screening of the site to ensure that no significant environmental or social issues will arise as a result of the use of the site. The screening will also include the findings of consultations with landowners, neighbors and shepherds and any other people using the area around the proposed camps. The results of the screening will be provided to the Engineer and RD for their review and approval. If the Engineer and RD are satisfied with the results of the screening exercise the Contractor shall then agree on/receive a permit for its use from the state or the land owner. No construction camp will be located within one kilometer of a residential area and at least 50 m from any surface water course.

1097. The Contractor will be responsible for the preparation of a Construction Camp Site Plan which will form part of the SEMP. The plan will comply with IFC/EBRD Guidance Note: Workers' accommodation: processes and standards. The Plan will indicate the system proposed and the locations of related facilities in the site, including latrines, holding areas, etc. The Contractor will ensure the following conditions are met within the Plan:

(i) Rain-water run-off arising on the site will be collected, removed from the site via a suitable and properly designed temporary drainage system and disposed of at a location and in a manner that will cause neither pollution nor nuisance. The drainage system will be fitted with oil and grease interceptors.
(ii) There will be no direct discharge of sanitary or wash water to surface water.

(iii) In the absence of functioning sewerage and sewage treatment facilities it is recommended that the Contractor provides his own on-site septic tanks. There will be no direct discharge of untreated sanitary or oily wastewater to surface water bodies.
(iv) Licensed contractors will be required to collect and disposal of liquid waste from the septic tanks on regular basis.
(v) Disposal of materials such as, but not limited to, lubricating oil and onto the ground or water bodies will be prohibited.
(vi) Liquid material storage containment areas will not drain directly to surface water.
(vii) Waste water from vehicle washing bays will be free of pollutants if the wash bay has been constructed correctly.
(viii) Lubricating and fuel oil spills will be cleaned up immediately and spill cleanup materials will be maintained at the storage area.
(ix) Construction and work sites will be equipped with sanitary latrines that do not pollute surface waters and are connected to septic tanks, or waste water treatment facilities.
(x) Discharge of sediment-laden construction water directly into surface watercourses will be forbidden. Sediment laden construction water will be discharged into settling lagoons or tanks prior to final discharge.
(xi) Washing out concrete trucks at construction sites will be prohibited unless specific concrete washout areas are provided for this purpose at the construction site (e.g. a bridge site). The washouts will be impermeable and emptied when 75% full.
(xii) Spill cleanup equipment will be maintained on site (including at the site maintenance yard and vehicle fueling areas). The following conditions to avoid adverse impacts due to improper fuel and chemical storage:
    (a) Fueling operations will occur only within containment areas.
    (b) All fuel and chemical storage (if any) will be sited on an impervious base within a bund and secured by fencing. The covered storage area will be located away from any watercourse or wetlands. The base and bund walls will be impermeable and of sufficient capacity to contain 110% of the volume of tanks.
    (c) Filling and refueling will be strictly controlled and subject to formal procedures and will take place within areas surrounded by bunds to contain spills / leaks of potentially contaminating liquids.
    (d) All valves and trigger guns will be resistant to unauthorized interference and vandalism and be turned off and securely locked when not in use.
    (e) The contents of any tank or drum will be clearly marked. Measures will be taken to ensure that no contaminated discharges enter any drain or watercourses.
    (f) Disposal of lubricating oil and other potentially hazardous liquids onto the ground or water bodies will be prohibited.
    (g) Should any accidental spills occur immediate cleanup will be undertaken, and all cleanup materials stored in a secure area for disposal to a site authorized to dispose of hazardous waste.

1098. If determined warranted by the Engineer, the Contractor will provide a wash pit or a wheel washing and/or vehicle cleaning facility at the exits from the sites. If so requested, the Contractor will ensure that all vehicles are properly cleaned (bodies and tires are free of sand and mud) prior to leaving the site areas. The Contractor will provide necessary cleaning facilities on site and ensure that no water or debris from such cleaning operations is deposited off-site. The Engineer will undertake regular monitoring of the construction camps to ensure compliance with the SEMP and the Construction Camp Site Plan.

1099. The Contractor will also ensure that potable water for construction camps and workers meets the necessary water quality standards of the GoG. If groundwater is to be used it will be tested weekly to ensure that the water quality meets the GoG drinking water standards specified in Table 31.

1100. The Contractor will be responsible to maintain and cleanup campsites and respect the rights of local landowners. If located outside the ROW, written agreements with local

landowners for temporary use of the property will be required and sites must be restored to a level acceptable to the owner within a predetermined time period. Construction camps will need to be generally reinstated, however the potential for long term community development facilities will be explored at these locations.

1101. **Concrete Batching Plants** – The Contractor will be responsible for the preparation of site-specific concrete batching plant management plans which will be prepared as part of his SEMP.

1102. The following measures will be followed to limit the potential for pollution from batching plants:

(i) To limit impacts from dust, the following conditions will apply:
   (a) Batching plants will be located downwind of residential areas and not within one kilometer of any residential area.
   (b) The entire batching area traversed by vehicles – including driveways leading into and out of the area – will be paved with a hard, impervious material.
   (c) Sand and aggregates will be delivered in a dampened state, using covered trucks. If the materials have dried out during transit they will be re-wetted before being dumped into the storage bunker.
   (d) Sand and aggregates will be stored in a hopper or bunker which shields the materials from winds. The bunker should enclose the stockpile on three sides. The walls should extend one meter above the height of the maximum quantity of raw material kept on site and extend two meters beyond the front of the stockpile.
   (e) The hopper or bunker will be fitted with water sprays, which keep the stored material damp at all times. Monitor the water content of the stockpile to ensure it is maintained in a damp condition.
   (f) Overhead storage bins will be totally enclosed. The swivel chute area and transfer point from the conveyor will also be enclosed.
   (g) Rubber curtain seals may be needed to protect the opening of the overhead bin from winds.
   (h) Conveyor belts which are exposed to the wind and used for raw material transfer will be effectively enclosed, to ensure dust is not blown off the conveyor during transit. Conveyor transfer points and hopper discharge areas will be fully enclosed.
   (i) Conveyor belts will be fitted with belt cleaners on the return side of the belt.
   (j) Weigh hoppers at front-end loader plants will be roofed and have weigh hoppers shrouded on three sides, to protect the contents from the wind. The raw materials transferred by the front-end loader should be damp, as they are taken from a dampened stockpile.
   (k) Store cement in sealed, dust-tight storage silos. All hatches, inspection points and duct work will be dust-tight.
   (l) Silos will be equipped with a high-level sensor alarm and an automatic delivery shut-down switch to prevent overfilling.
   (m) Cement dust emissions from the silo during filling operations must be minimized. The minimum acceptable performance is obtained using a fabric filter dust collector.
   (n) Totally enclose the cement weigh hopper, to ensure that dust cannot escape to the atmosphere.
   (o) An inspection of all dust control components will be performed routinely – for example, at least weekly.
(ii) All contaminated storm water and process wastewater will be collected and retained on site.
(iii) All sources of wastewater will be paved and bunded. The specific areas that will be paved and bunded include; the agitator washout area, the truck washing area, the concrete batching area, and any other area that may generate storm water contaminated with cement dust or residues.
(iv) Contaminated storm water and process wastewater will be captured and recycled by a system with the following specifications:

(a) The system's storage capacity must be sufficient to store the runoff from the bunded areas generated by 20 mm of rain.
(b) Water captured by the bunds will be diverted to a collection pit and then pumped to a storage tank for recycling.
(c) An outlet (overflow drain) in the bund, one meter upstream of the collection pit, will divert excess rainwater from the bunded area when the pit fills due to heavy rain (more than 20 mm of rain over 24 hours).
(d) Collection pits should contain a sloping sludge interceptor, to separate water and sediments. The sloping surface enables easy removal of sludge and sediments.
(e) Wastewater will be pumped from the collection pit to a recycling tank. The pit will have a primary pump triggered by a float switch and a backup pump which automatically activates if the primary fails.
(f) Wastewater stored in the recycling tank needs to be reused at the earliest possible opportunity. This will restore the system's storage capacity, ready to deal with wastewater generated by the next rainfall event. Uses for recycling tank water include concrete batching, spraying over stockpiles for dust control and washing out agitators.

1103. **Asphalt Plants** – The Contractor will be responsible for the preparation of site-specific concrete batching plant management plans which will be prepared as part of his SEMP.

1104. The following measures will be applied by the Contractor regarding asphalt plants:

(i) Emissions & Noise:
  (a) Asphalt plants will be located downwind of residential areas and not within one kilometer of any residential area or protected area.
  (b) Adequate Personal Protective Equipment (PPE) will be provided to staff working in areas of high noise and emissions.
(ii) Storage and Use of Hazardous Materials (including bitumen):
  (a) Ensure all hazardous materials are stored (including within suitable sized bunds for liquids), handled and disposed of according to their Material Safety Data Sheet (MSDS).
  (b) Copies of MSDS will be kept on site with all hazardous materials.
  (c) The Contractor will keep a log of the type and volume of all hazardous wastes on site.
  (d) The Contractor will keep a plan of site indicating where all hazardous materials are stored.
(iii) Vehicle Movement:
  (a) The Contractor will include the asphalt plant in his Traffic Management Plan, including haul routes from the plant.
(iv) Health and Safety:
  (a) To prevent bitumen burns it will be compulsory for the workers handling hot bitumen to wear full-body protection.
  (b) All transportation, handling and storage of bitumen will be handled safely by experienced personnel.
  (c) The dust from the manufacturing process may pose respiratory hazards, hence protective air mask will be provided to the operators for the loading and unloading of aggregates.
  (d) Ear-muffs will be provided those working on the plant.
  (e) First Aid kits (compliant with OSHA standard 1910.266 App. A) will be available on site for the workers in case of emergency.
  (f) The MSDS for each chemical product will be made accessible onsite and displayed.

Temporary facilities, such as storage areas, roads and river crossings will be required throughout the pre-construction and construction phase.

Residual Impacts

Impact Significance before Mitigation	*Assessment of impacts after Mitigation / Management Measures Implemented*	*Residual Impact Significance after Mitigation*
Construction Phase		
Medium*	*If the mitigation measures suggested are implemented residual impacts will be minor*	***Minor***
Operational Phase		
Medium*	*If the mitigation measures suggested are implemented residual impacts will be low as long as reinstatement plans are followed correctly.*	***Low***

*Based broadly on screening for air quality, noise, waste management, etc.

F.7.9 Access and Access Roads

Potential Impacts

1105. The following table summarizes the key potential impacts to access and from access roads and indicates the potential significance of the impacts using the methodology outlined in **Section F.2**.

Table 133: Impact Screening – Access and Access Roads

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	Road diversions	Nearby communities / Road users	M	M	M	-	MOD	ST	SMALL	LOW	DEF	L
C	Construction traffic access	Nearby communities / Road users	M	M	H	-	MAJ	ST	SMALL	MED	DEF	M
C	Public access	Nearby communities	L	M	H	-	MOD	ST	SMALL	LOW	DEF	L
O	Public access	Nearby communities / Road users	L	M	H	-	MOD	LT	SMALL	MED	DEF	M

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely
Cells shaded in blue are positive impacts.

1106. Potential impacts and other minor impacts are described in more detail below.

Construction Phase

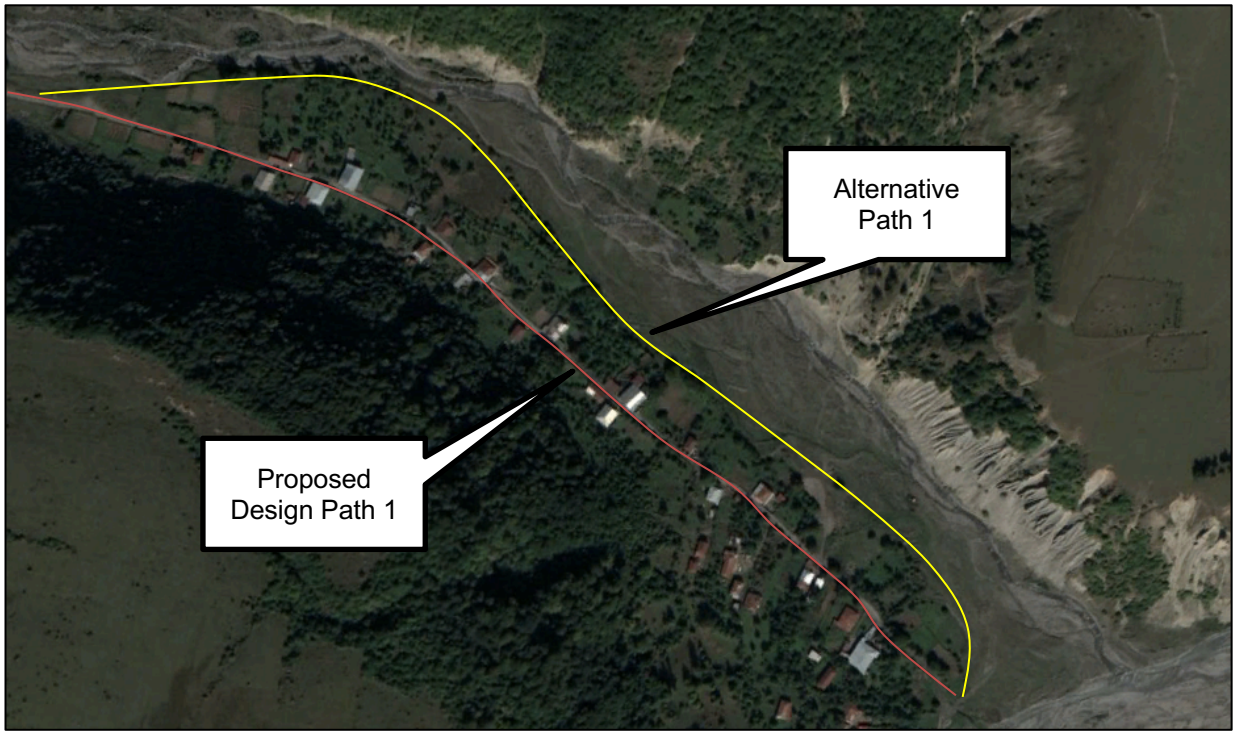
1107. Two of the main impacts resulting from Project works will be short term road diversions and some temporary blocking of access to properties during the construction phase.

1108. In some locations closure of access roads will be needed and may occur for periods between one and two hours and as such is not a significant issue as long as the local population are given notice of the delays and suitable detours are provided. Longer-term road closures maybe required while the new road is constructed across existing roads. This issue is discussed above under section **B.5.4 – Access to Site / Temporary Roads**.

1109. Blocking of access to properties will be temporary while structures, such as side drains and culverts, are constructed, however alternative access to properties will be provided at all times by the Contractor.

1110. Consultations undertaken as part of this EIA have identified Path 1 route as having potentially negative impacts on local residents, in terms of noise and vibration and as such construction vehicles should not be allowed to use the existing road through the village, rather a new access road should be constructed to the north of the village to reduce noise and vibration impacts. This will require careful design by the Contractor to ensure that the road does not interfere with the flow of the river and also that during peak flow the temporary road is not washed away. Also, consideration will need to be paid to any tree cutting and impacts to the river ecology. As noted above method statements will need to be prepared for any temporary road and this will include a review by the Contractors ECoW.

Figure 144: Proposed Alternative Location of Access Road (Path 1)



1111. As noted in **Section B.5.4 – Access to Site / Temporary Roads**, it is unlikely that Path 2 from Kvesheti to the Plateau will be used due to its steep gradient. However, in the unlikely event that the Contractor decides to use this track, a method statement will need to be prepared outlining the environmental and social aspects and management measures for the use of this route.

Operational Phase

1112. **Kvesheti and Arakveti** – Once operational, the junctions planned in the design will allow simple access to both Kvesheti and Arakveti. During the consultation phase comments were raised about access between these two villages, both for vehicles and pedestrians. Currently residents use the existing road and once operational this will no longer be practical for pedestrians. The following figures (Figure 145, Figure 146 and Figure 147) illustrate the routes that vehicles and pedestrians will have to use during the operational phase.

Figure 145: Pedestrian Access between Kvesheti and Arakveti

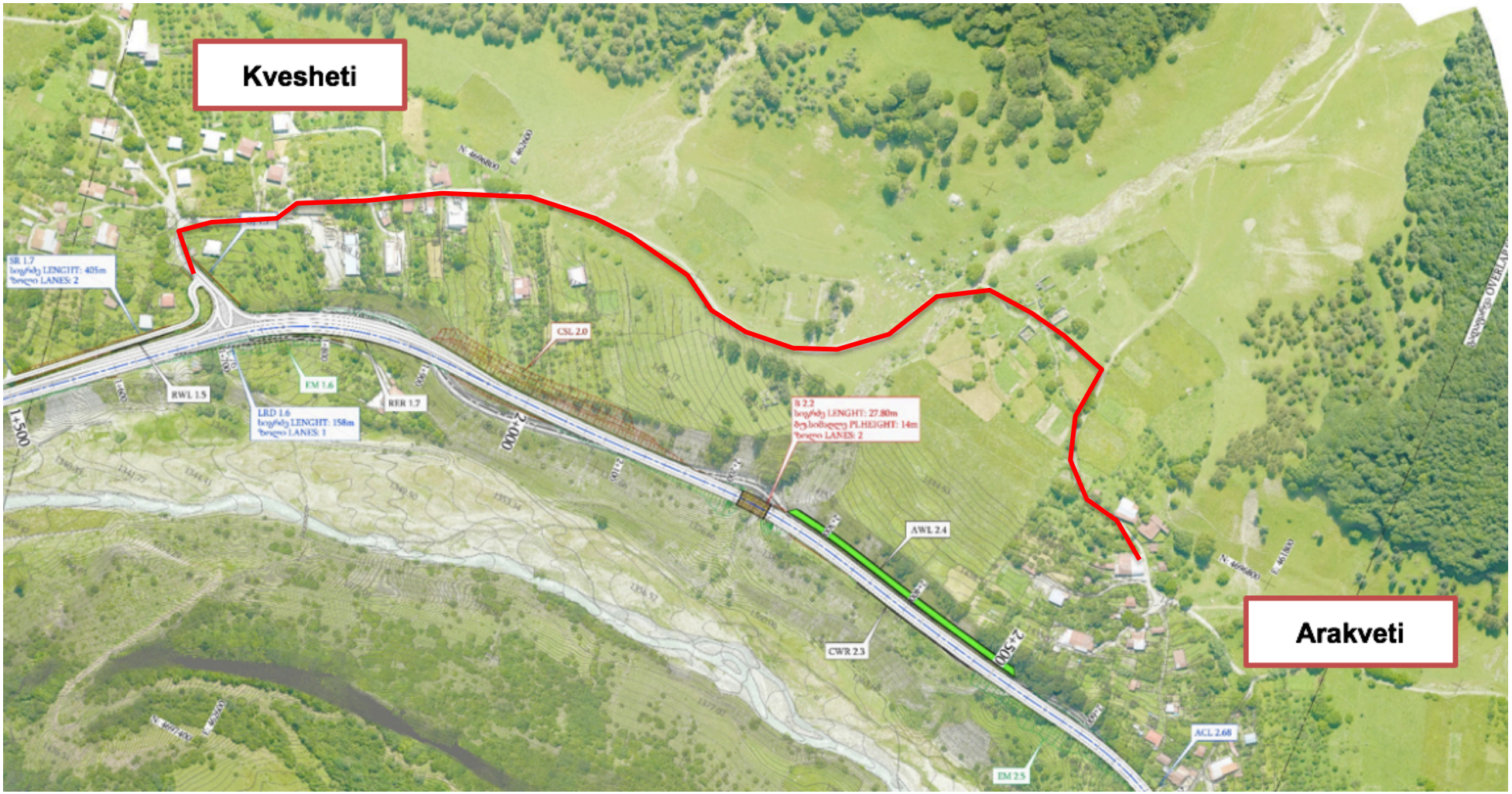


Figure 146: Vehicle Access between Kvesheti and Arakveti

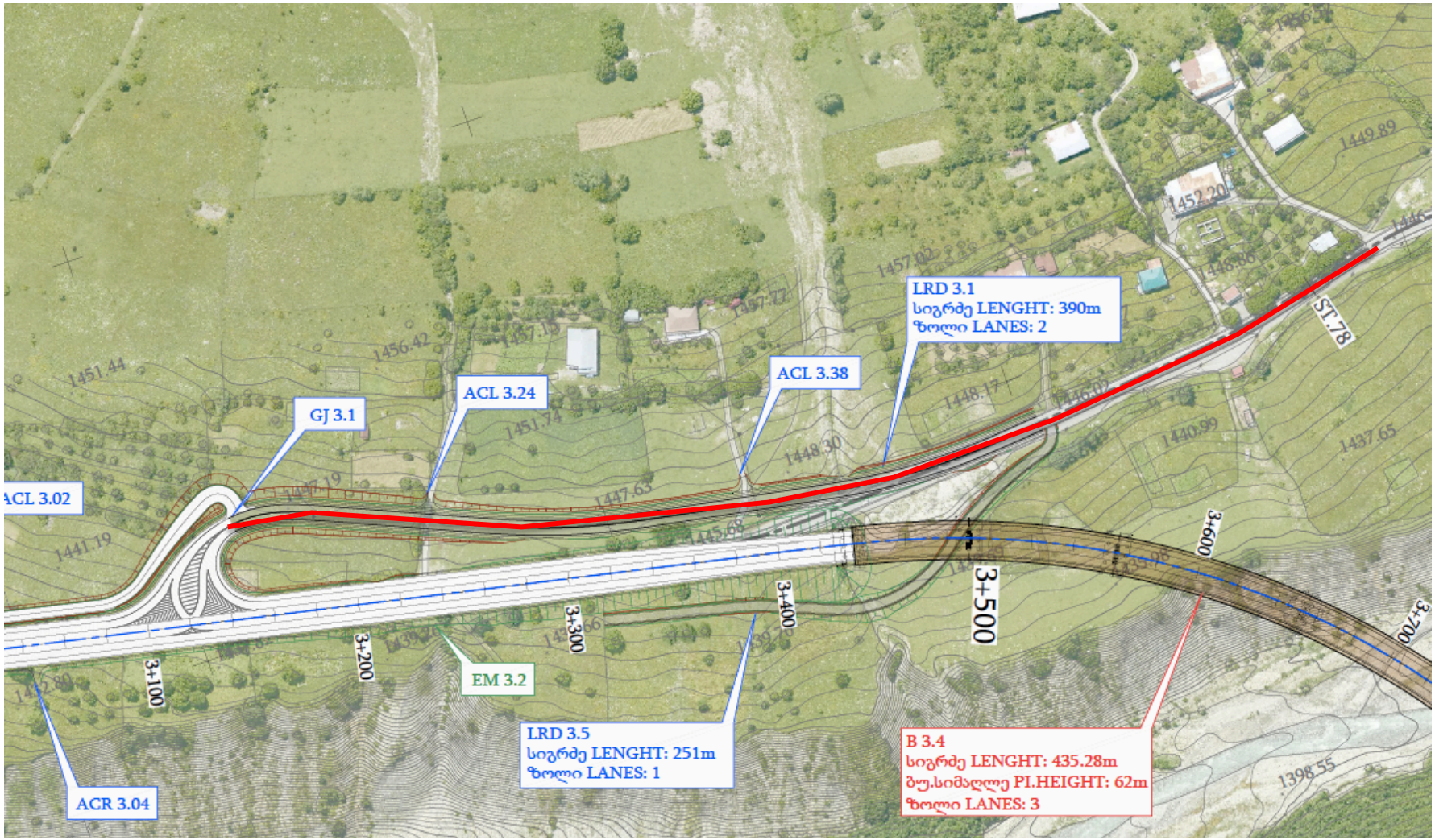
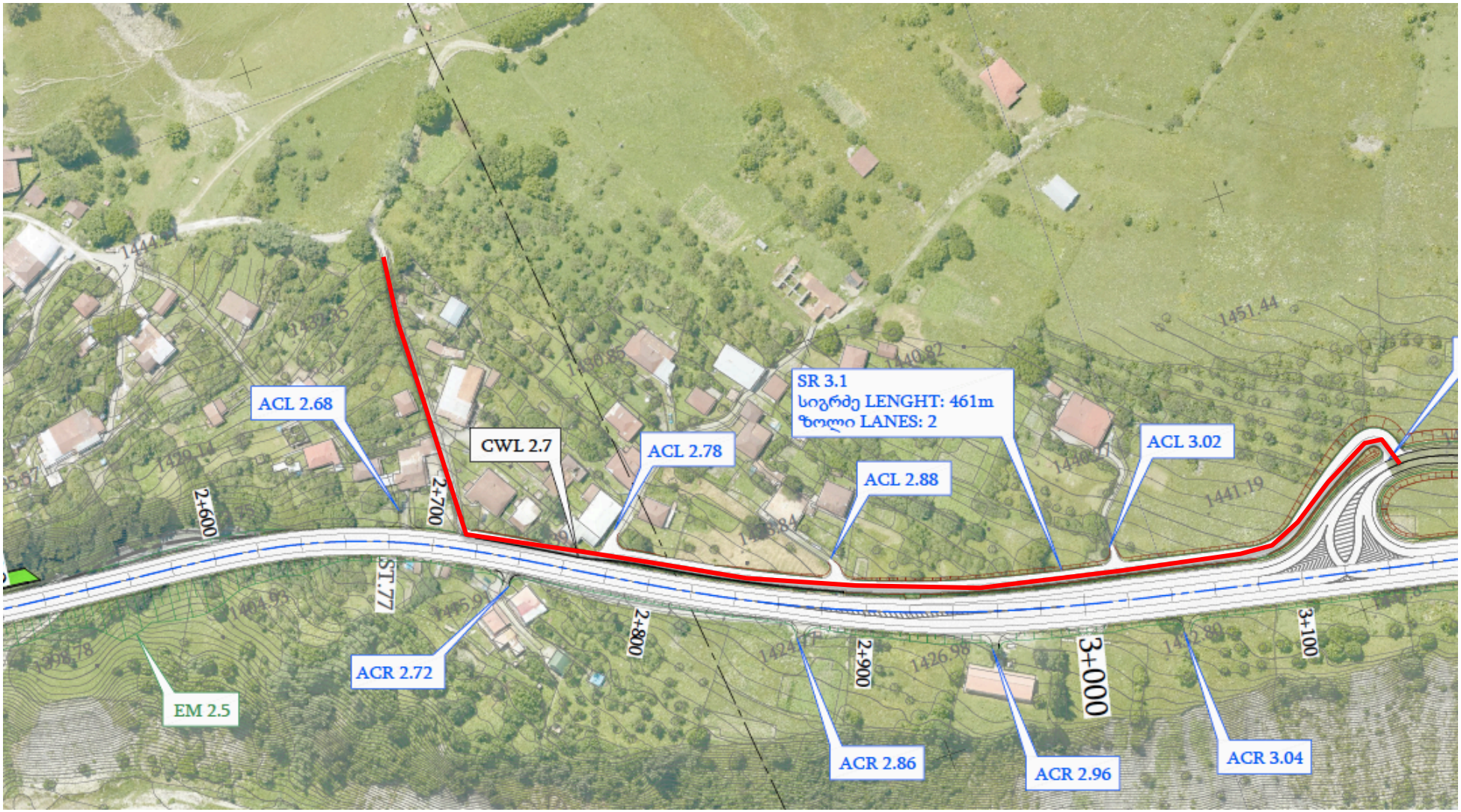


Figure 147: Vehicle Access between Kvesheti and Arakveti



1113. **Khada Valley** – Within the valley access will be significantly improved for the local population as the existing track will link up with the Project road at the interchange located in Begoni. Access to any village in the Khada valley will be less than 2.5km from this intersection thereby significantly increasing villagers access in and out of the valley.

1114. **Zakatkari** – as noted from the community maps which were prepared during consultations with locals (see Figure 113), the fruit and nut trees located between Zakatkari and the Khadistskali river in the Khada valley are a valuable resource for the villagers which is currently accessed on foot (around 200 to 300 meters from Zakatkari). The proposed alignment does not currently provide access for the villagers to reach this area.

Management & Mitigation Actions

Planning

1115. The following plans will be prepared by the Contractor as part of his SEMP:

- **Traffic Management Plan –** To mitigate the potential impacts the Contractor will submit a Traffic Management Plan to local traffic authorities prior to mobilization and include the plan as part of his SEMP. The TMP shall include plans of haul routes and access roads used for construction traffic which will be strictly adhered to with oversight from the Engineer. As part of his TMP, the Contractor shall provide haul routes to spoil disposal sites which, as far as is practical, avoid populated areas. The volume of construction traffic is considered to be intensive truck traffic and will need to be managed both in terms of surface damage. A road condition survey of all roads included in the Contractors TMP will be conducted by the Engineer prior to construction in order to gauge any damage to the road as a result of the intensive heavy traffic during the construction phase. Before completion of the Project the Engineer shall repeat the survey to determine which, if any roads need to be repaired by the Contractor.

1116. In addition, as part of the design, an overpass or underpass should be provided in the Zakatkari area to allow the villagers to continue to access the area to the east of the alignment.

Construction Phase

1117. During the construction phase of the Project, the Contractor will also be responsible for preparing the following method statements:

- **Temporary Road Method Statement –** This will include detailed plans for the use of Path 1, including and designs for this roads and measures such as erosion protection, dust prevention, reinstatement, etc. The statements shall be prepared with contribution from the ECoW.
- **Temporary River Crossing Method Statement** – for the Path 1 river crossing at Sviana – Rostiani and Tskere.

1118. In addition, the Contractor shall:

- Provide information to the public about the scope and schedule of construction activities and expected disruptions and access restrictions at least 24 hours before the disruptions;
- Allow for adequate traffic flow around construction areas via diversions or temporary access roads;
- If temporary access roads are to be constructed with a gravel surface, they shall be routinely watered by the Contractor during dry weather to reduce dust impacts;
- Access roads which are also used by local traffic shall include passing places every 200 meters where the roads are narrow;
- Provide adequate traffic signs, appropriate lighting, well-designed traffic safety signs, barriers and flag persons for traffic control.

- Access roads for batching plants, etc., should be maintained to their exiting (or better) condition during the construction phase.

Residual Impacts

Impact Significance before Mitigation	*Assessment of impacts after Mitigation / Management Measures Implemented*	*Residual Impact Significance after Mitigation*
Construction Phase		
Low / Medium	*No residual impacts are anticipated if the TMP and the other mitigation measures outlined above are implemented correctly. It is also recommended that residual impacts will be further minimized if Path 2 is not used by the Contractor*	***Minor***
Operational Phase		
Medium	*During the operational phase there will be some inconvenience for people using local roads who will have to make some minor detours to access the new road. Pedestrians will no longer be able to walk along the road between Kvesheti and Arakveti, and while alternative routes exist they may not be as convenient, or as well maintained as the existing road.*	***Low / Medium***

F.7.10 Emergency Response Planning

Potential Impacts

1119. Emergency situations may arise during the construction phase of the Project, for example, fires and explosions (through poor management and storage of fuels and chemicals). The following table indicates the potential significance of emergencies during the construction and operational phases using the methodology outlined in Section F.2.

Table 134: Impact Screening – Emergencies

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	Fires, explosions, etc, at site.	Nearby communities / Contractors staff	M	H	L	M	MOD	L/F	SMALL	LOW	UNL IKE	L
O	Fires, explosions, etc, at site.	Nearby communities / Contractors staff	L	H	L	M	MOD	MT	SMALL	MED	UNL IKE	L

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely
Cells shaded in blue are positive impacts.

Management & Mitigation Actions

Planning

1120. The Contractor will be responsible for preparation of an **Emergency Response Plan** (ERP) which will include sections relating to:

- Containment of hazardous materials;
- Oil and fuel spills;
- Fire, gas leaks and explosions;
- Work-site accidents;
- Community /civil unrest and strike action; and
- Earthquake and other natural hazards.

1121. The plan will detail the process for handling, and subsequently reporting, emergencies, and specify the organizational structure (including responsibilities of nominated personnel). The plan will be submitted to the Engineer for approval.

Construction Phase

1122. Implementation of the plan will be monitored by the Engineer. Any emergencies, and how they were handled, will be reported in monthly progress reports by the Contractor to the Engineer. The Engineer will also provide periodic monitoring of the Contractors works throughout construction to ensure the ERP is implemented effectively.

Operational Phase

The RD shall be responsible for the preparation of an ERP for the operational phase of the Project.

Residual Impacts

Impact Significance before Mitigation	***Assessment of impacts after Mitigation / Management Measures Implemented***	***Residual Impact Significance after Mitigation***
Construction Phase		
Minor	*Although considered a low risk, emergency situations may arise during the construction phase. However, a properly prepared and implemented ERP should ensure that residual impacts will be minor.*	***Minor***
Operational Phase		
Low	*If the mitigation measures suggested are implemented residual impacts will be minor during the operational phase.*	***Low***

F.8 Social and Cultural Aspects

F.8.1 Community and Livestock Safety and Security

Potential Impacts

1123. The following table summarizes the key potential impacts to the local community and livestock and indicates the potential significance of the impacts using the methodology outlined in Section F.2.

Table 135: Impact Screening – Community and Livestock Safety and Security

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	Accidents involving humans	Nearby communities / Road users	M	H	H	-	MOD	L/F	SMALL	MED	POSS	M
O	Accidents involving humans	Nearby communities / Road users	M	H	H	-	MOD	LT	SMALL	MED	POSS	M
O	Accidents involving cattle	Nearby communities / Livestock	L	M	H	-	MOD	LT	SMALL	MED	POSS	M

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely
Cells shaded in blue are positive impacts.

1124. The identified key potential impacts and other minor impacts are described in more detail below.

Construction Phase

1125. **Safety** - During the construction phase, the Project will be adding a mix of light, and heavy and slow-moving vehicles onto the road network. This will include vehicles transporting workers, trucks carrying heavy equipment between work areas and haul trucks moving spoil.

1126. The potential impacts of Project construction include the increased risk of collisions and road transport accidents (potentially resulting in injury, death, or fuel or cargo spillage) and subsequent harm to animals, local shepherds and communities (including contamination of soils and groundwater).

1127. In the Khada valley, there is currently very little traffic and any vehicles are not travelling at speed, thus the potential for collisions with livestock during construction is greater as the construction access roads will be paved (enabling greater speeds) and will be frequented by a mix of heavy and light vehicles.

1128. Potential areas where community safety could be affected during the construction phase are highlighted in the following figures.

1129. **Security** - There is the potential that an improved road will bring greater crime due to improved accessibility to the area to people outside the valley. During the construction phase, this will include the presence of road construction workers, which could have a potential effect of increased crime in the Project area.

Operations Phase

1130. Figures on road safety are described in **Section B.6.2**, most of which are due to collisions for unidentified reasons or wrong maneuvers. Most of the accidents (including fatalities and collisions with pedestrians) are occurring in the area which will be avoided through the construction of the Project (i.e. in the Gudauri and Jvari pass areas).

1131. With regards to livestock safety, shepherds are not always present in directing livestock across the roads to ensure safety of both the livestock and vehicle drivers/passengers do not interact. However, interviews with local people in the Kvesheti-

Arakveti section of the existing road described that collisions with livestock on this section of the existing road are infrequent (1 or 2 animals annually), although it has not been possible to verify this figure.

1132. There are currently no official crossing areas along the existing Road through Kvesheti and Arakveti villages, so the introduction of underpasses included in the design after consultations with villagers (see **Section B.4.3** for details of the process) provides a clear safety benefit for all road users.

1133. During the operations phase, security issues may also be present due to increased accessibility of the area as per the construction phase, however due to access by all road users rather than specifically the construction workforce. It may be possible that being able to keep traffic moving with improved conditions on the new road will ensure that opportunistic security issues/crime is minimised in comparison to the existing road, where traffic conditions mean that trucks in particular can experience long delays due to poor road conditions.

1134. The new road is considered to be beneficial for traffic flow in comparison to the existing road, which suffers from delays particularly in poor weather conditions and can result in unpredicted stoppages of drivers (especially trucks) in the Project area. Mitigation measures for minimising possible crime/security issues on the road include: coordination with police by the RD during construction and operations to ensure regular patrolling as per other international roads; facilitating planned rest areas along the route to enable better control of spaces within the project area that receive visitors.

Mitigation Measures

Planning

1135. The Contractor shall prepare an **Occupational and Community Health and Safety (OCHS) Plan**.

Construction Phase

1136. The mitigation measures to be adopted for the Project's construction transport activities include the following, noting a degree of flexibility in the event of adverse weather or unforeseen circumstances:

- Stipulations that all driving is to occur during daytime hours where possible;
- Stipulations in regard to maximum driving hours per day and week;
- Strict adherence to speed limits;
- Strict adherence to spill response measures in the event of a spillage from a vehicle, particularly in the vicinity of the Khada River;
- Consultation with local households, community groups, police, and emergency services along the transport routes; and
- Driver training programs to ensure that Contractors staff are aware of community sensitivities, such as specific livestock movement periods.

1137. The access roads will be paved to minimize dust affects to neighboring households and, indirectly, livestock through dust deposition on pasture.

1138. Ongoing community engagement will be required as well as the implementation of the grievance mechanism in order that any community or livestock safety issues are being adequately addressed and rectified.

1139. Finally, the Contractor will provide a series of road safety awareness sessions for schools in the Project area. The sessions will be provided on a six-monthly basis throughout

the construction phase. As part of the awareness sessions children will be given reflective badges to fix to their coats and school bags.

Residual Impacts

Impact Significance before Mitigation	***Assessment of impacts after Mitigation / Management Measures Implemented***	***Residual Impact Significance after Mitigation***
Construction Phase		
Medium	*Correct implementation of the mitigation and management measures will ensure that residual impacts in the construction phase are minor.*	***Minor***
Operational Phase		
Medium	*Provision of underpasses and safer driving conditions should result in reduced accident rates.*	***Beneficial***

F.8.2 Workers Rights and OHS

Potential Impacts

1140. The following table summarizes the key potential impacts to workers and indicates the potential significance of the impacts using the methodology outlined in Section F.2.

Table 136: Impact Screening – Workers

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	Accidents involving workers	Contractors staff / sub-contractors	M	H	L	M	MOD	L/F	SMALL	MED	POSS	M
C	Unsuitable living and working conditions on site	Contractors staff / sub-contractors	M	H	L	M	MOD	ST	SMALL	MED	POSS	M

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely
Cells shaded in blue are positive impacts.

1141. Georgia is a member of the International Labor Organization (ILO) and has ratified 16 ILO Conventions, including the 8 core conventions. However, gaps persist between Georgian legislation and ILO conventions/EBRD's Performance Requirement 2. These include around issues of:

- **Collective bargaining**. The statutory framework is minimalist and does not encourage meaningful engagement between the employer and workers' organizations.
- **Retrenchment**: There is no obligation to consult or develop a plan to mitigate the adverse impacts.
- **Worker accommodation**: there are no specific provisions on worker accommodation.
- **Non-employee workers**: there are no specific provisions on non-employee workers.

1142. Potential effects on worker health and safety is access to adequate health facilities. Health services for the existing population is limited and thus support for up to 600 additional persons will not be possible.

Mitigation and Management Measures

Planning

1143. An **Occupational and Community Health and Safety (OCHS) Plan** will be prepared by the Contractor to manage worker safety. The Plan will include the following items:

(i) Safety Training Program. A Safety Training Program is required and will be delivered by a qualified H&S expert. The program will consist of:
   (a) Initial Safety Induction Course: All workmen will be required to attend a safety induction course before they are allowed access to the Site.
   (b) Periodic Safety Training Courses: Period safety course will be conducted not less than once every six months. All Contractor (and any sub-contractor) employees will be required to participate in relevant training courses appropriate to the nature, scale and duration of the works. Training courses for all workmen on the Site and at all levels of supervision and management. A list of training participants names and time-stamped photographic evidence of the training will be provided by the Contractor to the Engineer for his records.
   (c) Safety Meetings. Regular safety meetings will be conducted on a monthly basis. The Engineer will be notified of all safety meetings in advance. The Engineer may attend in person or by representative at his discretion. The minutes of all safety meetings will be taken and sent to the Engineer within seven (7) days of the meeting and will include a list of participants names and time-stamped photographic evidence of the training.
   (d) Safety Inspections. The Contractor will regularly inspect, test and maintain all safety equipment (including firefighting equipment), scaffolds, guardrails, working platforms, hoists, ladders and other means of access, lifting, lighting, signing and guarding equipment. Lights and signs will be kept clear of obstructions and legible to read. Equipment, which is damaged, dirty, incorrectly positioned or not in working order, will be repaired or replaced immediately by the Contractor.
   (e) PPE – Workers will be provided (before they commence works) with of appropriate PPE suitable for electrical work such as safety boots, helmets, gloves, protective clothes, goggles, and ear protection at no cost to the workers. Life vests will be provided for all staff working around, or above rivers.

(ii) The Contractor shall keep a log of both training records and safety incidents including near misses.

(iii) All construction plant and equipment used on or around the Site will be fitted with appropriate safety devices. These will include but not be limited to:
   - Effective safety catches for crane hooks and other lifting devices, and
   - Functioning automatic warning devices and, where applicable, an up-to-date test certificate, for cranes and hoists.

(iv) Zones with noise level above 80 dBA must be marked with safety signs and appropriate PPE must be worn by workers.

(v) Portable toilet facilities for workers at road work sites will be provided.

(vi) Fencing on all areas of excavation greater than 2 m deep will be installed along with warning signs.

(vii) Ensure sufficient fresh air supply to confined work spaces.

(viii) Keep air inlet filters clean and free of dust and microorganisms.
(ix) Ensure reversing signals are installed on all construction vehicles.
(x) Implement fall prevention and protection measures whenever a worker is exposed to the hazard of falling more than two meters, falling into operating machinery or through an opening in a work surface. Note: fall prevention/protection measures may include installation of guardrails with mid-rails and toe boards at the edge of any fall hazard area, proper use of ladders and scaffolds by trained employees, use of fall prevention devices, including safety belt and lanyard travel limiting devices to prevent access to fall hazard, fall protection devices such as full body harnesses, etc.
(xi) Mark the areas where risk of injuries from falling objects exist with rope or flagging to minimize risks and injuries.
(xii) Provide spotters. Employ flag persons to control traffic when construction equipment is entering or leaving the work area.

1144. The Contractor shall ensure that the OCHS plan is strictly implemented through his Health and Safety Officers.

1145. A template for the OHS aspects of the plan can be found in **Appendix R**.

Pre-construction / Construction Phase

1146. For the development of the Project the Contractor shall:

- Set targets for local employment based on initial assessment of the labor market for unskilled and semi-skilled work force.
- For unskilled the Contractor shall use a 'ballot' system to ensure that employment is fair and not weighted to connected people for unskilled roles. Repatriation of locals through recruitment measures will use online resources such as jobs.ge.

1147. Provisions in the Contractors contract are to include as far as practicable items to address the collective bargaining, retrenchment, worker accommodation and non-employee worker gaps, to ensure that ILO and Lender requirements are met. At a minimum the Contractor shall ensure the following measures are followed:

- The development and implementation by the contractor of Human resources policies to hire, train, assess, and reward the project workforce. These policies should prevent any form of discrimination in the workplace and ensure that all employees are treated fairly and equally, in line with EU non-discrimination requirement.
- Prior to implementing any collective dismissals of the project workforce, the Contractor will be required to conduct an analysis of alternatives to retrenchment.
- Further, policies should exclude the use of child or forced labor in the project, and that national and international requirements for non-employee workers and supply chain workers are also reflected in these policies.
- A grievance mechanism for workers will need to be provided for the workforce to be able to raise reasonable workplace concerns. The Contractor will inform the workers of the grievance mechanism at the time of hiring and make it easily accessible to them.
- The workers will additionally not be restricted from joining or forming workers organisations or from bargaining collectively, and the contractor will not discriminate or retaliate against workers who form or join collectives or bargain collectively.
- Working relationships and conditions of work are also to be managed and monitored in implementing the project.

- Aspects include the working environment; the organisation of work; training; health and safety; working hours; fair wages and decent working conditions; and terms of employment.

1148. A suitably staffed and equipped health clinic for all workers is to be provided on site.

1149. First aid kits (compliant with OSHA standard 1910.266 App. A) will be provided at all work sites.

Sub-Contractors

1150. All Project sub-contractors will be supplied with copies of the SEMP. Provisions will be incorporated into all sub-contracts to ensure the compliance with the SEMP at all tiers of the sub-contracting. All subcontractors will be required to appoint a safety representative who will be available on the Site throughout the operational period of the respective sub-contract unless the Engineers approval to the contrary is given in writing. In the event of the Engineers approval being given, the Engineer, without prejudice to their other duties and responsibilities, will ensure, as far as is practically possible, that employees of sub-contractors of all tiers are conversant with appropriate parts of the SEMP. To implement the above items the Contractor will designate a qualified environmental, health and safety personnel.

Residual Impacts

Impact Significance before Mitigation	***Assessment of impacts after Mitigation / Management Measures Implemented***	***Residual Impact Significance after Mitigation***
Construction Phase		
Medium	*Correct implementation of the mitigation and management measures will ensure that residual impacts in the construction phase are minor.*	***Minor***
Operational Phase		
Medium	*No residual impacts are anticipated.*	***None***

F.8.3 Landscape and Visual Impacts

Potential Impacts

1151. The following table summarizes the key potential landscape and visual impacts and indicates the potential significance of the impacts using the methodology outlined in Section F.2.

Table 137: Impact Screening – Landscape and Visual

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	Visual change	Nearby communities /tourists	L	H	H	-	MAJ	M/F	SMALL	MED	DEF	M
O	Visual change	Nearby communities /tourists	L	H	H	-	MAJ	LT	SMALL	HIGH	DEF	H

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely
Cells shaded in blue are positive impacts.

1152. These identified key potential impacts are described in more detail below.

Pre-construction / Construction Phase

1153. During the construction phase of the project, visual impact will be local and temporary. The activities during construction that will affect the aesthetics of the area include excavation and storing of material in stockpiles and dumping at the waste disposal areas.

Operational Phase

1154. Visual impacts are the effects on people (receptors) of the changes in available views through intrusion or obstruction and whether important opportunities to enjoy views may be improved or reduced.

1155. In the case of the Project receptors are:

- Local population
- Tourists
- Passengers in transit

1156. Visual impact to nearby receptors of the Project include:

- Degradation of aesthetic value of the area due to construction activities; and
- Permanent change in visual character due to proposed Project.

1157. The Project Area consists of 3 different sections:

- Kvesheti Section;
- Khada Valley section;
- Kobi section.

1158. When in place, the new alignment will change the landscape substantially being a new section where there are currently no asphalt roads. However, more than 50% of the alignment will be in tunnel and the visual impact will be limited to the areas above ground, including spoil disposal sites. Moreover, in some sections, cut and cover technique has been adopted to improve visual impact and possibility of crossing the infrastructure.

1159. Renders of the current and future situation are shown in the following figures. Note that images of spoil disposal sites have not been provided as they are subject to change depending upon the Contractor and the findings of the Contractors **Spoil Disposal Plan.** Visual impacts from the spoil disposal sites will initially be significant as excavated materials are dumped into the spoil disposal sites, but proposed design profiles (see **Appendix O**) illustrate that the spoil sites will be layered into the existing landscape, and once they have been covered with topsoil and re-vegetated the visual impacts on these areas will be reduced. Given the low population levels close to the main spoil disposal areas in Kobi and on the Plateau the actual visual impact will be limited to passengers in vehicles passing along the Project road and visiting Gudauri.

Figure 148: Kvesheti, Existing situation, East – West view

Figure 149: Kvesheti, Future situation with project, East – West view

1160. Figure 148 and Figure 149 show the Aragvi river bed close by Kvesheti. The existing road is currently passing through the village and the future configuration will reduce the visual impact from the village perspective with the proposed bypass whilst also improving other issues such as safety.

1161. The next section, where the future alignment will leave the existing one to cross the plateau and enter into the Khada Valley, will be the most impacted from a visual point of view (see Figure 150, Figure 151 and Figure 152).

1162. A long viaduct in a curve shape is foreseen to cross the Aragvi river and to reach the portal of Tunnel 1. Other solutions have been studied, but this one was selected due to the best rock condition for the tunnel.

Figure 150: Tunnel 1, Existing situation

Figure 151: Tunnel 1, Future situation, East – West view

Figure 152: Tunnel, Future situation, West – East view

1163. From Tunnel 1 the alignment runs enters the plateau and Zakatkari village and after this, at chainage KM 8.5, the project foresees an arch bridge to cross the Khadistskali River.

1164. This solution has been adopted to avoid the construction of piers in the river bed and to reduce the visual impact of tall piers. This bridge is not visible from Kvesheti and there are no villages in its immediate proximity that would be impacted visually. In fact, given its design and height above the river (more than 100 meters), it may be possible that this bridge will become an attraction for tourists in the future. This structure will be a beautiful structure from an engineering point of view. However, the landscape will completely change from its origin (see Figure 153, Figure 154 and Figure 155).

Figure 153: Valley, Aerial view, Existing situation

Figure 154: Valley, Aerial view, Future situation

Figure 155: Valley, Arch bridge, Future situation

1165. After the crossing of the Khadistskali River the alignment runs along the left side of the river with an alternate of bridges and small tunnels, as shown in the figures below.

Figure 156: Valley, Larger Aerial view, Existing situation

Figure 157: Bridge 3 and 4 – Tunnel 4, Future Situation

1166. The alignment enters then in the valley where small villages are located (Gomurni, Beniani and Begoni). The alignment has been studied in order not to cut off the villages and runs through the valley very close to the escarpment.

Figure 158: Valley, Aerial view, Existing Situation

Figure 159: Valley, Future Situation

1167. After Beniani village the alignment proceeds towards Tskere and on to the portal of Tunnel 5. Before that, two cut and cover sections have been foreseen around Tskere to permit the re-use of the agricultural plots, reduce visual impact and reduce noise impacts. These cut and cover sections also improve accessibility for the local population. An underpass will also be provided in this location to allow villagers to access the cemeteries in this area.

Figure 160: Tskere, Existing situation

Figure 161: Tskere, Focus on cut and covers and portal of the long tunnel

1168. From chainage KM 12.9 to KM 22.0, the alignment is underground in Tunnel 5. The exit of the tunnel is in proximity of Kobi village and the visual impact is shown in the figures below. The impact will be minimal in this section because the future road will be connected to the existing one and no major changes will be foreseen.

Figure 162: Kobi, Existing Situation

Figure 163: Kobi, Future situation, portal tunnel, North South view

1169. The main recipients of the visual impact will be local residents, travelers/tourists and commuters using the road. The scale and importance of the change will differ by the category of the viewers. Effect on commuters will be short term and limited to the travel time only. Besides, for some of the passengers the landscape may be not familiar – for these category of receptors the change will not be crucial.

1170. The local community, with time, will get accustomed to the new infrastructure, visual discomfort related to the change will diminish. Therefore, the magnitude visual discomfort will become lower. It should be mentioned that perception of the viewers may differ, for some new infrastructure may be acceptable for other – less acceptable or non-acceptable change.

Mitigation Measures

Pre-construction / Construction Phase

1171. The visual impact following to completion of works will be mitigated by clean up and re-cultivation of all sites temporarily disturbed for the needs of the project and re-vegetation of spoil disposal areas.

1172. Regarding physical works, the following measures shall be applied by the Contractor:

- Reinstate all temporarily disturbed sites after completion of works. Plant with vegetation.
- Avoid using ‘alien’ plant species.
- Choose colors of above ground sections of technical buildings at tunnel exits so to merge with environment.
- Give priority to use of geotextile against shotcrete.
- Use irregular shape stones for riprap.
- Avoid use of white concrete.

Operational Phase

1173. Tree re-planting will go some way to restoring the natural landscape of the area. However, this will not alleviate all of the visual impacts associated with the elevated bridges and cut slopes stabilized with anchored concrete, rock walls, other.

1174. The visual effect from new infrastructure can be mitigated by surface/color treatment of piers, road barriers, using transparent noise barriers whether appropriate and maintenance of vegetation. The road will also be cut in various locations so visual impacts will not be visible from local settlements potentially, such as Begoni.

1175. In addition, the planned reduction of the height of the technical buildings to 4m by using the underground space for the main facilities will contribute to reduction of the impact in these areas (around tunnel portals).

Residual Impacts

Impact Significance before Mitigation	***Assessment of impacts after Mitigation / Management Measures Implemented***	***Residual Impact Significance after Mitigation***
Construction Phase		
Medium	*Construction works, including land clearing, cutting of slopes and developing tunnel portals will no doubt have a visual impact in the Project area. Realistically there is little that can be done about these temporary construction activities.*	***Minor / Moderate***
Operational Phase		
High	*Cut slopes, embankments, concrete bridges and tunnels will have an impact on the landscape within the valley throughout the Project lifecycle. The mitigation measures outlined above may go some way to enhancing the aesthetic value of the Project especially as vegetation grows back around construction zones, and in all likelihood any negative opinion of the new road in terms of visual impact will decrease over time as people get used to the altered landscape.*	***Low / Medium***

F.8.4 Lighting

Potential Impacts

1176. The following table summarizes the key potential impacts from lighting and indicates the potential significance of the impacts using the methodology outlined in Section F.2.

Table 138: Impact Screening – Lighting

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	Disturbance to humans and animals	Nearby communities / Wildlife	L	M	L	-	MOD	ST	SMALL	LOW	POSS	L
O	Disturbance to humans and animals	Nearby communities / Wildlife	L	M	L	-	MOD	LT	SMALL	MED	POSS	M

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely
Cells shaded in blue are positive impacts.

These identified key potential impacts and other minor impacts are described in more detail below.

Pre-construction / Construction Phase

1177. Lighting during the construction phase can potentially impact upon local residents and biodiversity with the use of floodlights to illuminate construction zones, e.g. in areas around rivers or at construction camps.

Operational Phase

1178. Lighting has been proposed along the entire alignment as part of the detailed design. Discussions with the RD on this issue have indicated that lighting of the road is consistent with all other on-going road rehabilitation projects in the country and that the main reason for the lighting the entire road in this instance is to provide safe driving conditions, especially given the tight curves in some sections of the road.

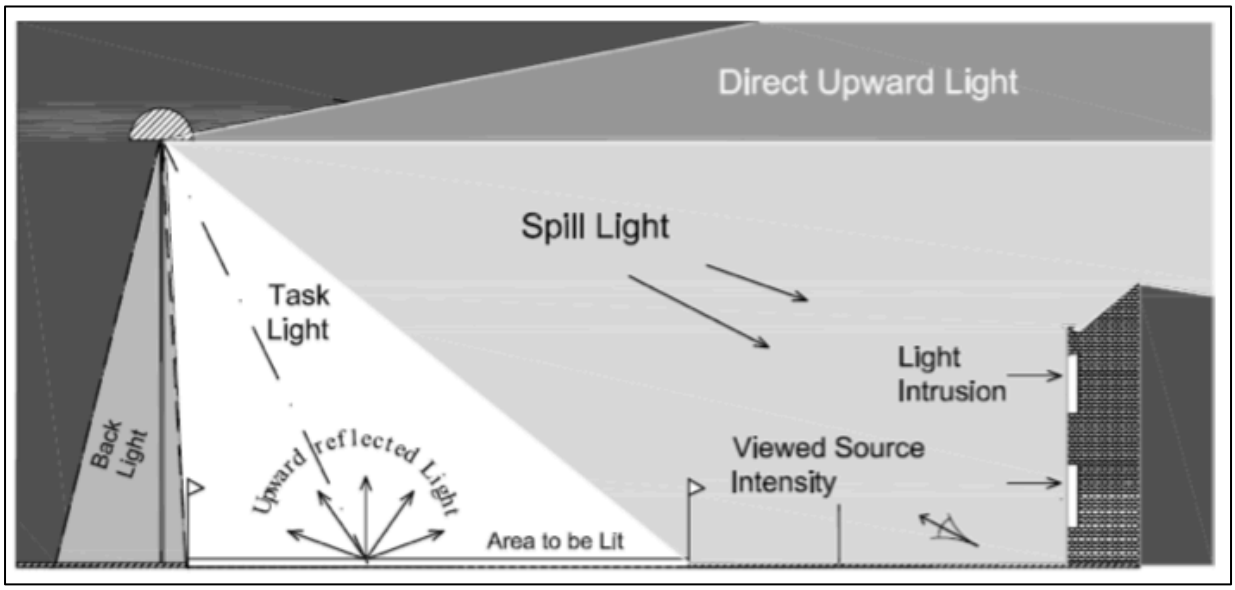
1179. Considering the design of the road, the number of bridges, junctions and tunnels included it can be seen that, in any case, the majority of the road needs to be lit. Only around 3.5km of road is free of any of these features that require lighting. Also, given the layout of the road through the Khada valley, bridges, tunnels, intersections, etc., we will in any case see more or less a continuous strip of lighting through the valley until it reaches Tunnel 5 portal. Perhaps one area where lighting could be eliminated would be on the plateau area, however this is a specific area where the RD believe lighting is necessary due to the complex geometry of the road.

1180. The impacts of street lighting can be discussed in terms of impacts to landscape and local community.

1181. In terms of impacts on the landscape, as noted above, large portions of the road would need to be lit for safety reasons and to meet design specifications, e.g. lighting of junctions and bridges. Lighting of the remaining portions of the road is unlikely to add significantly to the effects of the light on the landscape although it will still have a negative impact to a certain degree.

1182. Street lighting can also impact upon the local community and residential areas if the light is not shielded correctly and light 'spill' occurs.

Figure 164: Light 'Spill'



Source: Guidance Notes for the Reduction of Obtrusive Light GN01:2011. http://www.wiltshire.gov.uk

1183. In these terms light spill only has the potential to impact upon the residential areas of Kvesheti and Arakveti, all other villages and properties are too far away from the road to be significantly impacted. A simple solution is to provide suitable shielding. Effective shielding can maximize the desired effects of lighting by controlling the light output and minimizing glare and light spill.

1184. Impacts of lighting on biodiversity has been discussed in the biodiversity section above and a number of mitigation measures have been proposed such as shining lights away from the rivers during construction at dusk and in the mornings.

Mitigation and Management Measures

Pre-construction / Construction Phase

1185. During the construction phase, in addition to the biodiversity mitigation measures already mentioned above (see **Section F.6),** all lighting related to construction activities shall be shielded or directed to restrict any direct illumination onto property located outside of the Project Site boundaries. All construction site lighting shall be turned off when construction activities have ceased for the day. In addition, the use of low wattage lamps directing light downwards at work sites and camps shall be applied. Siting of construction camps away from residential areas will further reduce the impacts of lighting on residential areas.

Operational Phase

1186. To limits impacts of street lighting in the operational phase of the Project it is recommended that:

- Use of full horizontal cut off glass lens luminaires are installed at 0^{o} uplift. These luminaires, in addition to reducing sky glow, help to minimise visual intrusion within open landscape.
- Where possible use lower lamp heights, however, this should not compromise safety aspects, such as the need to see road signs.
- To prevent future pollution issues, it is recommended that the use of sodium light bulbs is prohibited and that LED lights are installed with a “neutral” color temperature of 4000K.

Residual Impacts

Impact Significance before Mitigation	***Assessment of impacts after Mitigation / Management Measures Implemented***	***Residual Impact Significance after Mitigation***
Construction Phase		
Minor	*If the proposed mitigation measures are employed the impacts will be still be minor due to the fact that in some instances lighting will be needed during works at night and they could impact upon biodiversity. However, oversight of such works by the Ecological Clerk of Works should reduce the incidences of impacts occurring.*	***Minor***
Operational Phase		
Medium	*Even with the proposed lighting specifications there will still be some level of impact of lighting to the Project area and the Khada valley.*	***Low / Medium***

F.8.5 Noise

Potential Impacts

1187. The following table summarizes the key potential noise impacts and their potential significance using the methodology outlined in Section F.2.

Table 139: Impact Screening – Noise

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	Elevated noise levels from construction equipment.	Contractors staff / Nearby communities	M	H	M	H	MAJ	H/F	SMALL	HIGH	DEF	H
O	Elevated noise levels from vehicles using the road.	Nearby communities	L	H	M	H	MAJ	M/T	SMALL	MED	DEF	M

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely
Cells shaded in blue are positive impacts.

Pre-construction / Construction Phase

1188. The dominant source of noise from most construction equipment is the engine, usually a diesel, without sufficient muffling. Only in a few cases noise generated by the process dominates (for example, impact pile driving, pavement breaking).

1189. Noise levels during construction will vary depending on the activity, type and number of equipment, work schedule, duration of use and the distance from receptor. In this analysis, first the noise level due to each piece of equipment, which is likely to be used in the construction, is calculated. Noise levels induced by the main road construction equipment considered in assessment are presented in Table 140. (Note: the values indicated in the table may differ depending on the brand of machinery provided/used by contractor). The list includes all equipment except vehicles and some minor pieces of equipment.

Table 140: Typical Noise Levels from Construction Equipment

Equipment	Typical noise level (dBA)[153]
Pavement	
Dozer	81.7
Excavator	80.7
Grader	85
Roller	80.0
Rock Drill	81.0
Dump Truck	76.5
Paver	77.2
Concrete Mixer Truck	78.8
Tunnel Mouth	
Jackhammer	88.9
Dozer	81.7
Dump Truck	76.5
Tunnel	
Blasting	94.0
Bridge	
Piling	90.0

[153] The given noise level is given near the source of noise.

Equipment	Typical noise level (dBA)[153]
Dozer	81.7
Dump Truck	76.5
Paver	77.2
Boring Jack Power Unit	83.0

1190. As part of the Project EIA a noise model has been developed that includes modeling of potential construction related noise. Tables indicating predicted construction noise levels in the Project area have been produced and can be found in **Appendix K**. At the construction stage, the noise level modeling was done only for day hours, as within the scope of the project the construction activities will be prohibited in the night hours.

1191. The model indicates that the construction works will impact upon the following residential areas; Kvesheti, Arakveti, Kobi, Begoni, Sviana-Rostiani and Zakatkari.

1192. The impact of construction will be quite intense in these villages, average 65-70 dBA, and 75-80 dBA on the buildings adjacent to the Projects main construction zones.

1193. According to the model construction noise will not impact upon residential properties in Tskere due to the distance of these villages from the construction zones.

Operational Phase

1194. To assess the impacts of operational noise within the Project area a noise model has been prepared using CadnaA (Computer Aided Noise Abatement) software[154]. The model methodology can be found in **Appendix K**.

1195. The environmental noise model is based on a specific set of conditions for which the noise is being estimated, it will be a fixed representation or 'snapshot' of a physical environment of interest, in practice the physical environment of the area of interest is constantly and randomly changing. The model intends to represent the most typical or frequently occurring conditions as reconstructed by the input data.

Analysis of Results

The first step in the analysis of noise levels is to determine if the proposed Project will increase noise levels above IFC daytime and nighttime guideline limits (45 dBA and 55 dBA respectively) or more than 3 dB above the ambient noise levels at each receptor where IFC levels are already exceeded. Instrumental noise monitoring at each potential noise receptor in the Project corridor to determine ambient conditions is not possible and as such the noise model also included the baseline scenario showing the current noise levels in the Project corridor. This baseline was achieved by analyzing the most recent instrumental noise monitoring results in the locations they were measured and the traffic volumes on the existing roads. The following tables show the results for different portions (or villages) of the Project road for daytime and nighttime periods. Yellow cells represent properties identified per the LARP for physical displacement, Green cells represent compliance with daytime and nighttime IFC guideline limits, blue cells represent compliant values within 3 dB of the ambient, light blue cells represent those receptors within 1 dB of the IFC guideline limits, orange cells represent receptors within 3 dB of the IFC guidline limits, red cells represent receptors more than 4 dB above IFC guideline limits. Focus in the discussion has centered around values predicted for 2028 as this represents a ten-year period from the present and is considered an accurate period for which traffic projections and noise modelling can be predicted. Values up to 15 years are modelled for trend / reference purposes.

[154] The model has been updated since the previous disclosed EIA to include refined Digital Terrain Model and more representative daytime / nightime traffic flows.

Table 141: Noise Model Results, Kvesheti

Building #	Distance from the noise source	Baseline		2024		2028		2033	
		Day	Night	Day	Night	Day	Night	Day	Night
1	107	54	47	57	52	57	52	58	54
2	66	58	51	59	53	60	54	61	56
3	78	56	49	56	51	57	52	58	53
4	31	63	55	63	57	64	58	64	59
5	63	58	50	57	52	58	53	58	54
6	59	59	52	58	53	59	54	60	55
7	90	51	44	53	49	54	50	55	51
8	110	51	44	51	47	52	48	53	49
9	63	58	51	57	52	58	53	59	54
10	51	60	52	60	54	61	55	62	57
11	32	62	54	61	55	62	56	63	57
12	90	53	46	54	49	55	50	56	51
13	121	51	44	52	47	52	48	53	49
14	172	50	43	51	47	52	48	53	49
15	180	49	42	49	45	50	46	51	47
16	202	44	38	46	42	47	43	48	44
17	228	45	38	47	42	48	43	48	45
18	245	46	39	49	45	49	46	50	47
19	264	46	39	48	44	49	45	50	46
20	278	46	39	48	43	48	44	49	45
21	204	48	42	50	46	51	46	52	48

Building #	Distance from the noise source	Baseline		2024		2028		2033	
		Day	Night	Day	Night	Day	Night	Day	Night
22	34	63	55	60	55	61	55	62	57
23	89	54	47	55	50	56	51	57	52
24	140	51	44	53	48	53	49	54	50
25	170	45	39	49	44	49	45	50	46
26	222	42	36	48	44	48	45	49	46
27	268	41	35	46	42	47	43	47	44
28	321	45	39	48	44	49	45	50	46
29	294	43	37	48	44	48	45	49	46
30	35	64	56	60	54	61	55	61	56
31	26	64	56	59	53	59	54	60	55
32	116	52	45	52	48	53	48	54	50
33	137	48	41	51	46	51	47	52	48
34	180	46	40	50	46	51	47	52	48
35	149	48	42	51	46	51	47	52	48
36	239	45	39	49	45	50	46	50	47
37	305	46	40	49	45	50	46	51	47
38	349	43	38	47	43	48	44	49	45
39	385	46	40	47	43	48	44	49	45
40	340	45	39	48	44	49	45	49	46
41	300	47	41	50	45	50	46	51	47
42	291	47	41	49	45	50	46	51	47
43	334	44	38	47	43	48	44	48	45

Building #	Distance from the noise source	Baseline		2024		2028		2033	
		Day	Night	Day	Night	Day	Night	Day	Night
44	305	47	40	48	44	49	45	50	46
45	277	47	41	49	45	50	46	51	47
46	259	46	40	49	45	50	46	51	47
47	227	47	41	50	45	50	46	51	47
48	205	48	41	50	46	51	47	52	48
49	211	49	42	50	45	50	46	51	47
50	234	49	42	49	45	50	46	51	47
51	264	49	42	49	45	50	46	51	47
52	297	47	40	47	43	48	44	49	45
54	300	47	40	47	43	48	44	48	45
55	260	49	41	48	44	48	45	49	46
56	253	47	41	47	43	48	44	48	45
57	235	49	42	48	44	48	45	49	46
58	189	50	43	49	45	50	46	51	47
59	192	51	44	50	45	50	46	51	47
60	195	50	43	49	45	50	46	51	47
61	176	50	43	50	46	51	47	52	48
62	136	51	44	52	47	53	48	53	49
63	125	51	45	51	47	52	48	53	49
64	129	51	44	50	45	50	46	51	47
65	106	51	45	52	47	53	48	53	49
66	69	56	49	54	49	55	50	55	51

Building #	Distance from the noise source	Baseline		2024		2028		2033	
		Day	Night	Day	Night	Day	Night	Day	Night
67	25	66	58	58	52	59	53	59	54
68	41	62	54	57	51	57	52	58	53
69	56	58	51	55	50	56	51	57	52
70	48	61	53	56	50	57	51	57	52
71	49	61	54	56	51	57	52	58	53
72	45	62	54	57	51	57	52	58	53
73	104	53	46	53	48	53	49	54	50
74	103	53	46	52	48	53	49	54	50
75	133	51	44	51	47	52	47	53	49
76	139	51	44	51	47	52	47	53	49
77	169	49	42	50	46	51	47	52	48
78	172	48	42	50	46	51	47	52	48
79	23	67	59	64	59	65	60	66	61
80	17	66	58	62	56	63	57	63	58
81	17	68	60	61	55	61	56	62	57
82	17	67	59	60	54	61	55	61	56
83	18	67	59	59	53	60	54	61	55
84	21	58	51	60	54	61	55	62	56
85	16	66	58	59	53	59	54	60	55
86	21	65	57	59	53	59	54	60	55
87	20	62	54	59	53	59	54	60	55
88	21	66	58	58	52	59	53	60	54

Building #	Distance from the noise source	Baseline		2024		2028		2033	
		Day	Night	Day	Night	Day	Night	Day	Night
89	69	53	46	62	56	62	57	63	58
90	22	66	58	58	53	59	54	60	55
91	100	49	43	63	57	63	58	64	59
92	78	52	45	63	57	63	58	64	59
93	30	61	53	59	54	60	55	61	56
94	44	58	50	61	56	62	57	63	58
95	83	50	43	65	59	65	60	66	61
96	46	56	49	62	56	63	57	64	58
97	22	64	56	57	51	58	52	58	53
98	20	64	56	57	51	57	52	58	52
99	23	62	54	56	50	56	51	57	52
100	63	53	47	54	49	54	50	55	51
102	96	53	46	51	47	52	48	53	49
103	104	53	46	53	48	53	49	54	50
104	153	52	45	50	46	51	47	52	48
105	156	52	45	51	46	52	47	52	48
106	150	52	45	50	46	51	47	52	48
107	187	52	44	48	44	49	45	50	46
108	122	51	45	51	47	52	48	53	49
110	78	53	47	52	47	52	48	53	49
111	55	56	49	53	48	54	49	55	50
112	77	55	48	56	51	57	52	58	53

Building #	Distance from the noise source	Baseline		2024		2028		2033	
		Day	Night	Day	Night	Day	Night	Day	Night
113	128	52	45	53	48	53	49	54	50
114	129	53	46	52	48	52	49	53	50
115	156	48	41	49	46	50	46	51	48
116	117	51	45	50	46	51	47	52	48
117	164	50	44	51	47	51	48	52	49
118	215	46	40	50	46	50	47	51	48
119	258	45	39	49	45	49	46	50	47
120	276	42	36	47	42	47	43	48	44
1201	314	46	40	49	45	50	46	50	47
121	260	47	40	49	45	50	46	51	47
122	178	45	39	49	45	50	46	51	47
123	148	48	41	48	44	48	45	49	46
124	175	45	38	48	44	49	45	50	46
125	154	45	39	47	44	48	45	49	46
126	128	46	40	49	45	50	46	51	47
127	168	42	36	47	43	47	44	48	45
128	197	41	35	45	41	46	42	46	43
129	76	56	48	57	52	58	53	59	54
130	89	48	41	54	49	54	50	55	51
131	45	58	50	62	56	63	57	64	59
132	48	55	48	63	57	64	58	64	59
134	103	43	38	52	48	53	49	54	50

Building #	Distance from the noise source	Baseline		2024		2028		2033	
		Day	Night	Day	Night	Day	Night	Day	Night
135	132	43	37	50	46	51	47	52	48
136	100	44	38	54	49	54	50	55	51
137	100	44	38	54	49	54	50	55	51
138	134	45	39	54	50	55	51	56	52
139	78	43	37	52	48	53	49	54	50
140	40	61	53	59	54	60	55	61	56
141	26	64	56	61	56	62	57	63	58
Total Above IFC Guideline Limits		40	53	7	29	8	60	11	90

Figure 165: Receptors, Kvesheti (eastern portion)

Figure 166: Receptors, Kvesheti (western portion)

1196. The results from Kvesheti show that currently 53 receptors are above IFC guideline limits for noise in the 2018 baseline scenario, However, when the road becomes operational in 2024 this figure would reduce to 29 and then rise to 59 receptors by 2028.

Table 142: Noise Model Results, Arakveti

Building #	Distance from the noise source	Baseline		2024		2028		2033	
		Day	Night	Day	Night	Day	Night	Day	Night
142	80	50	46	48	44	49	44	50	45
143	182	49	45	49	44	49	45	50	45
144	178	49	44	49	44	50	45	50	46
145	160	49	45	49	45	50	45	51	46
146	141	50	45	50	46	51	46	51	47
1461	125	50	45	50	46	51	46	51	47
147	106	51	47	50	46	51	47	52	47
148	54	54	49	54	49	55	50	56	51
149	101	52	47	51	47	52	48	53	48
150	100	51	47	51	47	52	48	53	48
151	80	52	48	52	48	53	48	53	49
152	48	56	51	56	51	57	52	58	53
153	32	61	56	63	58	63	58	64	59
154	27	64	59	65	60	65	60	66	61
155	56	53	48	56	51	56	52	57	53
156	28	64	59	66	61	67	61	67	62
157	67	53	49	55	50	55	51	56	51
158	25	67	62	69	63	70	64	70	65
159	16	69	64	71	66	72	67	73	67
160	23	66	60	64	59	65	60	66	61
161	8	72	66	69	64	70	64	70	65

Building #	Distance from the noise source	Baseline		2024		2028		2033	
		Day	Night	Day	Night	Day	Night	Day	Night
162	42	57	52	58	53	59	54	60	54
163	20	69	64	70	65	71	66	72	66
164	25	64	59	66	61	67	62	68	62
165	27	64	59	66	61	67	62	68	62
166	47	57	52	58	53	59	54	60	55
167	66	52	48	54	50	55	50	56	51
168	96	51	47	51	47	52	48	53	49
169	82	53	49	55	50	55	51	56	52
170	106	51	47	51	47	52	48	52	49
171	93	50	46	51	47	52	48	53	48
172	68	56	51	58	53	58	54	59	55
173	32	64	59	65	60	66	60	66	61
174	44	62	57	63	58	63	58	64	59
175	102	53	49	54	51	55	51	56	52
176	132	48	44	53	49	53	49	54	50
177	198	46	42	50	46	51	47	51	47
178	236	48	45	50	46	50	46	51	47
179	183	50	46	52	48	52	48	53	49
180	78	59	54	59	54	60	55	61	56
181	103	57	53	59	54	59	54	60	55
182	104	58	53	58	53	59	54	60	55

Building #	Distance from the noise source	Baseline		2024		2028		2033	
		Day	Night	Day	Night	Day	Night	Day	Night
183	70	62	57	57	52	58	53	59	53
184	37	65	60	56	51	57	51	57	52
185	66	61	57	54	48	54	49	55	50
186	68	61	56	52	47	53	47	54	48
187	144	55	51	49	44	50	45	51	46
188	104	56	51	52	46	52	47	53	48
189	111	56	51	53	48	54	49	55	49
190	186	52	48	52	46	52	47	53	48
191	194	52	47	49	44	50	45	51	45
192	209	51	46	48	42	49	43	49	43
193	257	52	47	50	45	51	46	52	47
194	270	52	48	51	46	51	46	52	47
Total Above IFC Guideline Limits		25	46	0	2	0	3	5	5

Figure 167: Receptors, Arakveti (western portion)

Figure 168: Receptors, Arakveti (western portion)

1197. The results in Arakveti show that 47 receptors are above IFC guideline limits for noise in the baseline 2018 scenario. However, as the road becomes operational the number of noise affected receptors falls significantly and only five receptors are above the IFC guidelines limits even by 2033.

Table 143: Noise Model Results, Zakatkari

Boilding #	Distance from the noise source	2024		2028		2033	
		Day	Night	Day	Night	Day	Night
195	215	50	45	51	46	52	47
196	274	50	45	51	45	51	46
197	244	51	45	51	46	52	47
198	236	50	45	51	45	52	47
199	171	52	46	53	47	53	48
200	210	44	39	45	40	46	41
201	204	49	44	49	44	50	45
202	126	55	50	56	50	57	51
203	133	53	48	54	48	55	49
204	113	55	49	55	50	56	51
205	122	52	47	53	47	54	48
206	129	55	48	56	48	57	49
207	55	56	49	57	49	57	50
208	110	49	44	50	44	51	46
209	84	49	44	50	45	50	46
210	40	54	48	54	49	55	50
211	43	52	47	53	48	54	49
Total Above IFC Guideline Limits		1	9	3	11	4	15

Figure 169: Receptors, Zakatkari

1198. In Zakatkari, there is no existing 'road' only a track that leads to and from the village. Accordingly, there is no existing traffic noise to model a baseline. The results of the model show that 9 out of 17 identified receptors would be above with IFC nightime limits by 2024 with numbers increasing beyond.

Table 144: Noise Model Results, Sviana-Rostiana

Building #	Distance from the noise source	2024		2028		2033	
		Day	Night	Day	Night	Day	Night
271	225	50	44	51	45	51	46
272	217	48	42	48	43	49	44
273	204	47	43	48	43	49	44
274	196	50	45	51	46	52	47
275	176	52	46	52	47	53	48
276	163	55	50	56	50	57	51
277	194	55	50	56	50	57	51
Total Above IFC Guideline Limits		0	3	2	4	2	5

1199. In Svianan-Rostiana throughout all forcast scenarios approximately half of receptors are above the IFC guidline limits for noise. Again, this village does not have any existing road to model ambient changes against.

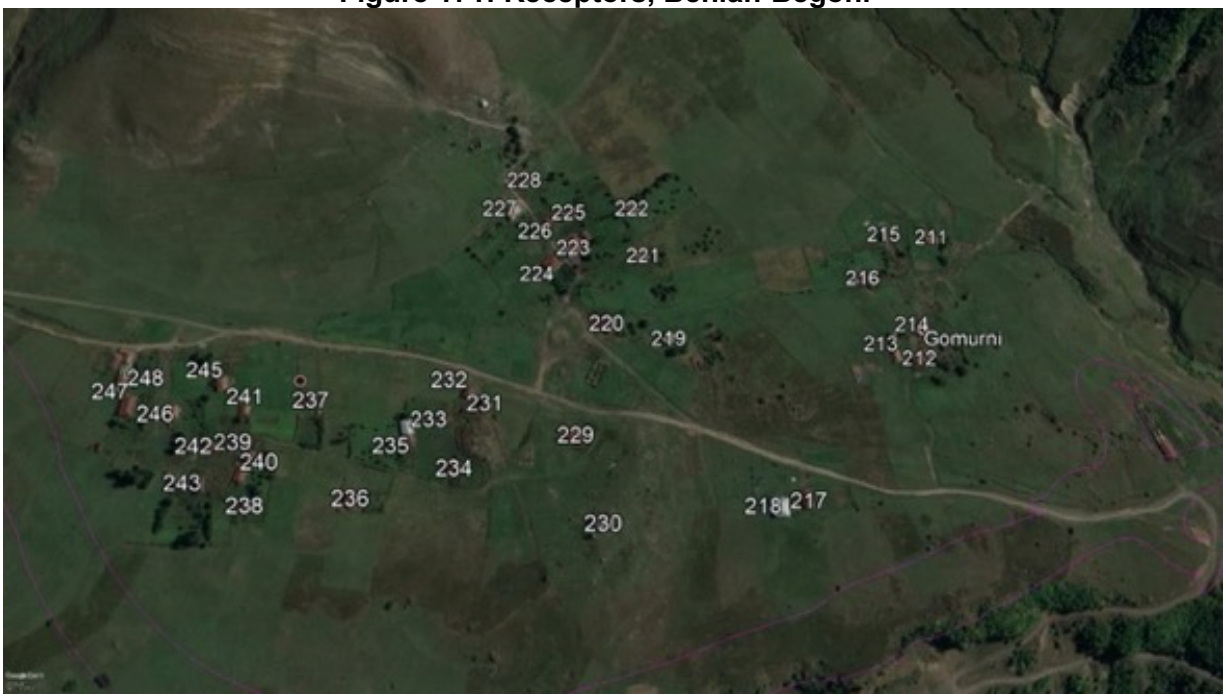
Figure 170: Receptors, Sviana-Rostiana

Table 145: Noise Model Results, Benian-Begoni

Building #	Distance from the noise source	2024		2028		2033	
		Day	Night	Day	Night	Day	Night
211	342	28	23	29	23	30	24
212	211	33	28	34	29	35	30
213	241	31	25	32	26	33	27
214	263	36	32	37	33	37	34
215	387	29	24	30	24	31	25
216	371	28	23	29	23	30	24
217	98	40	37	41	38	42	39
218	107	35	31	36	31	37	32
219	305	28	22	29	23	30	24
220	319	28	22	29	23	30	24
221	393	26	21	27	21	28	22
222	443	26	20	27	21	27	22
223	423	26	21	27	21	28	22
224	405	27	21	27	22	28	23
225	463	26	20	27	21	27	22
226	452	26	21	27	21	28	22
227	463	26	21	27	21	28	22
228	500	26	20	26	21	27	22
229	228	30	25	31	25	32	27

Building #	Distance from the noise source	2024		2028		2033	
		Day	Night	Day	Night	Day	Night
230	143	37	34	38	34	39	35
231	253	30	25	31	25	31	26
232	270	29	24	30	24	31	25
233	248	33	29	33	29	34	31
234	200	31	26	32	26	33	27
235	245	30	24	31	25	31	26
236	189	32	26	32	27	33	28
237	207	30	24	31	25	32	26
238	115	33	27	34	28	35	29
239	165	32	27	33	27	34	28
240	150	32	26	33	27	33	28
241	172	31	26	32	26	33	27
242	138	33	28	34	28	35	29
243	110	33	28	34	28	35	29
245	154	31	26	32	26	33	27
246	107	33	27	34	28	35	29
247	70	35	30	36	30	37	31
248	80	34	28	35	29	36	30
Total Above IFC Guideline Limits		0	0	0	0	0	0

Figure 171: Receptors, Benian-Begoni



1200. In Benaian-Begoni there are no receptors above IFC limits in all forcast scenarios. This is due to the fact that the road is below grade behind a cut slope to the north of the village. There is no existing road traffic to model against any changes to the ambient noise in this location, so only comparison against IFC day / night limits is appropriate.

Table 146: Noise Model Results, Tskere

Building #	Distance from the noise source	2024		2028		2033	
		Day	Night	Day	Night	Day	Night
249	196	47	40	47	41	48	42
250	228	47	40	47	41	48	42
251	287	45	39	46	40	47	40
252	327	44	38	45	39	46	40
253	326	45	38	45	39	46	40
254	341	44	38	45	38	46	39
255	363	44	38	45	38	46	39
256	354	44	38	45	38	46	39
257	354	44	37	45	38	45	39
258	366	44	37	45	38	45	39
259	378	43	37	44	37	45	38
260	386	43	37	44	38	45	39
261	391	43	37	44	37	45	38
262	394	43	37	44	37	45	38
263	406	39	32	39	33	40	34
264	415	32	26	33	27	34	28
265	384	43	37	44	37	45	38
266	412	42	36	43	37	40	38
267	420	43	36	43	37	44	38
268	444	42	36	43	36	44	37
269	460	42	35	43	36	43	37
Total Above IFC Guideline Limits		0	0	0	0	0	0

Figure 172: Receptors, Tskere

1201. In Tskere during the operational phase of the Project all properties would be within IFC daytime and nightime limits. This is due to the extension of the cut and cover section of the tunnel to the south of Tskere.

Table 147: Noise Model Results, Kobi

Building #	Distance from the noise source	Baseline		2024		2028		2033	
		Day	Night	Day	Night	Day	Night	Day	Night
271	219	49	41	51	46	52	47	53	48
272	10	67	59	70	65	71	66	72	67
273	18	65	57	64	58	65	59	66	60
274	31	64	55	63	56	64	57	64	58
275	44	51	43	54	47	55	48	55	49
276	50	54	46	54	48	55	48	55	49
277	23	71	63	69	61	69	62	70	63
278	44	56	49	53	47	54	48	55	49
279	17	66	58	64	58	65	59	66	60
280	72	55	48	56	51	57	52	58	53
281	82	55	48	56	51	57	52	58	53
282	111	52	45	54	49	55	50	56	51
283	53	60	52	60	55	61	56	62	57
284	52	59	52	60	55	61	56	62	57
285	87	55	47	56	51	56	52	57	52
286	102	55	47	55	50	56	51	57	52
287	128	52	45	52	48	53	48	54	49
288	136	47	40	47	43	48	43	49	44
289	169	47	40	47	42	48	43	49	44
290	166	52	44	48	44	49	45	50	46
291	209	50	42	50	45	50	46	51	47

Building #	Distance from the noise source	Baseline		2024		2028		2033	
		Day	Night	Day	Night	Day	Night	Day	Night
292	204	50	43	45	41	46	42	47	43
293	192	52	44	51	46	52	47	53	48
296	188	52	45	51	46	52	47	53	48
297	206	48	41	49	44	50	45	50	46
298	234	45	38	47	43	48	44	48	45
299	270	47	39	48	43	49	44	49	45
300	273	45	39	46	42	47	43	48	44
302	290	44	37	46	41	46	42	47	43
303	323	39	32	42	37	43	38	43	39
304	334	44	37	46	42	47	43	48	44
305	468	42	35	45	40	45	41	46	42
306	538	41	35	45	40	46	41	46	42
307	561	41	34	44	39	45	40	46	41
315	215	46	39	45	41	45	42	46	43
316	114	49	42	46	43	47	44	48	44
317	154	43	36	44	41	45	42	46	43
318	182	45	38	44	41	45	42	46	43
319	186	46	39	44	40	44	41	45	42
320	96	57	49	54	47	54	47	54	47
321	80	59	52	48	43	48	44	49	44
322	28	59	51	52	45	52	45	52	45
324	10	71	63	59	52	59	52	59	52

Building #	Distance from the noise source	Baseline		2024		2028		2033	
		Day	Night	Day	Night	Day	Night	Day	Night
325	62	44	37	50	44	51	44	51	45
326	53	57	49	44	40	45	40	45	40
327	11	74	65	60	53	60	53	60	53
328	12	70	61	54	47	54	47	54	47
329	46	60	52	48	43	48	44	49	44
330	93	51	45	45	40	45	41	45	42
331	53	64	58	58	53	58	54	58	55
332	112	51	44	50	43	50	43	50	44
333	50	59	51	47	42	48	43	48	44
334	149	49	42	47	41	47	42	47	42
335	98	53	46	45	41	46	42	46	42
336	13	68	60	54	47	54	47	54	48
337	11	68	60	54	47	54	47	54	47
338	25	64	56	50	43	50	44	50	44
339	12	69	61	55	48	55	48	55	48
340	221	54	47	54	47	54	47	54	47
341	205	56	48	56	48	56	48	56	49
342	243	44	38	42	38	43	39	43	40
343	258	43	37	42	39	43	40	44	40
344	272	42	35	39	35	40	36	40	37
Total Above IFC Guideline Limits		23	30	0	5	1	11	2	16

Figure 173: Receptors, Kobi (eastern portion)

Figure 174: Receptors, Kobi (western portion)

1202. Most of the properties in Kobi are within the IFC limits in 2024. In 2028 all properties in the eastern portion of Kobi are within the limits, but 11 are above the nightime limits in the western portion.

Addition of Noise Mitigation Measures

1203. Generic 4-meter-high noise barriers, located on the edge of the highway, were then added to the noise model at specific locations to determine the noise attenuation with the noise barriers. The tables and figures below show the results for each of the villages within the Project area.

1204. Cells in yellow are properties identified per the LARP, for physical displacement, green cells represent compliance with daytime and nighttime IFC guideline limits, blue cells represent compliant values within 3 dB of the ambient, light blue cells represent those receptors within 1 dB of the IFC guideline limits, orange cells represent receptors within 3 dB of the IFC guidline limits and red cells represent receptors more than 4 dB above IFC guideline limits.

Kvesheti Analysis

Table 148: Kvesheti Proposed Modelled Noise Barriers

Barriers		
Wall #	**Length (m.)**	**High (m.)**
1	70	4
2	140	4
3	180	4
4	200	4
5	180	4
6	400	4
7	165	4

Figure 175: Kvesheti Proposed Noise Barrier Locations

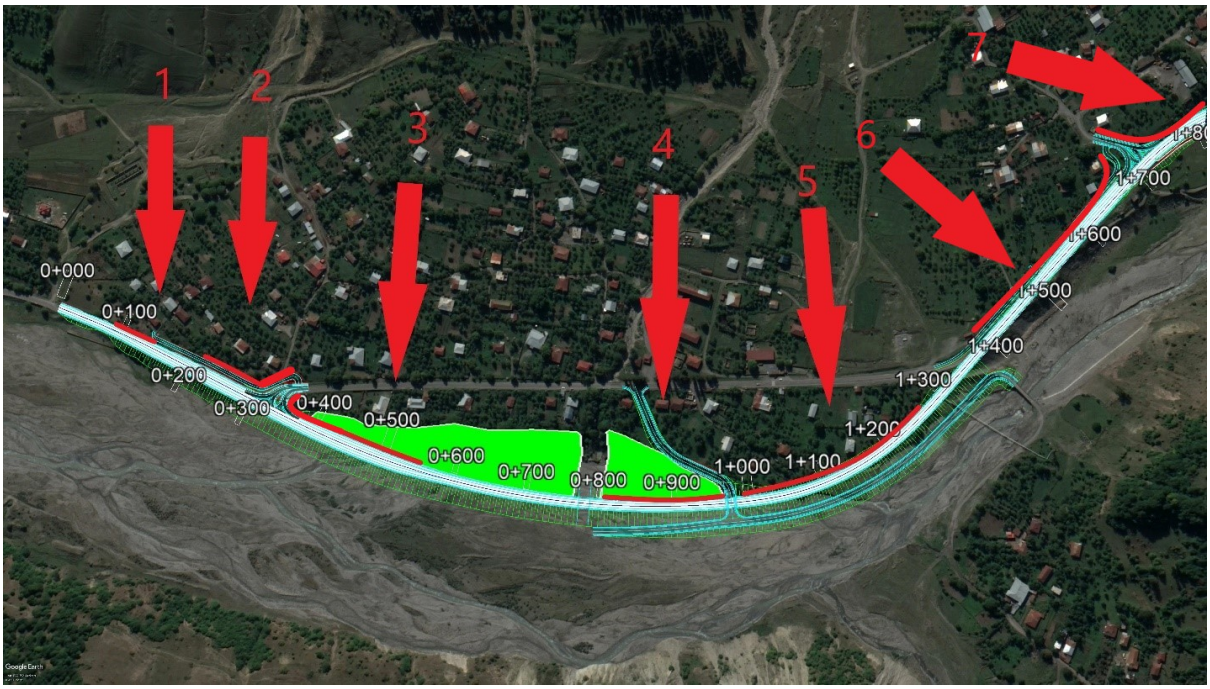


Table 149: Kvesheti Noise Model Results with Noise Barriers

Building #	Distance from the noise source	Baseline		2024		2028		2033	
		Day	Night	Day	Night	Day	Night	Day	Night
1	107	54	47	56	51	57	52	58	53
2	66	58	51	58	52	59	53	59	54
3	78	56	49	54	49	55	50	56	51
4	31	63	55	58	53	59	53	60	55
5	63	58	50	55	50	56	51	57	52
6	59	59	52	56	51	57	52	58	53
7	90	51	44	52	47	53	48	54	49
8	110	51	44	51	46	52	47	52	48
9	63	58	51	55	50	55	50	56	52
10	51	60	52	56	51	57	52	58	53
11	32	62	54	57	52	57	52	58	54
12	90	53	46	52	47	52	48	53	49
13	121	51	44	51	47	51	47	52	49
14	172	50	43	50	45	50	46	51	47
15	180	49	42	49	45	50	46	51	47
16	202	44	38	46	42	47	43	48	44
17	228	45	38	47	42	47	43	48	44
18	245	46	39	48	44	49	45	50	46
19	264	46	39	48	43	48	44	49	45
20	278	46	39	47	43	48	44	49	45
21	204	48	42	49	45	50	46	51	47
22	34	63	55	58	53	59	53	59	54

Building #	Distance from the noise source	Baseline		2024		2028		2033	
		Day	Night	Day	Night	Day	Night	Day	Night
23	89	54	47	53	49	54	50	55	51
24	140	51	44	51	47	52	47	52	49
25	170	45	39	47	43	48	44	49	45
26	222	42	36	47	44	48	45	49	46
27	268	41	35	45	41	46	42	46	43
28	321	45	39	47	43	48	44	49	45
29	294	43	37	47	43	48	44	49	45
30	35	64	56	57	51	58	52	58	53
31	26	64	56	57	51	57	51	57	52
32	116	52	45	51	47	52	48	53	49
33	137	48	41	49	45	50	46	51	47
34	180	46	40	49	45	50	46	51	47
35	149	48	42	49	45	50	46	51	47
36	239	45	39	48	44	49	45	50	46
37	305	46	40	48	44	49	45	50	46
38	349	43	38	47	42	47	43	48	44
39	385	46	40	46	42	47	43	48	44
40	340	45	39	47	43	47	44	48	45
41	300	47	41	49	44	49	45	50	46
42	291	47	41	48	44	49	45	50	46
43	334	44	38	46	42	47	43	48	44
44	305	47	40	47	43	48	44	49	45
45	277	47	41	48	44	49	45	50	46

Building #	Distance from the noise source	Baseline		2024		2028		2033	
		Day	Night	Day	Night	Day	Night	Day	Night
46	259	46	40	48	44	49	45	50	46
47	227	47	41	49	45	50	46	51	47
48	205	48	41	49	45	50	46	51	47
49	211	49	42	49	44	49	45	50	46
50	234	49	42	48	44	49	45	50	46
51	264	49	42	48	43	49	44	49	45
52	297	47	40	46	42	47	43	48	44
54	300	47	40	46	42	47	43	47	44
55	260	49	41	47	43	47	43	48	45
56	253	47	41	46	42	46	43	47	44
57	235	49	42	47	43	47	44	48	45
58	189	50	43	48	44	49	45	50	46
59	192	51	44	49	44	49	45	50	46
60	195	50	43	48	44	49	45	49	46
61	176	50	43	49	45	50	46	51	47
62	136	51	44	51	46	52	47	52	48
63	125	51	45	50	46	51	47	52	48
64	129	51	44	48	44	49	45	50	46
65	106	51	45	51	46	51	47	52	48
66	69	56	49	53	48	54	49	55	50
67	25	66	58	58	52	58	52	59	53
68	41	62	54	56	51	57	51	57	52
69	56	58	51	55	49	56	50	56	51

Building #	Distance from the noise source	Baseline		2024		2028		2033	
		Day	Night	Day	Night	Day	Night	Day	Night
70	48	61	53	56	50	56	51	57	52
71	49	61	54	56	50	56	51	57	52
72	45	62	54	56	50	57	51	57	52
73	104	53	46	52	47	52	48	53	49
74	103	53	46	52	47	53	48	53	49
75	133	51	44	51	46	52	47	52	48
76	139	51	44	51	46	52	47	52	48
77	169	49	42	50	45	50	46	51	47
78	172	48	42	50	45	50	46	51	47
79	23	67	59	58	53	59	54	60	55
80	17	66	58	59	53	60	54	60	55
81	17	68	60	60	54	61	55	61	56
82	17	67	59	59	53	60	54	61	55
83	18	67	59	59	53	59	54	60	55
84	21	58	51	59	54	60	54	61	56
85	16	66	58	58	52	58	53	59	54
86	21	65	57	57	51	57	52	58	53
87	20	62	54	56	51	57	51	58	53
88	21	66	58	55	50	56	51	57	52
89	69	53	46	56	50	57	51	58	52
90	22	66	58	55	48	55	49	55	50
91	100	49	43	54	48	55	49	56	50
92	78	52	45	53	48	53	49	54	50

Building #	Distance from the noise source	Baseline		2024		2028		2033	
		Day	Night	Day	Night	Day	Night	Day	Night
93	30	61	53	52	47	53	48	54	49
94	44	58	50	51	46	52	47	53	48
95	83	50	43	52	47	52	48	53	49
96	46	56	49	54	49	54	50	55	51
97	22	64	56	57	51	57	51	58	52
98	20	64	56	56	50	56	50	57	51
99	23	62	54	54	48	54	49	54	50
100	63	53	47	51	46	52	47	52	48
102	96	53	46	49	45	50	46	51	47
103	104	53	46	50	46	51	47	52	48
104	153	52	45	48	44	48	44	49	45
105	156	52	45	48	44	49	45	50	46
106	150	52	45	49	45	49	46	50	47
107	187	52	44	47	43	48	44	49	45
108	122	51	45	50	46	51	47	51	48
110	78	53	47	51	46	51	47	52	48
111	55	56	49	52	47	53	48	54	49
112	77	55	48	51	47	52	48	53	49
113	128	52	45	49	44	50	45	50	46
114	129	53	46	48	43	48	44	49	45
115	156	48	41	46	42	47	43	48	44
116	117	51	45	47	43	48	44	48	45
117	164	50	44	48	44	48	45	49	46

Building #	Distance from the noise source	Baseline		2024		2028		2033	
		Day	Night	Day	Night	Day	Night	Day	Night
118	215	46	40	47	43	47	44	48	45
119	258	45	39	46	42	47	43	47	44
120	276	42	36	45	41	45	42	46	43
1201	314	46	40	45	41	46	42	47	43
121	260	47	40	46	42	47	43	48	44
122	178	45	39	46	42	47	43	47	44
123	148	48	41	45	41	45	42	46	43
124	175	45	38	43	39	43	40	44	41
125	154	45	39	42	38	43	39	43	40
126	128	46	40	42	38	43	39	44	40
127	168	42	36	44	41	45	42	46	43
128	197	41	35	43	39	43	40	44	41
129	76	56	48	51	47	52	47	53	49
130	89	48	41	48	44	49	45	49	46
131	45	58	50	55	50	56	51	57	52
132	48	55	48	55	50	56	51	56	52
134	103	43	38	46	42	46	43	47	44
135	132	43	37	44	40	44	41	45	42
136	100	44	38	46	42	46	43	47	44
137	100	44	38	46	42	46	43	47	44
138	134	45	39	46	42	47	43	48	44
139	78	43	37	44	40	45	41	46	42
140	40	61	53	54	49	55	50	56	51

Building #	Distance from the noise source	Baseline		2024		2028		2033	
		Day	Night	Day	Night	Day	Night	Day	Night
141	26	64	56	57	52	57	53	58	54
Total Above IFC Guideline Limits (not including physically displaced building #95)		39	52	0	3	1	14	3	37

1205. The model results for Kvesheti are summarized as follows:

Table 150: Kvesheti Noise Results Summary

	Baseline	2024 Without Mitigation	2024 With Noise Barrier	2028 Without Mitigation	2028 With Noise Barrier
Properties predicted to be above IFC limits	53	28	3	59	14

1206. Incorporation of a noise barrier in the specified locations would ensure that all but three properties are below the IFC guidelines limits in 2024. However, by 2028 a total of 14 receptors would be above the IFC limits for nightime noise even with the proposed noise barriers. It is noted that 10 of these receptors only exceed the limit by 1 dB by this time. Without the noise barrier 59 receptors would be above the limit in 2028. Accordingly, all of the noise barriers are deemed beneficial even if some receptors are still above the IFC limits by 2028.

Arakveti Analysis

Table 151: Arakveti Proposed Modelled Noise Barriers

Barriers		
Wall #	**Length (m)**	**High (m)**
1	250	3

Figure 176: Arakveti Proposed Noise Barrier Locations

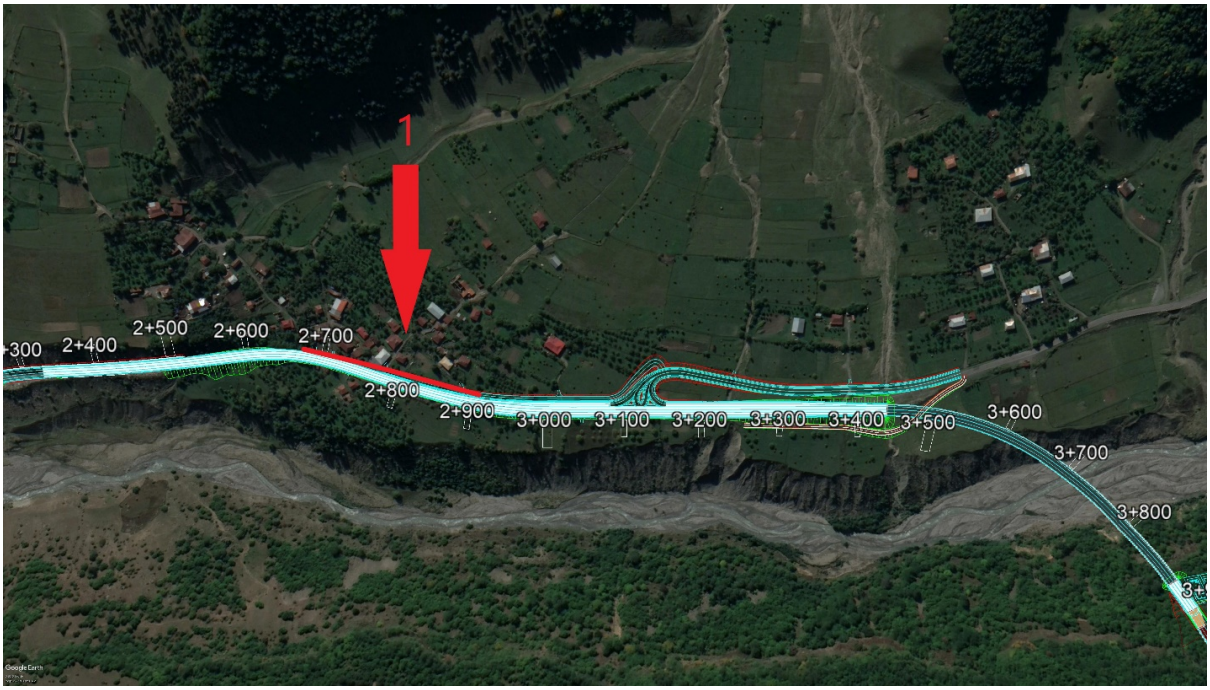


Table 152: Arakveti Noise Model Results with Noise Barriers

Building N	Distance from the noise source	Baseline		2024		2028		2033	
		Day	Night	Day	Night	Day	Night	Day	Night
142	80	50	46	48	44	49	44	50	45
143	182	49	45	48	43	48	44	49	44
144	178	49	44	48	43	49	44	49	45
145	160	49	45	48	44	49	44	50	45
146	141	50	45	49	44	49	45	50	46
1461	125	50	45	49	44	49	45	50	46
147	106	51	47	49	45	50	45	51	46
148	54	54	49	54	49	54	49	55	50
149	101	52	47	50	46	51	47	52	47
150	100	51	47	50	46	51	47	52	47
151	80	52	48	51	46	52	47	52	48
152	48	56	51	56	51	56	51	57	52
153	32	61	56	61	56	61	56	62	57
154	27	64	59	60	55	60	56	61	56
155	56	53	48	51	47	52	48	53	49
156	28	64	59	58	54	59	54	60	55
157	67	53	49	46	42	47	43	48	43
158	25	67	62	62	57	63	58	64	59
159	16	69	64	67	62	68	63	69	63
160	23	66	60	64	59	65	60	66	61
161	8	72	66	69	64	70	64	70	65

Building N	Distance from the noise source	Baseline		2024		2028		2033	
		Day	Night	Day	Night	Day	Night	Day	Night
162	42	57	52	51	47	52	48	52	48
163	20	69	64	63	59	64	60	64	60
164	25	64	59	54	50	55	50	56	51
165	27	64	59	56	51	57	51	57	52
166	47	57	52	51	47	52	48	53	48
167	66	52	48	48	44	49	45	50	45
168	96	51	47	47	43	48	44	49	44
169	82	53	49	49	45	50	45	50	46
170	106	51	47	47	44	48	44	49	45
171	93	50	46	49	45	50	46	51	47
172	68	56	51	51	47	52	47	53	48
173	32	64	59	58	53	59	54	59	54
174	44	62	57	59	54	59	55	60	55
175	102	53	49	53	50	54	50	55	51
176	132	48	44	52	48	52	49	53	49
177	198	46	42	49	45	50	46	51	47
178	236	48	45	49	45	50	46	51	47
179	183	50	46	52	47	52	48	53	49
180	78	59	54	59	54	60	55	60	56
181	103	57	53	59	54	59	54	60	55
182	104	58	53	58	53	59	54	60	55

Building N	Distance from the noise source	Baseline		2024		2028		2033	
		Day	Night	Day	Night	Day	Night	Day	Night
183	70	62	57	57	52	58	53	59	53
184	37	65	60	56	51	57	51	57	52
185	66	61	57	54	48	54	49	55	50
186	68	61	56	52	47	53	47	54	48
187	144	55	51	49	44	50	45	51	46
188	104	56	51	52	46	52	47	53	48
189	111	56	51	53	48	54	49	55	49
190	186	52	48	52	46	52	47	53	48
191	194	52	47	49	44	50	45	51	45
192	209	51	46	48	42	49	43	49	43
193	257	52	47	50	45	51	46	52	47
194	270	52	48	51	46	51	46	52	47
Total Above IFC Guideline Limits		25	46	0	1	0	2	0	2

1207. The model results for Arakveti are summarized as follows:

Table 153: Arakveti Noise Results Summary

	Baseline	2024 Without Mitigation	2024 With Noise Barrier	2028 Without Mitigation	2028 With Noise Barrier
Properties predicted to be above the IFC limits	46	2	1	3	2

1208. The situation in Arakveti by in 2028 is more straightforward. In general, the new road would see all but three receptors within IFC guidline limits by 2028. Inserting the noise barrier is beneficial for only one receptor and this is marginal (1dB above the IFC guidline limit), however, the noise barrier is still recommended in order to keep this receptor within the IFC limits.

Zakatkari Analysis

Table 154: Zakatkari Proposed Modelled Noise Barriers

Barriers		
Wall	**Length (m.)**	**High (m.)**
1	350	4

Figure 177: Zakatkari Proposed Noise Barrier Locations

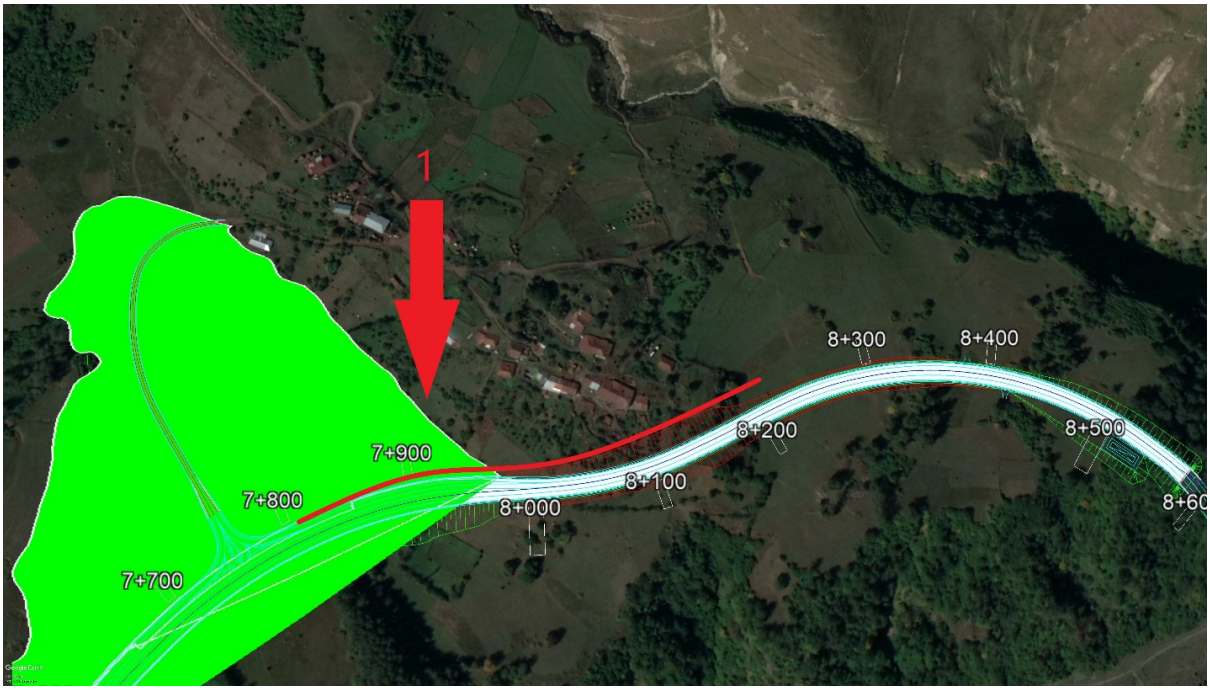


Table 155: Zakatkari Noise Model Results with Noise Barriers

Building #	Distance from the noise source	2024		2028		2033	
		Day	Night	Day	Night	Day	Night
195	215	46	41	47	41	48	42
196	274	46	41	46	41	47	42
197	244	46	41	47	42	48	43
198	236	46	41	47	41	47	43
199	171	45	40	46	41	47	42
200	210	44	38	44	39	45	40
201	204	44	39	45	40	46	41
202	126	46	42	47	42	47	43
203	133	47	42	48	43	49	44
204	113	47	42	48	43	49	44
205	122	49	44	49	44	50	45
206	129	47	40	47	41	47	42
207	55	47	41	48	42	49	43
208	110	46	41	47	41	47	42
209	84	45	41	46	42	47	43
210	40	42	38	43	39	44	40
211	43	41	37	41	38	42	39
Total Above IFC Guideline Limits		0	0	0	0	0	0

Note: As this location was rural baseline conditions are predicted to be equivalent to or below IFC guideline limits of 55dB (A) Day and 45dB(A) Night, therefore they have not been included in the table.

1209. The model results for Zakatkari are summarized as follows:

Table 156: Zakatkari Noise Results Summary

	2024 Without Mitigation	2024 With Noise Barrier	2028 Without Mitigation	2028 With Noise Barrier
Properties predicted to be above the IFC limits	9	0	11	0

1210. The noise barrier ensures that noise levels will be within IFC guidelines limits up to 2028. Noise barrier is recommended.

Sviana-Rostiani Analysis

Table 157: Sviana-Rostiani Proposed Modelled Noise Barriers

Barriers		
Wall	**Length (m)**	**High (m)**
1	300	2

Figure 178: Sviana-Rostiani Proposed Noise Barrier Locations

Table 158: Sviana-Rostiani Noise Model Results with Noise Barriers

Building #	Distance from the noise source	2024		2028		2033	
		Day	Night	Day	Night	Day	Night
271	225	46	40	46	41	47	42
272	217	45	40	46	40	47	42
273	204	45	39	45	40	46	41
274	196	42	36	43	37	44	38
275	176	46	40	46	41	47	42
276	163	47	41	48	42	49	43
277	194	47	42	48	42	49	43
Total Above IFC Guideline Limits		0	0	0	0	0	0

Note: As this location was rural baseline conditions are predicted to be equivalent to or below IFC guideline limits of 55dB (A) Day and 45dB(A) Night, therefore they have not been included in the table

1211. The model results for Sviana-Rostiani are summarized as follows:

Table 159: Sviana-Rostiani Noise Results Summary

	2024 Without Mitigation	2024 With Noise Barrier	2028 Without Mitigation	2028 With Noise Barrier
Properties predicted to be above the IFC limits	3	0	4	0

1212. In Sviana-Rostiani four out of seven receptors benefit from the proposed noise barrier. No receptors are above IFC guidline limits in 2028 with the noise barrier. The noise barrier is recommended.

Benian-Begoni Analysis

1213. No receptors are above IFC guidline limits during the operational phase. No noise mitigation is required.

Tskere Analysis

1214. No receptors are above IFC guidline limits during the operational phase. No noise mitigation is required.

Kobi Analysis

Table 160: Kobi Proposed Modelled Noise Barriers

Barriers		
Wall	**Length (m)**	**High (m)**
1	135	3

Figure 179: Kobi Proposed Noise Barrier Locations

Table 161: Kobi Noise Model Results with Noise Barriers

Building #	Distance from the noise source	Baseline		2024		2028		2033	
		Day	Night	Day	Night	Day	Night	Day	Night
271	219	49	41	51	46	52	46	53	47
272	10	67	59	70	65	71	66	72	67
273	18	65	57	64	58	65	59	65	60
274	31	64	55	63	56	64	57	64	58
275	44	51	43	54	47	55	48	55	49
276	50	54	46	54	48	55	48	55	49
277	23	71	63	69	61	69	62	70	63
278	44	56	49	53	47	54	48	55	49
279	17	66	58	63	56	64	57	65	58
280	72	55	48	46	40	47	41	48	42
281	82	55	48	46	40	47	41	48	42
282	111	52	45	50	46	51	47	52	48
283	53	60	52	54	49	54	49	55	50
284	52	59	52	53	48	54	49	55	50
285	87	55	47	53	48	54	49	55	50
286	102	55	47	53	48	54	49	55	50
287	128	52	45	51	47	52	47	53	48
288	136	47	40	46	42	47	42	48	43
289	169	47	40	46	41	47	42	48	43
290	166	52	44	46	41	46	42	47	43
291	209	50	42	49	45	50	45	51	46

Building #	Distance from the noise source	Baseline		2024		2028		2033	
		Day	Night	Day	Night	Day	Night	Day	Night
292	204	50	43	44	40	45	41	46	42
293	192	52	44	51	46	52	47	52	48
296	188	52	45	50	46	51	46	52	47
297	206	48	41	48	44	49	45	50	45
298	234	45	38	46	43	47	43	48	44
299	270	47	39	47	43	48	44	49	45
300	273	45	39	46	42	46	43	47	44
302	290	44	37	45	41	46	42	47	43
303	323	39	32	41	37	42	38	43	39
304	334	44	37	46	41	47	42	47	43
305	468	42	35	44	39	45	40	46	41
306	538	41	35	44	39	45	40	46	41
307	561	41	34	44	38	44	39	45	40
315	215	46	39	45	41	45	42	46	43
316	114	49	42	46	43	47	44	48	44
317	154	43	36	44	41	45	42	46	43
318	182	45	38	44	41	45	42	46	43
319	186	46	39	44	40	44	41	45	42
320	96	57	49	54	47	54	47	54	47
321	80	59	52	48	43	48	44	49	44
322	28	59	51	52	45	52	45	52	45
324	10	71	63	59	52	59	52	59	52

Building #	Distance from the noise source	Baseline		2024		2028		2033	
		Day	Night	Day	Night	Day	Night	Day	Night
325	62	44	37	50	44	51	44	51	45
326	53	57	49	44	40	45	40	45	40
327	11	74	65	60	53	60	53	60	53
328	12	70	61	54	47	54	47	54	47
329	46	60	52	48	43	48	43	49	44
330	93	51	45	45	40	45	41	45	42
331	53	64	58	58	53	58	54	58	55
332	112	51	44	50	43	50	43	50	44
333	50	59	51	47	42	48	43	48	44
334	149	49	42	47	41	47	42	47	42
335	98	53	46	45	41	46	42	46	42
336	13	68	60	54	47	54	47	54	48
337	11	68	60	54	47	54	47	54	47
338	25	64	56	50	43	50	44	50	44
339	12	69	61	55	48	55	48	55	48
340	221	54	47	54	47	54	47	54	47
341	205	56	48	56	48	56	48	56	49
342	243	44	38	42	38	43	39	43	40
343	258	43	37	42	39	43	39	44	40
344	272	42	35	39	35	40	36	40	37
Total Above IFC Guideline Limits		23	30	0	3	1	3	1	5

Table 162: Kobi Noise Results Summary

	2024 Without Mitigation	2024 With Noise Barrier	2028 Without Mitigation	2028 With Noise Barrier
Properties predicted to be above the IFC limits	5	3	11	3

1215. Noise barrier 1 is effective at reducing noise levels below IFC guideline limits in almost all cases. It is recommended. The church on the hill will be affected by elevated noise levels regardless of noise barrier heights or locations.

Model Conclusions

1216. The noise model identified 344 potential noise receptors within the Project corridor. The following table illustrates how many of the receptors in each village will be above the IFC guideline noise limits without mitigation measures and with a noise barrier as mitigation.

Table 163: Affected Receptors

# of receptors above IFC Guideline Limits	Kvesheti	Arakveti	Zakatkari	Sviana-Rostiani	Benian-Begoni	Tskere	Kobi	Total
2024 – **No Mitigation**	28	2	9	3	0	0	5	**47**
2024 – With Noise Barrier	3	1	0	0	0	0	3	**7**
2028 – **No Mitigation**	59	3	11	4	0	0	11	**88**
2028 – With Noise Barrier	14	2	0	0	0	0	3	**19**

1217. The model clearly shows that the modeled noise barriers will be beneficial at reducing noise levels to below acceptable standards for many receptors by 2028. However, a number of receptors will still be above the limits.

1218. In many instances (12 by 2028) the limits are only exceeded by 1 decibel which is not considered significant, and in but one of the cases this is during the nighttime period only where the more stringent 45 dBA limit is applied. Furthermore, it is also important to note that for six months of the year, night time temperatures will mean that windows are always closed at night and that many properties are not occupied for much of the year (see para 1229 – 1232 for further information), and it is also important to state that the margin or error in the model is assumed to be around 1dB.

1219. It is also a worthwhile exercise to examine other noise guidelines, including the UK Design Manual for Roads and Bridges, Volume 11 – Environmental Assessment (Highways Agency 2011). The guidelines indicate that in the short term, e.g. when a project is opened, a noise change of 0.1 – 0.9 dB is of negligible magnitude, 1.0 – 2.9 dB is of minor magnitude and 3.0 – 4.9 moderate magnitude. In the long term, typically 15 years after project opening a noise change of 0.1 – 2.9 dB is classified as negligible magnitude, and 3.0 – 4.9 dB as minor

magnitude. Given the above results, it can be suggested that an increase of 1 dB above the guideline limits would not be significant for the 12 identified receptors that are 1 dB above the IFC guidline limit by 2028.

1220. Given the above, it can be assumed that of the 19 receptors identified in the model that are above IFC guideline limits by 2018, that at least 12 of these receptors will only suffer minor noise impacts. Proposed mitigations for these 12 receptors are described below.

Mitigation and Management Measures

Planning

1221. The following plans will be prepared by the Contractor as part of his SEMP:

- **Noise Management Plan** – The plan shall provide details of mitigation measures, specific location and schedule where such measures shall be implemented to minimize impacts to sensitive receptors due to the presence of the camp, construction works, sourcing and transport of construction materials, and other project-related activities. Recommendations provided in the EIA must be considered.

1222. Other plans, prepared as part of the SEMP which will help reduce noise impacts include:

- **Labor and Working Conditions Management Plan**
- **OCHS Plan.**

Pre-construction and Construction Phase

1223. Correct siting of construction camps and ancillary facilities will reduce the potential for elevated noise levels to affect sensitive receptors. Locating these facilities more than 500 meters from residential or sensitive receptors should mean that the noise generated by these facilities will be lower than IFC daytime and night-time guideline limits at this distance. Locating these facilities more than 1km downwind of sensitive receptors will further limit potential noise impacts.

1224. During the construction phase the Contractor will be responsible for the following:

(i) Time and Activity Constraints, i.e., operations will be scheduled to coincide with periods when people would least likely be affected; work hours and work days will be limited to less noise-sensitive times. Hours-of-work will be approved by the Engineer having due regard for possible noise disturbance to the local residents or other activities. Construction activities will be strictly prohibited between 10 PM and 7 AM in the residential areas. When operating close to sensitive areas (within 250 meters) such as medical facilities, the Contractor's hours of working shall be limited to 8 AM to 6 PM;
(ii) Use temporary noise barriers while working in sensitive locations in case accidence of allowable limits is expected. Placing the barrier close to the source proves to be effective.
(iii) Give notice as early as possible to sensitive receptors for periods of noisier works such as excavation. Describe the activities and how long they are expected to take. Keep affected neighbors informed of progress.
(iv) Within normal working hours, where it is reasonable to do so:
    (a) schedule noisy activities for less sensitive times.
    (b) provide periods of respite from noisier works (for example, periodic breaks from jackhammer noise).
(v) The weekend/evening periods are important for community rest and recreation and provide respite when noisy work has been conducted throughout the week. Accordingly, work should not usually be scheduled during these times.
(vi) All mechanical plant is to be silenced by the best practical means using current technology. Mechanical plant, including noise-suppression devices, should be maintained to the

manufacturer's specifications. Internal combustion engines are to be fitted with a suitable muffler in good repair.

(vii) Maintenance tools, machines and equipment so that they are in good conditions. When some wrong is found, they must be fixed immediately in order to reduce noise from the equipment.

(viii) Fit all pneumatic tools with an effective silencer on their air exhaust port.

(ix) Install less noisy movement/reversing warning systems for equipment and vehicles that will operate for extended periods, during sensitive times or in close proximity to sensitive sites. Occupational health and safety requirements for use of warning systems must be followed.

(x) Turn off plant when not being used.

(xi) All vehicular movements to and from the site to only occur during the scheduled normal working hours, unless approval has been granted by the Engineer.

(xii) Keep good conditions of trucks that use to transport construction materials so they cause no loud noise and control the truck speed, to be not exceeded 40 km/hr when driving through communities, and not exceeded 80 km/hr when driving on highways.

(xiii) Where possible, no truck associated with the work should be left standing with its engine operating in a street adjacent to a residential area.

(xiv) Provision of noise protection kits such as ear plug, earmuff, for workers who are working in the area with noise level is higher than 85 dB(A). It is designated as a regulation that workers must wear protection kits in case of working in a noisy area.

(xv) Implement monitoring in sensitive locations to keep impact under control, check efficiency of mitigation measures and enable adaptive management (development of additional mitigation measures to reduce an impact, etc.); and

(xvi) Train staff in construction best practice.

Operation stage

1225. The following noise barriers are recommended based on the findings of the noise model:

Table 164: Recommended Noise Barriers

Location	Barrier Number	Length	Height
Kvesheti	1	70	4
	2	140	4
	3	180	4
	4	200	4
	5	180	4
	7	400	4
	7	165	4
Arakveti	1	250	3
Zakatkari	1	350	4
Sviana-Rostiani	1	300	2
Kobi	1	135	3

1226. During the pre-construction phase the Engineer shall also undertake further refined noise modelling to determine the specification and precise locations of the proposed noise barriers. This work will also serve to further reduce the number of properties predicted to be above IFC guideline limits for noise in 2028, as well as landscape impacts.

1227. Notwithstanding the above, the noise model presented in this EIA has shown that a maximum of 19 receptors will be impacted by noise levels elevated above IFC guideline limits

for noise in 2028 even with the incorporation of the noise barriers into the Project (this number may be reduced during the additional pre-construction refining of the noise model mentioned above). These receptors will require further investigation to establish the occupancy of the properties, and once established, for those properties that are occupied, alternative mitigation may be suggested as follows:

- **Resettlement** – The owner of the house will be given the option to relocate after selling their house to the RD. Their property will be included in the LARP.
- **Waiver** – An alternate to expropriation is that the property owner, despite the high noise, may want to stay in their house. In that case, a legally binding agreement will be executed between the RD and the receiver.

1228. The RD will be responsible for consulting with the remaining affected receptors to determine what option is preferable to the individual receptors. This activity shall be completed during construction and the results of the consultations shall be presented to the ADB for final review and approval. A corrective action plan will be prepared for the Project LARP during the construction phase to take into account any properties that may choose resettlement.

1229. The following mitigation measures have also been considered as part of the Project:

- **Speed Limits** –This option was ruled out by the RD as it has negative impacts on the economic benefits of the road.
- **Noise Proof Windows** – Installing noise proof windows at the affected receptor (Noise Protection Class 1) can reduce noise levels by 25-29 decibels inside the property. Noise Protection Class 2-5 can have even greater noise reduction effects.[156] This option does not meet IFC requirements for noise measured at the façade of the affected property, but is effective at reducing noise levels inside the property.
- **Low Noise Asphalt** – Low noise asphalt performance will deteriorate over a 7-8 year period and would require regular maintenance to be effective. As such this measure can not guarantee continued compliance through the Project lifecycle.

1230. Planning Zones and Noise – It is possible that the population of the villages through which the Project road passes will expand in the future as growth in Georgia continues. If the population of the villages does increase homes could be constructed in areas where noise levels will increase above IFC standards for daytime and nightime noise as a result of increased traffic on the new road. WHO indicate that noise levels above 55 dBA for the daytime and 45 dBA for the nightime can lead to negative health impacts [157] and as such constructing residential properties in areas with high noise levels could have a detrimental impact on people's wellbeing.

1231. It is therefore considered prudent for the GoG to develop planning restrictions for residential buildings and other sensitive receptors where elevated noise currently exists or is anticipated due to traffic noise.

1232. The noise model has identified areas where noise levels are likely to be above the 45 / 55 dBA limits in 2033, but the model does not show the year that the limits will be reached. Discussions have been held with the RD regarding the issue of planning restrictions based on road noise, however, the RD do not have any experience of implementing such measures on other road Projects and no mechanism exists within the GoG planning framework to implement such measures.

1233. Other countries, such as the UK have prepared guidelines which direct the planning process. Specifically, the Uks Planning Policy Guideline Note 24 – Planning and Noise, provides noise exposure categories for new dwellings. Four categories are provided in the guidelines:

[156] Based on German Standard DIN 4109.
[157] Guidelines for Community Noise, WHO.

- Category A – Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as a desirable level. Nightime noise not exceeding 45 dBA, daytime noise not exceeding 55 dBA.
- Category B – Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection against noise. Nightime noise between 45-57 dBA, daytime noise between 55-63 dBA.
- Category C – Planning permission should not normally be granted. Where it is considered that permission should be given, for example because there are no alternative quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise. Nightime noise between 57-66 dBA, daytime noise between 63-72 dBA.
- Category D – Planning permission should normally be refused. Nightime noise greater that 72 dBA, daytime noise greater than 66 dBA.

1234. As an example, if in the future a development of houses was planned close to the Project road in Kvesheti it is possible that the development would fall within Category B. This would mean that the RD would need to consider potential noise mitigation measures on the road in this location or that planning restrictions would be placed on the development, e.g. ensuring that non-sensitive land uses, such as garages, are placed closer to the noise source to act as a noise barrier.

1235. Similar planning guidelines could be prepared for Georgia and would help limit potential future health impacts arising from road Projects across the country. It is therefore recommended that the RD coordinates with the MRDI to establish a set of planning guidelines for noise that can be applied during the operational phase of the Project.

Residual Impacts

Impact Significance before Mitigation	***Assessment of impacts after Mitigation / Management Measures Implemented***	***Residual Impact Significance after Mitigation***
Construction Phase		
Medium	*Despite the fact that comprehensive mitigation measures have been set to manage construction noise there may still be instances where construction works may result in unanticipated elevated noise levels. However, these will only be temporary and localized. Good oversight from the Contractors HSE team and the Engineers environmental manager should limit the impact of these types of incidents.*	***Minor***
Operational Phase		
High	*Residual impacts will be minor for all of the identified receptors if the noise barriers are constructed and the remaining 19 receptors are resettled. However, some property owners may choose to sign the waiver agreement and remain in their homes. These properties may be subject to elevated noise levels above IFC limits in the future, and for these receptors residual impacts will remain throughout the lifecycle of the Project, although in many instances limits will only be breached by 1-3 decibels which is considered to be of minor magnitude. Residual impacts will be low / medium due to the potential resettlement aspect.*	***Low / Medium***

F.8.6 Vibration

Potential Impacts

1236. The following table summarizes the key potential vibration impacts indicates the potential significance of the impacts using the methodology outlined in Section F.2.

Table 165: Impact Screening – Vibration

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	Damage to properties and PCR caused during blasting and piling.	Nearby communities / PCR	L	H	H	H	MAJ	H/F	SMALL	HIGH	DEF	H
O	Damage to properties and PCR from vehicle movement vibration.	Nearby communities / PCR	L	M	L	L	MIN	MT	SMALL	LOW	UNL IKE	L

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely
Cells shaded in blue are positive impacts.

1237. These identified potential impacts are described in more detail below.

Pre-Construction / Construction Phase

1238. Ground-borne vibration is the oscillatory motion of the ground about some equilibrium position, and can be described in terms either of displacement, velocity or acceleration. Because human sensitivity to vibration typically corresponds best to the amplitude of vibration velocity within the low frequency range of most concern (roughly 5- 100 Hertz), vibration velocity is the preferred measure for evaluating ground-borne vibration from transit projects.

1239. Vibration from the construction activities is a cause concern to the community. The effects of vibration vary and depends on the magnitude of the vibration source, the particular ground conditions between the source and receiver, presence of rocks or other large structures in the area. The intensity, duration, frequency and number of occurrences of a vibration all play an important role in both the annoyance levels caused and the strains induced in structures.

1240. The effects of vibration include annoyance, sleep disturbance, and potential damage to structures.

1241. In order to assess the potential impacts of construction vibration in the Project area a vibration model was prepared that considers structural damage (see **Appendix P** for the full model). Table 166 summarizes the results of the modeling at various distances from the source, in particular, the amplitude of vibration generated by the most impacting source (hammer and compactor) and the Damage Thresholds (that is the threshold for minimum damage not threatening structural integrity) according to the considered standards (DIN 4150-3).

1242. It should be stressed that at this stage, it is difficult to calculate exactly how much the vibration will exceed the admissible level. This depends on the equipment and technologies to be used during the drilling of tunnels and bridges (the level of vibration caused by explosion is directly proportional to the charge of explosion). The model uses a variety of assumptions which are discussed in the Vibration Survey and Modelling Report.

Table 166: Summary of the simulated amplitude of vibrations at the receivers, compared with Standards (DIN 4150-3) – construction works

#	Distance from the Road (m)	Source		Receiver Level Vibration		Standard Threshold DIN 4150-3		
				roller compactor	pneumatic hammer			
		Roller Compactor (dB)	Pneaumatic Hammer (dB)	building	building	category 2 long – duration (dB	category 3 short duration (dB)	category 3 long duration (dB)
1	5 m from source	104.00	101.00	91.04	88.04	105.00	100.5	99.00
2	10 m from source	104.00	101.00	81.09	78.09	105.00	100.5	99.00
3	15 m from source	104.00	101.00	79.96	76.96	105.00	100.5	99.00
4	20 m from source	104.00	101.00	77.98	74.98	105.00	100.5	99.00
5	25 m from source	104.00	101.00	75.67	72.67	105.00	100.5	99.00
6	30 m from source	104.00	101.00	73.40	70.40	105.00	100.5	99.00
7	50 m from source	104.00	101.00	62.12	59.12	105.00	100.5	99.00
8	80 m from source	104.00	101.00	55.49	52.49	105.00	100.5	99.00
9	150 m from source	104.00	101.00	49.12	46.12	105.00	100.5	99.00
10	300 m from source	104.00	101.00	43.12	40.12	105.00	100.5	99.00

1243. The analysis of the data reported in the above tables shows that, along the route, the level of vibration evaluated in terms of speed of vibrations, is lower than the thresholds assigned for residential buildings and historic buildings. Accordingly, the expected level of vibrations caused by the new road construction will not result in any structural damage to the considered buildings with possible exception of one identified residential property in Kvesheti, 10 m from the road. With its physical properties, the house belongs to the 3rd category (Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Lines 1 or 2 and have intrinsic value (e.g. buildings that are under a preservation order)). The vibration affecting this building will be within the guideline values, but close to the admissible level. However, it is noted that this house is a 'ruin' and is not currently occupied.

1244. In addition to the above activities, Table 167 shows, for demonstration purpose only, the potential impact produced by drive piling (with the vibration impact produced by a safe piling solution – drill piling). In addition, the vibration propagation modeling during the tunnel laying by using explosives is given.

Table 167: Summary of the simulated amplitude of vibrations at the receivers, compared with Standards (DIN 4150-3) – construction works

#	Distance from the Road (m)	SOURCE		RECEIVER LEVEL VIBRATION		STANDARD THRESHOLD DIN 4150-3		
				Pile Driver	Tunnel laying by using explosives			
		Pile Driver	tunnel laying by using explosives	main building	main building	category 2 long – short duration (dB)	category 3 short duration (dB)	category 3 long duration (dB)
1	5 m from source	123.00	120.00	113.01	110.01	105.00	100.5	99.00
2	10 m from source	123.00	120.00	112.32	109.32	105.00	100.5	99.00
3	15 m from source	123.00	120.00	110.21	107.21	105.00	100.5	99.00
4	20 m from source	123.00	120.00	109.52	106.52	105.00	100.5	99.00
5	25 m from source	123.00	120.00	107.23	104.23	105.00	100.5	99.00
6	30 m from source	123.00	120.00	106.22	103.22	105.00	100.5	99.00
7	50 m from source	123.00	120.00	97.12	94.12	105.00	100.5	99.00
8	80 m from source	123.00	120.00	88.02	85.02	105.00	100.5	99.00
9	150 m from source	123.00	120.00	83.01	80.01	105.00	100.5	99.00
10	300 m from source	123.00	120.00	77.01	74.01	105.00	100.5	99.00

1245. Piling works are planned in the bridge construction phase. Only two bridges are located close to residential areas, Bridge 1 and Bridge 2, both in Arakveti. Bridge 1 is a small span bridge of 27 meters, the closest property is approximately 100 meters from the bridge site (see Figure 180). Bridge 2 crosses the Tetri Aragvi river via a 435m bridge, the closest property to the first bridge pier is more than 100 meters away (see Figure 181). The bridge located to the east of Sviani Rostiani is located more than 150 meters from the village. Given the above and the numbers outlined in Table 167 it is considered unlikely that structural damage will be caused by the piling works to properties in the Project area.

Figure 180: Bridge 1

Key:

100 m buffer

Nearest Property

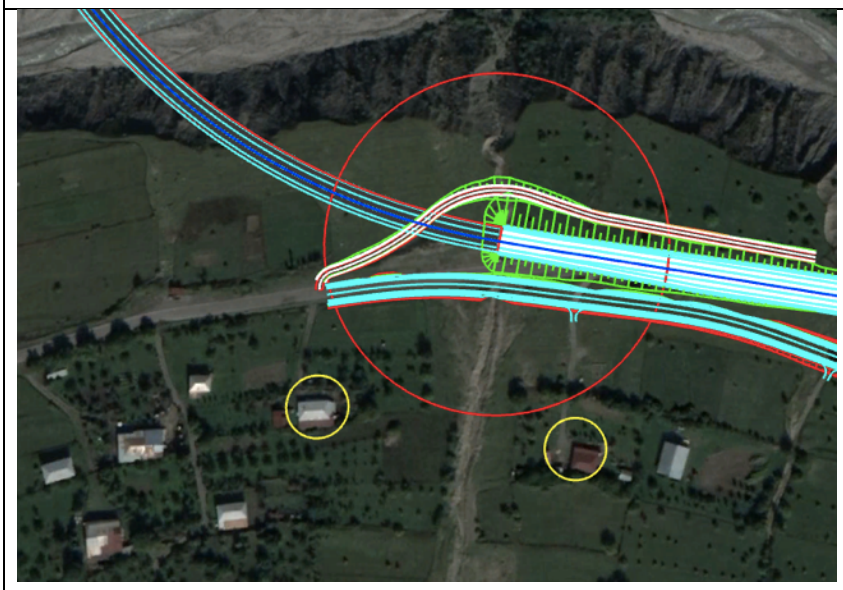


Figure 181: Bridge 1

Key:

100 m buffer

Nearest Properties

1246. Regarding tunneling, for Tunnel 5 TBM is assumed and NATM for the emergency gallery. Most of the village of Tskere is located within 100 meters of the main tunnel and within 120 meters of the emergency gallery (see Figure 182). Some properties are within 30 meters of the cut and cover section and some within 60 meters of the emergency gallery.

Figure 182: Tskere

Key:
Yellow Line: Approx. 50 m buffer from Main Tunnel
Green Line: Approx. 100m buffer from Main Tunnel

1247. Despite the calculations provided by the vibration model and shown in Table 167 other recent projects undertaken in Georgia have indicated that for tunnel blasting a safe distance of about 100-110 m from blasting point has to be considered for cosmetic damages and a distance of 60-65 m for structural damages. For mechanical tunneling and TBM a safe distance of 20-25 m can be assumed for structural damage. [158] Accordingly, to be prudent it should be considered that the properties in Tskere within 100 meters of blasting activities are at risk of cosmetic damage and properties within 60 meters of blasting activities are at risk of cosmetic damage. No other properties are located within 100 meters of the other Project tunnels.

1248. As noted in **Section E.4.5.1 – Physical Cultural Resources**, a number of cultural and historical structures are located within the Project Area. Table 166 indicates that no structural damage to Category 3 buildings from general construction works (compactor roller and pneumatic hammer) is anticipated, even within 5 m of the work sites (the ruin in Kvesheti is excluded from further analysis). One site (#23) has been recorded within 2m of an access road to the interchange on Begoni Plateau. This could potentially be impacted by construction vibration, e.g. by roller compaction, however it is noted that these are remains of a tower and therefore no collapse of the tower is anticipated. Nonetheless mitigation measures for this site are outlined below.

1249. For blasting, a safe distance of about 100-110 m from blasting point should be considered for cosmetic damages and a distance of 60-65 m for structural damages.

[158] Section F2 of the Khevi-Ubisa-Shorapani-Argveta Road (E60 Highway) EIA. 2018

1250. The following table indicates the PCR identified within 110 meters of the Project road and their proximity to any piling sites / tunnel excavation areas.

Table 168: PCR Locations

Ref #	Name	Distance from Road (m)	Distance from Bridge / Tunnels sites (m)
24	Niche (Jvarkhati)	45	>200 (Bridge)
26	War Monument	22	100 (Bridge)
27	Remains of a Tower	103	103 (Tunnel, Cut and Cover)
23	Remains of a Tower	95 (from main road), 2 from access road	80 (to interchange)
16	Naraidze Tower	89	89 (Tunnel 5 TBM)
17	Zakaidze Tower	57	57 (Tunnel 5 TBM)
18	All Saint Church, Tskere	79	79 (Tunnel 5 TBM)
2	Tower	50	>200 (Tunnel)

1251. As shown in Table 168, only one site (highlighted in red) is located within 65 m of the potential zone if influence for structural damage and four within 100 meters of the potential zone of influence for structural damage (highlighted in orange). One site has also been identified within 2 m of the access road of the Begoni Interchange – this site and proposed mitigation measures are discussed below under **Section F.8.7 – PCR**.

1252. Notwithstanding the above, the Projects Cultural Heritage Monitor may, during the course of the Construction works, identify additional sensitive sites. In the even that additional sites are confirmed that may be impacted by Project works they will be added to **Construction Vibration Management Plan** and mitigation and monitoring measures prepared for these sites.

Operational Phase

1253. Highway traffic is not likely to have any measurable impact on the structures or on comfort. The Federal Highway Administration of the USA has determined that "All studies the highway agencies have done to assess the impact of operational traffic induced vibrations have shown that both measured and predicted vibration levels are less than any known criteria for structural damage to buildings. In fact, normal living activities (e.g., closing doors, walking across floors, operating appliances) within a building have been shown to create greater levels of vibration than highway traffic." [159]

Mitigation and Management Measures

Construction Phase

1254. To manage the potential vibration issues the following procedures have been developed which must be followed by the Contractor.

1255. Condition Surveys – Not later than 28 days before the commencement of construction works, the Contractor and the Engineer will carry out joint condition surveys of all buildings within 25 meters of the road alignment that, in the opinion of the Engineer might be affected by vibration resulting from the Contractor's construction operations (approximately 40 properties, mainly in Kvesheti and Arakveti and a few in Tskere) – this will also include all of the PCR sites

[159] http://www.fhwa.dot.gov/environMent/noise/regulations_and_guidance/analysis_and_abatement_guidance/polguide09.cfm

listed above. The surveys shall be conducted in the presence of and with the permission of the property owners (and with representatives of the Ministry of Culture and Sport for PCR sites). The findings of the building condition surveys shall be recorded in the reports that shall contain the following information, as a minimum:

- Building address and location;
- A description of the building condition and any cosmetic and/or structural damage;
- Sketches and photographs showing the location and extent of any damage;
- High resolution video recordings of the surveyed buildings; and
- Verification of the report by the building owner (and MoCS).

1256. Construction Vibration Management Plan – Within 28 days of the Commencement Date, the Contractor shall submit to the Engineer for review and approval a written **Construction Vibration Management Plan** (CVMP) detailing the procedures for vibration monitoring and control. Such details shall include:

- Measurement locations and methods;
- Method statements for works likely to induce vibrations, including programs of trial construction sections to determine the likely magnitude of vibrations at defined distances from the vibration source, in sufficient detail for the contractor to develop a final method for constructing the works without excessive vibration;
- Method statements for the management of all PCR sites identified above. Specifically, the plan shall outline the measures to ensure that vibration levels are minimized at site #17, Zakaidze Tower;
- Description of the instrumentation and equipment to be used;
- Copies of the instruction manuals and the laboratory calibration and test equipment certification;
- The resumes of the vibration monitoring technical support personnel, sufficient to define details of relevant experience;
- Procedures for data collection and analysis;
- Frequency of measurements;
- Means and methods of providing warnings when the specified construction vibration limits are reached; and
- Action plans to be implemented in the event the specified construction vibration limits are reached. The generalized plans of action shall comprise the positive measures by the Contractor to control vibrations using alternative construction methods.

1257. Vibration Monitoring – The Contractor shall establish a vibration monitoring and control system in accordance with the CVMP approved by the Engineer, and measure vibrations resulting from its construction operations at predetermined points, in accordance with the CVMP.

1258. The Contractor shall monitor vibration during significant vibration-producing construction activities as determined by the Engineer. This monitoring shall consist of a continuous recording of the maximum single-component peak particle velocities for one-minute intervals. During the monitoring, the Contractor shall document all events that are responsible for the measured vibration levels and submit the documentation to the Engineer.

1259. All vibration monitoring data shall be recorded contemporaneously and plotted continuously on a graph by the data acquisition equipment. Each graph shall show time- domain

wave traces (particle velocity versus time) for each measurement location with the same vertical and horizontal axes scale.

1260. At a minimum continuous monitoring shall be undertaken at all of the PCR sites within 110 m of works sites as identified in Table 168 or by the Cultural Heritage Monitor.

1261. At the end of each work day, after blasting works are completed in areas within 100 m of PCR sites the Engineers Cultural Heritage Monitor Shall undertake a visual inspection of each site to determine the extent of any damage to the sites. If damage is identified, works in the area shall cease until the Contractor has contacted the MoCS to inform them of the damage and an action plan has been developed to repair any damage and ensure no further damage to the site.

1262. Claims for Construction Vibration Damages – Claims for damage caused by vibration shall be handled through the Project Grievance Redress Mechanism (GRM), which is described in **Section H.5 – Grievance Mechanism.**

1263. Alternative Construction Methods – Where the results of the vibration monitoring show that the specified construction vibration limit is reached at a particular location, the Contractor shall suspend the construction activities that generate the excessive vibration at such location, notify the Engineer and with the approval of the Engineer take mitigative actions necessary to keep the construction vibration within the specified limit. This may, for example include:

- The use of low roller vibration settings and performing compaction without vibration.
- Adjust TBM tunneling speeds and periodicity should the vibration monitoring indicate excessive vibrations;
- Select charge and delay time in drill and blast tunnels so to avoid excessive vibration; and
- Provide temporary vibration barriers in sensitive locations.

1264. Regarding blasting:

- Blasting will be scheduled during the day only.
- Local communities will be informed of blasting timetable in advance and will be provided adequate notice of when blasts are required outside of the planned schedule.
- Throughout the blasting activity, if required, vibration sensors will be installed at strategic locations to monitor the impact of blasting and to ensure that the vibration levels are within the adopted criteria. The monitoring plan will be part of the **Blasting Management Plan**.

Operational Phase

1265. Highway traffic is not likely to have any measurable impact on the structures or on comfort. However, with time, due to wear and other environmental factors, the road surface will develop defects, most of which (e.g. bumps) are the cause of vibration. The road surface quality should be regularly monitored to prevent and fix in timely and sustainable manner the defects that in turn cause increase in vibration caused by traffic load on the new road. Adequate resources should be allocated for maintenance of the new road segment of the new road and all maintenance works should be conducted preventively or swiftly as the damage occurs.

Residual Impacts

Impact Significance before Mitigation	***Assessment of impacts after Mitigation / Management Measures Implemented***	***Residual Impact Significance after Mitigation***
Construction Phase		
High	*Real time monitoring of sensitive sites and implementation of the procedures outlined above including measures to review and change construction methods based on monitoring results during construction*	***Minor***

Impact Significance before Mitigation	***Assessment of impacts after Mitigation / Management Measures Implemented***	***Residual Impact Significance after Mitigation***
	should ensure that no significant impacts from vibration are anticipated during the Construction phase.	
Operational Phase		
Low	*No residual impacts from vibration are anticipated if adequate maintenance of the road is provided.*	***Minor***

F.8.7 Physical Cultural Resources

Potential Impacts

1266. The following table summarizes the key potential impacts to PCR the potential significance of the impacts using the methodology outlined in Section F.2.

Table 169: Impact Screening – PCR

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	Damage to PCR caused during construction.	PCR site and its users	L	H	H	-	MOD	M/F	SMALL	MED	POSS	M
O	Effects to PCR in terms of elevated noise, dust, etc.	PCR site and its users	L	M	H	-	MOD	MT	SMALL	MED	UNLIKE	L

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely
Cells shaded in blue are positive impacts.

1267. These identified key potential impacts and other minor impacts are described in more detail below.

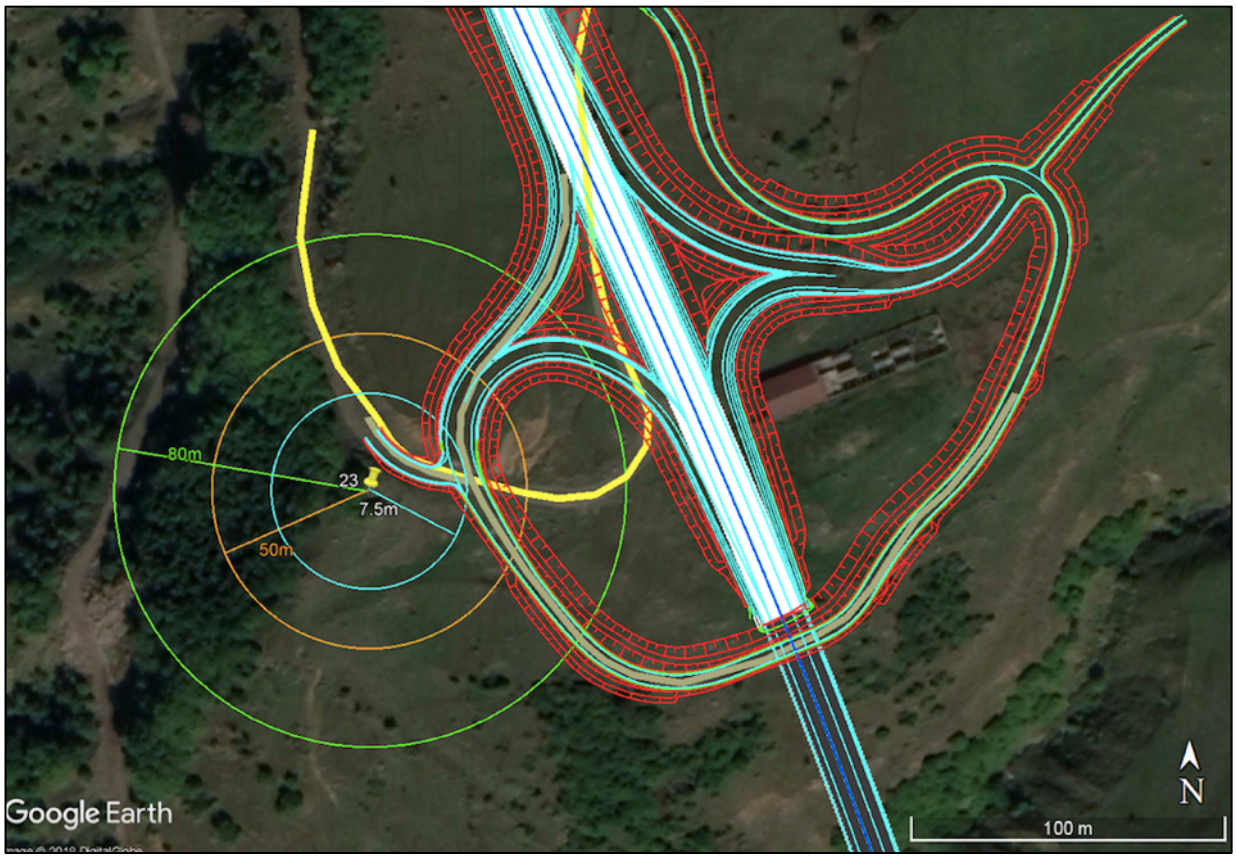
Pre-construction / Construction Phase

1268. The project alignment has been selected to bypass monuments identified in the area as far as feasible. According to the register of the cultural heritage monuments (source: Cultural Heritage Protection Agency data) most of the monuments do not have protection status. However, keeping in mind the sensitivity of the sites, in order to avoid any damage a physical protection zone of not less than 50m (that as indicated in the law of Georgian on Cultural Heritage (document registration code 450.030.000.05.001.002.815)) has been observed in the design. The exceptions are:

- Site #23, located 79m from the road embankment, but close to the interchange slip road (2 meters – see Figure 183).
- The Niche in Kobi, Site #24, which is 45 meters from the existing road.
- Cross, Site #9, on the road alignment.

- Site #2, a tower located on the Plateau, close to the border with spoil disposal site LFR-5.8. In this area a small mound of remains of a stone structure can be noted along with remains of stone masonry in several locations.
- Cemetery in Kobi, Site #1. Impact on the cemetery is not expected, however, the Contractor must consider the presence of the site while panning of works. In case deemed advisable by the Engineer, the site must be fenced to avoid accidental damage.
- Cemetery in Tskere, Site #3, adjacent to the alignment. Special measures have been considered in the design resulting from informal consultations with villagers (see **Section 4.5 – PCR**). Protection measures, e.g. fencing of the site, and careful management of construction works will be required in this section of alignment to avoid impact.
- Mineral outcrop located close to Path 1 in the Khada Gorge.

Figure 183: Location of Site #23



1269. Construction works, and project related traffic may have direct (accidental) or indirect impact on these identified sites.

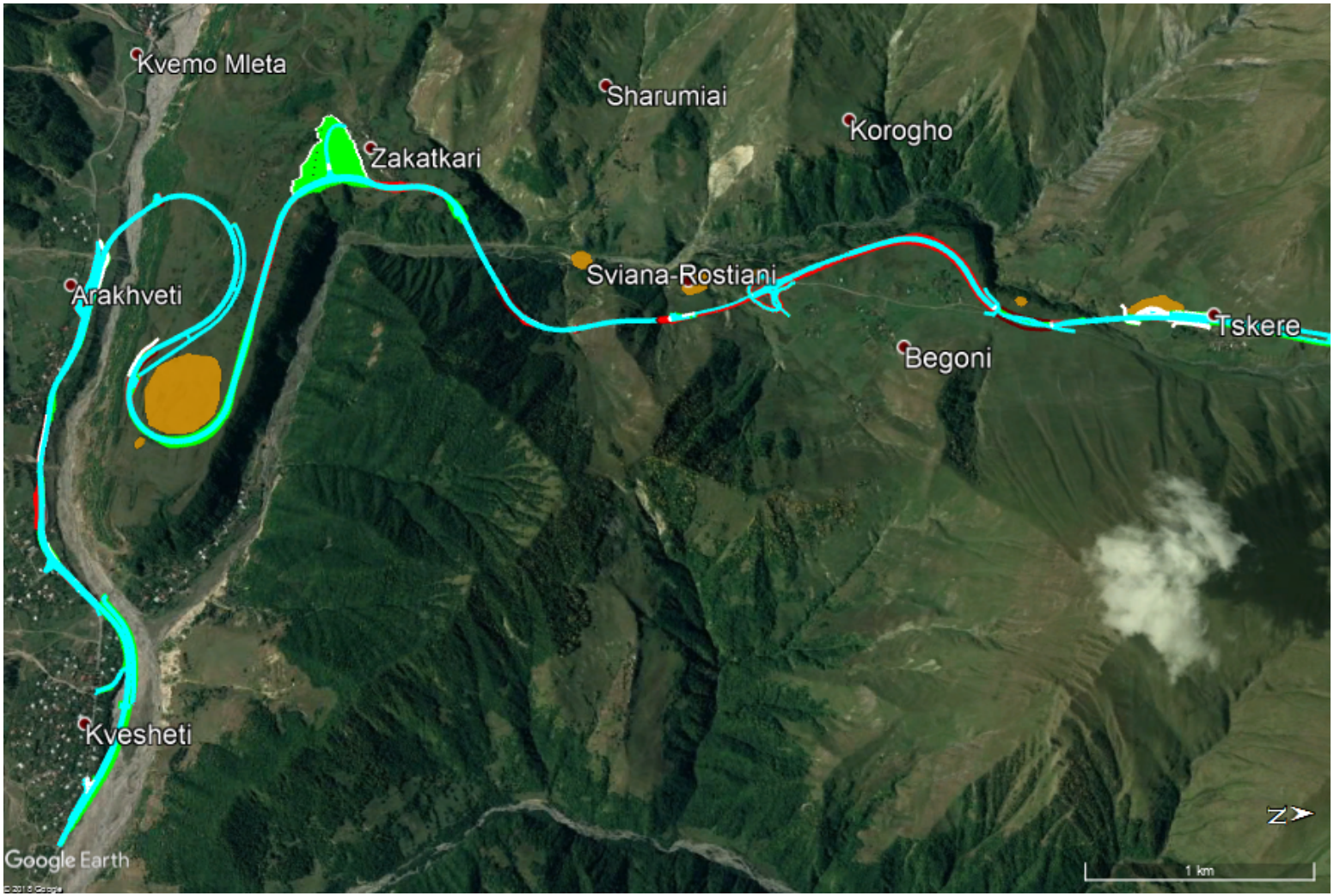
1270. The presence of a sacred forest around the church located on the top of the hill adjacent to the northern portal in Kobi (see Figure 129, site #25) is to be taken into account. Even though the project does not affect the area the boundaries of the site it must be preserved.

1271. Potential impacts could also occur if the Contractor decides to use spoil disposal area SDL-22.3 which wraps around a War Monument (#23). Mitigation measures have been provided above for this site (see **Section F.7.5 – Spoil Material**), including fencing of the area during the works period.

1272. Particular attention shall also be paid to the impact of vibration. Keeping in mind that the monuments are built without mortar they are particularly sensitive to vibration impact. Control and mitigation measures are described in **Section F.8.6 – Vibration**.

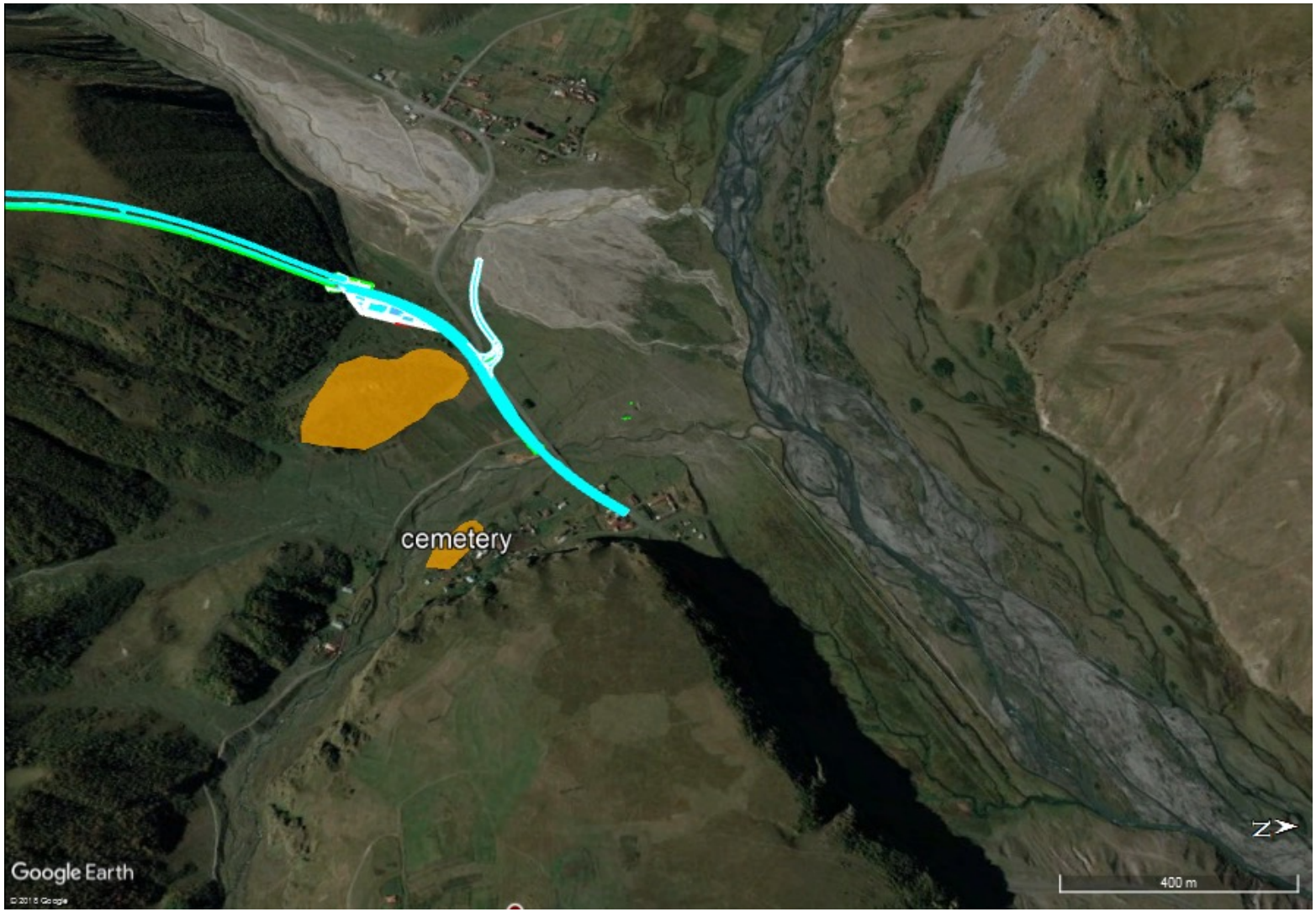
1273. In addition to the above, keeping in mind the history of the region and presence of architectural monuments (mainly towers), the probability of additional archaeological finds exists. The potentially sensitive sites where such finds may occur are shown below.

Figure 184: Potentially Sensitive PCR Sites (Kvesheti side)



Key: Blue line: Project Road / Brown Sites: Potentially Sensitive PCR Sites / Green Areas: Potential Spoil Disposal Sites

Figure 185: Potentially Sensitive PCR Sites (Kobi side)



Key: Blue line: Project Road / Brown Sites: Potentially Sensitive PCR Sites / Green Areas: Potential Spoil Disposal Sites

Mitigation and Management Measures

Planning

1274. The following plans and procedures will be prepared by the Contractor as part of his SEMP:

- **Cultural Heritage Management Plan** – will be prepared that includes the five-phase strategy for the progressive assessment and mitigation of the effects of construction (see **Appendix N**).
- **Chance Find Procedure** – an example of which can be found in **Appendix E**.

Pre-construction and Construction Phase

1275. During the pre-construction and construction phase of the Project the Contractor shall apply the following overarching commitments:

- Prevent damage and promote preservation of cultural heritage objects / sites.
- Suspend activity if chance finds are suspected.
- Cooperate with the Engineer and RD on Chance Finds
- Provide site supervision including H&S, labor, tools, equipment (including mechanical excavator as required by Engineer), facilities and attendances to chance find excavations
- Provide and install any identified measures such as bog mats over archaeological sensitive areas, demarcation of cultural heritage sites to be avoided (see list below), or other measures to assist the preservation of PCR. This will be in areas to be determined by the **Cultural Heritage Monitors** (see below for details).
- Reporting of Chance finds.

1276. More specifically, the Contractor will ensure:

- Implementation of the **Cultural Heritage Management Plan**.
- Areas of potential cultural heritage impact (identified above in Figure 184 and Figure 185) will be examined, and any necessary excavations conducted prior to construction.
- Monitoring of vibration sensitive locations as determined by this EIA.
- Archaeological sites identified during construction will be archaeologically recorded by the Cultural Heritage Monitors.
- Pre-construction works to evaluate, and record known archaeological sites will be agreed with the Ministry of Culture and Sport.
- A program of archaeological surveillance (watching brief by the Cultural Heritage Monitor) will be implemented during topsoil stripping of work sites, the facility sites, construction camps and equipment lay-down areas and ancillary areas, spoil disposal sites, and those areas identified above in Figure 184 and Figure 185. The Engineer will be empowered to temporarily stop works, pending archaeological examination, if artefacts are found.
- If archaeological artefacts or structures are found, archaeological advice will be sought from Georgian National Museum and the Ministry of Culture and Sport, and the Chance Finds Procedure followed.
- The Cultural Heritage Monitor conducting the watching brief will advise on procedures to be followed by the construction supervisor in line with the Chance Finds Procedure.

- If works cannot easily be adjusted to avoid damaging the feature, construction activities will be suspended at the site until the excavation and recording required by the authorities has been carried out.
- Known archaeological sites within 50m of the road centerline or other construction activity (e.g. access roads, spoil disposal sites) will be demarcated throughout construction, e.g. fencing, barriers and/or signage.
- Issues relating to archaeological awareness (such as ownership of finds, notification of finds and protection of archaeological sites) will be included in induction training.

1277. All ground disturbance works during construction on the road corridor and other areas related to the project's facilities will be monitored by **Cultural Heritage Monitors** (CHM) appointed by Engineer. In addition to the items mentioned above, the main purpose of the CHM is:

- to allow, within the resources available, the preservation by record of archaeological deposits, the presence and nature of which could not be established (or established with sufficient accuracy) in advance of development.
- to provide an opportunity, if needed, for the CHM to signal to all interested parties, before the destruction of the material in question, that an archaeological find has been made for which the resources allocated to the watching brief itself are not sufficient to support treatment to a satisfactory and proper standard.

1278. The CHM is not intended to reduce the requirement for excavation or preservation of known or inferred deposits, and it is intended to guide, not replace, any requirement for contingent excavation or preservation of possible deposits.

1279. Site preparation may lead to discovery of additional archaeological resources that were not identified during the EIA (e.g. in the areas identified above in Figure 184 and Figure 185). To address this situation systematically, CHMs will be present with site clearance (i.e. clearing, Topsoil stripping, grading, etc.) and earthworks. Their purpose will be to assist with the initial evaluation of archaeological chances find, helping to distinguish archaeological finds from non-archaeological anomalies and to communicate initial data on such findings to appropriate Project personnel, the Contractor, the Engineers TL and the RD.

1280. The time available to evaluate and address potential chance finds will depend on the spatial gap maintained between the progress of the clearing crews (clearing being the operation likely to make most chance finds) and the main construction activities. Consideration will be given to maintaining a wider gap between the clearing and construction operations in archaeologically Sensitive Areas: those areas which, based on the concentration of sites identified in this EIA and the Cultural Heritage Management Plan, have the greatest potential to yield chance finds. The wider gap will allow more time to evaluate a chance find, and potentially to implement mitigation by data recovery or additional re-routes. In addition, should the time gap between identification and construction not prove adequate to design and implement measures needed to protect a particular significant chance discovery, then work around procedures would be employed to allow that extra time. This will be clarified with the Contractor, Engineer and RD during the negotiations process with the representatives of Ministry of Culture and Sports. Archaeological works, although included in construction schedule and budget planning, will only be used when absolutely necessary.

1281. The CHMs will identify and report archaeological chance finds and communicate these finds to appropriate Project personnel, the Contractor, the Engineers TL and the RD for timely evaluation and formulation of any appropriate site-specific response that may be needed. As part of the Cultural Heritage Management Plan a specific written set of monitoring and protection protocols, including notification and reporting requirements for Project team and appropriate government authorities will be developed.

1282. CHMs will also be responsible for verifying the implementation and effectiveness of all monuments protection measures that were put in place during Phase 2 and Phase 3 monuments work, and they will call on appropriate monuments expertise to accomplish this objective.

1283. The cultural heritage mitigation works will be monitored by the CHMs and representatives from the Ministry of Culture and Sports if required.

1284. A specific protocol for the CHMs will be developed as an integral part of the overall Cultural heritage Management Plan. Key elements of the required protocols are:

- Current archaeology and monuments list with resource coordinates and status of each resource.
- CHMs able to order a stop work order at suspected chance find locations.
- flagging and/or fencing and signs at known and newly discovered resources.
- formal process for timely evaluation and salvage of potentially threatened resources reported through the Chance Finds process.
- Contracted archaeological expeditions and monuments specialists for timely salvage work.
- Orientation program delivered by the CHM to all Contractors staff to assure understanding guidelines and lines of communication regarding cultural issues.

1285. The CHM will also be responsible for visual inspection of PCR identified in **Section F.8.6 – Vibration**.

Specific Mitigation measures

1286. Site #23 is located within 2 meters of the slip road connecting to a local access road off the main intersection on Begoni Plateau. It is recommended that the design of the slip road be moved at least 20 meters to the north of its current location to avoid impacts to this site in both the construction and operational phases of the Project. The site shall also be fenced during the construction phase as mentioned below.

1287. Particular sites requiring fencing/protection prior to construction commencement include:

- Niche (Jvarkhati), near Kobi – Site #24.
- Giorgitsminda, near Kobi – Site #25.
- Tskere cemetery, Site #3.
- Kobi War Memorial, Site #26.
- Sacred forest around the church located on the top of the hill adjacent to the northern portal in Kobi (Site #25).
- Site #23 close to Begoni Plateau Intersection.
- Plateau Tower, Site #2.
- Mineral Outcrop in Khada Gorge.

1288. Particular sites requiring additional consultations to determine relocation prior to construction commencement include:

- Cross, Kvesheti section, Site #9.

1289. It should be noted that consultation with affected community members has commenced on this issue. Ongoing engagement is required to finalize the future location and relocation arrangements prior to construction phase commencement.

Operational Phase

Provision of permanent solid fencing around the eastern boundary of the Tskere cemetery shall be provided to reduce visual and noise impacts of the road on this site.

Residual Impacts

Impact Significance before Mitigation	***Assessment of impacts after Mitigation / Management Measures Implemented***	***Residual Impact Significance after Mitigation***
Construction Phase		
Moderate	*The key potential impacts to PCR during the construction phase relate to vibration (discussed above), potential encroachment on existing sites and the potential for impacts to unidentified PCR. However, measures outlined above, including demarcation and fencing of sites and the inclusion of a CHM on the Contractors roster, reduces the potential for significant impacts to occur.*	***Minor***
Operational Phase		
Low	*Impacts to PCR during the operational phase will be low as no significant impacts during this phase are anticipated. Fencing of the Tskere cemetery will reduce noise and visual impacts to some extent, but they will not be completely negated due to the proximity to the road.*	***Low***

F.9 Cumulative and Induced Impacts

As outlined earlier in this document, the Project Area supports a wide variety of features of ecological and social importance (referred to as Valued Ecological and Social Components in terms of Cumulative Impact Assessment). Many of these are already under threat across the region (including from within the Project area) from a number of sources including the following:

1290. Uncontrolled/ Overgrazing. This is a major issue in the sub-alpine zone of the Caucasus and has increased dramatically since the collapse of the old Soviet economy. Traditionally sheep grazing areas were mainly in the alpine zone and the sub-alpine meadows were used for food cultivation, and only as pastures (and seldom) in winter. Nowadays alpine pastures are not used so much (and access to pastures in Russia is denied) and cattle (in particular) tend to be kept in and around the villages. This is having a major impact on local ecosystems, including degradation of subalpine forest ecosystems and impacts on endemic species of the steppe sub-communities. A particular concern in the Kazbegi area is effects on the internationally red listed *Betula raddeana Trautv* which is also a key foodplant for the Caucasian Black Grouse (Tetrao mlokosiewiczi) – an IBA trigger bird species. ***Existing overgrazing within the Project area is already affecting local species diversity and pro-active measures are needed to encourage biodiversity within the Project area.***

1291. Invasive alien species. A range of alien species, including pests and diseases, are becoming established in Georgia and pose a threat to both terrestrial and aquatic ecosystems. Many forested areas are being invaded by the fast-growing Foxglove Tree (*Paulownia tomentosa*) and tree of heaven (*Ailanthus altissima*) which were both originally from China but have been grown in recent years in agricultural areas for timber. The poisonous exotic Azalea is also increasingly encountered in both meadows and woodland glades, and since it is not grazed by domestic animals is spreading unhindered. ***The proposed road risks introducing or spreading alien species into an area that is already threatened by such plant, and proactive removal of alien species should be put in place to support local conservation efforts.***

1292. Poaching and Hunting. This remains a major threat within the region, again exacerbated by the collapse of the soviet economy and increased dependency on natural resources. Recent data indicates that poaching activity affecting more than 90% of the populations of Tur (*Capra cylindricornis*), Chamois (*Rupicapra rubicapra*) and Bear (*Ursus arctos*) in Georgia resulting in a

high threat severity to these species. Anecdotal evidence suggests that this is one reason why Chamois and Tur are not recorded from within the Project area itself. Illegal trapping and sale of birds for falconry is also a traditional practice in Georgia and affects over 200,000 birds each year, especially species such as the saker falcon, Eurasian sparrowhawk, northern goshawk and peregrine falcon. This is not, however, reported to be a major concern within the Project area. Finally, illegal poaching has had an especially adverse impact on trout (Salmo spp.), which have decreased by at least 30% in local rivers over the last 15 years. Even where population sizes remain healthy the fish are often small, a result of overfishing, and similar results have been recorded within the Project area. ***Further enforcement of National Park safe-guarding efforts is required to prevent induced impacts from poaching as a result of the proposed road opening up the area to visitors.***

1293. Logging and extraction of non-timber forest resources. Legal and illegal tree felling has lead to fragmentation of forests in the area (including the nearby Sea Buckthorn (Hippopha rhamnoides L.) community). Uncontrolled use of timber and non-timber resources can also have major effects on fauna that rely on these habitats, as well as contributing to soil erosion, leading to uncontrollable geodynamic processes. ***The project will further exacerbate such loss of timber species and commitments to no net loss should be supplemented by additional conservation measures to prevent further loss of timber following the opening up of the valley.***

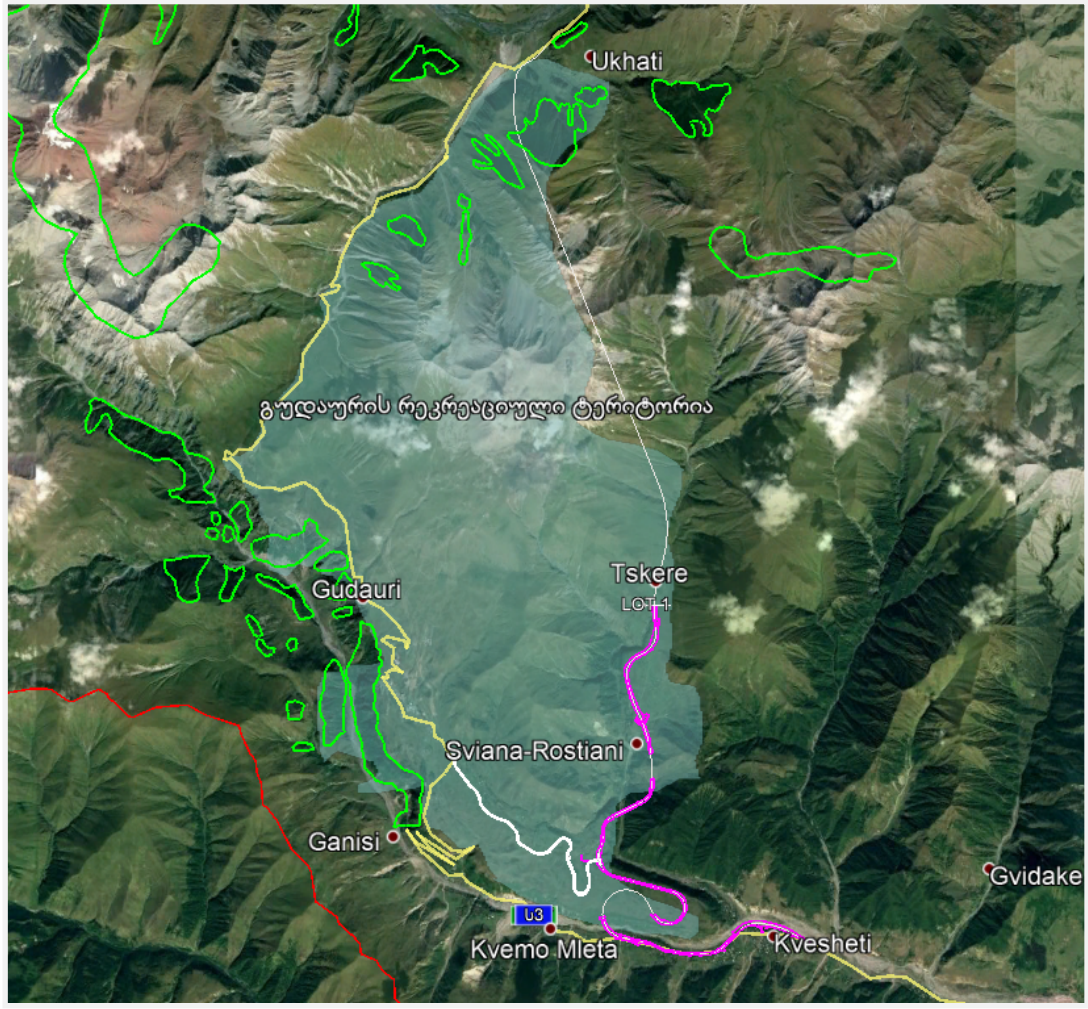
1294. Uncontrolled recreation and development activities. Activities such as heli-skiing, hiking and camping in sensitive areas (including the meadows within the Project area) can adversely affect rare and endemic species, which can also be at threat from plant collection. Uncontrolled development (including that to support tourism) is a major area of concern within the Project area and there is a considerable risk that unplanned developments will be introduced into the valleys around the project by the new road development, as happened in the adjacent village of Gudauri. ***Proactive support to the long-term management and master planning of the proposed National Park Extension is considered critical to minimize long-term impacts to the conservation of the region.***

1295. Human conflict. Increasing pressure on land and resources and the deteriorating ecological balance in the natural ecosystems, means that wild animals more often come into conflict with local people: for example, by raiding orchards and crops, and attacking livestock and bee hives. This is especially acute for large carnivores and may be exacerbated by the destruction of habitats and natural prey as well as the lack of household waste management, i.e. random landfills near settlements. ***This could be further exacerbated by issues of uncontrolled induced development associated with the project, and long-term support to the national park management system will be important to minimize long-term impacts to notable species.***

1296. Cumulative Impacts Associated with other Plans – In addition to the above impacts may also be generated in association with other development plans within the Project area or the wider region. The most relevant to the Project itself if the plan 'Granting a status of recreation areas to resorts, resort places, skiing centers and the Black Sea coast and approval of respective boundaries' [161]. Under this plan Gudauri ski resort area, Bakuriani, Bakhmaro and Ureki recreation areas were established. The Gudauri area includes the ski resort and adjacent area within the boundaries shown in Figure 186.

[161] By order of the president of Georgia (order #968, document registration # 470.210.000.08.002.003), 2005.

Figure 186: Boundaries of Gudauri recreation area (shaded area)



1297. The objective of giving the status of recreational area was to support sustainable development of the area avoiding unauthorized construction. According to the law on State Property, which will start from June 3, 2019 privatization of the state property in the boundaries of the recreation areas and/or the areas of the special regulation zones will not be allowed (Article 4, point j1 of the law). Privatization of the properties located in the boundaries of the mentioned areas will be allowed only by decision of the Government of Georgia. The GoG may temporarily delegate decision making responsibility to other administrative body or self-government unit.

1298. In addition to the main road infrastructure components, as mentioned previously a 'visitor center' will also be included as part of the project (see **Appendix Z**). This facility will act as a potential hub for agri-business, conservation, development of eco-tourism and for sustainable community development within the project area. The visitor center has been included as a project component to ensure that residents of the Khada Valley, particularly women get some direct benefits from the project and it will also act to promote conservation and sustainable eco-tourism development in the region. ***Accordingly, the cumulative impacts of the plan and the visitor center are deemed beneficial as they will help promote conservation and control the potential for uncontrolled development within the Project area and its associated impacts, such as human conflicts as mentioned above***.

F.10 Compliance Impacts

1299. In addition to the impacts associated with the construction and operation phases of the project several compliance impacts have also been identified as follows:

(i) Lack of Environmental Clauses in Contracts – The EIA is an environmental statement prepared by the RD. While it is prepared by the EIA consultant the EIA defines the commitment by the GoG through the proponent and its contractors and consultants, to implement the mitigation and monitoring actions listed in the EIA. For the measures proposed in the EIA's EMP to be taken seriously, they must become legally binding through inclusion as environmental clauses in the loan agreement between the GoG and ADB as well as the specifications in the contract-bid documents. This will be achieved by integrating the EMP into the contract specifications as a clause and using the EMP to prepare the SEMP defining specific steps to be taken by the contractors and the government during the project construction phase. References to the EMP will be made in the loan agreement between the GoG and ADB. It will be the Engineers responsibility to review the environmental mitigation and monitoring activities undertaken by the Contractor, with payments made only after verification that each work component has been completed as prescribed.

(ii) Lack of Construction Compliance Inspection Services and Environmental Training – While the EMP and the environmental covenants can be very clear and specific, if there is no one knowledgeable to undertake compliance monitoring, inspection and regular reporting, little of the EMP will be implemented or completed. The Engineer, through his National Environmental Specialist (NES) and International Environmental Specialist (IES), will ensure that compliance inspections are undertaken on a regular basis. In addition, the Engineers IES will also provide training to the Contractor and his Environmental Officer in the correct implementation of the SEMPs prior to the commencement of works.

(iii) Lack of Permits / Approvals – The Contractor must obtain a number of permits and licenses in order to comply with national environmental regulations. Any delay in obtaining these approvals, for example the national environmental assessment for the spoil disposal area, could delay the works schedule.

G. Environmental Management Plans and Institutional Requirements

G.1 Introduction

1300. The EMP provides the overall Project environmental management framework. It provides summary information of the types of impacts, which are described in detail in **Section F**. It also provides detailed information about the required mitigation and monitoring measures, their implementation arrangements reporting requirements. In addition, the approximate costs of the EMP are outlined.

G.2 Environmental Management Plan

1301. **Appendix A** provides the environmental mitigation and observational monitoring for the Project during the pre-construction, construction and operational phases. The EMP is divided into the two Project Lots. The EMP also includes the costs for each itemized mitigation aspect.

G.3 Environmental Monitoring Plan

1302. Regular monitoring of air quality, water quality and noise levels against Georgian and IFC standards shall be carried out throughout the construction period. The party responsible for monitoring will be the Contractor who will report the results monthly to the Engineer and RD. The reports shall clearly indicate the monitoring dates, times, locations, weather conditions, types of equipment used and calibration information. In addition, during the first year of operation, the RD will hire a Contractor to undertake further monitoring of environmental issues.

1303. **Appendix B** provides the monitoring actions required during these phases of the Project for both Project Lots. The costs of the monitoring actions are also provided in the tables provided in **Appendix B**

G.4 Specific EMP (SEMP)

1304. The SEMP is the documents that the Contractor shall prepare outlining how he intends to implement the EMPs and ensure that all of the mitigation and monitoring is completed according to the implementation arrangements specified in the EMPs and the EIA as a whole.

1305. The SEMP will describe the precise location of the required mitigation / monitoring, the persons responsible for the mitigation / monitoring, the schedule and reporting methodology. The SEMP and all of its topic and site-specific plans will be submitted to the Engineer and RD for approval at least 30 days before taking possession of any work site. No access to the site will be allowed until the SEMPs are approved by the Engineer and RD, and where indicated in the tables above, the ADB and EBRD. New topic specific or site specific EMPs may also need to be developed by the Contractor during the construction phase. These new plans will also need to be approved by the Engineer and the RD. A framework for the SEMP is provided by **Appendix X**.

1306. The SEMP will include the following topic specific plans:

Table 170: SEMP Topic Specific Plans

Plan	Description	Approvals		
		RD	Engineer	ADB/EBRD
Topsoil Management Plan	The plan shall describe topsoil stripping procedures and rules, topsoil stripping depth and volumes, topsoil stripping	Yes	Yes	No

Plan	Description	Approvals		
		RD	Engineer	ADB/EBRD
	supervision, transportation and stockpiling requirements, stockpile location, topsoil stockpile design, stockpile management, erosion hazard and erosion control, runoff drainage/diversion, soil protection measures at the storage area, maintenance of the stockpile and topsoil application procedure.			
Waste Management Plan	The plan shall describe waste streams and amounts, describe recycling/reuse methods for each material, identify the waste destinations and transport modes, including what materials are being segregated on site for reuse or recycling, specify responsibilities for managing and disposal of waste. Describe special measures for material use and handling. Describe communication and training to support and encourage participation from everyone on site.	Yes	Yes	No
Waste Water Management Plan	The plan must provide details on waste water (sewage) volume, disposal scheme, information on capacity and type of waste water treatment facility, location of the discharge point/points with indication of coordinates. A discharge permit will be sought from the MoEPA and Maximum Allowable Discharge Limits (MADLs) will be set which the project must then comply with.	Yes	Yes	No
Air Quality Management Plan	The plan shall provide details of mitigation measures, specific location and schedule where such measures shall be implemented to minimize impacts to sensitive receptors due to the presence of the camp, construction works, sourcing and transport of construction materials, and other project-related activities. Recommendations provided in the EIA must be considered. Prior to commencement of works likely emissions from crushers, concrete production facilities and other emissions generating facilities must be calculated and agreed with the MoEPA. Separate plan/schedule for air quality control in the tunnel must be provided.	Yes	Yes	No
Noise Control Plan	The plan shall provide details of mitigation measures, specific location and schedule where such measures shall be implemented to minimize impacts to sensitive receptors due to the presence of the camp, construction works, sourcing and transport of construction materials, and other project-related activities. Recommendations provided in the EIA must be considered.	Yes	Yes	No

Plan	Description	Approvals		
		RD	Engineer	ADB/EBRD
Spill Management Plan	The plan shall provide details of procedures, responsibilities, resources, documentation and reporting requirements, training provisions for relevant staff, etc. to avoid spills of hazardous substances and to effectively respond to such incidents. Recommendations provided in the EIA must be considered.	Yes	Yes	No
Traffic Management Plan	The plan shall be designed to ensure that traffic congestion and traffic safety impacts due to construction activities and movement of construction vehicles, haulage trucks, and equipment is minimized. The plan shall be prepared in consultation with traffic officials. The plan shall identify traffic diversion and management issues, traffic schedules, traffic arrangements showing all detours/lane diversions, modifications to signaling at intersections, necessary barricades, warning/advisory signs, road signs, lighting, and other provisions to ensure that adequate and safe access is provided to motorists and other road users in the affected areas. Pre-construction access road surveys will also form part of the TMP. The plan shall also include locations for cattle crossings on access roads and conditions for the management of these crossings, including the use of flagmen.	Yes	Yes	No
Occupational and Community Health and Safety Plan	Consistent with international standards (e.g., World Bank Group Environmental, Health, and Safety Guidelines, 2007) and Labor Code of Georgia. The Plan shall address health and safety hazards associated with construction activities (e.g., excavations, tunneling etc.), use of heavy equipment, transport of materials and other hazards associated with various construction activities. The document to be read together with the Camp Management Plan. A template for the occupational health and safety component of the plan has been provided by **Appendix R**.	Yes	Yes	No
Labor and Working Conditions Management Plan.	This will include: policy/legal framework information (including labor and OHS requirements of national legislation, ADB SPS 2009, and EBRD Performance Requirements 2 and 4), workforce induction and information on rights, child and forced labor, equal opportunity, migrant workers, promotion of local employment opportunities, labor union, worker accommodation requirements, provision for retrenchment plans, workforce grievance	Yes	Yes	Yes

Plan	Description	Approvals		
		RD	Engineer	ADB/EBRD
	mechanism, security personnel (Voluntary Principles on Security and Human Rights), etc. Contractor needs to ensure that the core labor requirements are cascaded down across the entire contracting chains, including sub-contractors and suppliers of core materials. The plan shall also be in compliance with IFC/EBRD Guidance Note "Workers' accommodation: processes and standards".			
Code of Conduct	The Contractor shall prepare a **Code of Conduct** that outlines camp rules articulating acceptable behaviors of the workforce with local communities. Associated induction training will be provided to ensure rules are well understood and enforced.	Yes	Yes	Yes
Emergency Response Plan	to prevent, mitigate, respond to and recover from emergency events that could occur due to project activities such as accidents, spills of hazardous substances, fire, extreme weather events, and others; measures to prevent, mitigate, respond to and recover from emergency events that could occur due to project activities such as accidents during tunneling (e.g., tunnel collapse, electrocution, etc.), release of toxic gas during tunneling, spills of hazardous substances, fire, floods, and other events.	Yes	Yes	No
Ground Water Management Plan	covering water diversion, treatment (settling) and discharge for each tunnel.	Yes	Yes	No
Re-cultivation/Land Restoration Plan	covering all sited temporarily used for the needs of the project. The plan must state necessity to prohibit the use alien or invasive plant species and need/method for control and removal of Exotic Species. (Note: The plan can be developed/revised at a later stage or stepwise site by site to provide a plan and schedule of re-cultivation works. The plan must be developed in association with biodiversity specialist and the state forestry authorities.	Yes	Yes	No
Biodiversity Management Plan	Outlines the actions required by the contractor to safeguard, conserve or enhance biodiversity during site works. Compliance with the BMP will be responsibility of Contractor and his ECoW.	Yes	Yes	Yes
Construction Vibration Management Plan	Detailing the procedures for vibration surveys, monitoring and control. Such details shall include; procedures to complete condition surveys (for all properties indicated in this EIA), Measurement locations and methods;	Yes	Yes	No

Plan	Description	Approvals		
		RD	Engineer	ADB/EBRD
	Method statements for works likely to induce vibrations, including programs of trial construction sections to determine the likely magnitude of vibrations at defined distances from the vibration source, in sufficient detail for the contractor to develop a final method for constructing the works without excessive vibration; Description of the instrumentation and equipment to be used; Copies of the instruction manuals and the laboratory calibration and test equipment certification; The resumes of the vibration monitoring technical support personnel, sufficient to define details of relevant experience; Procedures for data collection and analysis; Frequency of measurements; Means and methods of providing warnings when the specified construction vibration limits are reached; and Action plans to be implemented in the event the specified construction vibration limits are reached. The generalized plans of action shall comprise the positive measures by the Contractor to control vibrations using alternative construction methods.			
Tunnel Blasting Plan	Provide the methodology for the management of control of tunnel blasting including methods for noise and air quality management and occupational and community health and safety.	Yes	Yes	No
Cultural Heritage Management Plan	Will be prepared to include the five-phase strategy for the progressive assessment and mitigation of the effects of construction.	Yes	Yes	No
Local Content Management Plan	Describing the local procurement and local employment actions.	Yes	Yes	No

1307. In addition to the topic specific plans a number of site-specific plans will also be required, including:

Table 171: SEMP Site Specific Plans

Plan	Description	Approvals		
		RD	Engineer	ADB/EBRD
Accommodation Option Risk Assessment	This will include aspects such as: siting of the accommodation camp in low proximity to villages/local community members; and determination whether workers can be accompanied by families or whether rosters will enable locally engaged workers to go home daily or not.	Yes	Yes	No
Construction camp layout plan	This is to include: layout of the site, including location of temporary storage areas for waste, equipment maintenance areas, lubricant and	Yes	Yes	No

Plan	Description	Approvals		
		RD	Engineer	ADB/EBRD
	fuel storage sites with indication of the distance from watercourses; description of sewage management, energy supply and waste management activities. The EIA includes criteria/recommendations for site selection, requirements and procedures for approval of the site by RD, MoEPA. Camp site as well as any sites considered associated facilities require ADB and EBRD consideration, due diligence and approval. Note: Consultations with local communities before the construction camp is developed are required.			
Construction Camp Management Plan	The plan shall cover such aspects as community relations, restriction of access to camp and facilities, induction briefing on camp rules and local issues/sensitivities, camp rules (such as restrictions on alcohol, drugs use; discipline; noisy activities; community liaison; no poaching; environmental protection measures applicable to the camp site; decommissioning and re-cultivation, etc.); workers welfare. The plan shall also describe power supply methods.	Yes	Yes	Yes
Spoil Disposal Plan	to be developed based on site specific topo-geodetic, geotechnical, hydrological data, environmental and social data. The plan shall include information on location, layout of the spoil disposal area (dimensions, slope angle) with 3D view, cross sections, runoff management and bank protection measures, re-cultivation measures, designation of suitable transport routes and schedule for spoil truck movements to minimize traffic disruption/congestion, and environmental mitigation measures to address impacts during transport and disposal of spoils. The plan must be developed in association with a biodiversity specialist and the state forestry authorities. The plan must specify spoil dewatering procedures (and facilities), as necessary, and describe mitigation measures to ensure adequate treatment of wastewater prior to disposal. Framework document describing requirements and procedure of site selection is attached (see **Appendix F**). The EIA includes criteria/recommendations for site selection, requirements and procedures for approval of the site/sites by RD. Spoil disposal site as well as any sites considered associated facilities require ADB and EBRD consideration, due diligence and approval.	Yes	Yes	Yes
Asphalt Plan Management Plan	Describing the layout and management of asphalt plant, including management of bitumen.	Yes	Yes	No

Plan	Description	Approvals		
		RD	Engineer	ADB/EBRD
Concrete Batching Plant Management Plan	Describing the layout and management of concrete batching plant, including waste water discharge, dust management, etc.	Yes	Yes	No
Method Statements for Temporary Storage Areas, Temporary river crossings and temporary roads	The Contractor will be responsible for preparing a method statement for the opening, operation and reinstatement of any temporary storage area he uses, temporary road or temporary river crossing.	Yes	Yes	No
Bridge Construction Plan	for each bridge construction site	Yes	Yes	No
Occupational Health and Safety (OHS) Plan for Tunnels	Specific plans shall be prepared for Tunnel 5 and for Lot 2 tunnels (all included under one plan). The plan shall include sections on air quality and ventilation, plant related risks, visibility, lighting, noise, electrical safety, confined spaces, emergency response, etc.	Yes	Yes	No
Tunnel Transition Plan	At minimum will include: an operations handover process and the documentation required for handover; training requirements including commissioning and staffing requirements; occupational health and safety requirements and risk management and reporting.	Yes	Yes	No

1308. A standalone Project **Biodiversity Action Plan (BAP)** for those specific species or habitats of greater note has been prepared. The BAP will help ensure no net loss, or if required, net gain of natural habitats and support notable species of conservation importance. The responsibility for the implementation of the BAP is both with the Engineer and Contractor who will outsource specific components of the BAP to external organisations, such as conservation societies, NGOs or universities.

1309. To monitor the progress of the BAP the Engineer, through his International Environmental / Biodiversity Specialist, will prepare and implement a **Biodiversity Monitoring and Evaluation Plan (BMEP)** to track the performance of the key actions in the BAP and help consolidate the results of the individual monitoring and survey tasks specified in the BAP.

G.5 Bid Documents

1310. The Bid Documents for the potential Contractors will contain two sections relating to environmental issues, firstly a basic clause indicating that the Contractor will be responsible for following the requirements of the EMPs and that he should prepare his own SEMP for the Project. Secondly, the EMPs shall be repeated in its entirety as an Annex to the Bid Documents so as the bidder is aware of his environmental requirements under the Project and help him put environmental costs to his proposal.

G.6 Contract Documents

1311. The Contract Documents will follow a broadly similar pattern to the Bid Documents. It is not considered necessary to repeat the mitigation measures verbatim in a list of environmental contract provisions, rather the Contract will specify that the Contractor is responsible for implementation of the EMPs via his SEMP. Again, the EMPs will be included as an Annex to the

Contract so the Contractor will be liable for any non-conformance with the EMPs, and thereby this EIA.

G.7 Contractor Requirements

1312. As stated above, the Contractor for each Lot will be responsible for the preparation of the SEMP. The SEMP will need to be fully compliant with the EMPs and this EIA as a whole, and will need to be prepared within 30 days of Contract award and approved 10 days prior to access to the site.

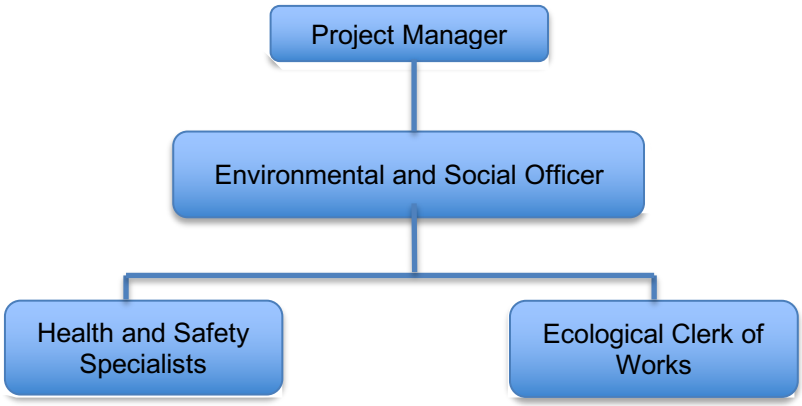
1313. The Contractor is also responsible for engaging external services from a certified laboratory for instrumental monitoring of air quality, noise and water during the construction phase (see **Appendix B** for the instrumental monitoring requirements).

1314. Further, at completion of the construction phase and prior to the start of the defects liability period, the Contractor shall be responsible for preparing an Operational Phase EMP for the Project. The Contractor shall implement the plan during the defects liability period and hand over the plan to the RD for continued implementation after this period. At a minimum the EMP should include:

- **Waste Management Plan**
- **Emergency Response Plan**
- **Noise and Vibration Management Plan**
- **Air Quality Management Plan**
- **OCHS Plan**
- **Spill Response Plan**
- **Local Content Management Plan (local procurement and local employment)**
- **Stakeholder Engagement Plan (update for the Operation phase)**
- **Biodiversity Management Plan**

1315. In order to prepare and implement the SEMP (and the operational EMP during the defects liability period) a team of Specialists will be required as illustrated in the following figure and described in detail below.

Figure 187: Contractors Environmental, Social, Health and Safety Team



Environmental and Social Officer

1316. During construction the Contractor must retain the expertise of an Environmental and Social Officer (ESO) to implement and continually update the SEMP and to oversee and report

on the operation throughout the contract period. The ESO will be the Contractors main focal point for all environmental, social, health and safety and cultural heritage issues associated with the Project and will lead the other team members listed below.

1317. The ESO should be full-time member of staff on the Contractors roster and should be on site at least five days per week.

1318. The required qualifications of the ESO are as follows:

- Degree in environmental sciences and related expertise.
- Fluent in Georgian and English.
- Experience of at least two construction projects of a similar size and scale, including road projects with tunnels.

1319. The ESO will be responsible for the preparation of weekly environmental checklists and an environmental section of the Contractor's monthly progress reports that shall be submitted to the Engineer for review. The Engineer shall provide a template of the checklist to the Contractor.

1320. The monthly reports, which will include the weekly environmental checklists, shall contain sections relating to:

(i) General Progress of the Project.
(ii) Environmental Incidents; e.g. spills of liquids, accidents, etc.
(iii) Progress of any environmental initiatives, e.g. energy savings, recycling, etc.
(iv) Records of any environmental monitoring, both observational and instrumental.
(v) Conclusions and Recommendations.

1321. The ESO shall provide daily toolbox training at the construction camp and also at construction sites. The ESO shall keep a record of all monthly training and toolbox training undertaken.

1322. The ESO will also act as the Focal Person at the camp site for receiving and fixing grievances in the Log Book. The ESO shall also manage all social and labor related issues. The ESO will also act as the Contractors 'Environmental Manager' as required by Article 15 of the Waste Management Code (2015). [162]

Ecological Clerk of Works (ECoW)

1323. Construction through multiple habitat types provides challenges, especially around avoidance and minimization of impacts during works in sensitive sites (e.g. protected areas), sensitive habitats (including e.g. effective control of silt near water) and where protected or notable species may be present in the working corridor. The ECoW will work closely with the Engineers International Environmental and Biodiversity Specialist on key biodiversity related tasks. The key roles of the ECoW are therefore to:

- Identify any areas of particular ecological sensitivity (e.g. with protected or notable habitats or species) on the route that may need to be avoided, moved (e.g. plants/amphibians) or disturbed later in the year (e.g. if birds are nesting there).
- Translate mitigation requirements written in the SEMP and its sub-plans (including relevant elements of the Biodiversity Management Plan) into practical measures on the ground
- Advise in a timely manner as to how best to address changeable and less predictable situations on the ground from an ecological perspective (e.g. should new species be encountered)

[162] **Article 15 – Environmental Manager**
(a) The persons under Article 14 of this Law shall nominate a suitable person as a company environmental manager.

- Ensure that all staff are fully aware of the environmental sensitivities of the site and their responsibilities, as outlined in the management plans (e.g. via practical toolbox talks ahead of the construction).
- Take field notes and photographs to demonstrate compliance with the management plans

1324. The ECoW should undertake the enabling surveys a couple of weeks ahead of the work teams and produce hazard maps to show the location of particularly sensitive habitats and species that are to be avoided e.g. by changing timing of works, amendments to construction methods statements, etc. In addition, and to coordinate responses to ecological concerns, appropriate reporting mechanisms should be set up to allow issues to be raised and resolved in an efficient manner (this may be part of the project grievance mechanism). To do this the ECoW should be well trained in (or have access to expertise in) the practical elements of protected species (including handling of species that they may have to move) and the recognition of sensitive habitats; they should also have a working understanding of wider environmental issues and the construction/engineering process.

Health and Safety Specialists

1325. The Contractor shall also hire a team of qualified Health and Safety Specialists (HSS) for the Project duration. According to Georgian Law at least 1 H&S specialist is required for every 50 workers. The H&S specialists shall have at least five years on-site experience of similar sized infrastructure Projects. A Lead HSS shall be nominated to lead the health and safety team, the Lead HSS will also deputize for the ESO when he is absent from the site.

1326. The HSS's and the Lead HSS shall report directly to the ESO. The main responsibilities of the HSS's will be:

- Provide H&S training, including daily toolbox training sessions at each work site.
- Approve H&S Plans for specific work activities.
- Conduct routine site inspections and issue internal stop notices if necessary, for unsafe activities.
- Maintain H&S statistics log for near misses, as well as incidents.
- Provide H&S input to Contractor reports.

Staff Costs

1327. The following table provides a summary of the anticipated staff costs for Lot 1 and Lot 2.

Table 172: Lot 1 Contractor Environmental, Social, Health and Safety Staff Costs

#	Position	No. of Months	Month Cost ($)	Total Cost ($)
1	Environmental and Social Officer	48	1,500	72,000
3	Ecological Clerk of Works	48	2,000	96,000
5	Health and Safety Specialist	48 per HSS	1,500	72,000 per HSS

Table 173: Lot 2 Contractor Environmental, Social, Health and Safety Staff Costs

#	Position	No. of Months	Month Cost ($)	Total Cost ($)
1	Environmental and Social Officer	48	1,500	72,000
3	Ecological Clerk of Works	48	2,000	96,000
5	Health and Safety Specialist	48 per HSS	1,500	72,000 per HSS

Control of Records

1328. The list of records that must be available by each Contractor for review must include:

- Work program and schedule;
- Environmental permits and licenses;
- List of equipment;
- List of mitigation measures;
- Route/program of construction material transportation;
- Inspection records – noise, water quality monitoring data;
- Copies of correspondence related to environmental issues;
- Site drainage plan;
- Records of maintenance and cleaning schedules for sediment and oil/grease traps;
- Records of sewage disposal (if relevant);
- Records of quantity of discharged wastewater and concentration of pollutants;
- Waste disposal records
- Written designation of waste disposal sites and instructions for waste transportation from local authorities;
- Log of material inventories and consumption;
- Chance find records (if any);
- Complaints register;
- Incidence register (environmental limits expedience forms, injuries records, etc.);
- Records on remedial actions taken;
- Equipment control and maintenance log;
- Corrective and preventive action request records;
- Training records.

1329. These records shall be kept on-site by the Contractors EO and available for inspection at any time.

1330. The Contractor will also appoint a Focal Person at the camp site as well for receiving and fixing grievances in Log Book. It is recommended that the Environmental Officer fulfil this responsibility.

G.8 Engineer Requirements

1331. The Engineer (assumed one for both Lots) will ensure the implementation of the Project's EMP, and all related documents (including *inter alia* the Environmental and Social Action Plan). The specific tasks will include the following:

Prior to commencement of the works:

- Organize a training program for MRDI and RD staff on how the environmental aspects of the project will be monitored, giving emphasis on SEMP evaluation; compliance monitoring of construction activities and preparation of corresponding reports; supervision responsibilities and interaction with contractors; and documentation, resolution and reporting of non-compliance issues and complaints;

- Provide guidance to the RD's environment specialist on the environmental and social aspects of the project with emphasis on compliance monitoring and reporting;
- Assist the RD with establishing and operating the grievance redress mechanism, including creating a grievance chart (format to be agreed with the RD) which is to be updated on a weekly basis;
- Evaluate the environmental aspects of the contractors' method statements and working drawings and recommend corrective actions needed, if any, to ensure compliance with the project's environmental and social requirements;
- Review the Contractors' SEMP and all topic specific (such as waste) and site specific (such as construction camp) plans; recommend modifications to these documents to be compliant with: (a) the environmental and social requirements of the construction contracts as reflected in the EMP, and (b) the conditions of environmental approvals of the Government, if required;
- Develop the compliance monitoring system to be used during the construction period for monitoring the contractors' performance relative to environmental requirements, including the preparation of: (a) monitoring and corrective action forms and checklists, (b) inspection procedures, and (c) documentation procedures;
- Conduct orientation sessions with the contractors on the compliance monitoring system to be used, notification of non-compliance, and the process of requiring contractors to implement corrective measures when necessary; and
- Provide guidance to the contractors on how their respective SEMP will be implemented including the: (a) requirements for each mitigation measure, and (b) implementation schedule of each mitigation measure taking into consideration the general requirement that no specific construction activity will be approved to be commenced if the associated mitigation measures for such activity are not ready before work commences.
- Undertake further refined noise modelling to determine the specification and precise locations of the proposed noise barriers.

During implementation of the works:

- supervise the implementation of the SEMPs and its relevant topic and site specific EMPs;
- evaluate the contractors' submitted works activities and schedules relative to the requirements of the approved SEMP;
- undertake monthly inspection, monitoring and reporting of construction sites and all construction-related facilities (workers' camps, asphalt batching plants, concrete batching plants, borrow pits, disposal sites for tunnel and other spoil and unsuitable materials, equipment maintenance areas, fuel and materials storage sites, project- specific quarries and crushers, etc.) to assess the contractors' compliance with the SEMP and the Project EMP.
- require the contractors to update their respective SEMP when necessary;
- monitor the contractors' compliance with health and safety, and labor requirements of the project as stipulated in the contract documents and their approved health and safety, and labor plans (including the outcome of labor audits), and require the contractors to provide updated plans when necessary;

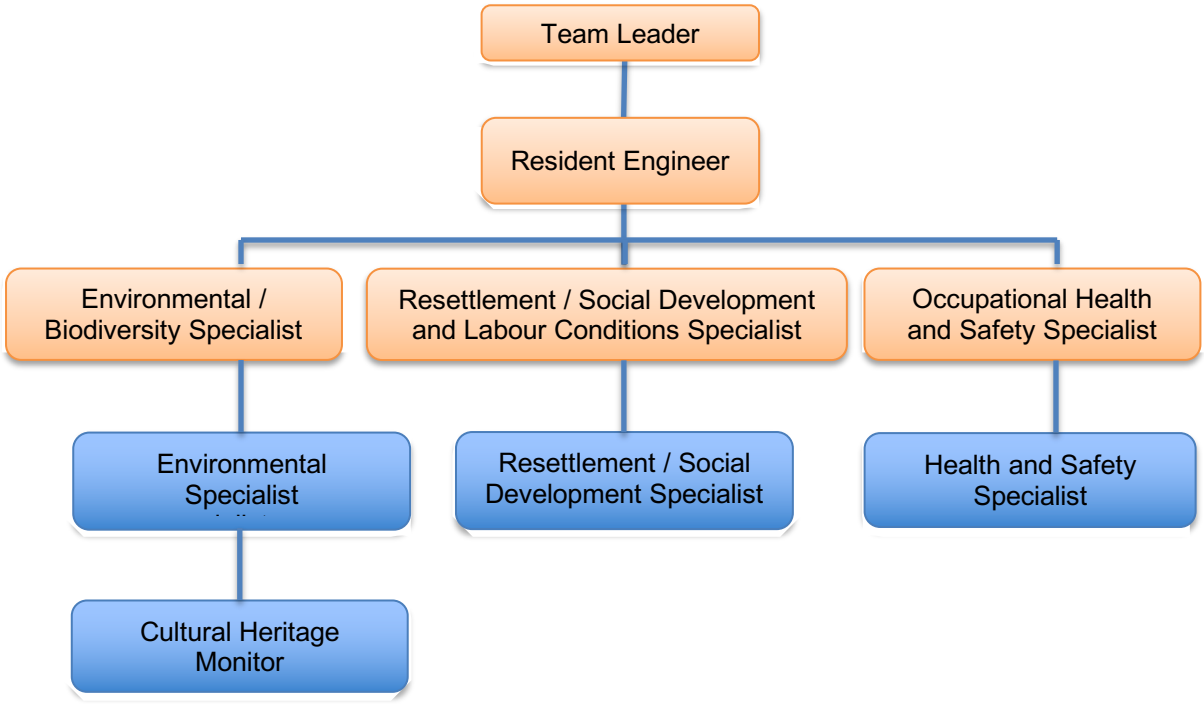
- record non-conformance cases, inform contractors of improvements needed, respond to contractors' proposals, prepare corrective action plans for contractors, and monitor their implementation;
- assess and approve use of temporary construction areas identified during construction such as camps, laydown areas, access roads, etc;
- include environmental and social monitoring in monthly monitoring reports for submission to the RD; and
- draft semi-annual environmental safeguard monitoring reports, as required by ADB;

Upon completion of the works:

1332. prepare a report on the project's environmental and social compliance performance, including lessons learned that may help MRDI and the RD in their environmental monitoring of future projects. The report will be an input to the overall project completion report.

1333. The Engineer should retain the use of a team of environmental, social and health and safety specialists as shown in the figure below to provide oversight of the Contractors environmental performance as outlined above. Terms of reference for the specialists is provided below.

Figure 188: Engineers Environmental, Social, Health and Safety Team



*International in Orange, National in Blue

International Environmental / Biodiversity Specialist

1334. The IES will prepare a detailed action plan including environmental monitoring checklists to be completed by the NES. The IES will be responsible for ensuring the BAP is properly implemented with support of the Contractor in commissioning various surveys. The IES will be responsible for monitoring activities by specialists with support of the Contractors ECoW for

implementation of the BAP and will be fully responsible for developing the BMEP to ensure the BAP is properly implemented. He/she will work closely with the Contractor ECoW on biodiversity focused tasks and will also work on more general environment focused tasks such as conducting environmental training and briefings to provide environmental awareness on ADB/EBRD and the government environmental safeguards policies, requirements and standard operating procedures in conformity with the government's regulations and international practice for project and RD Safeguards staff; ensure baseline monitoring and reporting of Contractor's compliance with contractual environmental mitigation measures during the construction phase.

1335. Qualified with a degree or diploma in environmental sciences or equivalent. Preferably fifteen years' experience in conducting environmental impact assessments and implementation of environment mitigation plans and/or monitoring implementation of environmental mitigation measures and health and safety plans during implementation of projects including road projects funded by developing partners, including twelve years' international experience. Working knowledge of Georgia is preferred.

National Environmental Specialist

1336. He/she will (i) review all documents and reports regarding the integration of environment aspects including contractor's environmental action plan, (ii) supervise the contractors' compliance to EMP, and (iii) prepare monthly compliance reports.

1337. Qualified with a degree in environmental sciences or equivalent. Preferably five years' experience in conducting environmental impact assessments and implementation of environment mitigation plans and/or monitoring implementation of environmental mitigation measures during implementation of projects including highway projects funded by developing partners.

Cultural Heritage Monitor

1338. The main objectives of the CHM are; (i) to allow, within the resources available, the preservation by record of archaeological deposits, the presence and nature of which could not be established (or established with sufficient accuracy) in advance of development and (2) to provide an opportunity, if needed, for the CHM to signal to all interested parties, before the destruction of the material in question, that an archaeological find has been made for which the resources allocated to the watching brief itself are not sufficient to support treatment to a satisfactory and proper standard.

1339. More specifically, the CHM shall; (i) Ensure the Contractor follows his Cultural Heritage Management Plan and follows the Chance Find Procedure; (2) Be present during site clearance (i.e. clearing, Topsoil stripping, grading, etc.) and earthworks to assist with the initial evaluation of archaeological chances find, helping to distinguish archaeological finds from non-archaeological anomalies and to communicate initial data on such findings to appropriate the Contractors project personnel, the Engineers Team Leader / Resident Engineer, Ministry of Culture and Sport and the RD; and (3) be responsible for visual inspection of PCR identified in **Section F.8.6 – Vibration**.

1340. The CHM shall have a Degree or qualification in Archaeology and at least five years' experience in conducting cultural heritage / archaeological monitoring surveys and implementation of cultural heritage management plans during implementation of projects in Georgia.

International Occupational Health and Safety Specialist

1341. Professionally qualified specialist in all health and safety aspects of major civil works construction, including tunnels, high level bridgeworks, and road works involving the use of explosives, preferably with 10 years of experience with projects similar to the project. The specialist will be responsible to the Team Leader for ensuring that all aspects of the project

comply with the health and safety provisions of the project's civil works contracts, and with relevant Georgian laws and regulations.

National Occupational Health and Safety Specialist

1342. Professionally qualified specialist in all health and safety aspects of major civil works construction, including tunnels, high level bridgeworks, and road works involving the use of explosives, preferably with 5 years of experience with projects similar to the project. The specialist will be responsible to the Team Leader for ensuring that all aspects of the project comply with the health and safety provisions of the project's civil works contracts, and with relevant Georgian laws and regulations.

International Resettlement, Social Development and Labor Specialist

1343. Qualified BSc. or equivalent in social development or related field, with preferably 10 years' experience in resettlement management, implementation of social safeguards, gender and complaints resolution. The specialist should have prepared or assisted in the preparation of 3 resettlement plans for infrastructure projects and have been engaged in preferably 3 similar projects in resettlement monitoring and implementation of social safeguards. The specialist will be responsible to the Team Leader with all resettlement aspects of the project, including monitoring and reporting on compliance with the project's resettlement plan.

1344. The specialist will also have knowledge of Core Labor Standards and will be able to audit worker facilities, accommodation and working conditions to ensure that Project Standards are being met.

National Resettlement and Social Development Specialist

1345. Professionally qualified BSc or equivalent in social development or related field, with preferably 5 years' relevant experience. The Specialist will work with the Senior Resettlement Specialist and the Senior Social Development Specialist in resettlement management, implementation of social safeguards, complaints resolution, gender and all other aspects of the project's land acquisition and resettlement and social development tasks.

Staff Costs

1346. The following table provides a summary of the anticipated staff costs.

Table 174: Engineer Environmental, Social, Health and Safety Staff Costs

#	Position	No. of Months	Month Cost ($)	Total Cost ($)
1	National Environmental Specialist	48	1,500	72,000
2	International Environmental and Biodiversity Specialist	12	20,000	240,000
3	National Resettlement and Social Development Specialist	16	1,500	24,000
4	International Resettlement, Social Development and Labor Specialist	6	20,000	120,000
5	National Occupational Health and Safety Specialist	24	1,500	72,000
6	International Occupational Health and Safety Specialist	18	20,000	360,000
7	Cultural Heritage Monitor	48	1,500	72,000

G.9 RD PIU Requirements

1347. A review of the environmental and social capacity of the RD was undertake as part of this EIA. The review indicates that the RDs safeguard department has extensive experience of implementing road projects for a range of donors, including ADB. However, they are understaffed and with many new projects coming on-line, such as the E-60 construction works, it is considered likely that they will not be able to adequately manage all of these contracts from an environmental and social performance perspective. It is therefore recommended that an additional member of staff be employed to manage the environmental and social aspects of this Project. The specialist should have at least 5 years' experience of managing environmental and social aspects of donor funded projects, preferably in the road sector.

1348. During the pre-construction and construction phase the RD and their staff will be responsible for:

- Reviewing and approving the SEMP and all the site and topic specific EMPs.
- Weekly site visits to audit site works.
- Approving bi-annual monitoring reports from the Engineer.
- Reporting on any key issues to lenders and management.
- Engage external expert(s) to undertake annual independent verification of monitoring information submitted to ADB and EBRD, to determine if various EMP/SEMP provisions are being implemented in thorough and timely manner and in accordance with budget identified within the EMP/SEMP.
- Review (annually) the EMP/SEMP and approve the changes.

G.10 Reporting & Review of the EMP

Reporting

1349. The following reporting requirements will be followed during the implementation of the EMP and Contractors SEMP:

Table 175: Reporting Requirements

Responsibility	Requirement	Submitted to
Contractor	Quarterly Environmental and Social Reports	Engineer / RD

Engineer	Monthly Environmental, Social and Health and Safety Reports, to include at least the following items:
	• Summary of Works to Date.
	• Status of EMP.
	• Status of Licenses and Permits.
	• Summary of camp site and work site inspections, i.e. observational monitoring by the Engineer.
	• Results of instrumental monitoring undertaken by the Contractor, including:
	  o Air Quality
	  o Noise
	  o Vibration
	  o Ground water
	  o Surface Water
	• Non-compliances identified during the reporting period.
	• Update on previously identified non-compliances.
	• Correspondence with the Contractor regarding environmental and social issues.
	• Findings from stakeholder meetings (per the SEP).
	• Table of grievances and actions to manage on-going grievances.
	• Summary of accidents during the reporting period.
		RD

	• Summary of meetings between the Engineer and Contractor regarding environmental, social and health and safety issues. • Overview of training provided by the Contractor during the reporting period. The report will be published monthly on the RD website.	
RD / Engineer	Bi-annual Environmental and Social Reports summarising the findings of the monthly and quarterly reports prepared by the Contractor and the Engineer	ADB / EBRD
External Monitoring Consultant	Annual Report	ADB / EBRD

Review of EMP

1350. The EMP shall be reviewed periodically to evaluate environmental controls and procedures to make sure they are still applicable to the activities being carried out. Reviews will be undertaken by the Contractor's EO and Engineer as follows:

- The full EMP shall be reviewed at least annually;
- Relevant parts of the EMP shall be reviewed following a reportable incident;
- In case any issues of failure of mitigation measure to reduce the impact occurs;
- Relevant parts of the EMP shall be reviewed following the receipt of an updated site specific or topic specific plan; and
- At the request of stakeholders.

1351. The review shall include analysis of the data collection and analysis of data, monitoring reports, incident reports, complaints/grievances and feedback from stakeholders.

G.11 EMP Implementation Summary

1352. The following Table summarizes the various institutional responsibilities for the implementation of the environmental management plan at various stages of the Project Road rehabilitation.

Table 176: EMP Implementation

Project Stage	Responsible Institution	Responsibilities
Design	Detailed Design Consultant, EIA Team in association with RD	• Incorporate EMP mitigation measures into engineering design. • Incorporate EMP mitigation measures into tender document.
	RD	• Ensure EMP is incorporated into the works Contracts. • Review Contractors proposals to ensure that they are aware of the EMP requirements and that the items for environmental management as per the EMP are included in the BOQ. • Post the EIA (including EMP) to the webpage and keep it into the public domain.
Pre-construction	Contractor	• Select location for camp/camps, rock crushing facilities, concrete batching yards and asphalt plants, specify location of spoil disposal area. • Obtain the required permits/licenses prior to the

Project Stage	Responsible Institution	Responsibilities
		start of construction from MoEPA, MoESD. • Prepare Plans specified in EMP and Specific Environmental Management Plan (SEMP). • Appoint and environment officer, health and safety specialists to oversee timely and proper implementation of mitigation and monitoring measures specified in the EMP/SEMP.
	RD	• Develop RAP, obtain approval from ADB and EBRD, • Implement the plan.
	Engineer	• Monitor the environmental performance of contractors in terms of implementation of mitigation measures for pre-construction phase as specified in the EMP/SEMP. • Issue the Contractor with non-compliance notices.
	Engineer, RD, ADB, EBRD	• Review and approve the EMP and the plans defined under the EMP
	Contractor and Engineer	• Provide site Induction.
	ECoW	• Map and clear the route in advance of construction works. • Identify areas of greatest ecological value, areas needing translocation, bird nesting areas where schedules need to be altered etc. • Survey to inform the development of additional mitigation (if required) such as bat surveys and other species-specific surveys, and surveys to help ensure that specific mitigation is applied within the project Right of Way (RoW) in advance of vegetation clearance. • Ensure implementation of Biodiversity Action Plan.
Construction	Contractor though Contractor's ESO, ECoW and H&S staff	• Daily monitor environmental, social and health and safety compliance. • Prepare checklists (biweekly). • Develop monthly environmental and social reports. • Develop additional mitigation measures whether appropriate. • Elaborate corrective action plans. • Hold monthly community meetings within the Project area throughout the construction period. • Provide daily toolbox training. Keep record of all monthly training and toolbox trainings. • Review SEMP as appropriate. • Develop Operational EMP for road to be completed and approved by engineer prior to the completion of construction.
	RD	• Visit site weekly to monitor performance. • Engage external expert(s) to undertake annual independent verification of monitoring information submitted to ADB an EBRD, to determine if various EMP/SEMP provisions are being implemented in thorough and timely manner and in accordance with budget identified within the EMP/SEMP. • Review (annually) the EMP/SEMP and approve the changes.
	ADB/EBRD	• Review semi-annual monitoring reports from the Engineer.

Project Stage	Responsible Institution	Responsibilities
		• Review reports from annual independent monitoring.
	Engineer	• Undertake environmental effects monitoring during pre-construction and construction phases • Weekly monitor the Contractors compliance with EMP / SEMP. • Monitor the environmental performance of contractors in terms of implementation of mitigation measures for construction phase as specified in the EMP/SEMP. • Issue the Contractor with non-compliance notices. • Review and approve the specific environmental management plans (e.g., Spoil Disposal Plan, Noise Control Plan, etc.) to be prepared by contractors as specified in the EMP. • Review (annually) and approve the EMP/SEMP • Prepare monthly environmental monitoring reports on EMP implementation to RD. • Prepare and submit semi-annual monitoring reports on EMP/SEMP implementation to the RD for presentation to Lender.
Operation	RD	• Ensure implementation of EMP and report to the lenders as per the plan.

G.11 EMP Summary Costs

1353. Most costs associated with the environmental recommendations of the EMP are a normal part of preparing the bid and contract documents and ensuring that proper environmental provisions are incorporated therein. The installation of septic systems at construction camps, for example, is an environmental necessity, but not generally considered an "environmental cost".

1354. **Appendix A** provides the Project EMP for both Lot 1 and Lot 2. Estimated costs[163] are provided in this table for the items considered a specific environmental cost. These costs are summarised in the tables below along with the instrumental monitoring costs foreseen in **Appendix B**.

Table 177: Lot 1 Estimated Costs (excluding BAP costs)

Aspect	***Item***	***Estimated Cost ($)***
Development and implementation of the mechanism to resolve environmental complaints due to the project implementation	*24 Hour Complaints Hotline*	*24,000*
	Noticeboards	*5,000*
Air quality impacts due to exhaust and dust emissions	*Truck washing facilities*	*10,000*
Hydrology and Soils	*Spill Kits*	*10,000*
Spoil Disposal	*Fencing*	*2,000*
	Simple Environmental Assessment	*10,000*
Waste Management / OHS	*Asbestos PPE*	*2,000*

[163] These estimated costs are broadly in line with the estimated costs for the recently completed EIA (June 2018) of Section F2 of the E-60 Highway in Georgia.

Operational Noise	*Refined Noise Modeling by Engineer*	*10,000*
	Noise barriers	*175,500*
PCR	*Fencing*	*5,000*
Oversight and Management	*Engineers EHS staff*	*480,000*
	Contractors EHS Staff	*312,000**
Instrumental Monitoring	*Pre-Construction / Construction*	*133,460*
	Operational	*19,200*
Lot 1 Total Estimated Costs		***1,198,160***

***** Includes a minimum of 2 national EHS staff

Table 178: Lot 2 Estimated Costs (excluding BAP costs)

Aspect	***Item***	***Estimated Cost ($)***
Development and implementation of the mechanism to resolve environmental complaints due to the project implementation	*24 Hour Complaints Hotline*	*24,000*
	Noticeboards	*5,000*
Air quality impacts due to exhaust and dust emissions	*Truck washing facilities*	*10,000*
Hydrology and Soils	*Spill Kits*	*10,000*
Spoil Disposal	*Fencing*	*2,000*
	Simple Environmental Assessment	*10,000*
Waste Management / OHS	*Asbestos PPE*	*2,000*
Operational Noise	*Refined noise modelling by Engineer*	*20,000*
	Noise barriers	*2,905,500*
PCR	*Fencing*	*5,000*
Oversight and Management	*Engineers EHS staff*	*480,000*
	Contractors EHS Staff	*312,000**
Instrumental Monitoring	*Pre-Construction / Construction*	*264,120*
	Operational	*41,600*
Lot 1 Total Estimated Costs		***4,091,220***

***** Includes a minimum of 2 national EHS staff

H. Stakeholder Engagement, Information Disclosure & Grievance Mechanism

H.1 Public Consultation Requirements

1355. According to the ADB Safeguard Policy Statement (2009):

> "*The borrower/client will carry out meaningful consultation with affected people and other concerned stakeholders, including civil society, and facilitate their informed participation. Meaningful consultation is a process that:*
> *(i) Begins early in the project preparation stage and is carried out on an ongoing basis throughout the project cycle;*
> *(ii) Provides timely disclosure of relevant and adequate information that is understandable and readily accessible to affected people;*
> *(iii) Is undertaken in an atmosphere free of intimidation or coercion;*
> *(iv) Is gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups; and*
> *(v) Enables the incorporation of all relevant views of affected people and other stakeholders into decision making, such as project design, mitigation measures, the sharing of development benefits and opportunities, and implementation issues.*
>
> *Consultation will be carried out in a manner commensurate with the impacts on affected communities. The consultation process and its results are to be documented and reflected in the environmental assessment report."*

1356. The EBRD requirements for stakeholder engagement are outlined in the Bank's Environmental and Social Policy of May 2014 under the Performance Requirement (PR) 10 Information Disclosure and Stakeholder Engagement and in the Public Information Policy (PIP) approved in 2014. The EBRD requires that clients conduct stakeholder engagement on the basis of providing local communities that are directly affected by the project and other relevant stakeholders with access to timely, relevant, understandable and accessible information, in a culturally appropriate manner, and free of manipulation, interference, coercion and intimidation.

1357. **Section D** describes the national legal requirements of Georgia with regards to stakeholder engagement and information disclosure.

H.2 Stakeholder Engagement Activities

General Principles

1358. Stakeholder engagement has been undertaken throughout the development of the Project, with the view to determining and responding to the views of interested and parties potentially affected by the Project throughout the life of the Project, and ensure open and transparent, two-way communication between Project proponent, the RD, and stakeholders. The approach to engagement seeks to meet both national and international requirements.

1359. The following general principles will govern stakeholder engagement activities:

- The content of documents for public comment will provide accessible and adequate information on the Project, and not create undue fears (regarding potential negative impacts) or expectations (regarding potential positive impacts such as job creation, etc.);
- Written information will be accompanied by visual illustrations and explanations as needed to build understanding of the project;

- The information will be disclosed in the local language(s) where needed and in a manner that is accessible and culturally appropriate, taking into account any vulnerable people;
- If key issues of particular concern arise, workshops may be offered to explain technical processes, assessment techniques, and quality assurance measures to verify results and ensure mitigation procedures are followed; and
- Efforts will be made to explain not only the proposed project and EIA process, but also applicable national laws and legislations, international principles and standards and how the RD will address compliance.

Stakeholder Engagement Plan

1360. A Stakeholder Engagement Plan (SEP) was developed for this Project, which documents the Project's design and implementation requirements with regards to engagement with stakeholders. The SEP outlines the approach to engagement, responsibilities and an action plan for consultation during the course of project design, construction and operations. The SEP design provides for participatory processes of directly and indirectly potentially affected parties, including households, vulnerable groups, civil society organisations, various levels of government and thematic specialists.

1361. Engagement with households includes: those resident / semi-permanent resident in the Project Area; vulnerable groups such as women headed households with dependents, pensioners, disabled or other people receiving disability support from the Government, IDPs or those with another vulnerability who may be specifically be affected by the Project; those with an interest in a specific topic (e.g. biodiversity). Government was also engaged and included consultation with representatives from municipalities, the District and national levels across environmental, social and economic disciplines. Civil society was engaged and focused on environmental and development issues.

1362. Meaningful engagement was undertaken, and included participatory processes in Community Mapping, repeated engagement efforts on topics of specific interest in the community, and inclusion of design changes in response to engagement. Further detail is provided below on engagement activities and design changes.

1363. Engagement activities have been designed and continue to be implemented in accordance with the SEP. This documents the engagement activities that seek: to outline a systematic approach to stakeholder engagement that will help the proponent to build and maintain a constructive relationship with stakeholders, in particular directly affected communities; to promote improved environmental and social performance of the project through effective engagement with the project's stakeholders; to promote and provide means for adequate engagement with affected communities throughout the project lifecycle on issues that could potentially affect them and to ensure that meaningful environmental and social information is disclosed to the project's stakeholders; and; to ensure that grievances from affected communities and other stakeholders are responded to and managed appropriately.

Stakeholder Engagement Undertaken to Date

1364. From the 4th April 2018 to the 6th March 2019, 41 stakeholder engagement events have been held.[164] The events, summarized in Table 179, were organized by the RD with support from ADB and EBRD experts as well as consulting firms. They included public meetings, focus group discussions and one-on-one meetings with affected individuals, communities, civil society meetings, and expert consultations with both government and civil society representatives.

[164] Prior to ADB's involvement in the project (May 2018), consultation events were held during pre-feasibility, feasibility, and design stages of the project, but due to limited information availability, they are not included in this summary.

Guided by the SEP, the events were carried out in line with national requirements as well as those of both ADB and EBRD.[165]

1365. The 41 events broadly covered three topics – EIA process, the LARP, and a proposed eco-tourism support activities under the project, as listed below:

Environmental Impact Assessment Process (22 events)

- 5 public meetings
- 5 one-on-one meeting days with affected communities
- 2 civil society meetings
- 8 expert consultation events with NGOs
- 2 expert consultation events with MoEPA's biodiversity department.

Land Acquisition and Resettlement Plan (14 events)

- 7 public meetings with affected communities
- 7 focus group discussions with affected communities

Potential Eco-Tourism Support Component of the Project (5 events)

- 3 meetings with NGOs/Associations
- 2 meetings with municipality mayors – Dusheti and Kazbegi

1366. More than half of the events held during the period were EIA related. These events collected environmental and social baseline data, disclosed the EIA Scoping Report and subsequent draft international and national EIA reports, and gathered feedback to refine the international EIA before its finalization and final disclosure. Georgian law requires one public consultation event to disclose the EIA Scoping Report and one public consultation event to disclose the final national EIA. The Project exceeded this requirement by holding two consultation events for each of these disclosure requirements (events 7,8, 32, and 33 in Table 81).

1367. The detailed consultations required for LARP preparation are well-advanced with 13 events carried out on LARP preparation. In addition, each household directly affected has been further engaged in preparation of the Detailed Measurement Survey (DMS) as part of the LARP.

1368. The proposed eco-tourism component of the Project is a recent initiative and is still in the early stages of planning, following initial consultations with civil society and local and national government. Consultations with affected communities on potential eco-tourism support activities are currently being scheduled and will likely continue throughout 2019.

1369. As further consultation events will be ongoing, updated stakeholder engagement activity reports will be produced periodically.

Table 179: Summary of Stakeholder Engagement Events (April 2018 to February 2019)

#	Event type and topic	Date	Location	Stakeholder group
1	One-on-one meetings – EIA	4 April 2018	Tetri Aragvi and Khadistskali gorge settlements	Affected communities
2	One-on-one meetings – EIA	11 April 2018	Natvani, Baidara, and Tergi	Affected communities

[165] A project Communications Plan was finalized in February 2019 to guide a range of activities to implement the Stakeholder Engagement Plan that are not event-related. For example, a Frequently Asked Questions (FAQ) and Fact Sheet were recently produced and disseminated.

#	Event type and topic	Date	Location	Stakeholder group
3	One-on-one meetings – EIA	19 April 2018	Tskere, Kobi	Affected communities
4	One-on-one meetings – EIA	8 May 2018	Zakatkari	Affected communities
5	One-on-one meetings – EIA	12 May 2018	Settlements along Kvesheti-Kobi alignment	Affected communities
6	Public meeting – project introduction and LARP	14 May 2018	Kvesheti	Affected communities
7	Public meeting – EIA Scoping disclosure	10 July 2018	Kvesheti	Affected communities and interested stakeholders
8	Public meeting – EIA Scoping disclosure	10 July 2018	Kobi	Affected communities and interested stakeholders
9	Civil society meeting – EIA	13 Aug 2018	Tbilisi	NGOs, residents, government representatives
10	Focus group discussion – LARP	30 Aug 2018	Begoni	Affected communities
11	Focus group discussion – LARP	30 Aug 2018	Kvesheti	Affected communities
12	Focus group discussion – LARP	31 Aug 2018	Kobi	Affected communities
13	Civil society meeting – EIA	4 Sept 2018	Tbilisi	NGOs, businesses, government representatives
14	Public meeting alignment/alternatives/EIA	7 Sept 2018	Mleta	Affected communities
15	Expert meeting – EIA	10 Sept 2018	Tbilisi	NGOs
16	Expert meeting – EIA	10 Sept 2018	Tbilisi	NGOs
17	Expert meeting – EIA	11 Sept 2018	Tbilisi	National government
18	Expert meeting – EIA	11 Sept 2018	Tbilisi	NGOs
19	Public meeting – LARP	14 Sept 2018	Begoni	Affected communities
20	Public meeting – LARP	14 Sept 2018	Tskere	Affected communities
21	Public meeting – LARP	15 Sept 2018	Kvesheti	Affected communities
22	Public meeting – LARP	15 Sept 2018	Zakatkari	Affected communities
23	Expert meeting – EIA biodiversity	26 Sept 2018	Tbilisi	NGOs
24	Expert meeting – EIA biodiversity	26 Sept 2018	Tbilsi	NGOs
25	Expert meeting – EIA biodiversity	26 Sept 2018	Tbilsi	NGOs
26	Expert meeting – EIA biodiversity	28 Sept 2018	Tbilsi	National government
27	Focus group discussion – LARP	16 Oct 2018	Kvesheti	Affected communities
28	Focus group discussion – LARP	16 Oct 2018	Tskere	Affected communities
29	Focus group discussion – LARP	16 Oct 2018	Beniani-Begoni	Affected communities

#	Event type and topic	Date	Location	Stakeholder group
30	Focus group discussion – LARP	17 Oct 2018	Kobi	Affected communities
31	Expert meeting – EIA biodiversity	10 Nov 2018	Tbilisi	NGOs
32	Public meeting – EIA disclosure	10 Dec 2018	Kobi	Affected communities and interested stakeholders
33	Public meeting – EIA disclosure	10 Dec 2018	Mleta	Affected communities and interested stakeholders
34	Public meeting – LARP	9 Jan 2019	Mleta	Affected communities, government representatives
35	Expert meeting – ecotourism	30 Jan 2019	Tbilisi	NGOs
36	Expert meeting – EIA	1 Feb 2019	Tbilisi	NGOs
37	Expert meeting – EIA /ecotourism	1 Feb 2019	Tbilisi	NGOs
38	Expert meeting – tourism	1 Feb 2019	Tbilisi	NGOs
39	Meeting – tourism	4 Feb 2019	Dusheti	Local government (Dusheti Mayor)
40	Meeting – tourism	4 Feb 2019	Stepantsminda	Local government (Kazbegi Mayor)
41	Public meeting - LARP	6 Mar 2019	Kaishaurebi	Affected communities

Key Stakeholder Engagement Findings to Date

1370. From the stakeholder engagement events, affected communities identified a number of benefits that they anticipate from the Project, these include the following:

- the new road will be safer;
- travel will be shorter and more comfortable;
- more opportunities for local livelihoods such as selling woven socks and other produce;
- more opportunities for local hotels and restaurants;
- development of tourism and income generating activities;
- more employment for the local population;
- access to villages all year round;
- more people will decide to live permanently in these villages;
- better access to health, education, markets and other facilities;
- availability of public transport; and
- promotion of overall economic and social development of the project area, especially in villages.

1371. The engagement events also provided important feedback on project issues from the perspective of affected communities and interested stakeholders. Table 180 synthesizes these into 13 key issues, of which nine were raised in multiple consultations. They range from social and environmental issues such as the impact of the Project on cultural heritage sites and on local biodiversity, to challenges with land registration and questions about compensation.

1372. In recent months, the project team has been working to, and will continue to, address all of these issues. Some of the issues raised have been addressed by providing more detailed information (for example on project alignment alternatives) while others require additional mitigation measures. For example, the inclusion of a Cultural Heritage Monitor as an EIA mitigation measure to ensure cultural heritage sites are not affected by construction. These, and other actions are also summarized in Table 180. For further detail on the consultation events and issues raised and topics discussed, see **Appendix S**.

Table 180: Key Issues and Responses from Stakeholder Engagement to Date

Main issues raised	Relevant events*	Issues raised by	Initial clarifications/responses	Project actions in response to engagement	EIA reference
1. Impact of the Project on cultural monuments such as graves, shrines, churches	6, 7, 8, 10, 12, 13, 14, 32	Residents from Kvesheti, Kobi, and Almasiani, Representative of the Georgia Tourism Association	According to the project design, cultural monuments will not be damaged during construction and the National Agency for Cultural Heritage Preservation of Georgia is collaborating with the project to ensure this.	• The engineer will employ a Cultural Heritage Monitor to be onsite during topsoil stripping and initial earthworks in high sensitivity areas identified in the EIA. • Specific vibration monitoring will be undertaken near identified cultural heritage sites to ensure there are no impacts • A "chance find" procedure has been developed for all cultural heritage and will be implemented by the Contractor.	PCR in the Project area identified in **Section E.4.5 - PCR**. Impacts to PCR, cemeteries, and specific monuments (e.g. St George cross and soldier's monument near Kobi) are addressed in **Section F.8.7 – PCR** and **Section F.7.5 – Spoil Disposal**. Supervision of the works by a Cultural Heritage Monitor is foreseen as per **Section F.8.7 – PCR**. Chance Find covered in **Annex E/**
2.Impact of the Project noise and vibration on households	6, 7, 11, 14, 22	Residents from Kvesheti, Begoni Plateau villages, Arakhveti, Zakatkari, and Mleta	Vibration and noise impacts, and mitigation measures are part of the EIA process. Compensation will be provided in case of construction-caused damage. Pre-construction, RD will do property inventories as necessary.	• Vibration: Pre-construction surveys will be conducted for all properties <50m from the new road to identify potential vibration impacts during construction. • Appropriate mitigation actions will occur. The Contractor will also monitor vibration onsite, particularly in sensitive locations where buildings are in poor condition. • Noise: Barriers will be installed to ensure that project standards are met.	Impacts of vibration and the requirements for pre-construction surveys included in **Section F.8.6 – Vibration**. Noise impact modelling and mitigation provided in **Section F.8.5 – Noise**
3.Impact of the Project on protected areas, biodiversity	7, 8, 9, 13, 23, 24, 25, 26, 31, 32, 36, 37	Residents from Kvesheti and Kobi.	No impact expected on protected areas such as the Kazbegi national park (including its expanded	• Five meetings with NGOs (events 23, 24, 25, 26, 31) held to generate additional information about biodiversity	Migration of animals and birds has been studied in detail as part of **Section E.2 – Biodiversity Analysis** of protected areas,

Main issues raised	Relevant events*	Issues raised by	Initial clarifications/responses	Project actions in response to engagement	EIA reference
		Representatives from Green Alternative, SABUKO, Tbilisi State University, NACRES, CENN.	boundaries) and Emerald Network Site. Noted need for further area surveys on bird species such as the Egyptian vulture and the importance of buckthorn. Mitigation actions for potential environmental impacts in the project area, including the Khada valley, addressed in the EIA.	in the area to inform the project's Biodiversity Action Plan. • The Project will employ an Ecological Clerk of Works as well as an International Biodiversity Expert to ensure biodiversity focused mitigation occurs and the BAP is implemented. • Engagement with NGOs and government will continue as the project is implemented.	including the Emerald Network, has been undertaken as part of **Section E.2.2 – Protected and Notable Areas** and specific impacts for affected species prepared under **Section F.6.1 – Habitat and General Ecological Impacts** and **Section F.6.2 – Notable Species**
4.Disposal of project spoil and waste	7, 8, 12, 13, 14, 33	Residents from Kvesheti, Kobi, Almasiani, Mleta, and Arakhveti. Representative from Green Movement of Georgia	Contractors are obliged to ensure appropriate waste management in accordance with Georgian Law and waste management specified in the EIA. The location of spoil sites is guided in the EIA but will be determined by contractors. Spoil can be potentially used for community building needs, such as carparks.	• The project team, has confirmed all spoil sites will be located outside of the boundary of Kazbegi National Park (including extended boundaries). • The Project team has discussed with Kazbegi Municipality where spoil can be used for community or municipal purposes as part of the Kobi Development Plan • The project team has confirmed there will be no impacts to Cultural Heritage sites from spoil disposal.	**Section B** of the EIA discusses proposed spoil disposal sites. **Section F.7.5 – Spoil Material** discusses specific impacts and mitigation for spoil disposal, and the potential use of spoil disposal areas for car parking, cafes, market stalls. The issue of waste management is discussed under **Section F.7.6 – Waste Management**
5.Impact of project on road and other access for potentially affected communities	6, 7, 10, 11, 14, 19, 22	Residents from Kvesheti, Arakhveti, Khada, and Tskere,	New vehicle access roads, crossing points, underpasses, walking pavements will be constructed – traffic will not be hampered and overall access will be maintained or improved	• Based on consultations, additional underpasses have since been included in the design and the Bedoni access road alignment changed to avoid going through the village.	Access routes are extensively covered in **Section B.5.4,** and their impacts assessed in **Section F.7.9 – Access and Access Roads.** Underpasses covered in **Section B.4.3.**

Main issues raised	Relevant events*	Issues raised by	Initial clarifications/responses	Project actions in response to engagement	EIA reference
			for communities, including moving livestock.	• The tunnel section at Tskere will be extended to ensure pedestrian access to the cemetery is maintained.	
6.Impact of project on utilities infrastructure	8, 10, 12, 13, 32	Residents from Kobi, Almasiani, Begoni plateau villages, Arakhveti, Kvesheti. Representative of Green Movement of Georgia.	The gas pipeline in Kobi won't be moved.		Utilities in the Project area will be managed according to the measures outlined in **Section F.7.2 – Social Infrastructure.**
7.Lack of information about, input into, and consideration of project design alternatives	7, 9, 11, 13, 14, 21, 32, 33, 36,	Residents from Arakhveti, Kvesheti, Mleta, Representatives of Green Alternative, and GeoGraphic, SABUKO, CENN, and an individual activist	RD agreed that there should have been a round of public consultations during feasibility and design stages. Pointed out nine alternatives were assessed in detail and more information will be provided in the final EIA scoping report and final EIA. Geological conditions and geometrical curves important determinant of the project road alignment. Upgrading the existing road to meet requirements was deemed not feasible.	• In consultation events from no.9 onwards, RD provided more comprehensive information on road alignment selection and the alternatives. • The EIA has been strengthened to include justification on the proposed final route and to include more data collected in relation to why upgrading the existing road or using the existing corridor was not feasible and alternative corridors outside of Khada valley were not possible.	Alternatives discussed in detail in **Section C - Alternatives**.
8.Difficulties with land registration	6, 8, 10, 14, 9, 33, 34, 41	Residents from Arakhveti, Kvesheti, Kobi, Beniani, Begoni Plateau villages, Tskere, Mleta	RD offered to assist individual households in the registration process.	• RD and the Land Recognition Committee are working together with residents on each case where land registration has been having difficulties. Each case is open	Registration of land ownership is included in **Section F.7.4 - Land Use and Natural Resources** (*the Land Acquisition and Resettlement plan covers this issue in detail*)

Main issues raised	Relevant events*	Issues raised by	Initial clarifications/responses	Project actions in response to engagement	EIA reference
				for resubmission and further analysis.	
9.Clarity about compensation arrangements for affected households	6, 7, 12, 19, 20, 21, 22, 41	Residents from Kvesehti, Tskere, Beniani, Begoni, Arakhveti,	LARP process is designed to address this and will be in line with the guidelines of ADB and EBRD. Assessments of affected households is being done via private consultations.	• APs made aware of compensation allowances through the LARP preparation and to further support, RD and the Land Recognition Committee are working with APs who do not have full documentation, to further access grounds for claims.	Compensation arrangements are included in **Section F.7.4 - Land Use and Natural Resources** *(the Land Acquisition and Resettlement plan covers this issue in detail)*
10.Project impacts on Khada valley eco-tourism	9	Local activist		• Six tourism consultation events subsequently held with the Georgian Eco-Tourism Association (event no. 34) national NGOs: CENN, SABUKO, WWF (36, 37, 38) and the mayors of Dusheti and Kazbegi (events 26 & 27). Broad consensus that the Khada valley has significant eco-tourism development opportunities that the Project could potentially support. As a result, an eco-tourism component of the Project has been specifically included and consultations for this are ongoing.	Local livelihood mitigation included in **Section F.7.1 - Local Economic and Livelihoods Impacts** and **Appendix Z** for proposed Visitor Center Concept
11.Impact of construction camps	13	Representative of Green Movement of Georgia	Contractor has the right to determine where the construction camps are placed.	• Commitment made in EIA and EMP to locate construction camps >500m from residential areas.	Construction camp management and mitigation measures based on best practice are outlined in **Section F.7.8 – Construction Camps, Asphalt Plants, Concrete Batching Plants and Temporary Facilities.**

Main issues raised	Relevant events*	Issues raised by	Initial clarifications/responses	Project actions in response to engagement	EIA reference
12.Project employment opportunities for potentially affected communities	6		Local population will be given preference for project employment opportunities.	• Targets have been included in the EIA for local employment with an estimate of 70% being from local labor.	Conditions for the use of local labour are outlined in **Section F.8.2 – Workers Rights and OHS**.
13. Road safety for school children	11	Residents from Begoni plateau villages	n/a (focus group discussion)	• Design of road includes tunnel section in Begoni, reducing risks to resident's children and livestock. • The contractor will provide a series of road safety awareness sessions for schools in the Project area.	The EIA has specific recommendations for the Contractor to provide traffic safety awareness sessions for schools in the Project area – **Appendix A – EMP**.

*Event numbers correspond to numbering in **Table 179**

H.3 Information Disclosure

1373. Notification of the proposed Project was provided for disclosure on the ADB, EBRD and RD websites from May 2018. In addition, in compliance with ADB's SPS (2009) the draft EIA has been provided for disclosure on the ADB, EBRD and the RD Website (in local language).

1374. With regards to information disclosure, ADB is committed to working with the borrower/client to ensure that relevant information (whether positive or negative) about social and environmental safeguard issues is made available in a timely manner, in an accessible place, and in a form and language(s) understandable to affected people and to other stakeholders, including the general public, so they can provide meaningful inputs into project design and implementation.

1375. The EBRD requires that clients conduct stakeholder engagement on the basis of providing local communities that are directly affected by the project and other relevant stakeholders with access to timely, relevant, understandable and accessible information, in a culturally appropriate manner, and free of manipulation, interference, coercion and intimidation.

1376. According to PR 10 stakeholder engagement has to involve the disclosure of information.

1377. In line with its policies, the EBRD will disclose on its website the Project's Environmental Impact Assessment Non-Technical Summary (NTS), Stakeholder Engagement Plan (SEP) and Environmental and Social Action Plan (ESAP).

1378. The Government of Georgia's requirements on public consultation are set forth in the Environmental Assessment Code. According to this Code, public consultation is to be performed both during the scoping phase and during the EIA phase, and requires disclosure of particular information, as follows:

1379. **Scoping phase -** Once the scoping application is submitted by the proponent, the Ministry posts within three days the scoping application and the scoping report on its website and on the notice board of the municipalities involved. The public has then 15 days to submit opinions and comments, which the Ministry has to take into account if there are appropriate grounds. Between the 10th and the 15th day the Ministry has to hold a public review of the scoping report in a venue within the administrative body closest to the location of the planned activities. The meeting is open to everyone and information on the meeting has to be provided at least 10 days before it is held. Minutes of the meeting have to be taken by a representative of the Ministry. Between the 26th and the 30th day after the scoping application submission the Ministry has to issue a scoping opinion which contains indications on the list of studies and information that has to be addressed in the EIA report.

1380. **EIA phase -** Once the EIA application is submitted by the proponent, the Ministry posts within three days the EIA application and the EIA report on its website and on the notice board of the municipalities involved; in addition, within three days the Ministry establishes an expert commission that has to provide an expert opinion on the EIA report within 40 days.

1381. The public has 40 days to submit opinions and comments, which the Ministry has to take into account if there are appropriate grounds.

1382. Between the 25th and the 30th day the Ministry has to hold a public review of the EIA report in a venue within the administrative body closest to the location of the planned activities. The meeting is open to everyone and information on the meeting has to be provided at least 20 days before it is held. Minutes of the meeting have to be taken by a representative of the Ministry. Between the 51st and the 55th day after the EIA application submission the Ministry has to issue an individual administrative act which provides or denies the environmental authorization for the project.

1383. Both of these activities have now been completed.

1384. The RD PMU will be responsible to notify and inform the public of construction operations prior to construction works, publish an emergency response plan disclosing his intentions to deal with accidents and emergencies, including environmental/public health emergencies associated with hazardous material spills and similar events, etc.

H.4 Grievance Mechanism

H.4.1 Introduction

1385. Grievance Redress Mechanisms (GRMs) are locally based, formalized way to accept, assess, and resolve community feedback or complaints. They provide predictable, transparent, and credible processes to all parties, resulting in outcomes that are relatively low cost, fair, and effective. They build on trust as an integral component and facilitate corrective action and pre-emptive engagement. GRMs also set out a timeframe in the resolution of complaints.[167] The Project GRM will serve as a venue for receiving and addressing project-affected peoples' concerns and grievances about environment related impacts. It will address concerns promptly through an understandable and transparent process that is accessible to all members of the community, gender responsive and culturally appropriate. The overall approach of the GRM is to deal with grievances at a local level first in an efficient manner and escalate to to the next level or higher level of authority if grievance cannot be resolved.

1386. The ADB Accountability Mechanism (AM) provides an independent forum and process for people to voice and seek solutions to their problem as well as alleged non-compliance by ADB with its operational policies and procedures. As ADB adheres to early problem prevention and problem-solving, Project complaints and concerns should first be addressed promptly and effectively at the Project, through the GRM, and operational levels. The AM is the "last resort" process for dealing with problems and compliance issues that were not prevented or solved at GRM and operational levels.

1387. The GRM is also aligned with the EBRD's Project Complaints Mechanism (PCM), which is the EBRD's accountability mechanism that has been established to assess and review complaints about Bank-financed projects. It provides individual(s) and local groups that may be directly or adversely affected by an EBRD project, as well as civil society organizations, a means of raising complaints or grievances with the Bank, independently from banking operations.[168]

1388. The GRM should be established and operated in compliance with the Georgian Regulations and ADB Policy requirements.

1389. The ADB's 2009 Safeguards Policy Statement[169] requires the borrower/client to establish a mechanism that will receive and facilitate the resolution of affected persons' concerns and grievances about physical and economic displacement and other Project impacts, paying particular attention to vulnerable groups.

H.4.2 Georgian Regulations

1390. The Administrative Code of Georgia is the legal document defining the rules and procedures for any grievance review and resolution within the national regulatory framework.

1391. According to the law, the Administrative body receiving officially lodged claims is obliged to review the claims and engage the claimant in the grievance review and resolution process, and issue final decision in that regard.

1392. Clause 181. defines the content and the grievance submission forms. In particular, the grievance package should include: a) Name of the administrative body to whom the complaints

[167] World Bank. 2014. Global Review of Grievance Redress Mechanisms in World Bank Projects. Washington, DC. © World Bank.
[168] https://www.ebrd.com/work-with-us/project-finance/project-complaint-mechanism.html
[169] ADB. 2009. *Safeguards Policy Statement.* Manila.

are addressed; b) Name, address and contact details of the claimant; c) Name of the administrative body, who's decisions or administrative acts are the subject of complain; d) Name of the administrative act or decision, which is subject of complain; e) Content of the claim; f) The context and facts, based on which the complaint is substantiated; g) list of attachments

1393. Clauses 194 and 198 define the rules and procedures ensuring participation of the claimants in the grievance review process.

1394. According to the clause 202, the decision issued by the Administrative Body in relation with the reviewed claim has a status of individual administrative legal act.

1395. The standard period given for the issuance of the decision in relation with the grievance is 1 month.

H.4.3 Grievance Redress Process

1396. The EIA includes in its scope the establishment of a responsive, readily accessible and culturally appropriate Grievance Redress Mechanism (GRM) capable of receiving and facilitating the resolution of affected persons' concerns and grievances related to the project. An established grievance redress mechanism allows an AP to appeal any decision, practice or activity arising from land or other assets compensation that they disagree with. The scope of the GRM is to address issues related to involuntary resettlement, social and environmental performance, and information disclosure.

1397. The APs will have the right to file complaints and/or queries on any aspect of the project, including environmental issues and other social aspects such as land acquisition and resettlement. Under the adopted grievance mechanism, the APs may appeal any decision, practice or activity related to the project. All possible avenues will be made available to the APs to voice their grievances. The IA will ensure that grievances and complaints on any aspect of the project are addressed in a timely and effective manner.

1398. The fundamental objectives of the Grievance Redress Mechanism are:

- To reach mutually agreed solutions satisfactory to both, the Project and the APs, and to resolve any grievances locally, in consultation with the aggrieved party;
- To facilitate the smooth implementation of the EIA and LARP, particularly to cut down on lengthy litigation processes and prevent delays in Project implementation;
- To facilitate the development process at the local level, while maintaining transparency as well as to establish accountability to the affected people.

1399. APs were fully informed of their rights and of the procedures for addressing complaints whether orally or in writing during the EIA and LARP consultations and surveys, and will be informed again when the compensation is disbursed. Care will be taken to prevent grievances rather than relying solely on the redress process. This can be achieved by establishing extensive communication and coordination between the affected communities, the EA, and local governments in general.

1400. The GRM consists of the project-specific systems established at the municipal level and a regular system established at RD. Grievance Redress Committees (GRCE) were established at a municipal level as a project-specific instrument, and will function for the duration of Project implementation. The Grievance Redress Commission (GRCN) was formed as an informal structure within the RDMRDI to record and ensure grievance review and resolution.

1401. The Grievance Redress Commission (GRCN) was formed by the order of the Head of the RD as a permanent and functional informal structure, engaging personnel of RD from all departments to work on LAR and environmental issues and complaint resolution. This includes the top management of the RDMRDI, safeguard or LAR units, legal other relevant departments (depending on the specific structure of the IA). The GRCN is involved in Stage 2 of the grievance resolution process. The order states that if necessary, a representative of local authorities,

NGOs, auditors, APs and any other persons or entities can be included in the Commission as its members.

1402. A Grievance Redress Committee (GRCE) is an informal, project-specific grievance redress mechanism established to administer grievances at Stage 1. This informal body has been established at the community level in each affected municipality (village/community authority). The GRCE includes representatives of municipal LAR teams and local communities. The RD representative in the municipal LAR team coordinates the GRCE formation. He/she is responsible for the coordination of GRCE activities and organizing meetings (conveyor). In addition, GRCE comprises the village Rtsmunebuli or his/her representative, representatives of APs, women APs, and appropriate local NGOs to allow the voices of the affected communities to be heard and ensure a participatory decision-making process.

1403. GRCEs were established at the municipality level for the Project with an office order from the Road Department (RD). The GRCE at the municipality level consists of seven members as listed in the following tables.

GRCE at Kazbegi Municipality

1404. The GRCE for the Kazbegi municipality will be based in Kobi.

Table 181: GRCE at Kazbegi Municipality

Name	Position	Telephone/email	Status
Shota Batsikadze	Representative of Resettlement Division at RD	577613302	Conveyor; Contact person
Archil Jorbenadze	Representative of LAR Commission (GRCN) of RDMRDI	591403038	Member
Givi Chkareuli	Representative of Mayor in Kobi village	598240334	Member Secretary
Kakha Chopikashvili	Representative of Kobi village in Sakrebulo of Kazbegi municipality	595555918	Member
Artur Abaev	Representative of APs	555446125	Member
Fatima Koblova	Representative of Kobi population	599567894	Member

GRCE at Dusheti Municipality

1405. The GRCE for Dusheti Municipality will be based in Kvesheti.

Table 182: GRCE at Dusheti Municipality

Name	Position	Telephone/email	Status
Shota Batsikadze	Representative of Resettlement Division at RD	577613302	Conveyor; Contact person
Archil Jorbenadze	Representative of LAR Commission (GRCN) of RDMRDI	591403038	Member
Tengiz Bedoidze	Representative of Mayor in Kvesheti	551102790	Member
Ketevan Kakhurashvili	Elected Representative of Kvesheti village	591113462	Member
Ushangi Zakaidze	Representative of APs	595012903	Member
Vasiko Burduli	Representative of Kvesheti population (Male)	597212120	Member
Marta Mezvrishvili	Representative of Kvesheti population (Female)	555916273	Member

Grievance Redress Commission (GRCN) at Road Department

1406. The Grievance Redress Commission, was established at the RD level as a permanent GRM structure by order No. 224. It consists of 17 permanent members, two secretaries and three non-permanent members without the right of vote. The list of the permanent members is presented in the following table:

Table 183: Grievance Redress Commission (GRCN)

No	Name of Member	Position
1	Irakli Karseladze	Head of the Commission
2	Aleksandre Tevdoradze	Deputy Head of the Commission
3	Levan Kupatashvili	Member
4	Giorgi Tsereteli	Member
5	Koba Gabunia	Member
6	Salome Tsurtsumia	Member
7	Pikria Kvernadze	Member
8	Davit Sajaia	Member
9	Giorgi Eragia	Member
10	Nodar Agniashvili	Member
11	Mikheil Ujmajuridze	Member
12	Nino Mtsuravishvili	Member
13	Gia Sopadze	Member
14	Akaki Mshvidobadze	Member
15	Davit Kaladze	Member
16	Davit Getsadze	Member
17	Pavle Gamkelidze	Member
18	Girogi Tsagareli	Non-permanent member of commission
19	Mariam Begiashvili	Non-permanent member of commission
20	Archil Jorbenadze	Non-permanent member of commission

Grievance Resolution Process

1407. A representative of the resettlement service of the IA is responsible for coordination of the Committee's work and at the same time, he/she is nominated as a Contact Person who receives the grievances and handles the grievance logbook. The local authorities at the municipal level, the civil works Contractor, the Supervising Company (Engineer), as well as APs (through informal meetings) are informed about the Contact Person and his contact details are available in the offices of all mentioned stakeholders.

1408. The Contact Person collects and records the grievances, informs all members of the Committee and the management of RD about the essence of the problem, engages the relevant stakeholders in discussions with the aggrieved party and handles the process of negotiation with APs at Stage 1 of the grievance resolution process. The Contact Person prepares the minutes of meetings and collects signatures. If the grievance is resolved at Stage 1, the Contact Person records the resolution of the grievance in his logbook and informs the RD management in writing.

1409. If the complainants are not satisfied with the GRCE decisions, they can always use the Stage 2 procedures of the grievance resolution process. In such case, the Contact Person helps the AP lodge an official complaint (the complainant should be informed of his/her rights and obligations, rules and procedures of lodging a complaint, format of complaint, terms of complaint submission, etc.).

1410. The APs were informed about the available GRM. This was achieved through implementing information campaigns, distributing a Project information brochure, keeping all focal points up-to-date and maintaining regular communication with them, allowing multiple entry points for complaints and introducing forms for easer reporting of complaints.

Table 184: Grievance Resolution Process

Steps	Process
Step 1	The complaint is informally reviewed by the focal point at the village level, which takes all necessary measures to resolve the dispute amicably.
Step 2	• If the grievance is not solved at the previous level, the municipality level LAR representative will assist the aggrieved APs to formally lodge the grievances with the respective GRCE at the municipality level. The aggrieved APs will lodge the complaint if there is failure of negotiation at the village level and produce documents supporting his/her claim. • The GRCE member secretary will review the complaint and prepare a Case File for a GRCE hearing and resolution. A formal hearing will be held with the GRCE at a date fixed by the GRCE member secretary in consultation with the conveyor and the aggrieved APs. • On the date of the hearing, the aggrieved AP will appear before the GRCE at the village office and produce evidence in support of his/her claim. The member secretary will note down the statements of the complainant and document all procedures. • The decisions will be issued by the conveyor and signed by other members of the GRCE. The case record will be communicated to the complainant by the LAR Team at the village level. The grievance redress at this stage shall be completed within 4 weeks.
Step 3	If the aggrieved AP is unsatisfied with the GRCE decision at the municipality level, the next option will be to lodge grievances with the Grievance Redress Commission (GRCN) at the Resettlement Division of the RD at the national level within two weeks after receiving the decision from GRCE. The complainants must produce documents supporting his/her claim. The GRCN will review the GRCE hearing records and convey its decisions to the aggrieved APs within four weeks after receiving the complaint.
Step 4	If the RD decision fails to satisfy the aggrieved APs, they can pursue further action by submitting their case to the appropriate court of law (local courts) without reprisal. The aggrieved AP can take legal action over the amount of compensation or any other issues, e.g. occupation of their land by the contractor without their consent, damage or loss of their property, restrictions on the use of land/assets, environmental concerns such as dust caused by the contractor's machinery, etc.

H.4.4 GRC Records and Documentation

1411. RD will keep record of all complaints received for its use as well as for any review by ADB and EBRD during regular supervisions.

H.4.5 Special Recommendations to PAP for Legalization of Land Plots

1412. It is likely that many land parcels to be acquired are not registered or not properly registered. An AP who occupies land plots that are not owned by other private persons or the state and that are legitimately used by the AP but have not been registered under the privatization process, may be legalized. The legalization process is in progress and will be completed by the time of Implementation of the LARP. APs can only be compensated for lost land after legalization of the land plots.

1413. The Roads Department and local governments from the Project area are already assisting the APs by preparing accurate land parcel maps with geometric descriptions which will be provided to them. However, in order complete this efficiently, the Project authorities need

APs to cooperate by providing the necessary documents. To facilitate the process, the cost of registration of land parcels has been included the replacement cost of land.

H.4.6 Communication

1414. Prior to start of site works, the Contractor shall:

- Communicate the GRM to communities in the project impact zone.
- Set-up and publicize a 24-hour hotline for complaints.
  Ensure that names and contact numbers of representatives of GRCE, the RD and the Contractor are placed on the notice boards outside the construction site.

1415. In addition, it is recommended that the RD consult with PAP representatives prior to implementation of the GRM to make any necessary revisions, if appropriate, to make the process more effective and ensure PAPs ownership/active participation in the process.

1416. The complaints resolution process was presented formally during the public consultations. The grievance redress mechanism will also be presented during routine community meetings in the Project area during the construction phase of the Project.

I. Conclusions and Recommendations

I.1 Conclusions

1417. This EIA has established that, with the exception of the residual impacts mentioned below, there are no significant environmental issues that cannot be either totally prevented or adequately mitigated to levels acceptable to the GoG and international standards for Project activities.

1418. The identified residual impacts during the **Construction Phase** are shown in the table below.

Table 185: Construction Phase Residual Impacts

Topic	Residual Impact	Geographical Extent
Notable Habitats	Residual impacts on notable habits are expected to be **MINOR/MODERATE.** Whilst some habitats will be lost, use of an ECoW to avoid notable habitats wherever possible, aligned with sensitive routing, use of TBM, habitat restoration and offsets will reduce such impacts to acceptable levels.	Unmitigated impacts could affect around 0.1 ha of sub-alpine birch krummholz near the northern portal. Impacts to low grass marshes near Zakatkari close to proposed spoil disposal areas at the northern portal will be marked for avoidance by the ECoW and subject to separate national EIA.
Notable Species	Residual impacts on notable species are expected to be **MODERATE**. Direct impacts will be associated with habitat loss, disturbance and accidental mortality. Indirect impacts could also arise from fragmentation and introduction of people to the Khada valley. The implementation of the proposed mitigation, including the proactive use of the ECoW, and the preparation of appropriate Biodiversity Action Plans (BAPs) for key species, means that such impacts are, however, expected to be reduced to an acceptable level.	Direct impacts within the Project Corridor (150m either side of road) and to 500m downstream of river crossing points. Indirect impacts from introduction of people over a wider area, incorporating most of the Khada valley.
State Forest Fund	Cutting of the trees during the construction phase will have a negative impact upon habitat and the species in these areas. Residual impacts will be **MINOR / MODERATE**.	Areas of state forest fund within the Project corridor.
Land Use	No residual impacts are anticipated if the LARP is implemented correctly. However, there will still be disruption to the local community during the LARP implementation process. A GRM has been prepared to manage complaints received during this process. Residual impacts will be **MINOR / MODERATE.**	In all villages throughout the Project corridor.
Tunnels	In general impacts will be minor during the construction phase. However, due to the potential impacts on productive boreholes the residual impacts are upgraded to **MINOR / MODERATE**.	Around all tunnel portals impacts to biodiversity will occur. In addition, the productive boreholes in Kobi maybe affected.
Spoil / Landscape	If the proposed mitigation measures are implemented, including for example the buffer zones for Otter protection, impacts should be	At the identified spoil disposal sites in Kobi, Zakatkari and the Plateau. Impacts in Kvesheti

Topic	Residual Impact	Geographical Extent
	manageable. However, restoration of any spoil disposal area will take a number of years and as such the residual impacts for the spoil disposal areas are considered **MINOR / MODERATE**.	will not be felt due to the fact the spoil material is being used as fill for the road.
Lighting	If the proposed mitigation measures are employed the impacts will be **MINOR/MODERATE** due to the fact that in some instances lighting will be needed during works at night and they could impact upon biodiversity. However, oversight of such works by the Ecological Clerk of Works should reduce the incidences of impacts occurring.	The key geographical areas impacted by lighting in the construction phase are the work sites near rivers and areas around construction camps / ancillary facilities, e.g. asphalt plants.
PCR	The key potential impacts to PCR during the construction phase relate to vibration, potential encroachment on existing sites and the potential for impacts to unidentified PCR. However, measures outlined above, including demarcation and fencing of sites and the inclusion of a Cultural Heritage Monitor in the Engineers team, reduces the potential for significant impacts to occur and as such they are considered **MINOR / MODERATE**.	PCR sites throughout the corridor specifically those in Tskere, Kobi and on the Plateau.

1419. The identified residual impacts during the **Operational Phase** are shown below

Table 186: Operational Phase Residual Impacts

Topic	Residual Impact	Geographical Extent
Air Quality	No significant degradation of air quality is anticipated in the operational phase of the Project in most of the Project area. However, as traffic levels increase levels of NO_2 are anticipated to rise in the Kobi area, potentially above allowable national limits in 20 years time (but below IFC guideline limits). However, by 2043 it is fully expected that the vehicle emissions will be lower than today's levels and as such these elevated levels of NO_2 may not be realized in the long term. However, based on the model results residual impacts are classified as **LOW / MEDIUM**.	According to the air quality model Kobi is the only area where potential operational impacts maybe felt by 2043.
Climate Change	Residual impacts from the generation of GHGs will remain throughout the lifecycle of the Project. This is an unavoidable consequence of the Project, but as noted in other sections of this report, the growth of the electric car market and more fuel-efficient cars may, in the future lead to a decrease in the emissions generated on the Project road. Residual impacts will be **LOW/MEDIUM.**	Climate change a global issue and is not specific to any particular part of the Project area.
Notable Habitat	Impacts to notable habitats during operation of the road will result from disturbance, potential pollution (including light pollution) and increased access to habitats. Given the proposed mitigation impacts to habitats per se are expected to be of only **LOW/MEDIUM** significance.	Impacts on habitats *per se* will be restricted to the road corridor itself (ie 150m either side of the centreline) with the run-off which could affect downstream habitats if unmitigated.

Topic	Residual Impact	Geographical Extent
Notable Species	The operation of the road will result in direct impacts to notable species from RTAs as well as indirect impacts associated with disturbance, habitat fragmentation, pollution and increased access to habitats. Given the proposed mitigation, including the use of species-specific BAPs, such impacts are expected to be reduced to an acceptable level. Residual impacts will be **MEDIUM**.	Direct impacts will be associated with the road corridor itself. Indirect impacts could affect a wider area across the Khada valley and downstream of watercourse crossings.
Spoil Disposal	Restoration of any spoil disposal area will take a number of years and as such the residual impacts for the spoil disposal areas are considered **LOW / MEDIUM**.	At the identified spoil disposal sites in Kobi, Zakatkari and the Plateau. Impacts in Kvesheti will not be felt due to the fact the spoil material is being used as fill for the road.
Tunnels	It is possible that the construction of tunnels could deplete groundwater and affect groundwater users, including Aqua Geo. If this is the case affected villagers will be supplied with an alternative source of potable water and methods to compensate any businesses affected will be applied. Residual impacts in this case will be **LOW / MEDIUM**.	Kobi and potentially villages in the Khada valley.
Access and Access Roads	During the operational phase there will be some inconvenience for people using local roads who will have to make some minor detours to access the new road. Pedestrians will no longer be able to walk along the road between Kvesheti and Arakveti, and while alternative routes exist, they may not be as convenient, or as well maintained as the existing road. Residual impacts will be **LOW / MEDIUM,** although it should be noted that for all residents in Khada Valley access will be significantly improved as a result of the Project.	Existing tracks in the Khada Valley and the existing road in Kvesheti, Arakveti and Kobi.
Landscape	Cut slopes, embankments, concrete bridges and tunnels will have an impact on the landscape within the valley throughout the Project lifecycle. The mitigation measures outlined above may go some way to enhancing the aesthetic value of the Project especially as vegetation grows back around construction zones, and in all likelihood any negative opinion of the new road in terms of visual impact will decrease over time as people get used to the altered landscape. Residual impacts will be **LOW/MEDIUM.**	Visual impacts will mainly be associated with changes to the landscape in the Khada valley and in Arakveti with Bridge 2 crossing the Tetri Aragvi. Impacts will be felt less in Kobi and Arakveti.
Lighting	Even with the proposed light shielding there will still be some level of impact of lighting to the Project area and the Khada valley. Residual impacts will be **LOW/MEDIUM**	Main impacts will be seen in the Khada valley. Minor impacts to residents in Arakveti and Kvesheti.
Noise	Residual impacts will be minor for all of the identified receptors if the noise barriers are constructed and the remaining 19 receptors are resettled. However, some property owners may choose to sign the waiver agreement and remain in their homes. These properties may be subject to elevated noise levels above IFC limits in the	Impacts will be focused on the residential areas close to the alignment, in particular Kvesheti and Arakveti.

Topic	Residual Impact	Geographical Extent
	future, and for these receptors residual impacts will remain throughout the lifecycle of the Project, although in many instances limits will only be breached by 1-3 decibels which is considered to be of minor magnitude. Residual impacts will be **LOW/MEDIUM** due to the potential resettlement aspect.	

I.2 Recommendations

1420. The EMP, its mitigation and monitoring programs, contained herewith will be included within the Bidding documents for project works for all Project components. The Bid documents state that the Contractor will be responsible for the implementation of the requirements of the EMP through his own SEMP which will adopt all of the conditions of the EMP and add site specific elements that are not currently known, such as the Contractors camp locations. This ensures that all potential bidders are aware of the environmental requirements of the Project and its associated environmental costs.

1421. The EMP and all its requirements will then be added to the Contractors Contract, thereby making implementation of the EMP a legal requirement according to the Contract. He will then prepare his SEMP which will be approved and monitored by the Engineer (through his team of national and international environmental, social and health and safety specialists). Should the Engineer note any non-conformance with the SEMP (and the EMP) the Contractor can be held liable for breach of the contractual obligations of the EMP. To ensure compliance with the SEMP the Contractor should employ an Environmental and Social Officer and a team of experts (including an ECoW) to monitor and report Project activities throughout the Project Construction phase.

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