



# **E-60 SAMTREDIA-GRIGOLETI HIGHWAY km 42,0 – km 51,570 SECTION CONSTRUCTION**

## **ENVIRONMENTAL IMPACT ASSESSMENT**

### **VOLUME I**

Project No

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Foundation WEG

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**Road Department**

**Ministry of Regional Development and  
Infrastructure**

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## ABBREVIATION AND ACRONYMS

BP	Bank Procedures
CAS	Center of Archaeological Search of the Ministry of Culture and Sports
CBR	Californian Bearing Ratio
CPS	Country Partnership Strategy
CCP	Contractor Control Plan
CMP	Contractor's Management Plan
EIA	Environmental Impact Assessment
EIB	European Investment Bank
EMP	Environmental Management Plan
ESA	Equivalent Standard Axle
GDP	Gross Domestic Product
GIS	Geographical Information Systems
GP	Good Practices
GPS	Global Positioning System
HEC – RAS	Hydrologic Engineering Center – River Analysis System
IFI	International Financial Institution
JBIC	Japan Bank for International Cooperation
KP	Kilometer Point
MoE	Ministry of Environmental Protection and Natural Resources
MLHSP	Ministry of Labor, Health and Social Protection
MoI	Ministry of Interior
NTRC	National Transport Regulatory Commission
NSFSVPP	The “National Service for the Foodstuffs Safety, Veterinary and Plant Protection” of the Ministry of the Agriculture
OP	Operational Policy
PIU	Project Implementation Unit
RDMRDI	Roads Department of the Ministry of Economic Development
RoW	Right of Way
TEM	Trans European Motorway
TRRC	Transport Reform and Rehabilitation Center
USC	Unified Soil Classification

# 1 INTRODUCTION

## 1.1 Background

Since 2006, one of the government top priorities is to develop Georgia's competitiveness as a transit country by improving its transport corridors. This ongoing process is expected to last well into the future.

Promotion of trade with the neighboring countries and development of tourism infrastructures have major importance for the economic development of the country, for which an improved road network is a crucial factor.

The development of the transport sector is essential for the sustainable economic growth and for improving the living conditions of Georgia's population.

The Georgian Government has given the highest priority to improvements of the East - West Highway (between Caspian Sea and Black Sea) and North - South (between Russia and Turkey).

The Government has obtained funding for the sections immediately West of Tbilisi with the construction of a four-lane highway currently underway.

In 2009, the Feasibility Study and Environmental Impact Assessment of the Preferred Recommended Alignment for Upgrading the S-12 Highway between Samtredia – Grigoleti was presented to the Roads Department of the Ministry of Regional Development and Infrastructure of Georgia. This road section will give continuity to Zestaponi-Kutaisi-Samtredia Road Section of E60 – Highway.



**Figure 0.1 – Project Location**

## 1.2 Objective of the project and Terms of Reference

The objective of the Project is to allow the passage of the predicted increasing traffic flow and ensure safe traffic and transit cargo movement. The present and predicted levels of traffic flows are referred to in the table below.

**Table 1.1 – AADT flows year-on-year in current section of E-60**

OPTIMIST SCENARIO	Light Vehicles											
	2011	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
S12 - Qvemo Chibabati / Lanchkhuti	6,304	9,787	10,763	11,889	13,173	14,634	16,289	17,591	19,013	20,555	22,234	23,957
S12 - Lanchkhuti / Nigoiti	6,885	10,398	11,375	12,497	13,765	15,195	16,827	18,129	19,540	21,059	22,702	24,081
S12 - Nigoiti / Japana	6,688	10,199	11,174	12,297	13,570	15,005	16,643	17,942	19,361	20,880	22,538	23,931
S12 - Japana / 1st of May	6,042	9,352	10,285	11,360	12,586	13,981	15,564	16,812	18,181	19,657	21,269	22,425
S12 - 1st of May / Samtredia	5,845	9,092	10,013	11,067	12,278	13,655	15,219	16,450	17,801	19,251	20,835	22,136
OPTIMIST SCENARIO	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035		
S12 - Qvemo Chibabati / Lanchkhuti	24,844	25,763	26,715	27,710	28,738	29,410	30,081	30,773	31,482	32,199		
S12 - Lanchkhuti / Nigoiti	24,973	25,886	26,831	27,826	28,841	29,507	30,196	30,888	31,595	32,324		
S12 - Nigoiti / Japana	24,810	25,726	26,665	27,666	28,676	29,337	30,021	30,707	31,405	32,134		
S12 - Japana / 1st of May	23,259	24,121	25,039	25,973	26,956	27,578	28,207	28,851	29,512	30,190		
S12 - 1st of May / Samtredia	22,964	23,820	24,721	25,645	26,616	27,225	27,847	28,479	29,138	29,803		
OPTIMIST SCENARIO	Heavy Vehicles											
OPTIMIST SCENARIO	2011	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
S12 - Qvemo Chibabati / Lanchkhuti	880	1,170	1,257	1,356	1,466	1,590	1,727	1,853	1,994	2,144	2,308	2,453
S12 - Lanchkhuti / Nigoiti	850	1,147	1,236	1,337	1,450	1,578	1,721	1,848	1,991	2,144	2,310	2,454
S12 - Nigoiti / Japana	850	1,146	1,235	1,336	1,450	1,577	1,720	1,848	1,990	2,143	2,309	2,453
S12 - Japana / 1st of May	804	1,085	1,170	1,268	1,378	1,500	1,639	1,762	1,901	2,050	2,211	2,350
S12 - 1st of May / Samtredia	798	1,076	1,161	1,259	1,368	1,490	1,628	1,751	1,889	2,037	2,198	2,336
OPTIMIST SCENARIO	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035		
S12 - Qvemo Chibabati / Lanchkhuti	2,548	2,648	2,753	2,862	2,975	3,053	3,134	3,217	3,301	3,387		
S12 - Lanchkhuti / Nigoiti	2,551	2,652	2,757	2,867	2,982	3,061	3,142	3,223	3,309	3,397		
S12 - Nigoiti / Japana	2,550	2,651	2,756	2,866	2,981	3,060	3,141	3,223	3,308	3,396		
S12 - Japana / 1st of May	2,445	2,543	2,644	2,751	2,861	2,937	3,014	3,094	3,175	3,259		
S12 - 1st of May / Samtredia	2,431	2,528	2,628	2,734	2,844	2,920	2,996	3,076	3,157	3,240		
OPTIMIST SCENARIO	Total Vehicles											
OPTIMIST SCENARIO	2011	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
S12 - Qvemo Chibabati / Lanchkhuti	7,184	10,957	12,020	13,245	14,639	16,223	18,017	19,444	21,007	22,699	24,543	26,410
S12 - Lanchkhuti / Nigoiti	7,735	11,544	12,611	13,834	15,215	16,773	18,548	19,977	21,531	23,203	25,012	26,535
S12 - Nigoiti / Japana	7,538	11,345	12,409	13,634	15,020	16,582	18,363	19,790	21,351	23,023	24,847	26,384
S12 - Japana / 1st of May	6,846	10,437	11,456	12,628	13,964	15,482	17,203	18,574	20,082	21,707	23,480	24,775
S12 - 1st of May / Samtredia	6,643	10,168	11,174	12,326	13,646	15,145	16,847	18,200	19,689	21,288	23,032	24,472
OPTIMIST SCENARIO	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035		
S12 - Qvemo Chibabati / Lanchkhuti	27,392	28,412	29,468	30,572	31,713	32,463	33,215	33,990	34,783	35,586		
S12 - Lanchkhuti / Nigoiti	27,524	28,538	29,588	30,693	31,823	32,567	33,338	34,112	34,904	35,721		
S12 - Nigoiti / Japana	27,361	28,377	29,421	30,532	31,657	32,397	33,162	33,930	34,713	35,530		
S12 - Japana / 1st of May	25,704	26,664	27,683	28,723	29,817	30,515	31,221	31,945	32,687	33,449		
S12 - 1st of May / Samtredia	25,394	26,348	27,350	28,379	29,461	30,145	30,844	31,555	32,295	33,043		

According to the terms of reference (ToR) of the Client/Roads Department (RD), and the contract signed between the RD and the Consortium of Consultants, Samtredia - Grigoleti road section of E-60 highway is divided into four main lots:

- Lot 1 - km 0+000- km 11+500
- Lot 2 - km 11+500- km 30+000
- Lot 3 - km 30+000- km 42+000
- Lot 4 - km 42+000- km 51+570

The present EIA Report is related to the Lot 4 from km 42+000 to km 51+570 of Samtredia- Grigoleti road. This EIA is prepared as part of the design package. The Resettlement Action Plan is prepared as a separate document.

### **1.3 Methodology**

A combination of desk studies and site work (sampling observation verification of preexisting data etc.) has been utilized. Site ecological studies, sampling and analysis of air quality, soil and surface water contamination, measurements of background noise and radiation have been conducted. Required environmental and social information has been collected.

The EIA document is structured as main text and annexes. The main body of the EIA text provides description of the relevant sensitivities; impacts and potential mitigation and the EMP and Monitoring plan are developed. The Annexes provide detailed information regarding particular areas and detailed base line information and covers the following:

- Annex 1. Legal Framework and Administrative Structure in Georgia
- Annex 2. Environmental Baseline Data,
- Annex 3. Baseline Contamination Data
- Annex 4. Air Quality: Baseline, Project Impacts and Mitigation
- Annex 5. Noise Factor: Baseline, Project Impacts and Mitigation
- Annex 6. Procedures for Extraction of Plant Species Included in Red List of Georgia  
from the Natural Environment and Change of Category of Forestry Fund Land
- Annex 7. Waste Management Plan for Construction Camps and Equipment Yards
- Annex 8. Information about quarries within the project area
- Annex 9. List of Contributors to EIA
- Annex 10. List of References

Roughly 6 months of local expert time and 2 months of international expert time went into the report, taking into considering all the stages of environmental assessment (Feasibility Study, preliminary EIA and Final EIA).

## 2. PROJECT DESCRIPTION

### 2.1 Main road Design Criteria and Project parameters

Road geometry is selected based on traffic flow, type of road and terrain to ensure safe and commodity to the user/traffic, and minimizing at the same time to disturb the regions crossed through and its population.

Design was carried out according to TEM standards for highway design, where other international and Georgian standards were also taken into account. Georgian State Standard SST Gzebi 72:2009 “Public roads, geometric and structural requirements”, approved by National Agency of Georgia for Standards, Technical Regulations and Metrology on 9 February 2009, were used namely for local roads.

Construction of 4-lane road is envisaged in the design. Technical parameters adopted for the road section are as follows:

- Design speed - 120 km/hr;
- Minimum radius of horizontal curve - 3200 m;
- Maximum longitudinal slope - 0.77%;
- Minimum convex curve - 200 000 m;
- Minimum concaved curve - 250 000 m;
- Crossfall - 2%;
- Width of roadway - 28.5 m;
- Number of lanes - 4;
- Width of carriageway - 2x7.5 m;
- Width of lane - 3.75 m;
- Width of dividing strip - 4.0 m;
- Width of paved shoulders - 3.0 m;
- Width of paved shoulders by the dividing strip - 1.0 m;
- Unpaved roadside - 0.75 m.

In the approach to the temporary roundabout at the end of Lot 4, a minimum convex curve radius of 50 000 m was used.

### 2.2 Project section location and characteristic

Samtredia-Grigoleti road section starts at km 42+000 and ends at km 51+570. The project alignment is located entirely in the region of Guria namely in Lanchkhuti, is located to the north the existing road Samtredia-Lanchkhuti-Grigoleti because this point allows further perspective development of the route in the directions of Ureki-Choloki



and Poti. Based on this construction of roundabout at PK 515+70, which represents a temporary link, is envisaged in the design. Length of project section is 9.57 km.

Radii of horizontal and vertical curves, longitudinal slopes and crossfalls, vertical clearance meet the requirements of 4-lane highway (with dividing strip) based on the Terms of Reference.

Design cross-sections of the road and bridges meet the requirements of 4-lane road.

### 2.3 Plan of the road and plain land

Four-lane road axis is adopted in the design.

Total number of horizontal turning angles on the route is 4: one turning angle - 3200 m, one turning angle - 10000m, one turning angle 20000 m and one turning angle 30000 m.

Super elevations are not envisaged in the design due to the fact that all turning angles exceed 3000 m.

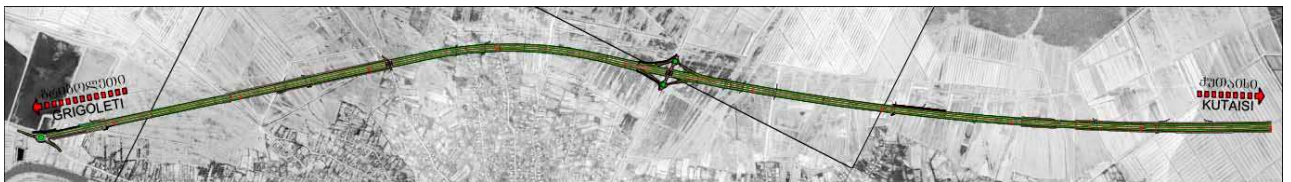


Fig. 2.1. Road plan

Roadway is designed in accordance with valid Georgian and international standards as well as typical design solutions.

Width of roadway envisaged in the design is 28.5 m. Slope of embankment envisaged in the design is 1:1.75.

Cross-sections are mainly designed in the embankments, which according to the above-mentioned, is caused by location and dimensions of design engineering structures within the project section (underpasses, cattle passes).

Construction of embankments is envisaged from rock and gravel. The lower part of the embankment is envisaged from rock, the maximum size of which shouldn't exceed 2/3 of the compacted layer. Compaction should proceed in layers, paying special attention to the quality of compaction. The base of the embankment requires strengthening as it is represented by soft soils.

Strengthening of embankment base in high embankments, mainly at the approaches to bridges, is envisaged by stone (gravel) columns, whilst in relatively low embankments strengthening is envisaged by high strength geotextile. In both cases, layer of separation geotextile is envisaged between the existing soil and the embankment. Construction of side (drainage) channels is envisaged in the design on both sides of the highway. Design envisages filling of top soil on the embankment slopes, followed by leveling and seeding of grass

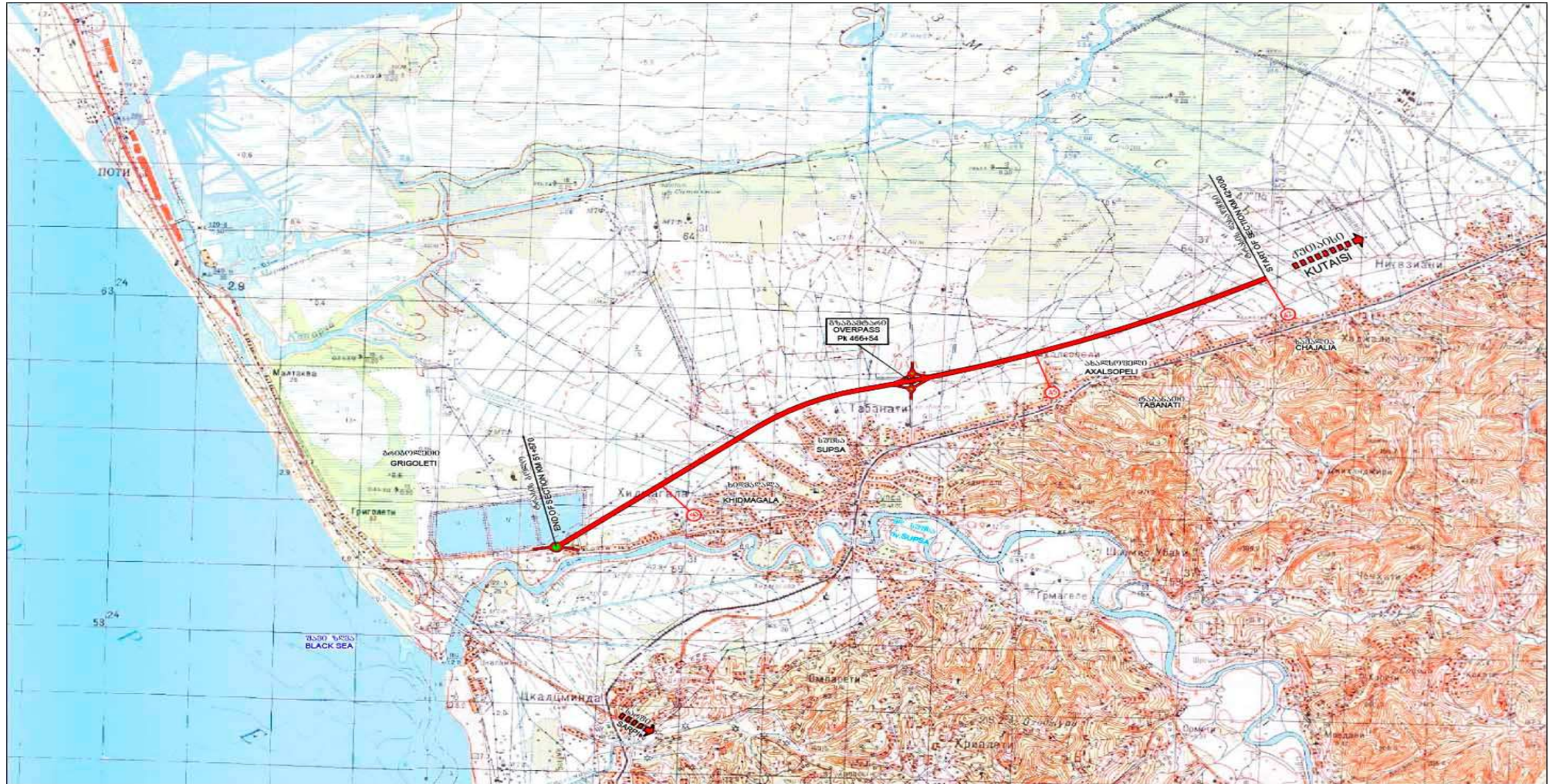


Fig. 2.2 Lot 4 Road Section Location and Layout

## 2.4 Road pavement construction

This chapter describes the pavement solutions adopted for the km 42+000-km 51+570 of the Samtredia – Grigoletti E-60 Highway Section. It includes the analysis of the traffic data and the design of the pavement structures for the current section and interchanges.

The issues concerning construction of pavement were discussed at RD's Technical Board on 13 May 2013. Asphalt concrete pavement was recommended for the construction due to expected general and non-homogenous settlements.

Proposed pavement structure is based on analytical calculations performed in "BISAR SHELL" Program.

Road pavement structure is designed based on the following data:

- Traffic flow;
- Reliability factor;
- Service life.

Corresponding works for determining traffic flow were carried out, as well as expected future traffic flows for each year of the study were also determined.

Road pavement structure for the current section is adopted analogical of that adopted for the section km 0+000-km 11+500 (I Lot) and is as follows:

**Table 5.15 - Road pavement structure for the current section**

N	Pavement layers	Thickness of pavement layers mm
1	2	3
1	Fine-grained dense asphalt concrete hot mix (wearing course)	50
2	Coarse-grained porous asphalt concrete hot mix (binding course)	70
3	Coarse-grained porous asphalt concrete hot mix (upper layer of base course)	120
4	Crushed aggregates (lower layer of base course)	300
5	Sand and gravel mix (sub-base)	300

**Table 5.16 - Road pavement structure for I interchange (Supsa) at PK 466+54**

N	Pavement layers	Thickness of pavement layers mm
1	2	3
1	Fine-grained dense asphalt concrete hot mix (wearing course)	50
2	Coarse-grained porous asphalt concrete hot mix (binding course)	70
3	Crushed aggregates (lower layer of base course)	300

N	Pavement layers	Thickness of pavement layers mm
4	Sand and gravel mix (sub-base)	300

**Table 5.17 - Road pavement structure for rural and local roads**

N	Material	Thickness of pavement layers mm
1	Sand and gravel mix	200

## 2.5 Interchanges

This section covers the types and locations of the proposed Interchanges Lot IV - km 42+000- km 51+570 Samtredia-Grigoleti Section of E60 Highway.

The types of proposed interchanges result of the design constraints identified and are the outcomes of previous discussions between the engineers of the Joint Venture (JV) COBA-Transproject and the Roads Department.

The locations proposed for the interchanges have been determined by taking into account the following, in conformity with Georgian and international standards:

- a) Distance between interchanges;
- b) Size of urban areas;
- c) Traffic Intensity;
- d) Land occupation;
- e) Cost of interchange construction;
- f) Maximum flood level.

The types of the interchanges proposed for design road section are as follows:

- Interchange 8 - Supsa – Diamond Type;
- Interchange 9 - Supsa – Roundabout.

### **INTERCHANGE 8 – SUPSA, PK 466+54**

Supsa interchange is located at PK 466+54, in Lanchkhuti region between the villages of Akhalsopeli and Supsa, to the north off these villages, with the village road passing under

Design envisages diamond type interchange with two roundabouts which links the project road with the existing Samtredia-Lanchkhuti-Grigoleti highway E-692 and with the villages located in Lanchkhuti region

The interchange is composed of the following elements:

- four one way slip roads (ramps A, B, C and D);
- two roundabouts;

- Local road.
- The table 2.2 presents the main geometric parameters adopted in Supsa interchange.

Designation	PLAN		LONGITUDINAL PROFILE		
	Minimum	Maximum	Max V. Gradient (%)	VERTICAL CURVES	
	R (m)	R (m)		Concave Min R (m)	Convex Min R (m)
RAMP A	25	200	5.0%	1200	1500
RAMP B	55	200	5.0%	1200	1500
RAMP C	25	200	5.0%	1200	1500
RAMP D	55	200	5.0%	1200	1500
ROUNDBABOUTS	15	-	2.00%	-	-
LOCAL ROAD	-	-	0.17%	-	-

**Table 2.2 –Interchange - Main Geometric Parameters on Plan and Longitudinal Profile**

### **INTERCHANGE 9 –PK 515+70**

The interchange is located at pk 515+70. Design envisages construction of roundabout which as mentioned above represents temporary activity, because this point allows further perspective development of the route in the directions of Ureki-Choloki and Poti. Roundabout also enables connection of the project highway with the villages located in Lanchkhuti region and as well as with the Poti direction.

The interchange it's composted of the following elements:

- One roundabout;
- Local Road.
- The table 2.3 presents the main geometric parameters adopted in the 1<sup>st</sup> of May interchange.

Designation	PLAN		Longitudinal Profile		
	Minimum	Maximum	Max V. Gradient (%)	Vertical Curves	
	R (m)	R (m)		Concave Min R (m)	Convex Min R (m)
ROUNDBABOUTS	20	-	2.00%	-	-
LOCAL ROAD	200	500	3.00%	1200	1500

**Table 2.3 –Interchange - Main Geometric Parameters on Plan and Longitudinal Profile**

## 2.6 Underpasses and Culverts

Water streams were studied in the project area whilst the survey. Locations of project underpasses and culverts were determined upon the final selection of the road axis in plan and road profile based on which hydrological report was set up (see in a separate chapter).

Several construction alternatives were studied for each engineering structure crossing each stream and existing roads. The alternatives with the best technical performance and cost efficiency were selected in the design. Decisions ensuring relatively highest traffic safety rate were also considered whilst selection.

As the project road section represents the extension of Samtredia-Grigoleti highway, dimensions of underpasses are adopted similar to those adopted for previous project sections which were accepted based on Addendum 15 of National Standards for Geometric and Structural Requirements on Georgian roads, corresponding to two-lane traffic in each direction on bridges and overpasses located on international roads and construction of single-pitch carriageway on bridges (slope 2%). Width of carriageway on the approach roads was considered whilst determining the width of underpasses:

- Total width of underpass is adopted 2X14m;
- Width of carriageway is adopted 2x11.5 m;
- Width of sidewalks is adopted 1 m (by adopting the width of at least 0.6 m according to the above-mentioned Georgian standards, we wouldn't achieve cost effectiveness anyhow, as the number of beams in the cross-section would still remain 8 units).

Project road section is located in seismically active zone and according to seismic sub-zoning belongs to 7-point zone under MSK64 Scale. According to seismic properties soil category on the construction site belongs to Group III ("Aseismic construction" under the standard PN 01.01.08).

Normative live loads of bridges adopted in the design are evenly distributed load A-11 and unit heavy wheel load NK-80. Normative load A11 consists of one double-axle cart, load on axle 11 t and evenly distributed load with the intensity 1.1 t/m. Heavy wheel unit load NK-80 represents one 4-axle vehicle, load on axle 20 t and total weight 80 t. The loads are adopted according to standards valid in Georgia at present.

New reinforced concrete underpasses that shall be constructed on the recommended alignment (according to stationing) are as follows:

N	Location of design underpasses	Number of spans m	Width of underpass m	Width of carriageway m	Length of underpass m
1	2	3	4	5	6
1	Underpass PK 466+27.68- PK 466+80.32	3X15	2X14.0	2X11.5	52.64
2	Underpass PK 488+08.78-PK 488+61.22	3X15	2X14.0	2X11.5	52.44

Unification of superstructure and piers took place whilst design of underpasses based on topographical and geological conditions of the route, which envisages application of similar types of structures. 15-meter spans are applied on the underpasses which shall be constructed at the intersection with the existing local road and at the interchange. Column-based piers on bored piles raft foundation are adopted in the design.

### **UNDERPASSES ON RURAL ROAD**

Project road crosses rural roads. Construction of cast in situ reinforced concrete structures of closed contours of rectangular cross sections is envisaged in the design. Construction is processed on the site. Design is based on the following:

- Minimal geometrical size of culvert cross-section and hydraulic calculation envisaged in the standards;
- Design height of fill;
- Design loads.

Based on the above-mentioned, structures of 6.0x3.5 m and 6.0x4.5 m cross-sections were selected to pass local traffic.

Eight underpasses on rural roads are envisaged on the design section.

Stone columns  $d=0.8$  m  $L=10\div 16$  m are constructed under the above mentioned structures. Construction of base from coarse-fragmented rocky soil  $h=2$  m with wedging and compaction follows the construction of stone columns

### **CATTLE PASSES**

Cattle passes ensure cattle cross the project road. Construction of cast in situ reinforced concrete structures of closed contours of rectangular cross section is envisaged in the design. Construction is processed on the site. Design is based on the following:

- Design height of fill;
- Design loads;
- Dimensions of cattle passes envisaged in standards.

Based on the above-mentioned cross-section of cattle passes envisaged in the design is 4.0x2.5 m. Total number of cattle passes envisaged in the design is 8.

Stone columns  $d=0.8$  m  $L=10\div 16$  m are constructed under the above mentioned structures. Construction of base from coarse-fragmented rocky soil  $h=2$  m with wedging and compaction follows the construction of stone columns.

## **CULVERTS**

Project road crosses big and small channels. Construction of closed contour cast in situ reinforced concrete culverts of rectangular cross section is envisaged in the design for passing water from channels. Construction is processed on the site. Design is based on the following:

- Minimal geometrical size of culvert cross-section and hydraulic calculation envisaged in the standards;
- Design height of fill;
- Design loads.

Based on the above-mentioned, culverts of cross-sections 1.0x1.5 m, 2.0x2.5 m, 4.0x2.5 m, 6.0x3.5 m and 6.0x4.5 m are adopted in the design.

Engineering structures envisaged in the design are as follows:

- 1) Culverts 2.0x2.5 m – 13 units;
- 2) Culverts 4.0x2.5 m – 8 units;
- 3) Culvert 6.0x3.5 m – 1 unit.
- 4) Culvert 6.0x4.5 m – 1 unit.

Stone columns  $d=0.8$  m  $L=10\div 16$  m are constructed under the above mentioned structures. Construction of base from coarse-fragmented rocky soil  $h=2$  m with wedging and compaction follows the construction of stone columns.

Construction of culverts cr. section 1.0x1.5 m - 2 units - is envisaged in the design on interchanges for rain water removal.

Stone columns  $d=0.8$  m  $L=8$  m are constructed under the above mentioned structures. Construction of base from coarse-fragmented rocky soil  $h=2$  m with wedging and compaction follows the construction of stone columns.

### **The system for detainment and treatment of run-off water**

The run-off water from the bridge road bed is removed and treated by means of special drainage system. Collected water is decontaminated from oil residue in separating reservoirs located on both sided from the bridges. The scheme of the separators is shown on the drawing fig. 2.4.



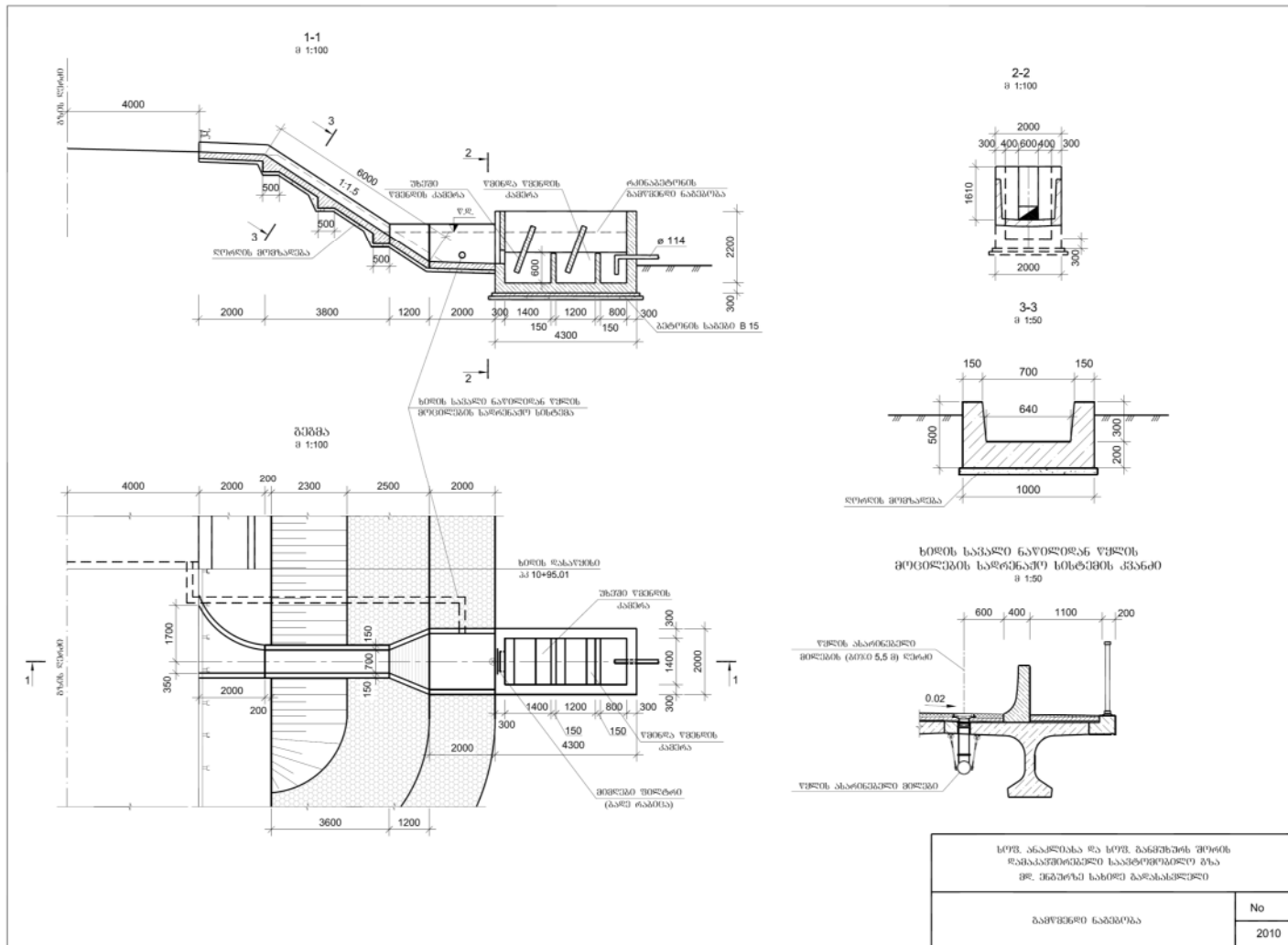


Fig. 2.4 Run-off water collection and treatment system

## **2.7 Relocations of existing infrastructures**

Design envisages relocation of all affected utilities, namely average-pressure, high-pressure and main gas pipelines, oil pipelines and overhead electric power lines.

The corresponding studies will appear in a separate volume of Relocation of Utilities, as indicated in the composition of the final report.

## **2.8 Construction works**

The Project envisages the transfer of average, high and main gas pipeline, air power lines and underground communication cables. A special passage shall be arranged across the gas pipeline crossing point according to the project agreed with the oil pipeline operating company.

### **Construction of Road Bed and Earthworks**

Volume of earthworks is calculated in accordance with the design cross-sections and is as follows for the main road:

- Volume of top soil that shall be removed - 118040 m<sup>3</sup>;
- Volume of cut – 39400m<sup>3</sup>.
- Volume of gravel fill 2240570m<sup>3</sup>;
- Volume of rock fill - 873030 m<sup>3</sup>;

Amount of spoil to be disposed off: 39400 m<sup>3</sup>;

Filling and compacting of top soil on fill slopes, seeding of grass shall be done under the present design.

### **Blasting Works**

No blasting operations are planned during construction of this section of the highway.

### **Topsoil Stripping**

Volume of top soil that shall be removed – 118040 m<sup>3</sup>;

## **2.9. Waste formation**

### **Waste Generation**

Various wastes will be produced throughout the construction process. The main waste producing areas are: construction sites and construction camps. Small amounts of waste are expected along the access and heavy equipment movement routes with ground and soil pollution.

## **Waste Classification**

During the construction of the bypass the following types of waste will be produced:

1. Household;
2. Hazardous industrial;
3. Non-hazardous industrial;
4. Inert.

## **Household Waste**

Both hazardous and non-hazardous household waste will be produced:

- Food waste (non-hazardous);
- Office waste (non-hazardous);
- Empty glass or plastic bottles (non-hazardous);
- Sewage (hazardous);
- Sweeping waste (proceeding from the object specifics, could be hazardous or non-hazardous);
- Bulb waste (hazardous);
- Medical waste (hazardous).

## **Non-Hazardous Industrial Waste**

- Packaging (wood, paper, carton, plastic);
- Expired or unusable metal parts;
- Damaged or expired tools;
- Personal safety means and clothes.

## **Hazardous Industrial Waste**

- Polluted soil;
- Polluted rags and oil absorbing fabric;
- Polluted water;
- Polluted industrial equipment in disrepair;
- Paint vessels and brushes;
- Lubricant vessels;
- Empty vessels of packaging;
- Polluted personal safety equipment and clothing.

## Inert Waste

- Natural materials (ground and stone-gravel, broken rock) – not expected to be significant in amount;
- Inert material from the decomposition of iron and concrete construction elements (infrastructure elements within the project zone);
- Wood (cut trees and shrubs in small amount).

The total amount of the Inert Construction Waste to be disposed of is estimated negligible as no cuts are envisaged in the project and no existing road structures are to be demolished.

Waste disposal sites will be selected accordingly by the Contractor. EIA team proposal in that regard is given in p. 8.1.1.3.

**Table 2. Anticipated Waste Generation**

Type of waste	Waste class	Quantity
Household waste	Non-hazardous	80-100 m <sup>3</sup> annually
Office waste -(sweeping waste, glass and plastic bottles, stationary waste, etc)	Non-hazardous	10-15 m <sup>3</sup> annually
Sewage	Hazardous	1500 m <sup>3</sup> annually
Bulbs in disrepair	Hazardous	50-70 units
Printer cartridges	Hazardous	2-3 units annually
Medicinal waste	Hazardous	0.1kg annually
Damaged or expired tools	Non-hazardous	1-2m <sup>3</sup> annually
Personal protection equipment and clothing	Non-hazardous	1 m <sup>3</sup>
Oil contaminated rags and absorbent materials	Hazardous	Depends on intensity of the leakage 1 m <sup>3</sup> annually
Cut wood	Non-hazardous	?

## 2.10 Equipment Used During Construction

**Error! Reference source not found.**3 provides a list of the typical equipment that will be used to construct the highway (the list is from of a 12 km section of the E-60 Highway, Agaiani – Igoeti section already constructed). The actual machinery to be utilized on the Kutaisi Bypass will be the responsibility of the Construction Contractor. Any emission approvals required under the Georgian Law on Ambient Air Protection for temporary concentrations will be obtained on the basis of actually machinery used before construction begins.

### Typical List of Equipment for Construction Activity

No.	Equipment Type and Characteristics	Minimum Number required
1	Bull Dozer with Ripper	4
2	Front loader	3
3	Tipper-Dumper	6
4	Motor Grader	2
5	Truck Excavator	1
6	Back Hoe	2
7	Vibratory Roller	2
8	Pneumatic Roller	1
9	Tandem Roller	3
10	Vibratory Screen	1
11	Crusher	1
12	Fully Automatic Batching Plant	1
13	Fully Automatic Hot-Mix Plant	1
14	Paver Finisher with Electronic Sensor	1
15	Compressor	2
16	Mobile Generator	2
17	Water Tank with sprinkler	2
18	Crane	1
19	Concrete Paver With Electronic Sensor	1

#### 2.11 A Complex of Ancillary Construction Facilities

Particular decisions regarding the Ancillary Construction Facilities (structure, composition, location, design etc.) will be taken by Construction Contractor. However, according to the experience of organization of construction works on the other sections of E-60 highway, we can anticipate that a Complex of Ancillary Construction Facilities will be constructed including Camp for accommodation of 200 workers (app. 1.5 ha area), Vehicle and Equipment Yard for 100 vehicles and 150 units for heavy construction machinery (app. 2ha) and (backhoes, excavators, cranes etc.). Decision regarding construction of Asphalt plant will be taken by Contractor.

**In chapter 8.1.1.13 of the EIA related to mitigation measures we specify procedures and conditions to be met during designing and operation of the mentioned Ancillary Construction Facilities and propose optimal sitting options.**

#### 2.12 Quarries and Borrow Pits

Prior to the construction works, the construction contractor must identify the sites of quarries and include them in the construction plans and descriptions. It should be noted that EIA describes the locations of potential quarries and borrow pits what can be used at the construction stage. The existing quarries have been evaluated by the engineering EIA teams.

The number of design quarries in the project area is limited. The data about these quarries are given in volume II, appendix 8

### 3 LEGAL AND ADMINISTRATIVE FRAMEWORK

#### 3.1 Introduction

Annex 1 describes in detail the environmental legal framework and administrative structure in Georgia including environmental regulations, measures required and indicates the institutions at the local and national levels responsible for issuing permits, licenses, and enforcing compliance with environmental standards. Below is a brief description of the environmental permitting process in Georgia, EIB safeguard requirements, and the differences between two systems.

#### 3.2 Environmental Laws of Georgia

##### Current Legislations Related to Environmental Permitting

Below is the list of laws relevant to environmental protection:

1994	Soil Protection
1996	System of Protected Areas
1996	Minerals
1996	Environmental Protection
1997	Wildlife
1997	Tourism and Resorts
1997	Water Protection
1997	Transit and Import of Hazardous Waste within and into the Territory of Georgia
1998	Resorts and Sanitary Protection of the Resort Zones
1998	Dangerous Chemical Substances
1998	Pesticides and Agrochemicals
1999	Atmospheric Air Protection
1999	Forest Code
2003	Red List and Red Data Book of Georgia
2005	Licensing and Permitting
2007	Environmental Impact Permit
2007	Ecological Expertise
2007	Cultural Heritage

#### 3.3 Georgian Legislation Related to Environmental Permitting

At present, the environmental permitting procedure in Georgia is set out in three laws:

The project proponent, in implementing projects, will comply with (i) The Law on Licenses and Permits (2005); (ii) The Law on Environmental Impact Permits (EIP), and (iii) The Law on Ecological Examination (EE) 2008.

In line with the mentioned laws, a provision "On the environmental Impact Assessment" is provided by Decree No. 31 of May 15, 2013 of the Minister of Environment and regulates the legal relations associated with the assessment of environmental impacts.

The Law on Licenses and Permits was adopted by Parliament of Georgia, on June 24, 2005. The new Law regulates legally organized activities posing certain threats to human life and health, and addresses specific state or public interests, including usage of state resources. It also regulates activities requiring licenses or permits, determines types of licenses and permits, and defines the procedures for issuing, revising and canceling of licenses and permits (Article 1, Paragraph 1).

**The Laws on Environmental Impact Permit and Ecological Examination:** The Laws published on 14.12.2007 and in force since 01.01.2008. These new laws integrated all recent Georgian legislation.

**The Law on Environmental Impact Permit:** The Law of Georgia on Environmental Impact Permit determines the complete list of the activities and projects subject to the ecological examination (clause 4 p.1) and the legal basis for public participation in the process of environmental assessment, ecological examination and decision making on issuance of an environmental impact permit.

In case if the activity included into the list given in clause 4 p.1 at the same time requires Construction Permit, the administrative body responsible for issuance of the Construction Permit ensures involvement of MoE, as a separate administrative body, in the administrative procedures initiated for the purpose of issuing Construction Permit, as it is envisaged by the Law on Licenses and Permits. In such cases the MoE is issuing the Conclusion on the Ecological Examination of the project based on the documentation provided to MoE by the administrative body issuing the Permit. The Conclusion on the Ecological Examination is adopted by the administrative (executive) legal act of the MoE and compliance with the conditions of the Conclusion is obligatory for the project proponent. The conditions of the Conclusion on Ecological Examination are a part of conditions of the Construction Permit.

In case if the activity included into the list given in clause 4 p.1 does not require Construction Permit, based on the Conclusion on the Ecological Examination the MoE will issue the Environmental Impact Permit, supported by the administrative (executive) legal act issued by the minister. The ecological examination is carried out in accordance with the law of Georgia on Ecological Examination and the conditions set forth by the Conclusion present the Conditions of the Permit.

The aforementioned laws do not provide details of screening procedure and do not define the responsibilities of parties. Screening of project proposals, preliminary assessment of environmental impact and proposed mitigation measures (scoping) are carried out by the project proponent in consultation with the MoE.



## **Public Consultation Procedures**

Clause 6 of the Law on Environmental Impact Permits provides detailed requirements and procedures for conducting public consultations and establishes timeframes for information disclosure and discussion.

According to Article 6, the developer is obliged to carry out public discussion of the EIA before its submission to an administrative body responsible for issuing a permit. Where an activity requires a construction permit this must be done before initiating stage 2 of the process for issuing a construction permit. The detailed description of Public Disclosure requirements is discussed more fully in this document in Chapter 9 on Public Consultation and in Annex 1.

## **Procedure of Official Submission of EIA/IEE to MoE**

Article 8 of the Law on Environmental Impact Permits specifies the documents which must be submitted by an operator to obtain a permit:

- (1) A written statement to the Ministry under the rules established by 'Law of Georgia on Licenses and Permits'.
- (2) The following information:
  - (a) An EIA/IEE report drawn up under the standards specified by the legislation of Georgia [in 5 hard copies and 1 soft copy]
  - (b) A situation plan of the planned activity (with the indication of distances)
  - (c) Volume and types of the expected emissions (a project of maximum permissible concentrations of emitted/discharged harmful substances [in 4 copies])
  - (d) A brief description of the activity (as a technical summary)
  - (e) A statement about the confidential part of the submitted statement.
- (3) An operator is obliged to submit a full diagram of the technological cycle to the permit issuing body even if the given activity contains a commercial and/or state secret. This part of the statement, according to sub-clause 'e' of clause 2 of the given Article should be submitted separately by the operator.

## **Issuance of the Permit on Environmental Impact**

**Article 9 of the Law on Environmental Impact Permits describes the procedures for issuing an Environmental Impact Permit. The issue is also addressed in the laws of Georgia on "Licenses and Permits" (2005) and "on Ecological Examination" (2008).**

1. According to the law on "Licenses and Permits," the MoE takes a decision on issuing Permit within the 20 days of the permit request by the project proponent.

2. MoE, in accordance with the law on Ecological Examination, ensures the quality of the submitted documentation and the Issuance of Conclusion on Ecological Examination.

Either the Environmental Permit, or Construction Permit (when the latest is required) is issued only in case of the positive conclusion of the Ecological Examination.

### **Regulation on EIA issued by the MoE and Approved by the Decree No. 31 of May 15, 2013 of the Minister of Environment**

The Provision is proved by Decree No. 31 of May 15, 2013 of the Minister of Environment and regulates the legal relations associated with the assessment of environmental impacts.

The procedure to assess the environmental impact includes drafting the confirmatory documentation and permits for the businesses on the legally established list, identifying any source of expected environmental impact, its nature and degree and integrated assessment of their environmental, social and economic outcomes in obtaining the environmental expert conclusion.

The given Provision defines the procedure to draft the environmental assessment report by a business actor to ensure the environmental and social-economic balance of future economic development. It precedes the decision of the Ministry of Environmental Protection of Georgia about the purposefulness of the business and relevant project to be implemented by the business actor.

The assessment of the environmental impacts covers the identification and description of direct and indirect impacts in the context of the planned activity and study of their outcomes on:

- human's residential space and health; vegetation cover and fauna;
- natural and modified eco-systems; landscapes, air, water, soil, climate;
- historical monuments and cultural values;
- social-economic factors;
- assessment of the existing state of geological and hydrological environments and expected risks.

The objects of environmental assessment are the activities on the list under clause 1 of article 4 of the Georgian Law "On Environmental Permit".

The content of the EIA document is specified in the clause 5 of the Regulation as follows:

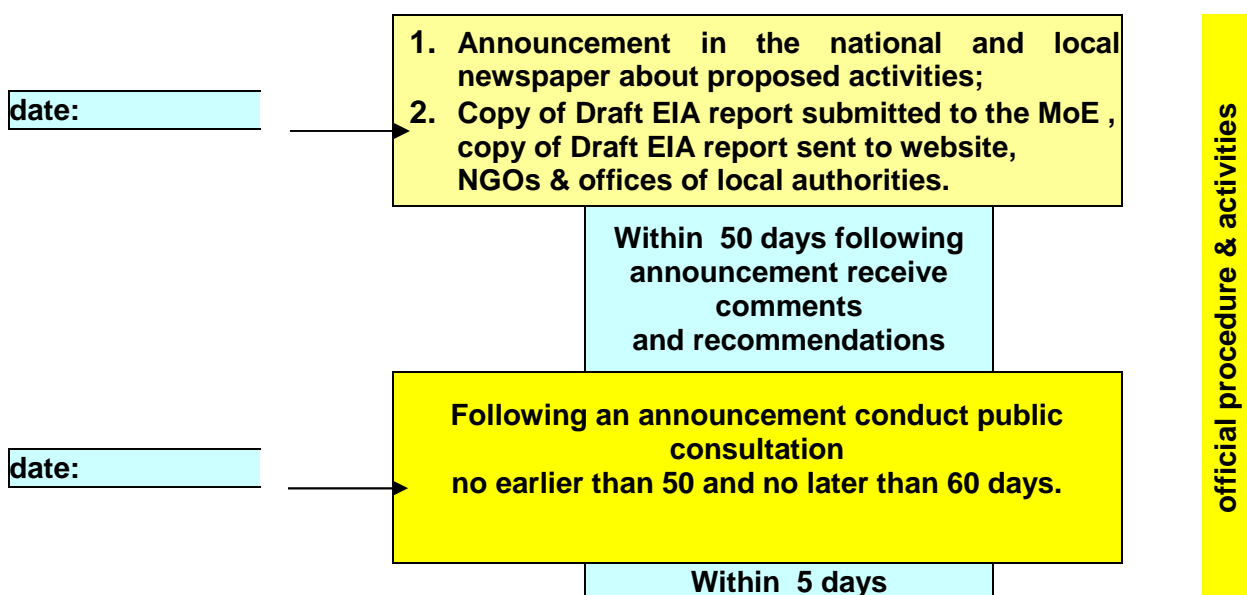
#### Article 5. Content of the environmental impact assessment

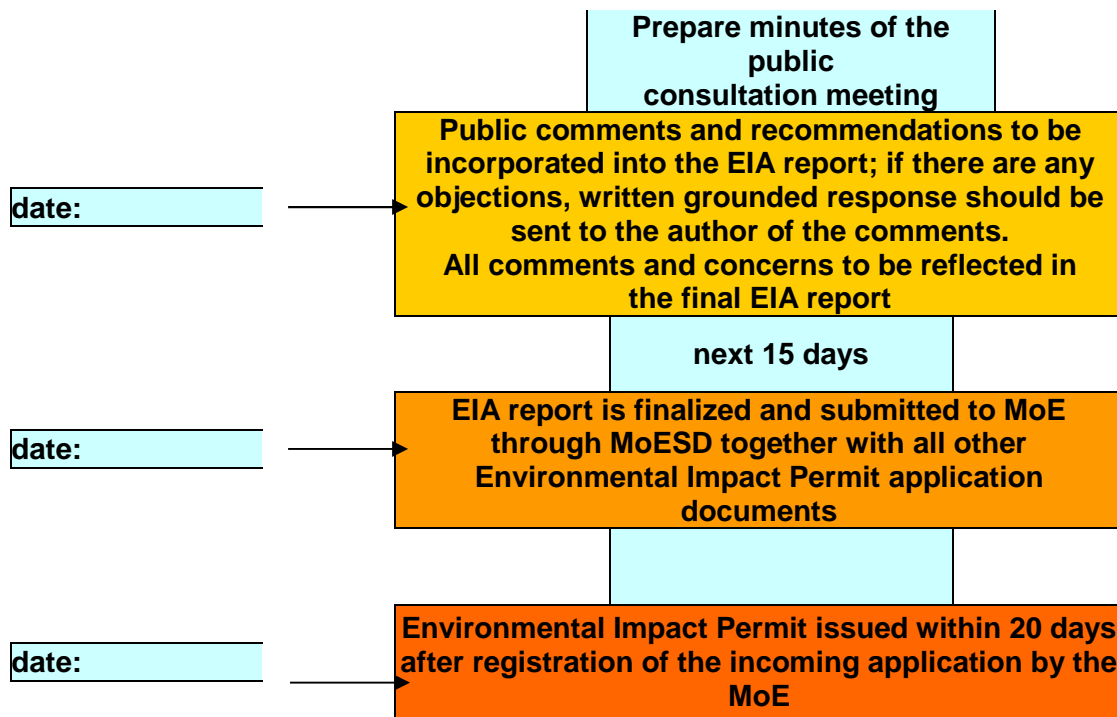
The Environmental impact assessment report should include the following information:

- (a) Analysis of the existing state of the environment;

- (b) Identifying the sources, kinds and objects of impact caused by the activity;
- (c) Forecast of the changes of quantitative and qualitative characteristics of the environment;
- (d) Determining the probability of emergency situations due to the activity and evaluating the expected results;
- (e) Evaluation of the environmental, social and economic results of the planned activity;
- (f) Specifying the reduction measures for the negative impact on the environment and human health and specifying the compensation measures as necessary;
- (g) Identifying the residual (cumulative) impact and measures for its control and monitoring;
- (h) Undertaking environmental and economic evaluation of the projects;
- (i) Analysis of the alternative variants of the project implementation, selection and forming new variants;
- (j) Identifying the ways and means to restore the initial environmental condition in case of terminating entrepreneurship or other activity;
- (k) Informing the society and studying the public opinion;
- (l) Plan for the post-project situational analysis;
- (m) Identifying the kinds and quantities of the expected emissions;
- (n) Forecast of the expected environmental state gained through the environmental impact factors;

Decree also requires development of the Monitoring Plan during the implementation of the project and at the end of the activity.





**Figure 3.1 Disclosure and Environmental Impact Permit Procedure**

### 3.4 EIB environmental and social requirements

The EIB’s environmental and social safeguard policies are based on the EU approach to environmental sustainability. The principles, practices and standards are highlighted in the Declaration on the [European Principles for the Environment \(EPE\)](#). The Bank operates within the framework of the EPE, which conforms to the environmental principles and the practices of the EC Treaty and all standards of EU environmental legislation.

The Bank’s approach to financing projects is based on the “[precautionary principle](#)”, preventative action rather than curative treatment should be taken, environmental damage should be rectified at source and the polluter should pay, according to the “Treaty Establishing the European Community”. All projects financed by the Bank are the subject of an Environmental Assessment (EA) to assess the requirements for an Environmental Impact Assessment (EIA) according to the [EU EIA Directive 85/337/EEC](#) as amended by Directive [97/11/EC](#), Council Directive [85/337/EEC](#) of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment, Council Directive 97/11/EC of 3 March 1997 amending Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment.

*Projects are screened into four categories based on these directives:*

- Cat. A – those for which an EIA is mandatory (Annex 1 of the Directive);
- Cat. B – those for which the competent authority determines the need for an EIA according to specified criteria (Annex II of the Directive, with ref. to Annex III);

- Cat. C – for which a limited environmental assessment is required according to any likely adverse environmental impacts of the project (projects outside the scope of the Directive);
- Cat. D – no environmental assessment required.

An EIA process requires appropriate public consultation and information disclosure.

Verification that this has been/will be undertaken forms an integral part of the Bank's due diligence process. The EIA should be completed and its main findings and recommendations must satisfy the requirements of the Bank prior to disbursement.

All projects financed by the Bank are also screened according to their potential impacts on sites of nature conservation. Where the impacts are expected to be significant, a special biodiversity assessment is carried out, according to the principles and practices of the [EU Habitats Directive](#) (ref. Art. 6 of the Directive). Bank projects are assessed for their expected impacts in terms of greenhouse gas emissions; The scope for improvements in energy efficiency and the need for measures to adapt to climate change are also reviewed.

All projects financed by the Bank should comply with the requirements of relevant multilateral environmental agreements (MEA) to which the host country – and/or the EU in the case of a EU Member State – is a party, including the [Montreal Protocol](#) (on ozone depleting substances), the [UN Convention on Climate Change](#) and the [Kyoto Protocol](#) (on greenhouse gas emissions) and the [Aarhus Convention](#) (on environmental information).

### 3.5 Screening finding of the project

In line with the legislation of Georgia, business associated with the construction or rehabilitation of an international or local road needs an Environmental Permit and EIA report.

EIB Rules:

The Project envisages construction of a new road section and relevant infrastructure. Despite the fact that the route will not cross any sensitive areas, according to Annex 1 of the Council Directive [85/337/EEC](#) of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment: **Construction of motorways, express roads (1) and lines for long-distance railway traffic and of airports (2) with a basic runway length of 2 100 m or more is subject for EIA.**

A full-scale EIA and public consultation is needed in line with the Georgian legislation and requirements of the EU Directives.

## 4. DESCRIPTION OF THE NATURAL ENVIRONMENT IN THE PROJECT AREA

### 4.1 Climate, Air Quality, Background Noise and Radiation

#### 4.1.1 Climate

The climate of the project area from Samtredia to Grigoleti is subtropical humid marine with warm and snowless winter and hot summer. The climate data of the project road segment has been obtained from the Georgian Climatologically Norm - PN 01.05-08, according to the data from Lanchkhuti and Supsa meteorological stations. Based on the main properties given in Table 4.1 to 4.6 of the above mentioned norm, the project road location area is attributed to IIIb sub-district. Climate properties are given in the Tables below.

**Table 4.1 Main climate properties of the climate subdistrict**

Climate district	Climate subdistrict	Average temperature in January, °C	Average temperature in July, °C	Relative humidity in July, %
III	IIIb	From +2 to +6	From +22 to +28	50 and more at 13hrs

**Table 4.2 Air temperature and humidity**

#	Climate Characteristics	Meteorological Station	By month												Ave. Annually
			I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
1	Average Monthly and Yearly Air Temperature, 0C	Lanchkhuti	4.7	5.6	8.8	13.0	18.0	21.0	23.2	23.5	20.4	16.2	11.2	7.0	14.4
		Supsa	4.5	5.2	7.9	11.4	16.2	20.0	22.5	22.6	19.4	15.2	10.5	6.5	13.51
2	Absolute Minimum Air Temperature, 0C	Lanchkhuti	-	-	-	-	-	-	-	-	-	-	-	-	-20
		Supsa	-	-	-	-	-	-	-	-	-	-	-	-	-13
3	Absolute Maximum Air Temperature, 0C	Lanchkhuti	-	-	-	-	-	-	-	-	-	-	-	-	39
		Supsa	-	-	-	-	-	-	-	-	-	-	-	-	41
4	Mean Maximum of the hottest month, 0C	Lanchkhuti	-	-	-	-	-	-	-	28.8	-	-	-	-	-
		Supsa	-	-	-	-	-	-	-	26.8	-	-	-	-	-
5	Range of ambient temperature, 0C	Lanchkhuti	7.5	8.7	10.1	11.7	11.6	11.0	9.0	9.4	10.8	11.0	9.5	8.0	-
		Supsa	7.1	7.8	8.8	9.6	10.3	9.1	8.0	8.2	9.7	10.2	9.1	7.7	-
6	Relative air humidity, %	Lanchkhuti	80	78	77	74	75	76	80	82	83	81	78	77	78
		Supsa	80	80	79	79	80	82	84	86	86	84	80	78	82

**Table 4.3 Amount of precipitation and snow cover**

Meteorological station	Amount of precipitation in a year, mm	Amount of precipitation in 24 hours, mm	Weight of snow cover, KPa	Number of days with snow cover
Lanchkhuti	1980	250	0.50	14
Supsa	2379	260	0.50	10

**Table 4.4 Standard values of wind pressure**

Meteorological station	W <sub>0</sub> Once in 5 years, KPa	W <sub>0</sub> Once in 15 years, KPa
Lanchkhuti	0.60	0.73
Supsa	0.38	0.60

**Table 4.5 Greatest wind velocity with probability once in 1, 5, 10, 15, 20 years, m/s**

Meteorological station	in 1 year	in 5 years	in 10 years	in 15 years	in 20 years
Lanchkhuti	27	32	34	35	36
Supsa	21	26	29	31	32

**Table 4.6 Frequency of wind directions**

Wind property			Direction								Calm
			N	NE	E	SE	S	SW	W	NW	
Frequency of wind directions (%)	January	Lanchkhuti	3	29	30	3	8	19	7	1	-
		Supsa	1	71	2	2	4	10	8	2	-
	July	Lanchkhuti	2	3	5	2	14	40	33	1	-
		Supsa	1	7	1	5	19	37	28	2	-
Wind direction and calm frequency per year (%)		Lanchkhuti	4	19	17	2	10	28	18	2	46
		Supsa	2	42	2	2	10	24	16	2	51

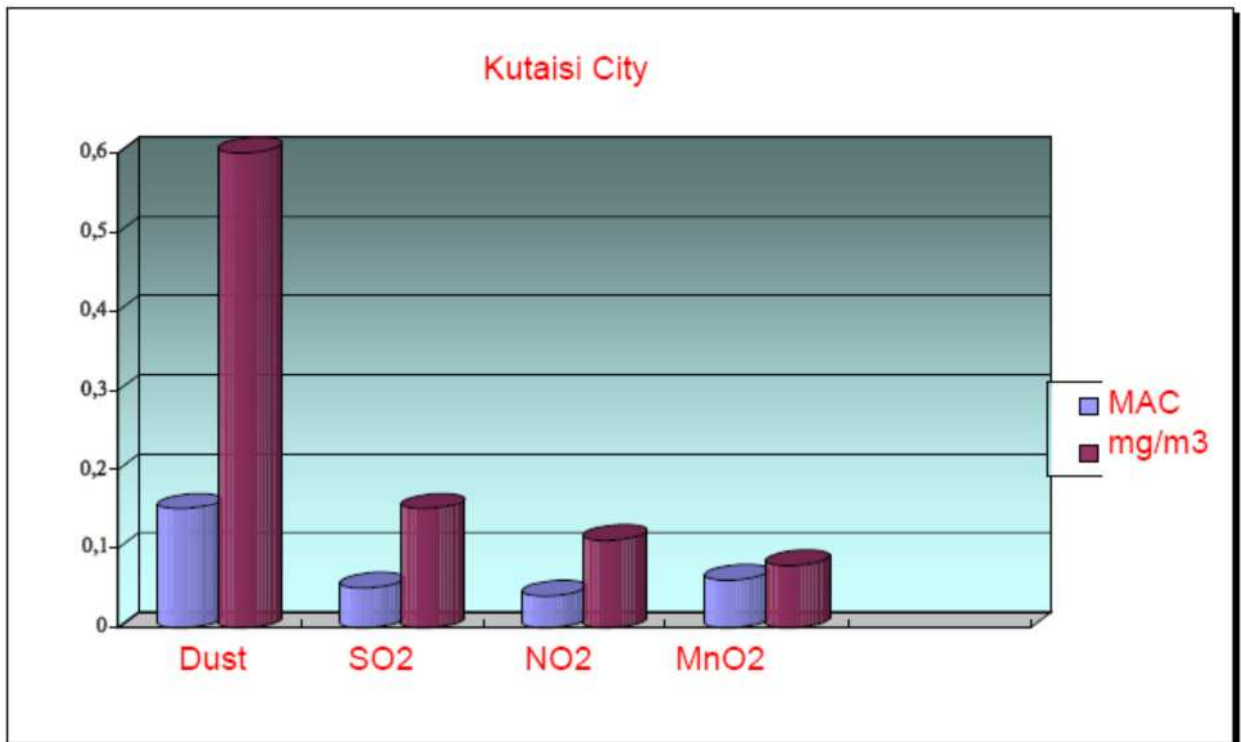
In Lanchkhuti and Supsa seasonal freezing depth for any soil is 0 cm.

#### 4.1.2 Air Quality and Noise

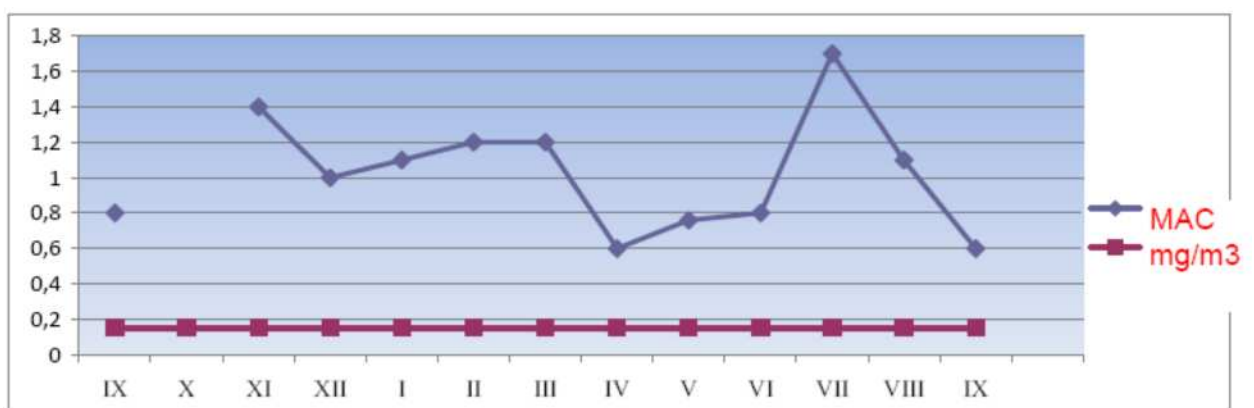
##### Baseline pollution according to available data

According to the data of 2009 (source: Monitoring and Prognosis centre of the MoE; September 2009) ambient air pollution in Kutaisi is significant:

- Dust – average monthly concentration is reported to be 0.6mg/m<sup>3</sup>, which exceeds MAC (for average daily concentrations) 4 times
- Sulfur Dioxide (SO<sub>2</sub>) – average monthly concentration is 0.15mg/m<sup>3</sup>, which exceeds MAC 3 times
- Nitrogen Dioxide (NO<sub>2</sub>) – average monthly concentration is 0.11mg/m<sup>3</sup>, which exceeds MAC 2.8 times
- Nitrogen Oxide (NO) - – average monthly concentration is 0.078mg/m<sup>3</sup>, which exceeds MAC 1.3 times

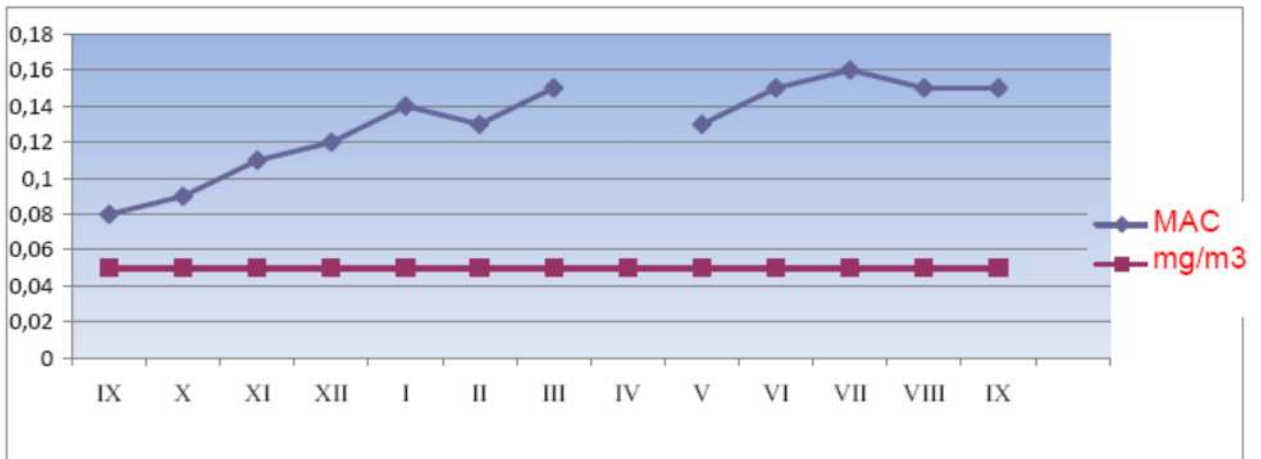


**Figure 4.1 Average Concentrations for September 2009**

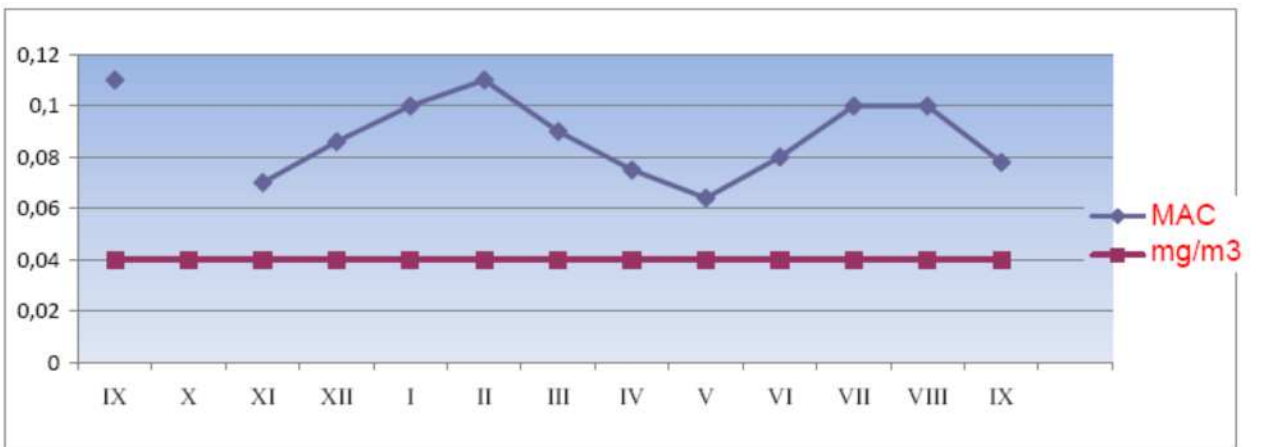


**Figure 4.2 Dust Concentrations (Average Monthly for 2008 – 2009)**

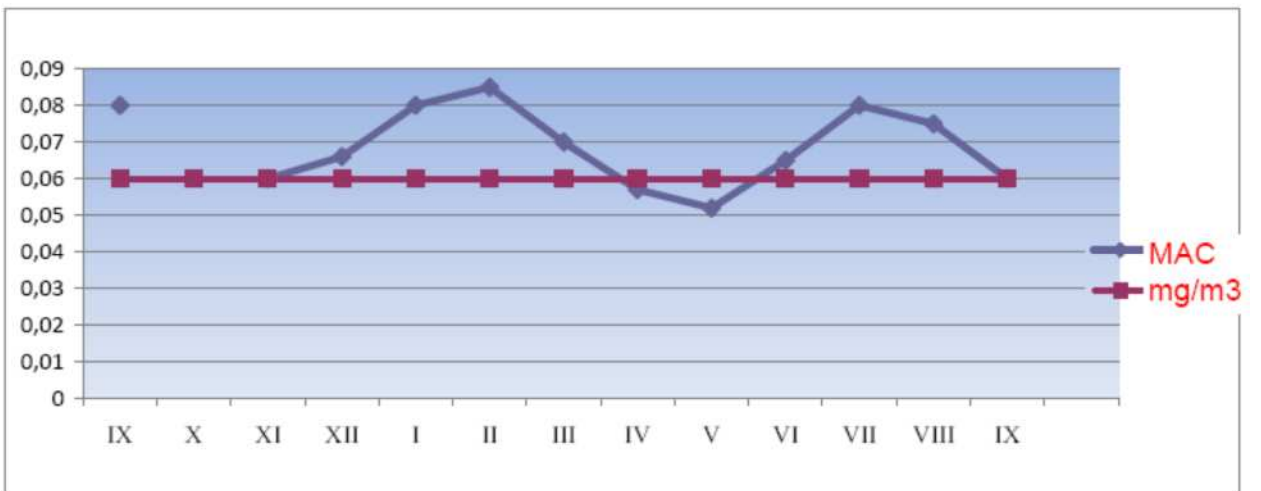




**Figure 4.3 SO<sub>2</sub> Concentrations (average monthly for 2008 – 2009)**



**Figure 4.4 NO<sub>2</sub> Concentrations (average monthly for 2008 – 2009)**



**Figure 4.5 NO Concentrations (average monthly for 2008 – 2009)**

As for the properties of atmospheric air immediately along the design road, by the order of the Project, the Department for the monitoring of environmental pollution has done measurements of 5 control sites. The results of the analysis are referred to in the table below.

### Data about the concentrations of polluting substances in the atmospheric air

Date of measurement	№	Place of measurement	Site coordinates	Concentration, mg/m <sup>3</sup>			
				Dust	CO	NO <sub>2</sub>	SO <sub>2</sub>
28-30.11 2012	№ 1	Samtredia	N 42°07'35,1" E <sub>o</sub> 42°18'00,4"	0.002	0.90	0.006	<0.1
	№ 2	Samtredia	N 42°07'37,3" E <sub>o</sub> 42°17'49,6"	0.002	0.87	0.005	<0.1
	№ 3	Samtredia Vazisubani	N 42°06'50,1" E <sub>o</sub> 42°14'18,8"	0.003	0.97	0.007	<0.1
	№ 4	Samtredia Gurkneti	N 42°05'40,6" E <sub>o</sub> 42°04'33,6"	0.004	1.27	0.120	<0.1
	№5	Samtredia	N 42°05'47,3" E <sub>o</sub> 42°03'37,0"	0.005	1.08	0.005	<0.1
	MAC			0.5	5	0.2	0.5

#### 4.1.3 Background level of radiation

Background radiation level has been measured along the whole proposed alignment for the preferable route. The measurements have been carried out on April 10 of 2014.



*Photo 4.1 Device – “CPI 6801”*

The measurements have been carried out using the standard certified Russian device – “CPI 6801”. The measurement was conducted continuously while driving the car along the proposed alignment and in 102 stopover sites out of car. The radiation background level varied from 6 to 12 micro-roentgen/hours for different sites;

#### 4.1.4. Surface water objects and soil

According to the data of the Center of monitoring and prediction of the Ministry of Environmental Protection and Natural Resources of 2009, the pollution of the river Rioni with ammonium ions in the environs of the city of Kutaisi is described as follows: the concentration of pollution along Kutaisi section is twice as much as MAC (maximum admissible concentration) upstream and 2.3 times more the MPC downstream the river Rioni.

Surface water samples were taken by the project team from three rivers and two channels crossed by the selected road alignment. These rivers are: Rioni-Samtredia (N42007'35,1" EO 42018'00,4"), Tskhenistskali-Samtredia (N42007'37,3" EO 42017'49,6"), Rioni-Vazisubani (N42006'50,1" EO 42014'18,8"), channel-Gurkaneti (N42005'40,6" EO 42004'33,6"), channel (N42005'47,3" EO 42003'37,0"). The measurement data are given in Appendix 3. The values of concentration of polluting substances are within the norm, what is clear, as the design section is distanced from the industrial zone and existing road mains.

Soil samples were taken from 5 sites in the area adjacent to the existing road mains and along the selected future alignment where there is no road at present. The integral parameters of pollution, lead (Pb), zinc (Zn), copper (Cu) and nickel (Ni) were analyzed. The results show that the concentration of heavy metals, including lead is within the limits of MAC (maximum admissible concentration).

The detailed data about the background pollution are given in Appendix 3.

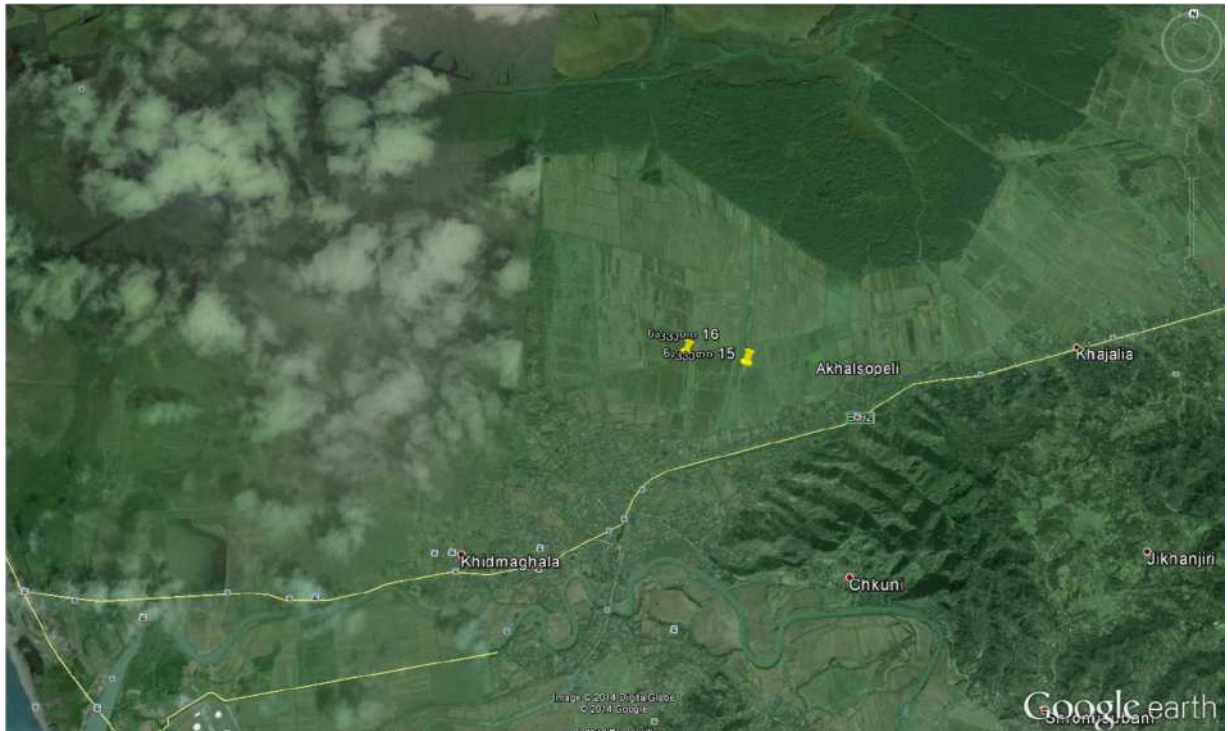
## **4.2 Physical-geographical Features**

The results of the detailed engineering-geological investigations are given in the design documents. See the summary for the Environmental Impact Assessment below.

### **4.2.1 Topography and Geomorphology of Project Area**

Stage 2 of Samtredia-Grigoleti motorway construction covers the area from Lanchkhuty Town to Grigoleti Village. The submitted Lot No 4 (km 42,000 – km 51,570) starts in the vicinity of Nigoeti Village and ends at Grigoleti Village.

Geomorphologically, the part of the territory of Georgia within which the project road will be located from Samtredia to Grigoleti, represents part of the Georgian intermountain depression Colchis table land, confined with uplands of triangular mountains on the east, south and north, while on the west it opens toward the Black Sea. At the same time it is the easternmost part of the latitudinal Black Sea geosynclines, which in the past (up to the end of Miocene) was occupied by the sea. Later on, as a result of tectonic processes, the sea retreated while the coastal basin filled with marine and mainland sand-gravel and clayey sediments. The process is still in progress.



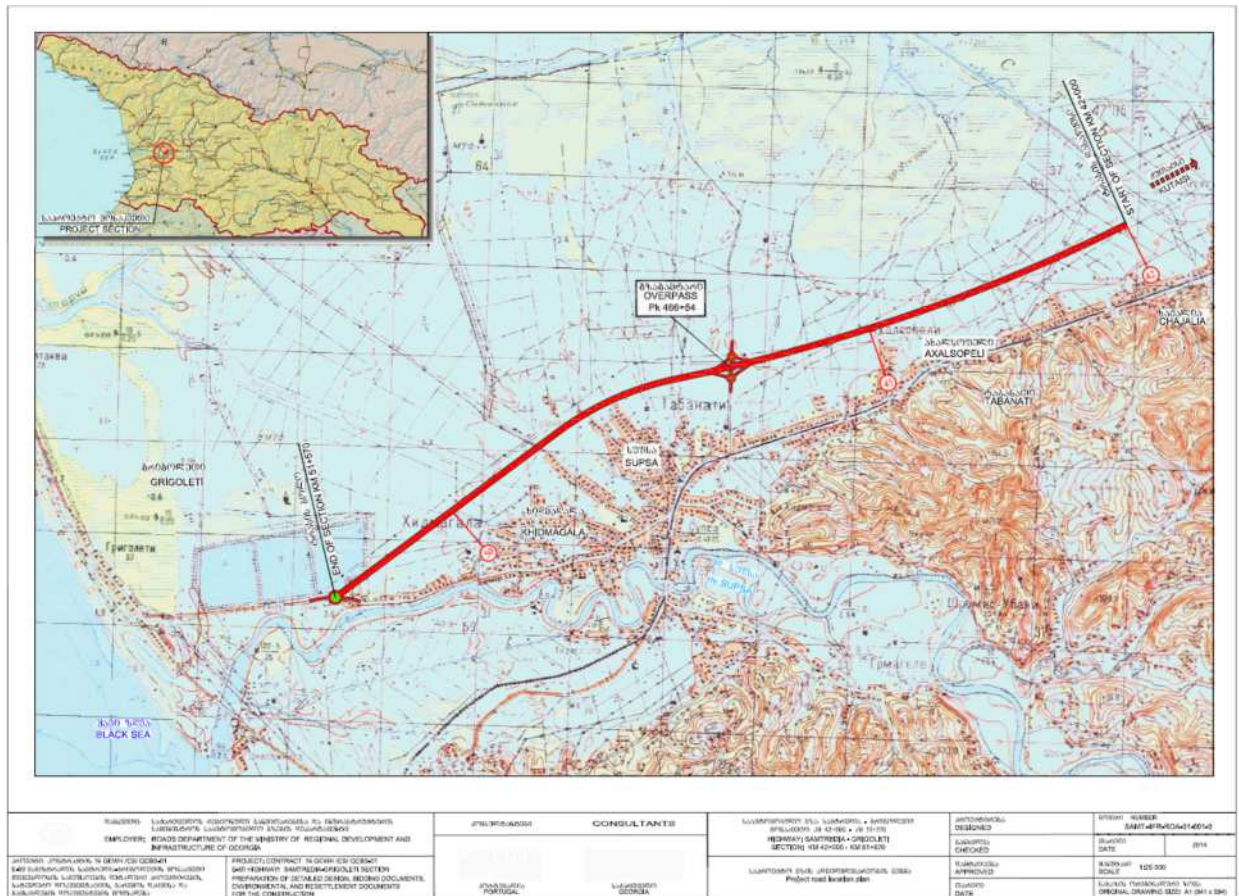
**Picture 4.2. Aerial photograph of Lanchkhuti-Grigoleti section. The view of photographed from the height of 24,19 km**

In general, direction of Samtredia-Lanchkhuti-Grigoleti motor road is south-western and it is to be located in the southern part of the Colchis table land. The initial part of the road from the beginning to village Japana (from pk0 to pk 134) will be located distanced from the mountain range bottom, first on the planed part of the r. Rioni right alluvial terrace, and then on the planed part of the r. Rioni left alluvial terrace. From v. Dafnari to v. Supsa (from pk 134 to pk 490) the road passes along the northern side-hill of the Meskheta mountain range, near the range bottom, on the coastal planed part in the microrelief of which depressions of the rivers flowing down from the northern side-hill of the mountain range and small elevations are observed formed by the debris of the sediments carried out by these rivers. The last segment of the route from village Supsa to village Grigoleti (from pk490 to pk570) will be located on the right terrace of the r. Supsa and follows it up to the sea coast, i. e. vlg. Grigoleti. The height of this terrace at v. Supsa is relatively big (4-5 m), while with the approach to the sea, within vlg Grigoleti area it lowers to 2-3m.

The whole area of the project road, in disregard of small topographic roughnesses of different genesis, represents one whole plain, with its surface being cut down to 1-5 m depth by river beds and races. In their turn, former river beds of the local rivers, among which most noticeable are the former beds of the R. Rioni, also contribute to the local topographic roughness.

The main relief-forming arteries of the hydrographic network within the road right of way are the rivers Rioni, Tskhenistskali and Supsa. The role of their tributaries in formation of the landforms (cutting downs of the river beds, micro-relief forms

as a result of sediment accumulation, etc.) was always conditioned by their erosion basis, or the state of the main river beds on this or that segment of the valleys.



**Picture 4.3. Location of the geomorphologic elements and hydrographic network of the design road, km 42,000 – km 51,570 section of the modernization road and its adjacent area. The red line marks the design road (topo-base scale: 1:70 000)**

The design section and its adjacent areas in respect of soil spreading, according to the soil zoning of Georgia by Sabashvili M. (1964) is located in the region of podzolic and alluvial soils of the elevated area of the lowland of the zone of boggy and podzolic soils of Kolkheti Valley of intermountain lowland of west Georgian soil zone (Fig. 4.4).

Mostly alluvial soils are spread here. These are the soils originated on the river deposits (alluvion) in terms of regular flooding. On the left bank of the river Rioni, there are so called saturated alluvial soils, and on the right bank of the river, in addition to them, there are alluvial carbonate soils and rarely acid alluvial soils. Floodplain vegetation is typical to the alluvial soils. There are subtropical podzolic soils with humus horizon of a minor thickness in the west-south of the region, in the areas adjacent to Lanchkhuti.

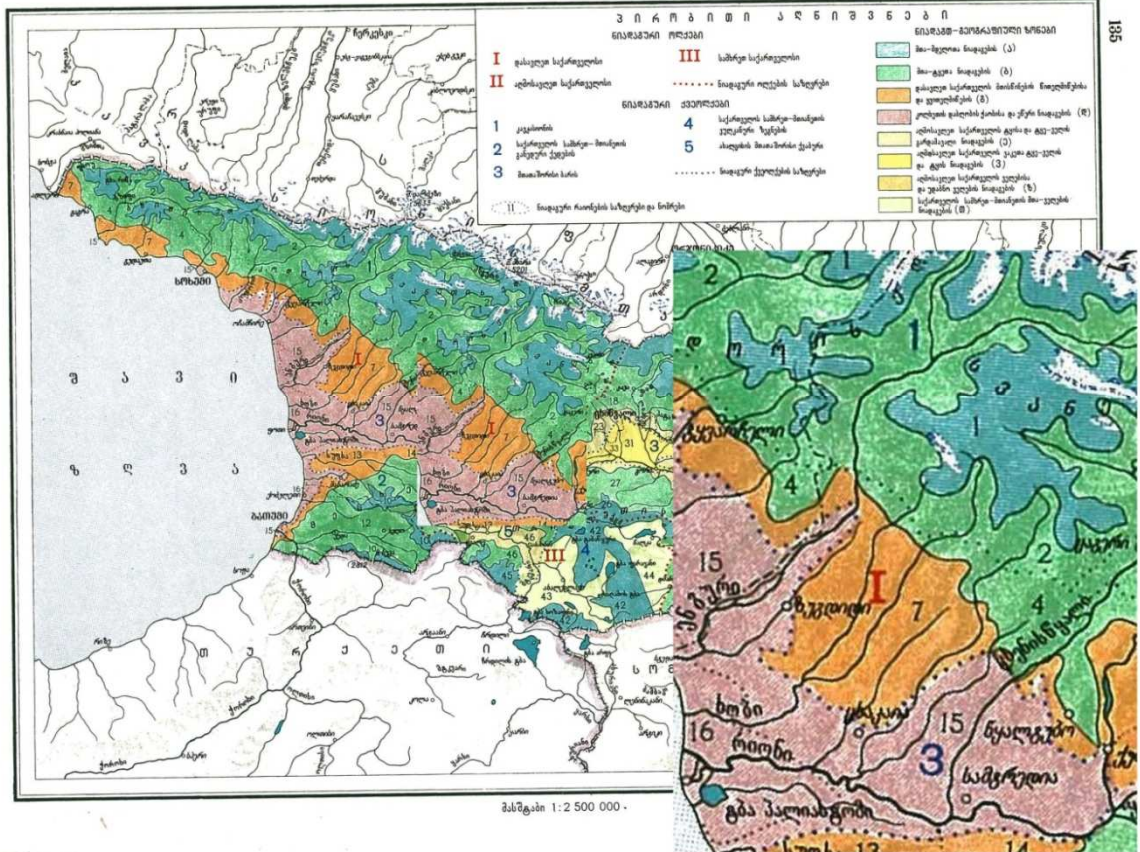


Fig. 4.4. Soil Map

In parallel to the design road, south of it, at the starting points of Samsari ridge, there are zheltozem soils spread. The nature of the soil spreading in the design area and areas adjacent to it is well seen on the soil map drafted under the guidance of Urushadze T., a corresponding member of the Academy of Sciences of Georgia (Fig. 4.5).

In geodynamic terms, no active processes are observed within the road construction line. Here the erosion processes ongoing slowly in the river-beds, and some canals should be taken into account. The depression of their beds is not more than 2-3 m; therefore, possible overflow of the rivers and flooding of certain areas is not excluded during high water periods. In respect of modern geodynamics (landslides, mudflows), the design section and its adjacent areas are located in the I category zone with 0 probability of developing geohazardous processes.

პირველი სტადია

## საქართველოს ნიადაგების რუკა SOIL MAP OF GEORGIA

მასშტაბი  
SCALE 1 : 500 000

- მოამბლელის პრიმტიული - *Leptosols*
  - მოამბლელის კორიანი - *Leptosols and Kistosols*
  - მოამბლელის კორიანტროფიანი - *Leptosols and Kiposols*
  - მოამბლელის ჰუმინი - *Gleyols and Khosols*
  - მოამბლელის უმუწოსები - *Kanis leptosols*
  - მოამბლელის - *Kanis cambisols*
  - ტყის ვიწრო მუცე - *Bystric cambisols*
  - ტყის ვიწრო ხუნტავ არაპატი - *Bystric cambisols*
  - ტყის ვიწრო გარეგანი - *Bystric cambisols*
  - ყვითელი-ფერხული - *Gleysols and Ferric Gleysols*
  - უმარალ-შუი - *Kanis cambisols and phaeozems*
  - წყლულ-გარბინტილი - *Podzolic leptosols*
  - წყლულ-გარბინტილი ფერხული - *Podzolic leptosols*
  - წყლულ-გარბინტილი წითელი - *Rhodic cambisols and hevisols*
  - წითელი - *Alisols*
  - წითელი-ფერხული - *Stagnic Alisols*
  - ყვითელი-ფერხული - *Gleysols and Ferric Gleysols*
  - ყვითელი-ფერხული - *Stagnic Ferric Gleysols*
  - სტერტილი ფერი - *Stagnic Vertisols*
  - სტერტილი ფერი ფერხული - *Humic and Stagnic Vertisols*
  - სტერტილი ფერი - *Gleysols*
  - შავი-გარბინტილი - *Thiolozems and chamozeozems*
  - შავი - *Chamozeozems*
  - შავი დამრეცილი - *Vertic Chamozeozems and vertisols*
  - შავი - *Vertisols*
  - შავი კამბინტილი - *Calcic vertisols*
  - შავი ჰიუმინი და დამრეცილი - *Hortic vertisols*
  - მდელოს შავი - *Clay Vertisols*
  - მდელოს შავი ჰიუმინი და დამრეცილი - *Clay-hortic vertisols*
  - ყვითელი კამბინტილი - *Calcic Kastanozems*
  - ყვითელი - *Distric cambisols and calcic Kastanozems*
  - ყვითელი კამბინტილი - *Calcic cambisols and calcic Kastanozems*
  - ღია ყვითელი - *Calcic Kastanozems*
  - მდელოს ყვითელი - *Calcic cambisols and calcic Kastanozems*
  - მდელოს-რუსო-ყვითელი - *Calcic vertisols*
  - მუსო-ყვითელი - *Calcic Kastanozems*
  - მუსო-ყვითელი - *Calcic Kastanozems*
  - მუსო-ყვითელი ღია - *Calcic Kastanozems*
  - წყლულ-გარბინტილი - *Oxisols*
  - ბიტილი - *Solcherts*
  - მლაშობი - *Solonchaks*
  - ხლუცილი მუცე - *Bystric Histosols*
  - ხლუცილი მლაშობი - *Distric Histosols*
  - ხლუცილი კამბინტილი - *Calcic Histosols*
  - ლამინტილი - *Gleyols*
  - გორეან-ჰუმინი - *Kistosols*
  - ანტიპოტენტილი ნიადაგი - *Andric regosols and Umbricols*
  - მლაშობი-გარბინტილი ნიადაგი და ტანგას გაშლუცილები - *Rock outcrops and leptosols*
  - მინტილი - *Glaciers*
- ტბები და წყლუცილები
  - მდინარეები და არხები
  - დასახლებული პუნქტები



Fig. 4.5. Soil Map

## 4.2.2 Geology and Tectonics

The study area, according to the tectonic division plan by Gamkrelidze P. (1961), (Picture 4.6.) is located in Kolkheti subzone of west subsidence of the Georgian block zone. It is mostly structured with Mesozoic and Cainozoic rocks, which are covered with terrigene deposits of the Quaternary Age and therefore, no older deposits are seen on the surface.



**Picture 4.6. Tectonic map of Georgia. Scale: 1:600 000 (Gamkrelidze P. 1961)**

Kolkheti Valley was drilled at many places in different times in the attempt to find oil, helping identify the essence and age of its constituent rocks (Photo 4). This is on average 2.500-m-thick, Jurassic-Cretaceous (J+K), mostly laguna deposits with gypsum and anhydride and 1700-1800-m-thick Tertiary (Eocene (e) and Miocene (m)), mostly Terrigene and volcanic rocks, covered with quite thick Quaternary or Modern Terrigene and clay deposits with 500 m thickness at some places.





Geological section of the Colchis table land is represented by marine and mainland formations. Marine sediments are represented by a complete stratigraphic sequence (Chaudi-Holocene - QI-IV). In the central part of the Colchis table land, including the neighborhood of the city Poti, total thickness of the Quaternary marine sediments is over 300 m. Here these sediments are mostly represented by alternation of dark gray clays and sands.

The mainland sediments on the area are mainly represented by alluvial sediments. They have accumulated in the flood plains of the rivers Rioni, Tskhenistskali, Supsa, etc., and lithologically are structured by sand/gravel and sand/cobbles soil varieties. On the last stage of the accumulation process, alternation of marine and mainland phases occurred which reflected in the alternation of sediment strata in the coast adjacent line (alluvial, marine sediments and turfs). West of city Senaki, this stage corresponds by age with Holocene, while east of it – to Pleistocene. In the very central part of the Colchis table land (Poti adjacent zone), the thickness of Holocene sediments (A. G. Laliev) reaches 40-50 m and three turf strata are distinguished in it – correspondingly. at 41, 37 and 10 m depth. The thickness of alluvial formations near city Kutaisi is not more than 4-5 m, near city Samtredia – over 30.0 m, while near city Poti the thickness of alluvial-marine formations is over 300 m.

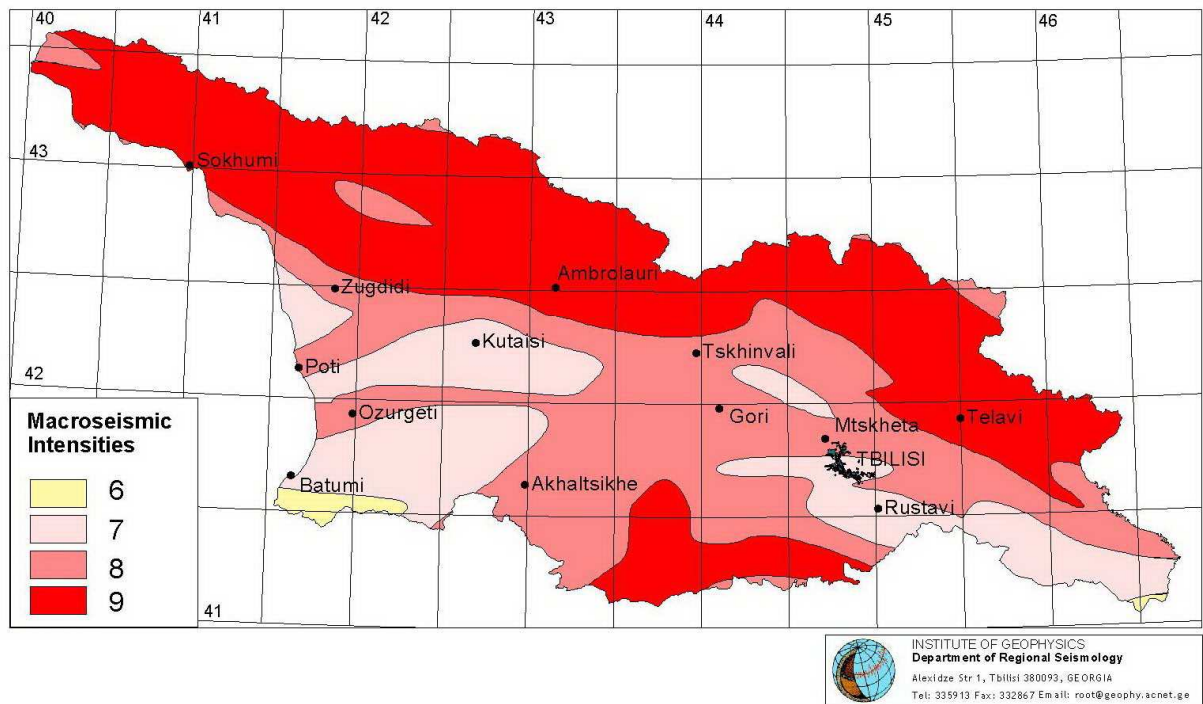
Distribution of swamp sediments, apparently alternating with alluvial fine sands, is represented by peat- bogs, organic silts and clays.

#### **4.2.3 Seismic Risks**

Based on the normative document currently effective in Georgia – PN 01.01-09 -"Antiseismic Construction" and according to the modern map of seismic hazards of Georgia (photo 4.3.), with a 2% probability of 50-year-long expectation, Samtredia-Lanchkhuti segment of the project road is situated in the seismic zone of intensity 7 by MSK64 scale, with the value of maximum horizontal acceleration (nonmetric seismic coefficient – A) 0.11-0.12 (see the Seismic Hazard Map below).

**MAP OF SEISMIC HAZARD ASSESSMENT OF GEORGIA**

Macroseismic Intensities, having 2% probability of being exceeded in 50 years (MSK scale)

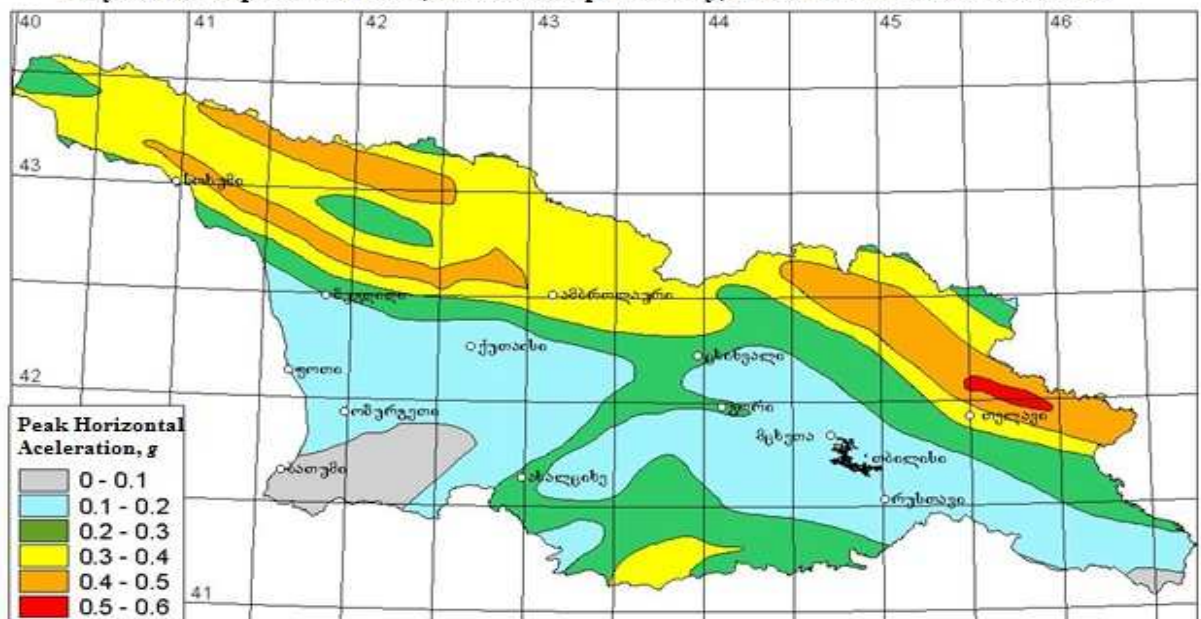


**Fig. 4.8 Seismic Map of Georgia**

In respect of seismic stability, the maximum acceleration of ground oscillations caused by earthquakes is even more important (Photo 4.4). This is marked with the abbreviation PGA (Peak Ground Acceleration) and measured in the units of free fall acceleration of a solid body (marked by g).

**Map of seismic hazard of Georgia**

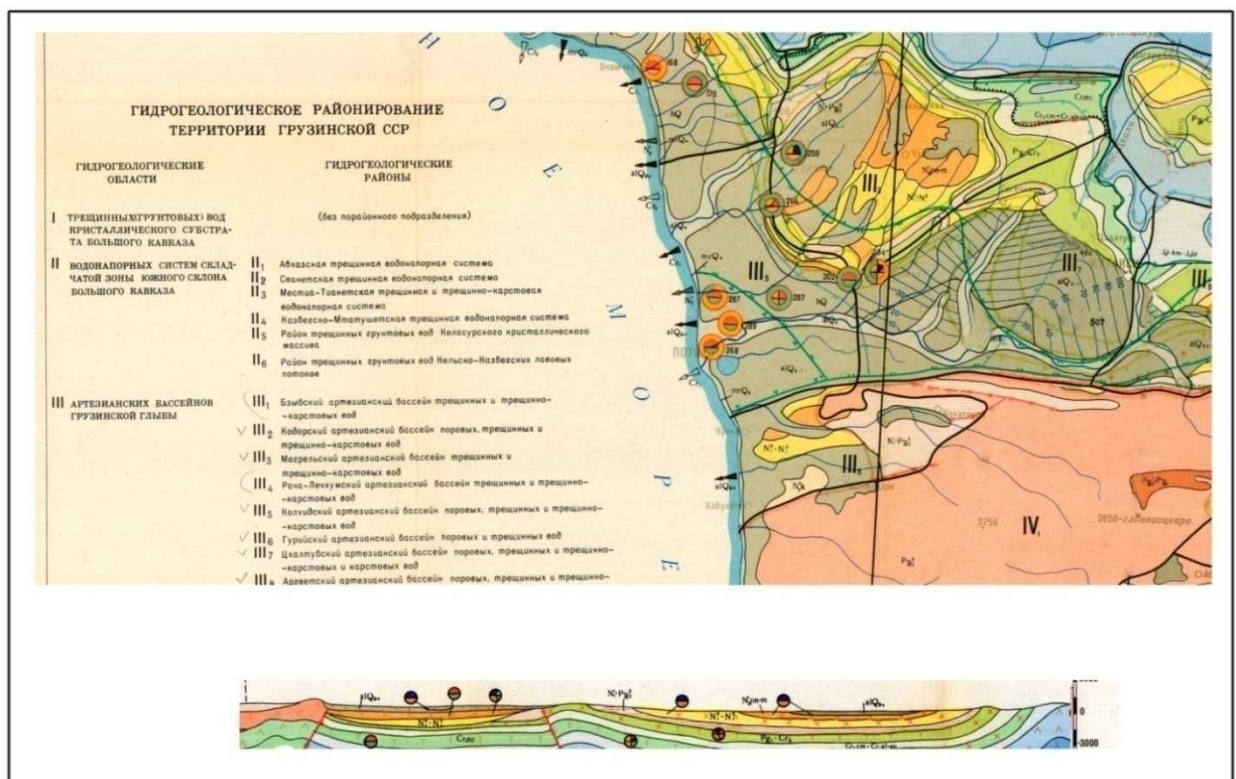
50 years of expectation time, 2% excess probability, Peak Horizontal Acceleration



**Fig. 4.9 Map of Seismic Hazard of Georgia**

#### 4.2.4 Hydrogeology

In a hydrogeologic respect, the given area is located in Artesian zone of the Georgian block (Photo 4.10) and is the area in the extreme southern part of the hydrogeological region of porous, fissure and fissure-karst waters of Tskaltubo Artesian basin and spreads over the south-western periphery of the hydrogeological region of porous, fissure and fissure-karst waters of Kolkheti Artesian basin (Buachidze I. 1970). Here, on Kolkheti Valley there are also waters associated with bedrocks, i.e. deep-circulation waters associated with deeply located rocks (from 500 to 4500 m), which do not outcrop on the surface and are fixed in wells only. These are also Mesozoic ( $J_3+K_2$ ) and Tertiary (Pg+Ng) deposits, as well as delluvial and alluvial, Quaternary (Q) deposits, or the ones associated with Modern deposits, i.e. non-deep circulation ground waters, i.e. the ones located near the surface.



**Fig. 4.10. Fragment of the map "Hydrogeological map of Georgian SSR" (Buachidze I., Chumburidze B., 1970), Scale: 1: 600 000**

According to the hydrogeological conditions, water bearing complex of the Quaternary clayey and sandy sediments of coastal plain are developed at the Lanchkhuti-Grigoleti project road section line. These sediments form one whole pore water bearing horizon because of presence of many, so called, sand "hydrogeological windows" in the clayey sediments. The groundwater standing level in the boreholes drilling along the route varies within 0.4 to 2.2 m depth interval. There is no available information regarding the groundwater seasonal fluctuation, however, taking into consideration that the boring works were being carried out during relatively dry period (September month), it is assumed that the groundwater level during precipitation

periods (autumn and spring) would be higher by 1-1.5 m, if compared with the levels observed during the boring. Information regarding chemical composition of the groundwater and its aggressiveness toward engineering structures is given below, in the review of engineering-geological conditions.

The chemical content of the waters is mostly hydrocarbonate-calcium or calcium-magnesium, with their general hardness varying from 5 to 15 g/eqv. The temperature of the waters is 14-20°C. The regime of the ground waters in these deposits is variable and varies together with the river levels. The drinking properties of the waters are satisfactory.

The boreholes drilled along the aforementioned road section show that the ground water is at the depth of 0.5-3.6m. There are aquiferous strata below the ground water level.

#### **4.2.5 Engineering-geological features of Samtredia-Lanchkhuti Section of the design motorway<sup>1</sup>**

Varieties of soils distinguished as a result of field and laboratory testing are described in whole for the entire Lanchkhuti-Grigoleti project road segment. Each soil type, i.e. Stratum, has been assigned its unique number, which designates it throughout the whole project road alignment in accordance with its repeatability.

In general, within the project road alignment there are 5 varieties of soils. Among the soils there are silts and clays, and subgroups of coarse-grained gravelly soils. The later type of soil was observed only in the Borehole No. 3, at the crossing with the old riverbed of the riv. Rioni. At river crossings, soils below the river-level are saturated everywhere. In general, within the road alignment, ground-waters reveal at different depths. Water tables are recorded on borehole columns (logs), as well as on the geotechnical section along the route-line.

Varieties of soils represented within the ROW of the project road, provisionally named "Strata", are described separately below. The properties of individual strata at the different sections of the road, among them with the bridge, are changed insignificantly. Soil properties are also evaluated individually for each bridge crossing; the assessment is given in the following item No. 3 (Chapter 3). Geotechnical descriptions of the strata are based on the results of the laboratory analyses conducted on the samples taken from the boreholes.

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<sup>1</sup> The detailed description (by pickets) of the engineering-geological features is included in the design documents as a separate report. The report was prepared by GEONEGINEERING in 2012. The title of the report is "Drilling and laboratory activities for engineering-geological investigations of Samtredia-Lanchkhuti-Grigoleti design motorway"

**STRATUM-1** – Brown, stiff clay. By origin it is an alluvial soil (aQ). STRATUM-1 has quite large distribution area in the surface part of the project line and has revealed in 33 boreholes. Stratum thickness in various parts varies from 0.4 to 2.0 m. The stratum ranges along the road RoW and in depth are graphically shown on the long sections of the project structures (see graphical part of the report).

According to GOST Standard, STRATUM-1 is plastic clay.

According to **BS** Standard, STRATUM-1 is slightly gravely, silty, intermediately plastic clay.

Based on the results of the shear test (see Annex 2.8), average standard values of strength characteristics of STRATUM-1 are as follows:

In natural condition: cohesion  $c=22$  KPa; internal friction angle  $\varphi=11^{\circ}$ ;

In consolidated condition: cohesion  $c=25.4$  KPa; internal friction angle  $\varphi=18^{\circ}$ .

Two samples taken from this Stratum were tested on consolidation (odometer) compression test. Testing results for the sample taken from the borehole No. 12, from 0.5-0.7 m depth interval, with indication of loading individual steps, are shown in the Annex 2.9, whereas according to the testing results for the sample taken from the borehole No. 14, from 1.0-1.2 m depth interval, compression index equals to  $C_c=0.271$ .

According to the standard values of physical properties characteristics, and as per SNIP 2.02.01-83, STRATUM-1 standard values of mechanical properties parameters are as follows:

- Deformation modulus  $E_0=6$  MPa;
- Elasticity modulus  $E_{el}=28$  MPa;
- Design resistance  $R_0=0.15$  MPa.

**STRATUM-2** – Bluish-gray and dark grey occasionally, soft clay with plant roots, occasionally with thin sand and peat lenses. Genetically this stratum is also alluvial soil (aQ). Stratum-2 has the largest distribution area at the project road line, both in width and in depth. It is revealed in all boreholes, moreover its layer is repeated in some boreholes. Stratum thickness in different places varies within wide range – from 2.1 m to 28.90 m. Stratum distribution area along the route and in depth is graphically shown on the longitudinal sections of the project structures (see graphical part of the report).

Based on the data from the tables:

- According to GOST Standard, STRATUM-2 is plastic clay.

- According to **BS** Standard, STRATUM-2 is soft, silty, slightly sandy clay.

Based on the results of the shear test (see Annex 2.8), average standard values of strength characteristics of STRATUM-2 are as follows:

In natural condition: cohesion  $c=29$  KPa; internal friction angle  $\varphi=7^0$ ;

In consolidated condition: cohesion  $c=36.1$  KPa; internal friction angle  $\varphi=19.1^0$

According to the standard values of physical properties characteristics, and as per SNIP 2.02.01-83, STRATUM-2 standard values of mechanical properties parameters are as follows:

- Deformation modulus  $E_0=5$  MPa;

- Elasticity modulus  $E_{el}=24$  MPa;

- Design resistance  $R_0=0.05$  MPa.

According to the testing results of 41 samples, average content of organic matter is 8.7%. According to the organic matters content, and as per the GOST and BS Standards STRATUM-2 is attributed to a layer with organic content. STRATUM-2 contains occasionally also fine-grained, thin sand and peat lenses.

**STRATUM-3** –Dark gray, fine-grained sand. Genetically, this stratum is also alluvial soil (aQ). At the beginning of the route it is distinguished in form of continuous layer in the middle part of lithological section, whereas afterward it is observed in form of individual lenses which are intercalated into the clayey soils mass (i.e. into Stratum-2). Stratum thickness at different places varies within wide range – from 0.5 m to 15.3m. Distribution range of the soil stratum along the route and in depth is graphically shown on the long sections of the project structures (See graphical part of the report).

- According to GOST Standard, STRATUM-3 is sand fine-grained, silty. The sand layers are located below the ground water level and, therefore, it is saturated.

- According to **BS** Standard, STRATUM-3 is saturated, loose to medium dense, silty, fine-grained SAND with organic content.

Based on the results of the shear test (see Annex 2.8), average standard values of strength characteristics of STRATUM-3 are as follows:

In natural condition: cohesion  $c=2$  KPa; internal friction angle  $\varphi=28^0$ ;

In consolidated condition: cohesion  $c=11.1$  KPa; internal friction angle  $\varphi=37.4^0$ .

According to the standard values of physical properties characteristics, and as per SNIP 2.02.01-83, STRATUM-3 standard values of mechanical properties parameters are as follows:

- Deformation modulus  $E_0=18$  MPa;
- Elasticity modulus  $E_{el}=80$  MPa;
- Design resistance  $R_0=0.1$  MPa.

According to the testing results of 7 samples, average content of organic matter is 3.6%. According to the GOST-25100-82, STRATUM-3 (sand) is attributed to layer with organic content ( $I_{om} \leq 0.03$ ), whereas according to BS Standard, it is loose to medium dense, silty, fine-grained sand with organic content.

**STRATUM-4** – Dark grey, medium-grained sand. Genetically it is also alluvial soil (aQ). It is observed only in the Borehole No. 2 at the first half on the route (i.e. in the north part in form of lens-like interlayer of Stratum-2 clayey soil. Medium-grained sands, i.e. Stratum-3a has been revealed mostly at the end part of the project section, within pk446 to pk510. Here it locates at shallow depth and below stiff clays, i.e. Stratum-1. The Stratum thickness varies from 2 m to 11 m. The stratum distribution range, both along the road alignment and in the depth, is graphically shown on the long section of the project structures (see Graphical Part of the report).

- According to GOST Standard, STRATUM-4 is medium-grained sand. The sand layers are located below the ground water level and is saturated.
- According to BS Standard, STRATUM-3a is saturated, loose to medium dense, silty, medium-grained sand.

Based on the results of the shear test (see Annex 2.8), average standard values of strength characteristics of STRATUM-3a are as follows:

In natural condition: cohesion  $c=1$  KPa; internal friction angle  $\varphi=32^0$ ;

In consolidated condition: cohesion  $c=10$  KPa; internal friction angle  $\varphi=38^0$ .

5 samples taken from this Stratum were tested on consolidation (odometer) compression test. The testing results are shown in the Annex 2.9.

According to the standard values of physical properties characteristics, and as per SNIP 2.02.01-83, STRATUM-4 standard values of mechanical properties parameters are as follows:

- Deformation modulus  $E_0=30$  MPa;
- Elasticity modulus  $E_{el}=110$  MPa;
- Design resistance  $R_0=0.15$  MPa.

According to the testing results of 11 samples, average content of organic matter in the Stratum-3a is 3.8%. According to the GOST-25100-82, STRATUM-4 (sand) is attributed to layer with organic content ( $I_{om} \leq 0.03$ ), whereas according to BS Standard, it is loose to medium dense, silty, fine-grained sand with organic



content.

**STRATUM-5** – Gravely soil with sand matrix. Genetically it is also alluvial soil (aQ). This layer is not widely spread and was observed only in the Borehole No. 3, at 1.4-2.4 m depth interval, at the old riverbed of the riv. Rioni. Stratum distribution range both, along the right of way and in depth is graphically shown on the long sections of the project structures (see Graphical Part of the report).

- According to GOST Standard, STRATUM-6 is gravely soil. The gravel has sand filler. The soil is moist, the natural moisture content is  $W=35.1\%$ .

- According to BS Standard, STRATUM-6 is moist, silty, sub-rounded and rounded gravel.

According to the particle-size distribution composition, and as per the SNIP 2.02.01-83, standard values of properties parameters of gravely soils are as follows:

Unit weight =  $\rho=1.85 \text{ gr/cm}^3$ ;

Cohesion  $c=4 \text{ KPa}$ ;

Internal friction angle  $\varphi=33^\circ$ ; Deformation modulus  $E_0=40 \text{ MPa}$ ; Elasticity modulus  $E_{el}=250 \text{ MPa}$ ; Design resistance  $R_0=0.4 \text{ MPa}$ .

The following classification of soils has been prepared based on the field and laboratory surveys results. The classification of soils is given as per the GOST and BS Standards. This classification is given below in form of table.

**Soils classification based on GOST 25100-82 Standard**

Group	Sub-group		Geological Index	Soil Stratum No.	Soil stratum description
Sedimentary Incoherent	Fragmental	Silty and clayey	aQ	1	Clay brown, plastic
			aQ	2	Clay bluish-gray and occasionally dark gray, plastic, with plant roots, occasionally with thin sand and peat lenses
		Sandy	aQ	3	Sand dark gray, fine-grained, loose to medium dense
				4	Sand dark gray, medium-grained, loose to medium dense
		Coarse	aQ	5	Gravely soil with sand filler, dark gray, medium dense

**Soils classification based on BS Standard**

Group	Sub-group	Geological Index	Soil Stratum No.	Soil stratum description
Fine soil	Alluvial	aQ	1	Slightly moist, brown, stiff, intermediately plastic clay with occasionally gravel inclusions

Group	Sub-group	Geological Index	Soil Stratum No.	Soil stratum description
		aQ	2	Very moist, bluish-gray and occasionally dark gray, soft, slightly sandy, silty clay with organic content, with plant roots, occasionally with thin fine-grained sand and peat lenses
Coarse soil		aQ	3	Saturated, dark gray, loose to medium dense, silty, fine-grained sand with organic content
		aQ	4	Saturated, dark gray, loose to medium dense, silty, medium-grained sand with organic content
Coarse soil		aQ	5	Moist, dark gray, medium dense, sandy, silty gravel; gravel is sub-rounded and rounded

#### 4.2.6 Hydrology

The reviewed section of Samtredia-Grigoleti design motorway (km 42,000 – km 51,570) does not cross any small or large rivers. It does not lie in the vicinity of lake or artificial ponds. The amelioration canal network covering the area has an impact on the project.

The chapter below provides the description of a hydrographic network and surface water bodies in the area. This description is sufficient to analyze the potential project impact on these features as well as their potential impact on the design road. The hydrological parameters to be taken into account in the engineering estimates (e.g. bridges, drainage schemes) are presented in Annex 2 (Volume II, Annex 2, Par. 2.3).

The project implementation requires acquisition of 248 private land plots (360506m<sup>2</sup>) and 34 state land plots (310114m<sup>2</sup>). The affected community will be paid the appropriate compensation for the loss of land, assets, trees, annual crops. The Resettlement Action Plan provides a detailed review of the aforementioned issues.

The study section of project alignment (km 42-km51) located in the south zone of Western part of Kolheti Lowland (former left branch of the river Rioni, nowadays-the river Pichori and floodplain) is distinguished by extremely difficult terrain, causing the flooding of big territories while elevation of water levels in river Rioni.

At present, following the bank protection and reclamation works done in last century, from the confluence of the river Khevistskhali till the end, the Rioni riverbed is diked up to width 0.5-1.5 km, the left floodplain of the river is covered with frequent network of soil reclamation canals. It is demonstrated by the Pichori riverbed situated into the main canals, which joins the Paliastomi Lake.

The project alignment crosses the start point of the south part of soil-reclamation canals system, which is fed by small rivers (area 0.3-1.4 km<sup>2</sup>) running-off from the north slopes of the river Supsa watershed (including the runoff from the hill located along the left bank). Streams after passing directly and through the hydrological structures of the road

are distributed into the left side tributaries of the river Pechora and complex system of soil-reclamation canals. Afterwards these streams through the rivers Uskubani-Kukani-Pichori on the one hand and on the other hand by the floodplains of the Dedabera canal – Kaparchina are accumulated into the Paliastomi lake. Following the specific study it was stated that maximum level of Paliastomi lake (relevant to 1% supply discharge) exceeds the Black Sea level (-0-40) by 1.9 m. At present the absolute level of Black Sea is adopted as equal to 0.00. So, the absolute level of flooding up from the side of Paliastomi lake is 1.9m.

Flow regime of rivers having the small basin is characterized by frequent, short and heavy inundations during the whole year, with rapid elevation of water levels. The frequency of inundation reaches its maximum in autumn. In summer and winter periods the intervals between inundations are not stable, however, sometimes it reaches 2 months (elevation of water level is always expected). Freezing events are not observed in the downstream of rivers.

The water quality of the rivers and gullies crossing Samtredia-Lanchkhuti section of Samtredia-Grigoleti modernization road near the crossing points is not specified. It should be noted that water intake of the small rivers and gullies crossing the modernization road is the river Pichori flowing across the territory of Kolkheti Park and channel at the bottom of the mountain known as “Didi Arhi” (Great channel). This channel is joined by the rectified beds of the rivers and gullies flowing down Guria ridge, and the water from their beds through the Great channel is discharged into the river Kaparcha and then, into Paliastomi lake and river Maltakva flowing into the Black Sea. The river Pichori flowing into one of the most important surface water objects of Kolkheti National Park, Paliastomi lake, is also the water intake for the rectified beds of the small rivers and brooks flowing from the eastern part of Guria ridge.

The Great channel, like the river Pichori, crosses the territory of Kolkheti Park. Therefore, arranging temporal beams in the beds of small rivers and gullies during the construction seems a necessary measure to prevent the pollution of the mentioned water courses and Kolkheti National Park accordingly. The beams shall retain the construction and domestic remains accidentally fallen into the beds of the rivers and gullies and shall protect the surface water on Kolkheti National Park against pollution.

#### **4.2.7 Soils**

Meadow boggy, subtropical podzol and podzol-gley, alluvial. It is characterized with clayey and heavy clayey composition, compaction of alluvial horizon (at some areas – with Ortstein layer). Average humidity of soil – 35%

### 4.3 Land Use

#### Land Use

The dominant land use in the area is cattle grazing land either on open ground in common use or in fields usually in association with maize. The soil is sparse and is mixed with various amounts of river gravel stones. In some places land has low bushes and is overgrown. Poplar trees are grown in rows as wind breaks some times in banks of up to 4 rows. There are occasionally some fruit trees at some sections of road were some mulberry trees will be affected by the corridor.

The Resettlement Action Plan is being currently developed and details of resettlement related impacts will be clarified soon. At this stage it could be summarized that about 282 land plots (670620 sq.m in total) are affected of which 31 (306685 sq.m) are state owned non-used land plots, 9 state owned land plots (10355sq.m) are illegally used by private persons and the rest 242 plots are in private ownership (353 580 sq.m. in total).

Total amount of affected households is close to 238. No one households lose their residential houses and are subject for physical relocation.

No businesses are permanently or temporarily affected.

Most of the affected households have agricultural lands and cultivate crops (mainly maize and beans) and fruit trees. Many of them lose crops and fruit trees due to land acquisition.

Detailed description of land use patterns is given in the Resettlement Action Plan.

### 4.4. Landscape and flora

#### 4.4.1. Landscape

The design route of Samtredia-Grigoleti motorway (Lot 4 km 42- km 51.750) starts south-west of Lanchkhuti Town near Khajalia Village and ends near Grigoleti Village. The design motorway mostly crosses agricultural lands.

The design motorway (km 42 – km 51 from Khajalia Village to Grigoleti Village) will cross one type of landscape (2:5 at the landscape map): **Lowland landscapes with oak forest, somewhere with evergreen understory**. The area comprises the remnants of riparian alder forests and settlements at 3-12m above sea level.

Floods, excessive moisture, heavy soils, chemical pollution of soils, land cultivation, railway, motorways, industrial enterprises, settlements, high density of the population.

The tail section of the motorway (about 750m) crosses a different type of landscape (24:3 at the landscape map) – Lowland landscapes with sphagnum and reed swamps.

Orographic units. Kolkheti Plain, relief. Accumulative; is subject to subsidence. Migration regime. Elluvial-accumulative. Geology. Quaternary, Neogene, rarely Paleogenic Continental and marine sediments (clays, sandstones). Types of impacts of

farming; mostly agricultural (cattle-breeding, maize growing, partly tree growing, subtropical fruit growing, vine growing); major threats to landscape; Floods, excess humidity, heavy ground; ground polluted with chemicals, land cultivation, railways and roads, industrial enterprises, settled areas, population density.

The last 750m of the design road passes through the different landscape (24:3): this is plain lowland with sphangum swamps.



#### 4.4.2 Flora

##### Plants Disposed in the Design Road Area

General Geobotanical characteristics of immediate designed territory given in annex 2 (p. 2.4.2.). Below we show description of plants existence in project impact region.

##### Detailed Description of the Project Corridor Flora and Vegetation

A detailed botanical survey of Samtredia-Grigoleti motorway corridor (km 0- km 51.750) and the existing Grigoleti-Choloki section was conducted in December 2012. The survey identified the potential negative and residual impact of the motorway construction and operation. The project affects the flora and vegetation in both the construction corridor and its adjacent areas. The survey identified the plant communities and varieties of conservation (endemic, rare) and commercial value in the project affected area. Plots No1-14 are covered by the first three lots (km 0 – km 42). The Lot under review (Lot 4 km 42 – km 51.750) comprises plots No15 and 16. These plots are different from others crossed by the motorway as they are not used for crop production. The other plots crossed by the design motorway section are heavily transformed, agricultural lands (used mainly for maize production).

Section No 15. GPS coordinates are N42<sup>0</sup>04'44.4"/E 041<sup>0</sup>53'55.1", 8 m above sea level. The coordinates were taken at the distance of 100m from the design corridor. There is alder (*Alnus barbata*) forest covering a 300m strip in this section. 50m wide strip of the forest is to be cut down. The width of alder trees is 20-80cm and the height is 6-14m. Some alder forests in this section have blackberry underbrush and some don't. The habitat has a medium conservation value.



Section No 15. Alder (*Alnus barbata*) forest.

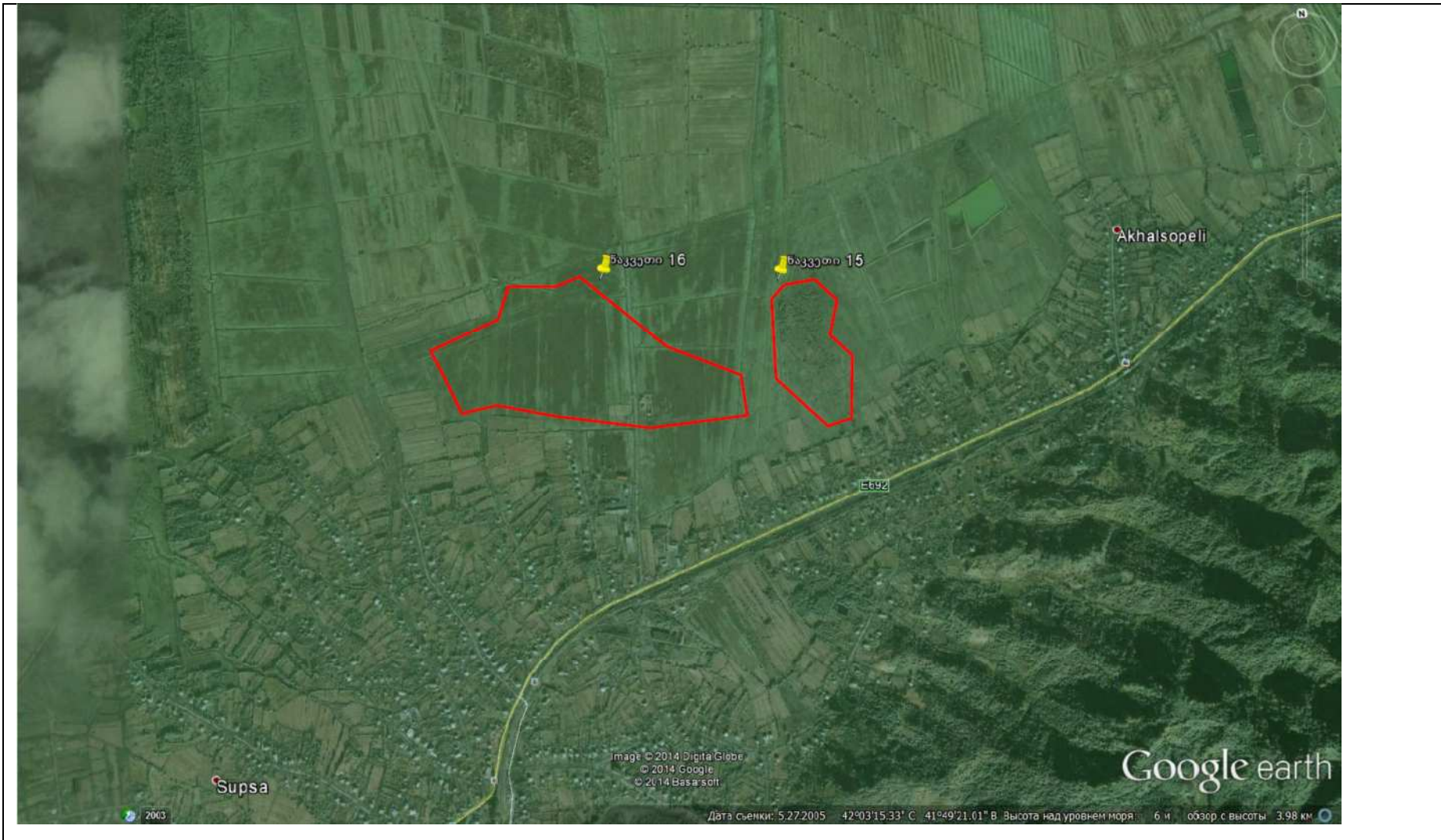


Section No 15. Alder (*Alnus barbata*) forest with blackberry underbrush

Section No 16. GPS coordinates are N N42<sup>0</sup>03'29.7"/E 041<sup>0</sup>49'11.1", 7 m above sea level. The section is covered with soft rush (*Juncus effusus*). The height of the coenosis is 1 m, the coverage is 80-90<sup>0</sup>. The habitat has a low conservation value.



Section No 16. Soft rush (*Juncus effusus*)



**Fig 4.5 Design road and the observation sites (site №15 and 16)**

## Protected territories and sensitive areas

In 1999, the Kolkheti National Park was established as a part of Georgia's Integrated Coastal Management Programme. The Kolkheti State Nature Reserve (500 ha), established in 1947, was included into the National Park. Very roughly – the National Park is spreading north-south between the mouths of the rivers Tikori and Supsa, and west-east from seacoast to the end of mires in the Pichori river basin. The main part of the Ramsar Site was included in Kolkheti National Park, but borders of the National Park and the Ramsar Site are not coincident in many places. The total area of the KNP is 45447ha and the terrestrial part is of 29704ha.

The National park consist of three parts: most northern Churia wetland (between rivers Churia and Khobistskali), Nabada wetland (between rivers Khobistskali and Rioni), and Pichori-Paliastomi wetland (south from the river Rioni, including lakes Paliastomi and Imnati, and surrounding mires up to limits of swamped forest at the road Samtredia-Batumi). This area represents rich with relics and endemic species of tertiary period - humid Colchic region. Seacoast and shallow marine area is not less important for biodiversity conservation than inland freshwater wetlands. 15,742 ha of marine water is included in the national park, due to it significance for fish and waterbirds, especially as feeding ground of all species of sturgeons occurring in the Black and Azov Seas. The area of the Kolkheti National Park forms about 21% of total area of all National parks of Georgia and 10% of entire area of protected areas of categories I-IV. However, this is only protected area in the World which dedicated to conservation of unique landscape of Kolkheti Lowland – Colchic swamped polydominant forest and alder forests, and peat bogs at the sea shore. This landscape covers about 15,000 ha within border of National Park. Nearly 10,000 ha are covered by hydromorphic lowland landscapes of deltas and floodplains with wetlands, swamped grasslands and salt marshes. The Colchic polydominant forest remained only within borders of the National Park, and even in the Park, it experienced hard anthropogenic pressure. Illegal logging for fuel wood is still one of major threat for biodiversity in this area.

The area is of importance as place of aggregation of birds during migration. The wetland habitats provide stopover site for dozen wader and waterfowl species and serves as a feeding ground for many raptor birds. The reserve is in indeed an important site for wintering birds. This area supports complex of animals of peat moss lowland wetlands extremely vulnerable to any contamination and pollution. Sensitive populations of two species of newts occur in the area: smooth newt (*Triturus vulgaris*) and banded newt (*Triturus vittatus*). In this area exists the most western population of the Marsh turtle - *Emys orbicularis*;

The wetland ecosystems of the Kolkheti National Park are attractive and interesting for visitors of various categories. Tourists' infrastructure of the protected area is quite developed. There is favorable situation for bird watching and hiking in the Nature Reserve.



## **Occurrence of the Endangered Plant Varieties Included in the Red List of Georgia in the Design Corridor**

It is worthy of note that the Red List of Georgia including 56 species is incomplete. The List is being amended, namely grasses are being grouped by IUCN (International Union for Conservation of Nature) categories by defining their condition and conservation status. The extrapolation of these data will significantly increase the number of protected species in the Red List of Georgia.

At this stage the field botanical surveys did not identify any plant varieties included in the Red List of Georgia in the design corridor. During the botanical survey, which has to be conducted prior to the construction, no plant varieties protected under the Red List of Georgia are likely to be found in the design corridor.

### **4.5 Fauna**

Zoogeographic characteristic of design section and adjacent territory and list of here spreaded species given in annex 2 (p. 2.5). Below is given immediate project road section's faunistic characteristic. Road mainly lays on very transformed, agricultural and village landscapes, which have Low ecologic sensitive. Fauna submitted here neither by species diversity and by the numbers do not represent an important ecological receptors getting impact. It is expected the death of the individual animal, but are not in danger animal populations and, especially, ab protected endangered species of animal populations.

#### **Design territory (km 42,0 – km 51,570 section) characteristic**

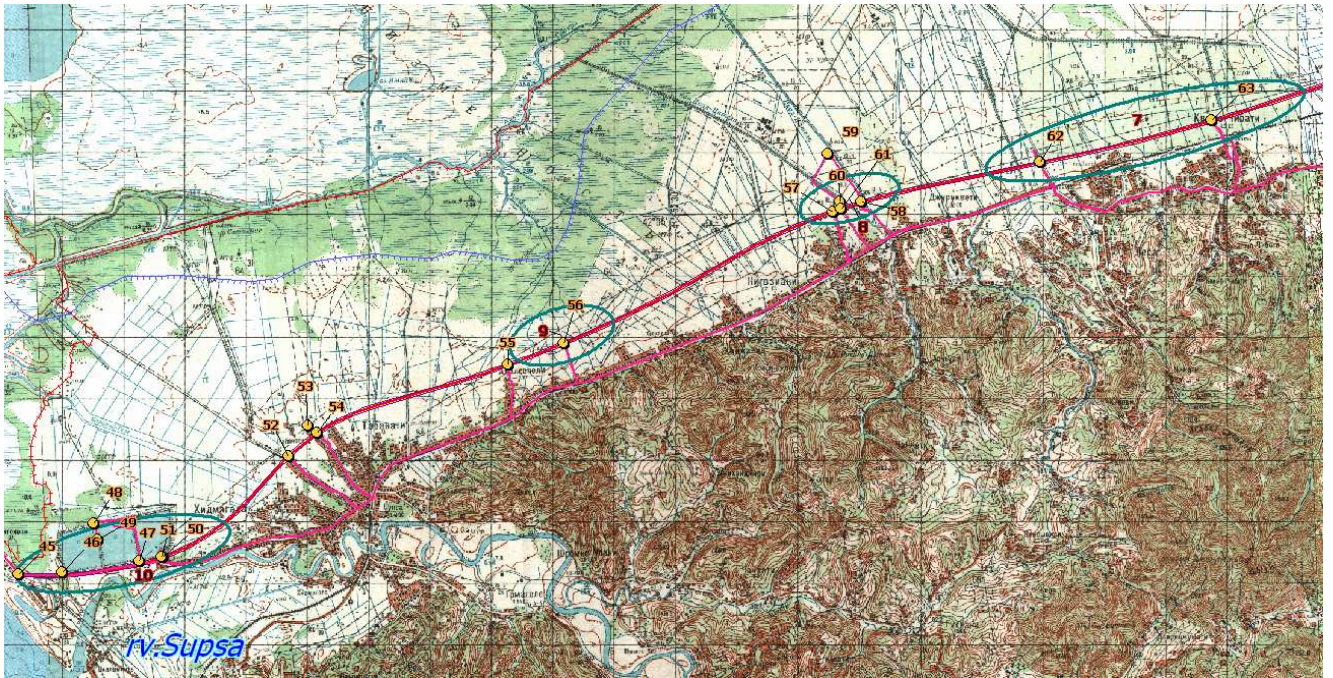
Images derived from maps and satellite as a result of cameral work, along Samtredia-Grigoleti highway construction corridor was pre-selected 10 research locations for the detailed field work, of which 2 (District # 9 and # 10) falls within this proposed design section (km 42,0 – km 51,570). Places were considered as a potentially important for maintaining biodiversity. Survey of these places was done by Zoologists and below is a brief list of research areas and their placement on the map:

Preselected site No 9 – Uskubani River crossing at the village Akhalsopeli; observation points No 55 da 56; Pasture and maize fields. On the topographic map – swamped forest, in reality, on place dried wetland and maize field.

Preselected site No 10. – Khidmagala fishponds and surrounding wetland at Grigoleti. : observation points No 45 – 51.

Site for additionally studies (not preselected) - RoW at the villages Khidmagala and Tabanati. Homestead on the RoW. Degraded alder forest; Pasture and maize fields:

observation points No 52 – 54.



**Fig. Observation sites: Preselected sites No 9 and 10 and additional site**

Site name and brief description: Preselected site #9 – Uskubani River crossing at the village Akhalsopeli; Pasture and maize fields. On the topographic map – swamped forest, in reality, on place dried wetland and maize field.

Observation points:

##	Latitude	Longitude	Elev.	Time	
55	42.062076°	41.840915°	3	15:0	v.Akhalsopeli vicinities
	N	E	0		
56	42.064994°	41.852199°	0	15:2	Bog on the map at the v. Akhalsopeli
	N	E	9		

Animals: 2 Buzzards;

Site name and brief description: Not a preselected site – RoW at the villages Khidmagala and Tabanati. Homestead on the RoW. Degraded alder forest; Pasture and maize fields.

Observation points:

##	Latitude	Longitude	Elev.	Time	
52	42.049748°	41.797070°	10	14:0	Tabanati village west
	N	E	0		
53	42.054111°	41.801103°	4	14:2	Baku-Supsa pipeline corridor at Tibanati
	N	E	5		
54	42.052986°	41.802875°	4	14:3	Homestead crossing at the northern point of v. Tibanati
	N	E	4		

Animals: Two Lesser Spotted Eagle (*Aquila pomarina*); Crows, small passerine not identified on species level; European Robin (*Erithacus rubecula*);

Site name and brief description: Preselected site #10 – Khidmagala fishponds and surrounding wetland at Grigoleti.

Observation points:

##	Latitude	Longitude	Elev.	Time	
45	42.03382 N	41.74325 E	2	10:41	Endpoint of the proposed Highway at Grigoleti
46	42.03343 N	41.75232 E	1	10:54	Westernmost edge of the Khidmagala fishponds
47	42.03539 N	41.76714 E	0	11:04	Entrance to fish farm
48	42.04088 N	41.75823 E	5	11:35	Fishpond from northern bank of the ponds
49	42.038353° N	41.759097° E	1	11:55	Dam between two fishponds  Bird eaten by Harrier
50	42.035577° N	41.771697° E	2	13:30	Westernmost point of v. Khidmagala

Animals: Gray heron - 5, Black kite – 3-4, Harriers: *Circus cyaneus* male – 1, female – 1, *C. aeruginosus* male -1, female – 8-9; Golden Eagle (*Aquila chrysaetos*) sub-adult 2 years – 1; Lesser Spotted Eagle (*Aquila pomarina*) – 4-5; Duck -1; flocks and solitary Passerine birds: European Robin (*Erithacus rubecula*); White wagtail, Mountain Sparrow, Chaffinch, Blackbird, Ortolan bunting (*Emberiza hortulana*), Starlings. Marsh frogs (*Rana ridibunda*) in plenty; no evidence of presence of Common Otter (*Lutra lutra*) and of Marsh Turtle (*Emys orbicularis*) was found.

### "Hot spots" – areas requiring special attention

There are areas, more or less sensitive to the Samtredia-Grigoleti Highway impact, along the Construction Corridor as well, as a sensitive species or groups of species, spread in the project area. Basing on the analysis of information presented in this report, and other issues, we can define several sensitive sites and faunistic complexes, which can be damaged during highway construction.

By faunistic standpoint following places are sensitive to Samtredia-Grigoleti highway impacts, provoked by construction influence.

Kolkheti State Nature Reserve (with the total area of 45447 ha and land area of 29704 ha in 2010) was established in 1947 and is a part of Kolkheti National Park.

- 1 **Kolkheti National Park** – the closest distance from the design motorway to the protected area border is 2km). Theoretically the Project may have a distant impact through irrigation canals (spread of pollution in case of toxic substance spill). The risk of such impact is small. The disturbance level of birds and animals is low.
- 2 **Canal crossings** – the main impact receptors are avifauna and to a lesser extent ichthyofauna and amphibians living in the canals (actually the existence of ichthyofauna in half dried canals has no significance).
- 3 **The Khidmagala fish ponds.** The Khidmagala fish ponds – at the section of the Highway situated between Grigoleti and Khidmagala villages sensitive from the ornithological point of view. The area holds during seasonal passages and in winter numerous flocks of various bird species, mostly waterfowl, waders and birds-of-prey, including rare and endangered species, protected at national and international levels by law.

## 5. SOCIAL IMPACT ANALYSIS

### 5.1. Demographic indicators

#### Population

The design road runs across the territories of the city of Samtredia and village Tolebi of Samtredia municipality in Imereti region, village 1 May of Abasha municipality in Samegrelo-Zemo Svaneti region and its major part runs across the territories of villages Nigoiti, Shukhuti, city of Lanchkhuti, villages Gvimbauri, Chibati, Lesa, Jurukveti, Nigvziani, Ninoshvili and Supsa of Lanchkhuti and Ozurgeti municipalities in Guria region.

**Guria** is located in west Georgia, in Kolkheti valley and in its adjacent mountainous zone. It is bordered by a 22-km-long Black Sea line. The area of the region is 2036.1 sq.km. By the data of 2012, the population of Guria was 140.3 thousand people.

The number of settled areas is 193, including 2 cities (Lanchkhuti and Ozurgeti), 5 settlements and 186 villages. The region is divided into 3 municipalities.

**Lanchkhuti municipality** with the area of 533.1 km<sup>2</sup> and with the population of 37.800 people. The rivers Supsa, Pichori, Lesistskali and others flow across the territory of Lanchkhuti municipality.

**Ozurgeti municipality** with the area of 675 km<sup>2</sup> and with the population of 84.126 people. The rivers Natanebi, Supsa, Bzhuzhi, Choloki, Bakhvistskali and others flow across the territory of Ozurgeti municipality.

**Samtredia municipality** with the area of 346.1 km<sup>2</sup> and with the population of 60.8 thousand people. The ethnic content is as follows: Georgians 99.2%, Russians 0.5%, Abkhazians 0.1%, Armenians 0.1% and Gipsy 0.1%.

**Abasha municipality** with the area of 322.5 km<sup>2</sup> and with the population of 28.500 people. The ethnic content is as follows: 99.2% Georgians, 0.4% Russians, 0.1% Abkhazians, 0.1% Moldavians and 0.1% Ukrainians.

#### Number of population of Georgia in different regions by January 1, 2010-2012

(thousand people)

Region	2010	2011	2012	Percentage growth after 2011
Georgia	4 436.4	4 469.2	4 497.6	0.6
Guria	139.8	140.3	140.3	0.0
Imereti	700.4	704.5	707.5	0.4
Samegrelo-Zemo Svaneti	474.1	477.1	479.5	0.5

Source: Georgian National Statistics Department

**Number of population in different municipalities  
(at the beginning of the year, thousand people)**

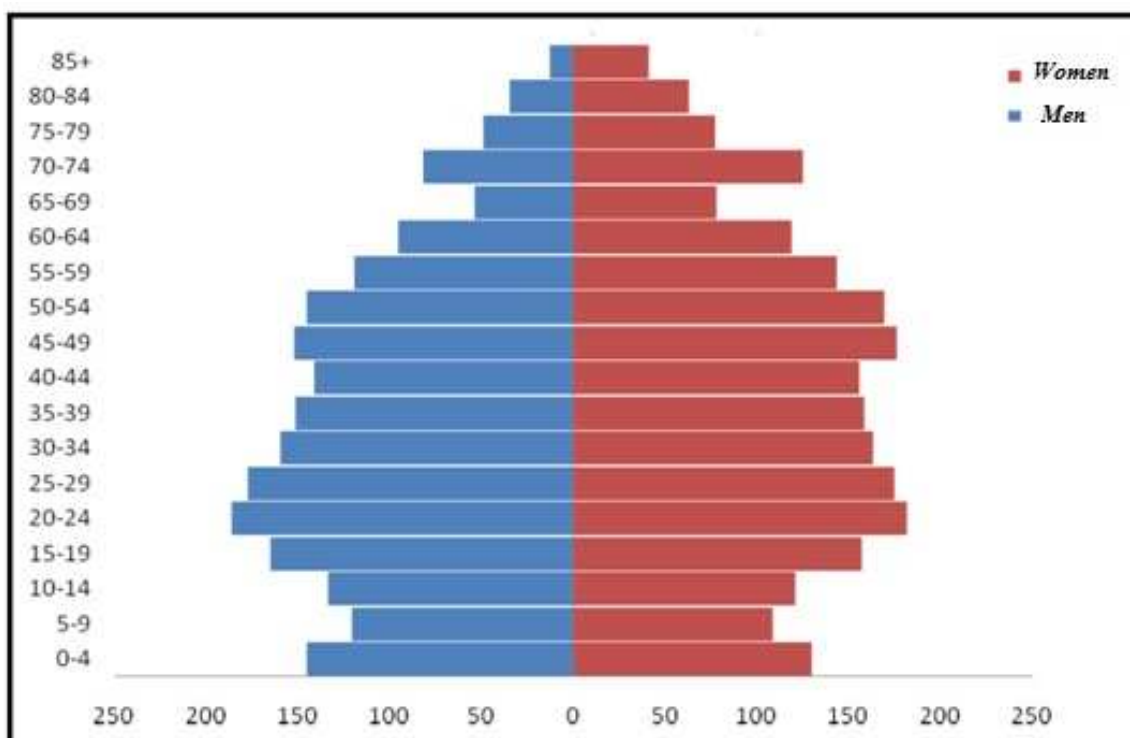
2007	2008	2009	2010	2011	2012	Territory
38.8	38.7	38.7	38.9	38.9	39.0	Lanchkhuti, Municipality
77.4	77.3	77.2	77.9	78.4	78.5	Ozurgeti, Municipality
60.2	59.9	59.8	60.3	60.7	60.8	Samtredia, Municipality
28.1	27.9	27.8	27.8	27.8	27.7	Abasha, Municipality

**Major demographic data in 2010**

Region	Birth	Death	Natural growth	Marriage	Divorce
<b>Georgia</b>	62,585	47,864	14,721	34,675	4,726
Guria	1,971	1,767	204	1,097	86
Imereti	10,041	8,726	1,315	5,362	580
Samegrelo-Zemo Svaneti	5,969	5,325	644	3,507	324

**Source: Georgian National Statistics Department**

According to sex and age, the population is evenly distributed across the regions of Georgia. The figure below shows the pyramid showing the distribution of the population according to sex and age in Georgia by January 1, 2011.



**Figure. Sex and age pyramid of the population by January 1, 2011**

**Distribution of permanent population according to nationalities in different administrative-territorial regions and municipalities (people)**

Region, Municipality	Total population	Georgians	Abkhazians	Ossetians	Armenians	Russians	Azeri	Greeks	Ukrainians	Kists	Jezijs
<b>Samtredia municipality</b>	60456	58883	33	33	615	635	24	22	80	-	-
<b>Abasha municipality</b>	28707	28474	32	14	11	124	10	-	15	-	-
<b>Guria</b>	143357	138942	78	152	2134	1558	91	49	194	2	23
<b>Lanchkhuti municipality</b>	40507	39868	7	33	160	345	33	18	28	-	-
<b>Ozurgeti municipality</b>	78760	75142	59	103	1944	1133	55	29	159	2	23
<b>Chokhatauri municipality</b>	24090	23932	12	16	30	80	3	2	7	-	-

Source: Georgian National Statistics Department

The religious indicators in the country were first identified during the general census of 2002 by the Georgian National Statistics Department:

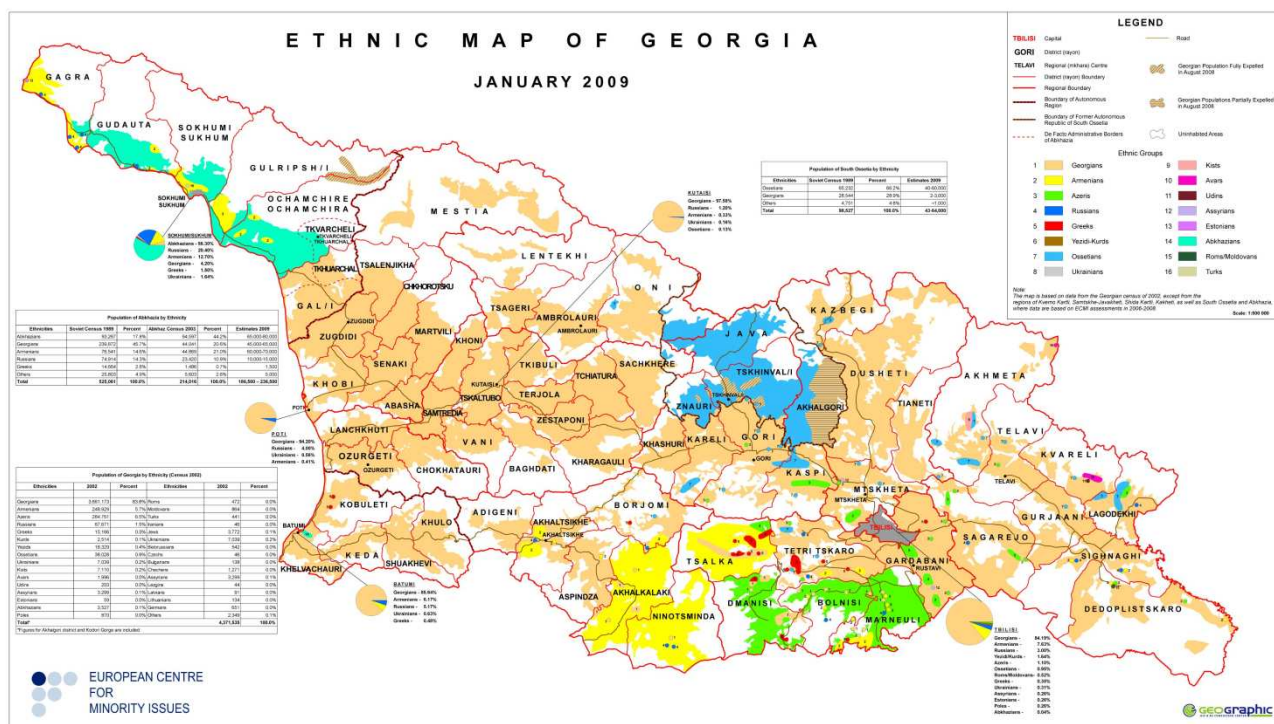
Orthodox Christians 83.9% (3,666.233); Moslems 9.9% (433.784); Armenian Gregorian 2.9% (171,139); Catholics 0.8% (34.727); Judaists 0.1% (3541); Other 0.8% (33,648); Atheists 0.6% (28,631).

Orthodox Christianity is the principal religion in Georgia and most Georgians are its followers. Orthodox Christianity has been playing a significant role in the historic development of the country. Christianity was declared a state religion of Georgia in the IV c. A.D.

**Distribution of the permanent population according to religions in different large administrative-territorial regions (according to the population census of 2002)**

Region, Municipality	Total population	Orthodox Christians	Catholics	Armenian Gregorian	Judaists	Moslems	Other religions
<b>Guria region</b>	143357	127217	724	341	13	13736	1326
<b>Imereti region</b>	699666	693462	478	591	365	1549	3221
<b>Samegrelo and Zemo Svaneti region</b>	466100	462435	64	190	51	1015	2345

The map shows the areas densely populated with the ethnic minorities of Georgia. In addition to the territories beyond the control of the government of Georgia (Abkhazia and South Ossetia), as the map shows, the regions densely populated by the ethnic minorities are Samtskhe-Javakheti and Kvemo Kartli. On average, the Georgians constitute 83.75% of the total population of the country (as per the data of census of 2002).



**Ethnic map of Georgia**

### Socially vulnerable groups, refugees

The socially vulnerable groups include the families of the following categories:

- Single pensioners
- People with limited abilities<sup>2</sup>
- Families left without bread-winners<sup>3</sup>
- Single mothers
- Families below the poverty line<sup>4</sup>.

Municipality	One-member families of single, unemployed pensioners
Lanchkhuti	89
Ozurgeti	224
Samtredia	108
Abasha	108

<sup>2</sup> A citizen of Georgia with the official status of the I- or II-degree limited ability (except the disabled from birth or war and military veterans with the III group of limited ability status).

<sup>3</sup> Any citizen of Georgia under the age of 18 with his/her bread-winner deceased.

<sup>4</sup> Socially vulnerable families registered in the single database with their rating not exceeding 57.000.



Number of People with limited abilities						
Municipality	Number in registered families		The ones receiving living allowance		Percentage of the ones receiving living allowance and those registered	
	Family with a member with limited ability	Person with limited ability	Family with a member with limited ability	Person with limited ability	Family with a member with limited ability	Person with limited ability
Lanchkhuti	1930	2268	794	963	41,1	42,5
Ozurgeti	2075	2308	699	803	33,7	34,8
Samtredia	1084	1183	466	522	43,0	44,1
Abasha	1066	1207	435	518	40,8	42,9

Municipality	The ones receiving living allowance	
	Family	Population
Lanchkhuti	1 972	6 304
Ozurgeti	2 416	7 572
Samtredia	1 914	5 915
Abasha	1 398	4 410

Source: Social Service Agency (data of 2012)

### Number of displaced people and refugees (by October, 2012)

Municipality	Displaced people living in compact settlements	Displaced people living in private sector	Refugees living in compact settlements	Refugees living in private sector	Total
Lanchkhuti	-	167	-	-	167
Ozurgeti	9	214	-	-	223
Samtredia	570	1372	-	-	1942
Abasha	353	1991	-	-	2344

Source: Social Service Agency

### Lanchkhuti municipality

Lanchkhuti municipality is located in west Georgia, north-west of Guria mountains. From west, it is bordered by an 18-km-long Black Sea coastline (resort area). Kolkheti National Park designed to protect flora and fauna and preserve the wild nature in Kolkheti Valley occupies 15.000 ha of the municipality. The villages in the mountainous zone are located at 400-500 m above sea level. The villages in the lowland mostly border Kolkheti National Park. The most part of the municipality is a subtropical zone. City of Lanchkhuti is distanced by 300 km from Tbilisi, by 85 km from Batumi and by 42

km from Poti. There are two lakes and 5 rivers with the total length of 75 km in the municipality.

Lanchkhuti municipality is located between the Black Sea, river Pichori and Guria ridge. It occupies Odishi-Guria lowland and adjacent hillocks. From west, it is bordered by an 18-km-long Black Sea coastline (resort area). The area of Lanchkhuti municipality is 533 sq.km, including 270 sq.km of agricultural plots of field and 15.000 ha of Kolkheta National Park. There are Imnati, Japana and other lakes, five rivers, including the Supsa, Pichori, Lesistskali, Shuti and others in Lanchkhuti municipality.

Lanchkhuti municipality is rich in minerals. There are several peat quarries in the region, with Imnati quarry being the largest one. It is located east of Palistomi lake and its reserve exceeds 300 million m<sup>3</sup>. Peat quarries are also found in Maltakva, Grigoleti and Supsa. The oilers are made in Supsa and Okvane. The Sea coastline (Tskaltsminda, Grigoleti, Maltakva) contains magnetite. There is merkel limestone quarry in Shukhuti and Junjuati, and loamy ground is found in villages Atsana, Zemo Aketi and Kvemo Aketi. Sulphur water flows in Guliani and Jurukveti and hydrocarbon sodium water flows in Baghlebi. Lanchkhuti municipality is also famous for many fossils, including limestone quarries, brick clay and peat quarries; there is phillipsite-containing rocks quarry in Shukhuti, and sand and gravel quarry in Supsa. Baku-Supsa oil pipeline and Supsa terminal play an important role in the economics of the municipality. Citrus-growing, cattle-breeding and nut-growing are leading agricultural branches. Tourism is developed along the marine coastline (Tskaltsminda, Grigoleti, Maltakva) of the municipality.

A 40-km-long Samtredia-Makhinjauri railway section and sections of international designation, such as 65-km-long Samtredia-Grigoleti road (S-12) and Sarpi-Senaki (S-2), as well as road of local designation (Japana-Abasha (47 km) and Lanchkhuti-Nasakirali (45 km)) run across the municipality.

By census of 2002, the population of the municipality was 40.5 thousand people. According to the birth and death rates, by January 1, 2009, the population amounted to 37.8 thousand people. The population density was 76 men/km<sup>2</sup>. According to the ethnic composition, the Georgians constitute 98,9% of the total population and the Russians are 0.7%. According to the religious background, most of the population is Orthodox Christians. There are also Moslems (Ajarians), and Starovers live in Tskaltsminda.

There are 55 settled areas in the municipality, including 1 city and 54 villages. There are 41 educational establishments with 5.332 pupils and students and 788 teachers and lecturers in the municipality. There is also one vocational training institute, 32 libraries and 2 theatres.

The total land fund of the municipality, by January 1, 2006, was 49.860,9 ha, with 76% of it still owned by the state.

### Distribution of the land fund by January 1, 2006 (ha)

Description of a land use	Area			Total within the administrative borders
	Privately owned lands	State lands	Total	
Total area	11955	37905.9	49860.9	49860.9
Agricultural among them	11955	10676.2	22631.2	22631.2
Arable among them	7702	4729	12631.2	12631.2
Perennial plants	4214	1641	5855	5855
Fruit orchards	1236	53	1289	1289
Vineyards	92		92	92
Tea	1144	844	1988	1988
Citrus	756	236	992	992
Mulberry	63	55	118	118
Laurel	13	28	41	41
Tung	31	303	334	334
Nuts	36		36	36
Others	843	122	965	965
Fallow land		298	298	298
Heyfields	30	394	424	424
Pastures	9	3614	3623	3623
Forests		18241	18241	18241
Bushes		1897	1897	1897
Waters		2044.19	2044.19	2044.19
Marshes		1218	1218	1218
Areas occupied with roads		224.61	22461	22461
Areas occupied with premises		2172	2172	2172
Other, not used		143291	143291	143291

**Source: Economic development plan for the municipality developed by the workgroup of Lanchkhuti municipality**

Despite the fact that most of the land fund is owned by the state, it should be noted that 53% of agricultural plots of field, as well as 60,9% of arable lands, 71.9% of perennial plants, including 96% of orchards, 100% of vineyards and 57,5% of tea plantations have been rendered to private owners.

## 5.2 Anticipated Social Impact of the project

## **Overall Social Impacts of the Project**

The proposed project will have short-term and long-term impact on the local communities. The social impact of the road rehabilitation project should be viewed under the broader context of improving transport safety and traffic patterns in major cities (including Samtredia and Lanchkhuti), developing transit transportation potential of Georgia, developing Imereti as major administrative, economic and tourism area. Impact will be tangible not only for the country as a whole, but also for the communities residing along the road, residents of Samtredia and Lanchkhuti and surrounding villages.

Currently the residents of the villages are mainly self-employers working on their agricultural land parcels. Only small part of agricultural products is produced for sale: most part of the harvested products is intended for internal consumption by the households. Low demand on agricultural products at site makes agriculture less profitable.

In general the project will have positive impact on socio-economic development of the region: firstly, it will support business and tourism development and, as a result several opportunities arise:

- creation of new jobs in business and tourism services sector
- increased demand on agricultural products in the region will make agriculture profitable
- commercial sector and small businesses (shops, café and small restaurants, entertainment) will be also supported by increased tourist flow

The road construction will have also more direct social impacts:

- improved transportation system will facilitate agriculture not only through the development of tourism-dependent local markets, but also through making easier and cheaper access to the distant markets

The improved roads will ensure better integration of local population in the entire socio-economic system of the country and ensure better access to the markets, supplies and services. This comprises better opportunities for timely provided medical services.

## **Construction Related Social Impacts**

In short term perspective, the project will have some benefit for local population, providing job opportunities (about 100 new jobs could be available for local residents).

Resettlement impacts are described in p. 5.4.

**Impact:** The negative impact related to the construction nuisance (dust, emissions, noise) is temporary, insignificant and manageable by application good construction practices.

**Mitigation measure:** Dust control by application of watering. Use as minimum as 2 browsers; Noise control, installation of mufflers on equipment, daytime works;

**Impact:** Creation of vectors of disease e.g. temporary breeding habitats for mosquito as stagnant pools of water, stagnant water bodies in borrow pits, quarries, etc. suited to mosquito breeding and other disease vectors.

**Mitigation measure:** pools should be drained down. Remove all created pools till spring-time. Reinstate relief and landscape.

**Impact:** Recontamination by infectious biological materials (e.g. Anthrax) during earth works near the pest holes (i.e. not registered Anthrax sites).

**Mitigation measure:** Permanent monitoring during land clearance and excavation activities. Stoppage and suspension of construction activities in case of burial site findings. Notification to the local division of Veterinary Department. Veterinary clearance before start up.

**Impact:** Hazardous driving conditions where construction interferes with pre-existing roads. **Mitigation measure:** Provide in design for proper markers and safety signs on roads, including lights. Instruct the drivers

**Impact:** Infrastructure. The main infrastructure elements that could be affected are the power transmission lines, water supply systems and irrigation pipes and channels.

**Mitigation measure:** Replace the affected infrastructure elements. Permanent monitoring during construction. Full reinstatement in case of damage.

**Impact:** Potential conflicts with local population due to impacts on water supply or power resources, other infrastructure, access to land or facilities, disturbance caused by noise, conflicts with workers etc.

**Mitigation measure:** Construction contractor should assign liaison officer and develop liaison plan. All conflict matters should be resolved through negotiation and sound compromise.

### 5.3. Socio-cultural environment.

**The List of Archaeological Sites in the Construction Corridor of Samtredia-Grigoleti Highway according to the Literary Sources**

In the villages along Samtredia-Grigoleti Highway and in the adjacent areas all types of archaeological monuments typical of Kolkheti culture were discovered during the excavations and prospecting. These archaeological sites include settlements under peat dated back to the 3rd millennium B.C., settlements with the remnants of the 13th-10th centuries B.C. wooden architecture, remnants of the 8th-7th centuries B.C. dune settlements and the 6th-5th centuries B.C. lowland settlements, burial grounds, including the 4th-3rd centuries B.C. dolium burials, etc. The lowland settlements deserve special attention. These are settlements built in a bit elevated areas of lowlands. Their cross sections contain dried gypsum layers. Most of such settlements are located within a range of 100-500m from settlement hills. One such site was discovered in Gvimbauri Village.

In the section between Japana and Grigoleti the archaeological sites were discovered and studied in the late 20th century when Bako-Supsa oil pipeline was laid.

Unfortunately, the archaeological references listing and describing the aforementioned sites do not specify their location. Therefore, in this report we present the locations of the sites by villages (as it is shown in the archaeological references).

### **Nigvziani Village**

1. The burial dated to the 7<sup>th</sup>-6<sup>th</sup> centuries B.C. is located in the village centre behind the railway station. It was excavated in the 20<sup>th</sup> century;
2. The remnants of an antique settlement in the pipeline route;
3. The remnants of a settlement and burial – middle ages.

### **Akhalsopeli Village**

4. Treasure – middle ages
5. The remnants of the settlement – antique period.

### **Tabanati Village**

6. Pipeline route – the remnants of the antique settlement.

### **Khidmaghala Village**

7. Pipeline route – the remnants of the antique settlement

### **Grigoleti Village**

8. “Gogelia’s Yard” – the remnants of the dune settlement and workshop, the 7<sup>th</sup>-6<sup>th</sup> centuries B.C;

9. The remnants of the dune settlement – antique period;
10. “The Yard of T. Chkonia” – the dune settlement, the 7<sup>th</sup>-6<sup>th</sup> centuries B.C.
11. The ruins of the dune settlement dated to the 6<sup>th</sup>-4<sup>th</sup> centuries B.C. It is located south-east of Grigoleti, on the left bank of the Supsa River, 800m from Batumi-Poti Highway. It was partly excavated in 1997 during the construction of the terminal building;
12. The burial of the 6<sup>th</sup>-4<sup>th</sup> centuries B.C. is located 300m north-east of the aforementioned settlement, on the right bank of the Chire River. A small part of it was excavated in 1997;
13. The coastline – dune settlements dated back to the 8<sup>th</sup>-7<sup>th</sup> centuries B.C.

#### **5.4 Land Acquisition and Resettlement**

The Resettlement Action Plan is being currently developed and details of resettlement related impacts will be clarified soon. At this stage it could be summarized that about 282 land plots (670620 sq.m in total) are affected of which 31 (306685 sq.m) are state owned non-used land plots, 9 state owned land plots (10355sq.m) are illegally used by private persons and the rest 242 plots are in private ownership (353 580 sq.m. in total).

Total amount of affected households is close to 238. No one households lose their residential houses and are subject for physical relocation.

No businesses are permanently or temporarily affected.

Most of the affected households have agricultural lands and cultivate crops (mainly maize and beans) and fruit trees. Many of them lose crops and fruit trees due to land acquisition.

The Resettlement Action Plan will provide detailed census of affected households, inventory of loses, description of social status and identification of vulnerable groups. Compensation and rehabilitation plan will be elaborated upon completion of valuation of the lost assets. All the affected households will be provided with the adequate compensation according to the Georgian legislation and EIB requirements. Vulnerable and severely affected households will be provided with the additional allowances.

#### **Principles Adopted for the Project**

To reconcile the gaps between Georgia laws/regulations and JBIC/WB Policy, RDMRDI has adopted a policy and a set of principles for the Project as set out in the approved RPF. The principles ensure compensation at full replacement cost for all items, the rehabilitation and/or restoration of livelihoods, assistance for informal settlers (non-titled land users), and the provision of subsidies or allowances for APs who will be relocated, suffer business losses, or will be severely affected.

Considering the abovementioned differences, any policy applied to interventions funded by JBIC must comply with Georgian legislation/regulation with additional provisions to meet WB policy requirements related to; (i) the economic rehabilitation of all APs (including those who do not have legal/formal rights on assets acquired by a project); (ii) the provision of indemnities for loss of business and income; and, (iii) and the provision of special allowances covering AP expenses during the resettlement process as well as covering the special needs of severely affected or vulnerable APs. The overarching objective of the policy in relation to land and asset acquisition is to minimise the impacts/losses and assist the APs in restoring their livelihoods at least to the level equal to the pre-project level.

In this regard the RPF for the Project was designed to cover (a) all affected/displaced persons irrespective of their title to land; (b) compensation for their lost assets and/or livelihoods; and (c) restoration and enhancement of livelihoods. The households/persons displaced by Project interventions will receive cash compensation for land and other assets at full replacement cost as per market price at the time of dispossession. Additional measures will be taken to ensure minimum disruption during Project construction period. Thus, households to be physically displaced and/or economically affected will receive due compensation, relocation assistance, and allowances in accordance with the following guidelines and policy which are also part of the RPF approved for the Project.

Accordingly, during implementation of the Project the RDMRDI is committed to ensure that:

- The options for road upgrading and reconstruction will be selected to avoid residential areas wherever possible to minimize physical relocation of people and to minimise acquisition of privately or publicly held productive land;
- Damages to assets, such as standing crops, trees, fences and kiosks, and loss of income, including loss of harvest, will be minimized, any residual impacts will be compensated as per the provisions of the RPF;
- For each section of reconstruction/upgrading of the highway that involves acquisition of private land, physical relocation of households or commercial entities, permanent income loss, or other impact that triggers the OP 4.12, a RAP will be developed in compliance with policies and procedures set out in the RPF (being based firmly on WB's OP 4.12, JBIC Guidelines and Georgian legislation);
- No civil work will commence for any section of highway incurring resettlement impacts before a RAP is prepared and approved by JICA and cleared by the project Executing Agency;
- Fair and transparent procedures will be developed, as defined in the Entitlement Matrix in the RPF, to determine compensation for (i) temporary loss of land/assets during construction; (ii) permanent acquisition of land and assets; and



- (iii) restrictions on use of land that may be applied to areas adjoining the corridor;
- All APs, without regard to legal status of property, will receive support of various kinds, as per the principles set out in the Entitlement Matrix, to assist them in their efforts to maintain their livelihoods and standards of living prevailing prior to the Project;
  - Those who illegally use land (non-titled users) will not be compensated for loss of land, but will receive compensation for loss of any other assets they own on the land they use, as well as for loss of income such that they are also assisted in their efforts to maintain or improve their livelihoods;
  - Damages to assets, such as standing crops, trees, fences and kiosks, and loss of income, including loss of harvest, will be compensated without regard to legal status of ownership according to the Entitlement Matrix provided in the RPF;
  - A market survey will be conducted to assess the prevailing market prices of land, construction materials for affected structures, crops and other relevant items, which will be used as the unit prices to determine compensation. This will additionally ensure that the market prices will allow APs to purchase replacement land;
  - APs will be offered effective compensation at full replacement cost for losses of assets; Loss of income and assets will be compensated on a net basis without tax, depreciation or any other deduction;
  - APs will be informed about their rights and they will be consulted on, offered choices among, and provided with technically and economically feasible resettlement alternatives;
  - The RDMRDI will facilitate that, whenever possible, the local authorities will provide the PAP with residential housing, or housing sites, or, as required, agricultural sites, as an alternative to the monetary compensation. In that case, a combination of productive potential, advantageous location, and other factors, should be at least equivalent to the advantages of the old site;
  - APs will be provided with assistance during relocation if resettlement is not avoidable;
  - Land (or right to use land) will be acquired through negotiated agreements and with the use of the power of eminent domain only as a last resort;
  - Special attention will be paid to the needs of the most vulnerable groups of the population – children, women, cultural or ethnic minorities, the elderly, those below the poverty line, disabled, and refugees/internally displaced people;
  - A fair and accessible grievance redress mechanism will be developed; and

Compensation measures and phased implementation of the RAP section by section are completed for each section prior to start of the construction activities at this section.

### **Compensation Eligibility and Entitlements**

Those entitled to compensation and/or rehabilitation assistance and provisions, under the Project are:

- All APs losing land either covered by legal title/traditional land rights or without legal status;
- Tenants and sharecroppers whether registered or not;
- Owners of buildings, crops, plants, or other objects attached to the land; and
- All APs losing business, income, and salaries.

As per the RPF, compensation eligibility will be limited by a cut-off date as the last day of the Census.

APs who settle in the affected areas after the cut-off date will not be eligible for compensation. They, however, will be given sufficient advance notice, requested to vacate premises and dismantle affected structures prior to project implementation. Their dismantled structures materials will not be confiscated and they will not pay any fine or suffer any sanction.

Eligibility to receive compensation and assistance will be limited by the cut-off date. The cut-off date for compensation and assistance is considered for those identified on the project ROW land proposed for acquisition at the time of census and IOL undertaken in December 2010 and January 2011. Any households or persons identified on the project right of way on the 31<sup>st</sup> January will be eligible for compensation and assistance from the Project.

At present, the following categories of APs will be entitled to compensation and/or assistance under the Project:

- Private landowners (with an established legal title to the land) whose land will be purchased or expropriated to implement subprojects, including the construction or rehabilitation of residential stocks;
- Private owners whose non-residential assets such as kiosks, restaurants, shops, stables, workshops, fences, barns, warehouses, trees, standing crops, and other valuable assets need to be demolished;
- Leaseholders (individual and enterprise) who have lease agreements with the Municipalities or other owners on use of land within the designed road corridor ; and
- Informal/illegal occupants and land users on existing rights of way.

The community owned or state infrastructure affected by the project is not subject for the RAP as the restoration/reconstruction works for all of the affected structures is included as part of the Detailed Design.

In cases where ownership rights can be formalized APs will be compensated for land purchased for permanent structures. APs (i.e., owners, informal users and leaseholders) will also be compensated for damages to or removal of structures, standing crops, trees, and losses of other economic assets. Whenever possible, and when acceptable to RDMRDI, Municipalities and the APs, lost land and assets will be replaced in kind.

Persons affected temporarily by construction activities (if any) will be compensated for any lost income, assets and damages.

### **Entitlements to Compensation for Impacts and Losses**

The main entitlements include:

- Agricultural land impacts for titled owners will be compensated at full replacement cost adopted for the project. When more than 20% of total agricultural land is acquired, APs (owners, leaseholders and sharecroppers) will get an additional allowance for severe impacts equal to the market value of a year's gross yield of the land lost. In case of severe impact on other income, the APs will be paid additional compensation for three months income. Legalized APs will be legalized and paid as titled owners.
- Non-legalized APs will not be compensated for agricultural land loss. If available, alternative land plots will be proposed for leasing.
- Non agricultural land (Residential/commercial land). Legal settlers, as well as legalized non-titled owners will be compensated at full replacement cost free of depreciation. Non-legalized APs will not be compensated for agricultural land loss. If available, alternative land plots will be proposed for leasing.
- Houses, buildings, and structures will be compensated in cash at full replacement cost (but not market cost) free of deductions for depreciation, and transaction costs irrespective of the registration status of the affected land. In case of partial impacts and unwillingness of the owner to relocate, compensation will cover only the affected portion of a building and its full rehabilitation to previous use. Full compensation will be paid if partial impacts imperil the viability of the whole building.
- The remaining materials after the demolishing the buildings and structures are deemed as a property of the AH. The AH has responsibility for removing the remaining materials before construction start up.
- Crops: In case of land take of the permanently cultivated agricultural land, cash compensation at current market rates for the gross value of one year's

harvest by default. Crop compensation will be paid both to landowners and tenants based on their specific sharecropping agreements<sup>5</sup>.

- Trees: Cash compensation at market price based on type, age and productivity of trees.
- Businesses: If business is lost permanently it will be compensated in cash equal to a one year income based on tax declaration or, if unavailable, based on the year of minimum salary; temporary business losses will be compensated in cash for the business interruption period based on tax declaration or, if unavailable, based on the months of minimum salary for the period of interruption;.
- Agricultural Tenant: if agricultural tenants are affected, it will be compensated in the form of assistance equivalent to one year of cash return from the land under tenancy as per recorded proof (tax declarations), or in its absence, months of minimum salary.
- Loss of wages/employment: if employees loss their wages due to the project interventions, they will be compensated in the form of assistance equivalent to three months of minimum salary.
- Relocation /Shifting Allowance: APs forced to relocate will receive a relocation subsidy sufficient to cover transport costs and living expenses for 3 month.
- Community Structures and Public Utilities: Will be fully replaced or rehabilitated so as to satisfy their pre-project functions.
- Vulnerable people: Vulnerable APs (as previously defined) will be assisted with allowance equivalent to three months of minimum salary.

### **Support, Assistance and Allowances**

A number of support and rehabilitation measures and allowances are included as follows:

- Households requiring relocation will be provided with transport allowance at 200 GEL per households (for vehicle hire for transport of household contents) and a livelihood restoration allowance for three months to support re-establishment at the new site. The livelihood support will be the equivalent of minimum salary (as per note below) providing a total relocation allowance of 1,112 GEL per household;
- Severely affected households i.e. those AHs losing 20% or more of income generating assets will be provided with either (i) additional compensation for

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<sup>5</sup> In case the leasing agreement states cash payment of leasing costs to the land owner, compensation for crops is given only to the leaseholder. In case the leasing agreement states sharecropping principles, both – the owner and the leaseholder will be compensated according to the agreed crop shares.

the one year's yield of the crop on the cultivated agricultural land affected; or  
(ii) an allowance equivalent to three months of minimum salary<sup>6</sup>;

Affected households that are vulnerable i.e. those below the poverty line, households headed by disabled or elderly, households headed by women, and displaced people or refugees will be entitled to an allowance equivalent to three months of minimum salary (as per note above).

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<sup>6</sup> As discussed in Chapter 3, in the absence of a minimum salary in Georgia, this allowance adopts recent support measures included in approved projects which have been based on the minimum subsistence income. The most recent information from National Statistics Office of Georgia for January 2011 is 304 GEL per household (of five people) being equivalent to 912 GEL per AH for three months.

## 6. ANALYSIS OF ALTERNATIVES

### **The “do nothing” project alternative.**

The “do nothing” or without project alternative would place heavy strains on local roads which are already poorly maintained in Georgia’s second city. The last serious attempt to improve traffic circulation in Kutaisi was in the 1980s when a 2-lane bypass was constructed between Nakhshirgele and the Baghdadi Road. The bypass was originally planned to provide a complete bypass to the city of Kutaisi but construction stopped halfway at the junction of Kutaisi-Baghdadi Road. Traffic congestion is still tolerable but expected to become more of an impediment to local circulation as car ownership is increasing rapidly. Congestion costs will be substantial if the project were not to go ahead as more than half the traffic flow on the road system in Kutaisi is through traffic. There will be additional impacts on health from extra vehicle emissions and noise associated with more and longer vehicle journeys and slower travel times in the congested city of Kutaisi. As a result of study we see, that do nothing” project must be denied, because it will preserve existing negative tendency. It can’t secure growing traffic movement maintenance.

### **Alternative choices of the route**

Since 2006, one of the government top priorities is to develop Georgia’s competitiveness as a transit country by improving its transport corridors. This ongoing process is expected to last well in to the future.

Promotion of trade with the neighboring countries and development of tourism infrastructures have major importance for the economic development of the country, for which an improved road network is a crucial factor.

The development of the transport sector is essential for the sustainable economic growth and for improving the living conditions of Georgia’s population.

The Georgian Government has given the highest priority to improvements of the East - West highway (between Caspian Sea and BlackSea) and North - South (between Russia and Turkey).

The Government has obtained funding for the sections immediately West of Tbilisi with the construction of a four lane highway currently underway.

In 2009, the Feasibility Study and Environmental Impact Assessment of the Preferred Recommended Alignment for Upgrading the S-12 Highway between Samtredia – Grigoleti was presented to the Roads Department of the Ministry of Regional Development and Infrastructure of Georgia. This road section will give continuity to Zestafoni-Kutaisi-Samtredia Road Section of E60 – Highway.

The present report is carrying out the next level of developing works for the detailed engineering designs and tender documents, from the abovementioned recommended alignment.

In a meeting held at Roads Department's offices with the Technical Board on the 24<sup>th</sup> of April of 2012, the joint-venture COBA-TRANSPROJECT presented an alternative alignment. This alignment differs from the Feasibility Report's preferred recommended alignment essentially on the first 15 km and last 3 km of the highway.

The Technical Board requested to the joint-venture COBA-TRANSPROJECT to produce an economical evaluation comparing the first 15 km of the alternative alignment with the corresponding section of the recommended alignment of the Feasibility Study, with more 3km.

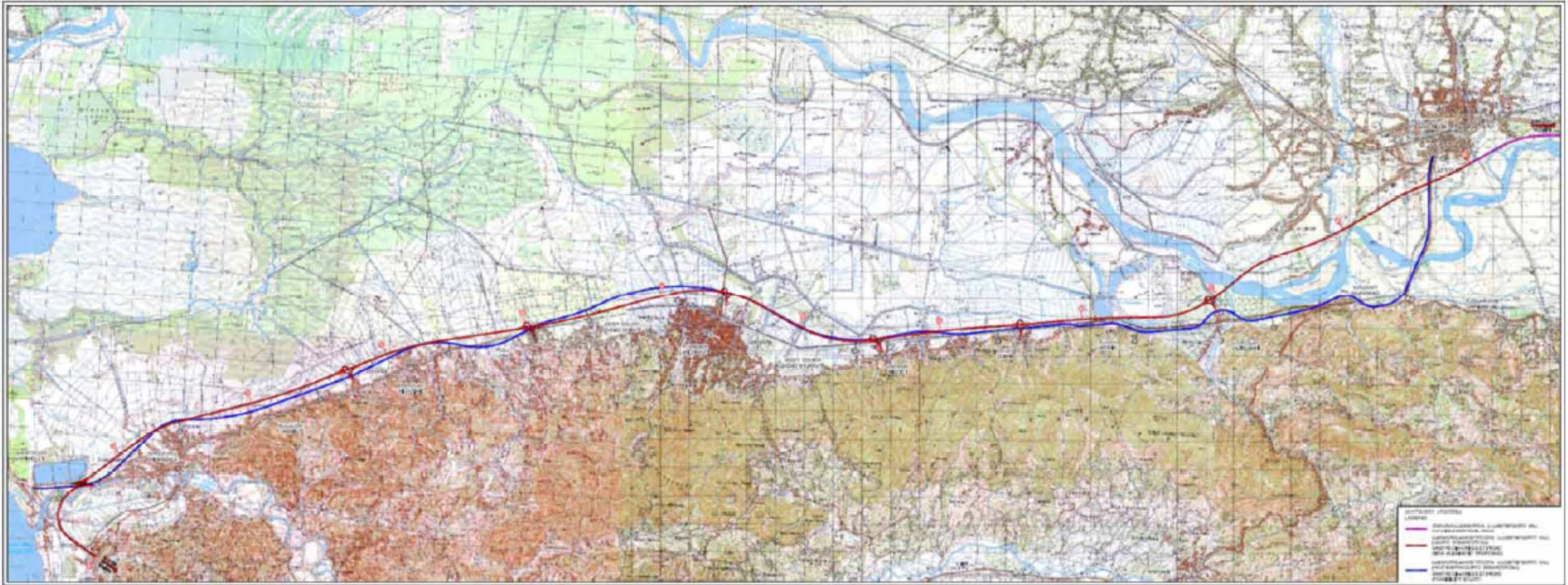
During the Technical Board meeting held on the 8<sup>th</sup> of May of 2012, the economical evaluation was presented. In order to retain the comparison principles between the design alignment proposed in the Feasibility Study and the new alignment, the economic analysis was based on the unit construction costs set out in the Feasibility Study of 2009.

The comparison that was based on the data from the Feasibility Study of 2009, other than updated factual data such as traffic intensity, has led to the conclusion that notwithstanding the increase of construction costs the alternative alignment has an economical advantage on account of the reduction of operation costs to road users in a 20-years perspective. On the other hand, it is worth noting that a substantial increase of prices of fuel and construction materials from 2009 to 2012 will lead to the substantial increase of construction costs.

The Technical Board concluded that a recommendation shall be provided for the preparation of detailed design documentation to the alternative option of design alignment of the highway proposed by the joint-venture COBATRANSPROJECT.

Comparison of alternative route, that finally selected version (project direction, proposed by COBATRANSPROJECT) has two superioritys comparativly to initial (TED) version:

- Approximatly 1 km section of the route, proposed on the TED stage, passes at the andriring bank of river Rioni and needs important coast-protectingworks, which is related with additional impacts.
- Direction proposed by COBATRANSPROJECT lets possibility reduction range of resettlement: isn't avoided impacts on the dwelling-houses and necessity of physical resettlement and total amount of plots behaving under impacts decreases by 30 (by 24 500 m<sup>2</sup>).



**Picture 6.1** *Alternative choice of the route (Blue line – ted choice; red line – finally choice)*



## 7. ENVIRONMENTAL IMPACTS

### 7.1 Summary of Activities and Anticipated Impacts

The project was screened for environmental impacts and a summary of activities and anticipated impacts is provided below in relation to project phases. In the case of the design phase the analysis describes how these potential impacts have been and will continue to be incorporated in the project design process.

#### A Environmental Impacts – Design and Pre-construction Phase

	Potential Impact	Comments
1	<p>Site specific considerations related to “project footprint” :</p> <p>Degradation of natural landscape (relief, soil cover, vegetation, natural habitats) in the certain part of the right-of-way (land strips adjacent to the highway – access roads, dumping sites, borrow pots).</p> <p>Sensitive ecosystems and sites of special importance</p> <p>Sites of archaeology and cultural significance,</p> <p>Existing human activities and land use – residential and farming land.</p> <p>Geohazard prone sites</p>	<ul style="list-style-type: none"> <li>• Resettlement dimensions minimization occurred on the route comparative stage</li> <li>• Crossing sensitive places has been avoided on the meandering and intensive lateral erosion section of Rioni</li> </ul> <p>The preferred Bypass route is selected based on a full analysis of alternatives - see p.6 Analysis of Alternatives.</p>
2	<p>Damage of infrastructure elements and the need to redesign road and/or plan for relocation of services and avoid disruption of services i.e.</p> <p>Railway &amp; existing roads,</p> <p>Power transmission lines,</p> <p>Gas pipelines,</p> <p>Irrigation channels</p>	<p>The highway crosses several important infrastructure systems:</p> <ul style="list-style-type: none"> <li>• Electro-transmission lines;</li> </ul>
3	<p>Location of borrow pits, waste disposal sites, any asphalt mixing sites, aggregate and concrete making facilities, workers camps, fueling and storage places and equipment yards</p>	<p>Dust/air pollution, water pollution, landscape degradation impacts on aquatic life - will depend on careful choice of site location. At the detailed engineering stage EIA consultants have proposed certain sites described in chapter 2.12 However, the final choice will be made later by the construction contractor.</p>
4	<p>Interchanges and interconnecting roads and their planning and design</p>	<p>Interference with local transportation circulation and local access with increased traffic safety problems. Need to design traffic circulation plans in consultation with local authorities and Regional Roads Department.</p>

	Potential Impact	Comments
5	Noise and traffic emission nuisance	Noise & emissions related to traffic is only a significant problem in densely populated areas & where residential properties adjoin the road.
6	Bridges, viaducts, interchanges and flood protection installations	Provided design is adequate to the hydrological and drainage characteristics of the area;

## B Environmental Impacts - Construction Phase

#	Potential Impacts During Construction Works	Yes/No Severity	Site Locations
1	Destruction of natural landscape (relief, soil cover, vegetation, eco-systems, habitats and wildlife) in the right-of-way occupied by the highway.	Yes Minor	Whole alignment
2	Destruction of natural landscape (relief, soil cover, vegetation, eco-systems, habitats and wildlife) on the access roads, in the borrow pit sites, waste dumps, construction camps and equipment yards.	Yes Medium	Borrow pit sites, waste dumps, construction camps and equipment yards to be defined by construction contractor
3	Landslides, slumps, slips and other mass movements in road cuts triggered by the construction activities.	Minor risk	No existing landslides.
4	Erosion stimulated from fresh road cuts and fills and temporary sedimentation of natural drainage ways. Erosion of lands below the road bed receiving concentrated outflow from covered or open drains.	Minor	Near embankments.
5	Increased suspended sediment in streams affected by erosion at construction sites and fresh road cuts, fills and waste dumps. Reduced water quality and increased sedimentation and impacts on water quality and fish breeding.	Yes Minor	Rivers – Supsa at its estuary, Network of drainage channels.
6	Impact of construction activities on aquatic ecosystems of the rivers and streams crossed by the highway	Minor	Rivers – Supsa at its estuary, Network of drainage channels.
7	Soil and water contamination during construction by oil, grease, fuel and paint in the RoW, access roads, construction camps and equipment yards and asphalt mixing sites.	Yes Minor	All construction site locations and activities, some to be determined by contractor.
8	Poor sanitation and solid waste disposal in construction camps and work sites (sewerage, sanitation, waste management)	Yes Medium	Site to be determined by Contractors
9	Construction wastes alongside the RoW and roadside litter.	Yes Medium	Whole alignment

#	Potential Impacts During Construction Works	Yes/No Severity	Site Locations
10	Air pollution from vehicle operations during construction in populated areas traversed by the highway, notably metropolitan areas or densely settled rural areas. Local dust.	Yes Minor	Anywhere construction vehicles pass through settlements
11	Air pollution from any concrete batching plants.	Yes Medium	Supplier and contractor site locations
12	Noise pollution from vehicle operation during construction particularly in populated areas traversed by the highway, such as densely settled rural areas. Local noise.	Yes minor	No residential houses close to the road alignment;
13	Poaching by construction workers	No or minor	Neither major rivers are not crossed by the road alignment, nor forested areas. Poaching is not a problem issue for the transformed rural landscapes;
14	Creation of temporary breeding habitats for mosquito vectors of disease e.g. sunny, stagnant pools of water. Creation of stagnant water bodies in borrow pits, quarries, etc. suited to mosquito breeding and other disease vectors. Recontamination by infectious biological materials (e.g. Anthrax) during earth works near the pest holes (i.e. not registered Anthrax sites)	Yes Minor	Whole alignment
15	Health hazards by noise, air emissions and dust raised and blown by vehicles during construction activities.	Yes Medium minor	No residential houses close to the road alignment;
16	Impacts on Archaeological Sites	Yes	Whole alignment; Probability near known sites listed in Annex 2 (p.2.6)
17	Hazardous driving conditions where construction interferes with pre-existing roads.	Yes Minor	At main interchanges of temporary construction roads
18	Road crosses several important infrastructural systems: <ul style="list-style-type: none"> <li>• Electro-transmission lines</li> <li>• Local gas- main lines</li> </ul>	Medium or High	Whole route
19	Accident risks associated with vehicular traffic and transport, that may result in spills of toxic materials, detonation of explosive load, injuries or loss of life	Yes Minor	Whole alignment but particularly where construction activity

#	Potential Impacts During Construction Works	Yes/No Severity	Site Locations
			affects existing settlements

### Character of Main of the Anticipated Impacts - Construction Stage

Activity	Impact	Character of impact							
		Direct	Indirect	Positive	Negative	Reversible	Irreversible	Temporary	Residual
Land clearance and grading in the RoW	Destruction of natural landscape, habitats, erosion	+			+		+		+
	Emissions	+			+	+		+	
	Noise, vibration	+			+	+		+	
	Ground pollution and/or waste generation		+		+	+		+	
	Ground and surface water pollution		+		+	+		+	
Construction of the new carriageway; pavement	Destruction of natural landscape, habitats, erosion								
	Emissions	+			+	+		+	
	Noise, vibration	+			+	+		+	
	Ground pollution and/or waste generation		+		+	+		+	
	Ground and surface water pollution		+		+	+		+	
Exploration of borrow pits	Destruction of natural landscape, habitats, erosion	+			+		+		+
	Emissions	+			+	+		+	
	Noise, vibration	+			+	+		+	
	Ground pollution and/or waste generation		+		+	+		+	
	Ground and surface water pollution	+			+	+		+	
Transportation of sand, gravel, stones from borrow pits. Material supply.	Destruction of natural landscape, habitats, erosion								
	Emissions	+			+	+		+	
	Noise, vibration	+			+	+		+	

Activity	Impact	Character of impact							
		Direct	Indirect	Positive	Negative	Reversible	Irreversible	Temporary	Residual
	Ground pollution and/or waste generation		+		+	+		+	
	Ground and surface water pollution		+		+	+		+	
Demolition of part of existing pavement during rehabilitation of the existing carriageway	Destruction of natural landscape, habitats, erosion								
	Emissions	+			+	+		+	
	Noise, vibration	+			+	+		+	
	Ground pollution and/or waste generation		+		+	+		+	
	Ground and surface water pollution		+		+	+		+	
Disposal of spoil and wastes	Destruction of natural landscape, habitats, erosion	+			+	+		+	
	Emissions	+			+	+		+	
	Noise, vibration	+			+	+		+	
	Ground pollution and/or waste generation		+		+	+		+	
	Ground and surface water pollution		+		+	+		+	

### C Environmental Impacts - Operations Phase

#	Potential Impacts During Operations	Yes/No Severity	Site Locations
1	Air Pollution from increased use of the highway in future	Yes Minor increasing	Whole alignment, but traffic related emissions in the vicinity of residential areas should meet Air Quality Norms.
2	Noise Pollution from increased use of the highway in future.	Yes Minor increasing	Whole alignment, but traffic related noise in the vicinity of residential areas should meet Noise Sanitary Norms.
3	Water quality deterioration with increased dust from highway surfaces to water courses	Yes minor	Whole alignment

#	Potential Impacts During Operations	Yes/No Severity	Site Locations
4	Traffic safety problems on poor feeder roads at the western end of the Bypass. Until the next section of the road is built there will be a need for a temporary solution to the problem of connecting the highway to the Samtredia via very poor existing road infrastructure.	Yes	The feeder roads to local communities & Samtredia at the western interchange of bypass
5	Roadside litter.	Yes Medium	Whole alignment
6	Soil and water contamination by oil, grease and fuel alongside the highway	Yes Minor	Whole alignment
	<b>Potential Operation Phase Emergency Related Impacts</b>	<b>Yes/No Severity</b>	
7	Accident risks associated with vehicular traffic and transport, that may result in spills of toxic materials injuries or loss of life(see 'Hazardous Materials Management' section), injuries or loss of life (see 'Public Health and Safety section)	Yes Medium	Crossed settlements  Whole RoW

### Character of Main of the Anticipated Impacts - Operation Stage

Activity/Factor	Impact	Character of impact							
		Direct	Indirect	Positive	Negative	Reversible	Irreversible	Temporary	Residual or long-term
Physical existence of linear installation	Destruction of natural landscape, habitats, erosion	+					+		+
	Emissions								
	Noise, vibration								
	Ground pollution and/or waste generation								
	Ground and surface water pollution								
Traffic	Destruction of natural landscape, habitats, erosion								
	Emissions	+			+				+
	Noise, vibration	+			+				+
	Ground pollution and/or waste generation		+		+	+		+	
	Ground and surface water pollution		+		+	+		+	
Maintenance works	Destruction of natural landscape, habitats, erosion	+		+					

Activity/Factor	Impact	Character of impact							
		Direct	Indirect	Positive	Negative	Reversible	Irreversible	Temporary	Residual or long-term
	Emissions	+			+				+
	Noise, vibration	+			+				+
	Ground pollution and/or waste generation		+		+	+		+	
	Ground and surface water pollution		+		+	+		+	
Accidents	Destruction of natural landscape, habitats, erosion		+		+	+		+	
	Emissions		+		+	+		+	
	Noise, vibration								
	Ground pollution and/or waste generation		+		+	+		+	
	Ground and surface water pollution		+		+	+		+	

## 7.2 Specific Environmental Impacts

Under the specific environmental impacts reviewed in this chapter we mean most typical and significant impacts characteristic particularly for road projects. While the overall summary of project impacts is given in p. 7.1 and more generic impacts associated with the construction activities are described in p. 7.3, here we focus on those particular issues, which are more specific for road projects and some of them require not only qualitative but also quantitative analysis.

### 7.2.1 Air Emissions Related to Construction Activities

Air emission related impacts and mitigations are usually considered as most typical and significant issues for the road rehabilitation projects. Emissions and dust related to construction activity, also their mitigation measures discussed in paragraph 8.1.1.4 Bellow we give transport emission brief analysis resume of traffic movement in current and forecast intensity conditions.

On the Samterdia-Grigoleti (km 42.0 – km 51.570 Lot 4) section of E-60 highway emissions related to traffic movement is less urgent, than for bypass roads of Kutaisi and Zestaponi and Kutaisi-Samtredia section. With the difference of these enumerated sections, Samtredia-Grigoleti highway (and, privately, km 42.0 – km 51.570) section does not pass near the densely settling regions and mainly crosses agricultural lands.

Estimation of emissions was done on the E-60 road of Samterdia section by extrapolation obtained from the results of emission simulation on the longer section of Zestaphoni-Samtredia and on the section Kutaisi-Samtredia.

### **Emission impacts related to current conditions of traffic.**

Surveys of the emission impacts of traffic have been undertaken at different sections of the existing highway. Based on current traffic intensity, calculation of traffic related emissions were determined for the following sections of the highway 1. Zestafoni bypass; 2. Zestafoni – Kutaisi section; 3. Kutaisi bypass; 4. Kutaisi – Samtredia. This work was done using licensed Russian software “Ecolog Magistral – City” (see Annex 4 for details).

For each section calculations were carried out for 500m long stretches (traffic intensity is very similar for different subsections of the same length) and the data sheets are provided in annex 4.

Air quality modeling for unfavorable meteorological conditions has been performed considering the area of a rectangle (700m x 100m) with centerline coinciding with the highway centerline. Spacing was taken as 50m. In addition, maximum concentrations of harmful substances have been calculated at two points: Point 1 at 25 m from the centerline and point 2 at 50m.

Graphical diagrams reflecting the modeling details are presented in annex 5. According to the modeling data maximum concentrations of harmful substances at check points 1 and point 2 are indicated below for the different sections of the road.

**Table 7.1. Air Quality Modeling Data (concentration in parts of MAC)**

Harmful Substance	Highway Section							
	I		II		III		IV	
Check point No	1	2	1	2	1	2	1	2
NO <sub>2</sub>	0,23	0,14	0,33	0,21	0,24	0,15	0,29	0,18
NO	0,0077	0,0048	0,01	0,007	0,0081	0,0051	0,0098	0,0062
Soot (PM)	0,0016	0,001	0,0024	0,0015	0,0018	0,0011	0,002	0,0013
SO <sub>2</sub>	0,0027	0,0017	0,0037	0,0024	0,0031	0,0019	0,0034	0,0021
CO	0,04	0,02	0,05	0,03	0,04	0,02	0,05	0,03
Benz(a)pyrene	0,0017	0,0011	0,0034	0,0021	0,0017	0,0011	0,0017	0,0011
Formaldehyde	0,0039	0,0024	0,0063	0,0040	0,0049	0,0031	0,0053	0,0034
Fractions of benzene	0,0042	0,0026	0,0056	0,0035	0,0042	0,0026	0,005	0,0031
Fractions of kerosene	0,002	0,0012	0,0034	0,0021	0,0027	0,0017	0,0027	0,0017
Impact summation groups (NO <sub>2</sub> & SO <sub>2</sub> )	0,23	0,14	0,33	0,21	0,25	0,16	0,29	0,18



Concentrations of harmful substances for current traffic conditions do not exceed Maximum Admissible Concentrations (MAC) and traffic related contamination at the locations adjacent to the highway is not expected to be significant in the near future.

### Impact on the air in forecast conditions

The ambient air quality for the traffic volumes forecasted for year 2030 could be estimated via linear extrapolation of the current parameters applying conservative (worst case scenario) approach. This conservative estimation is based on the assumption that the emission indices will not change for 2030. Based on the mentioned approach and forecasted traffic data following conversion factors could be applied for the linear extrapolation for each subsection of the highway:

#### Kutaisi – Samtredia Section

Forecasted traffic

Year 2007 - 6262 vehicles/per day

Year 2030 - 22866 vehicles/per day

conversion factor - 3,65

According to the proposed conversion factors the maximum concentrations of harmful substances in check points 1 and point 2 for different sections is calculated, as demonstrated in the table below. The units of figure in Tables are parts of MAC (% of MAC/100).

**Table 7.2**

Harmfu Substance	Highway Section	
	New Kutaisi Bypass - Samtredia	
№ of check point	1	2
NO <sub>2</sub>	0.45	0,28
NO	0,035	0,022
Soot (PM)	0,0073	0,0047
SO <sub>2</sub>	0,012	0,008
CO	0,18	0,11
Benz(a)pyrene	0,006	0,004
Formaldehyde	0,019	0,012
Fractions of benzine	0,018	0,011
Fractions of kerosene	0,009	0,006
Impact summation groups (NO <sub>2</sub> and SO <sub>2</sub> )	0.45	0,28

Analysis of the data provided in the above table demonstrates that the concentrations of harmful substances for forecasted traffic level still are lower than MAC.

## **7.2.2 Noise Impacts Related to Construction Activities and Highway Operations**

**Construction Phase** - It is assumed that construction related noise will not exceed a radius of 160m. Highway construction takes place away from urban areas and housing developments. There are no ecologically sensitive areas which will be disturbed by noise nuisance. According to the sanitary norms and standards applicable in Georgia, the noise level of 60dB is tolerable at the edge of the main roads and near the construction sites. Temporary increase of the noise level up to 60dB will be occurred within the 50m radius near the construction site and this is regarded as acceptable impact. Noise measurement baseline survey work and quantitative impact analysis are discussed in more detail in Annex 5. Here below we provide brief summary:

**Operation Phase** - Traffic related noise will not affect areas outside of 160m from the highway. Noise level is acceptable within the 80m zone radius. The impact is not expected to be high even in 2030, when the traffic intensity is expected to increase significantly as compared with the current situation. Actually, the implementation of the project will lead to decrease of the noise related impact on the settlements, so far as the most densely populated areas, like Supsa and Akhalsopelocities will be bypassed.

## **7.3 Potential Impacts Related To the Construction Activities**

### **7.3.1. Dangerous geological processes, soil erosion, soil contamination**

By visual inspection, highway in this section does not include any major road construction impeding physical -geological event or process. Required only surface water regulation taking into account micro-relief conditions.

At the same time, it should be noted, that by engineering - geological opinion, the ground is weak and is not expected local issues. Immediately for this reason was chosen no rigid road pavement (asphalt concrete), instead rigid pavement(concrete), which allows in case of groundwater local issues conduct repair - restoration works.

### **7.3.2 Pollution and Waste**

Improper handling, storage, use and disposal of construction materials, and construction waste can create a water/soil pollution danger on the construction and storage areas. Improper equipment maintenance and re-fueling may also cause soil/water contamination.

#### **7.3.2.1 Construction Related Wastes**

Usually, most of the waste originates in the construction phase and is associated with the waste origination in the sections, as well as inert materials originated as a result of demolishing the existing structures. The balance of ground works is as follows:

- Removing the vegetation ground (humus layer) 118040 m<sup>3</sup>;

- Cut volume – 39 400m<sup>3</sup>;
- Delivery of gravely ground from the quarry –224 0570 m<sup>3</sup>;
- Delivery of rocky ground from the quarry – 873 030 m<sup>3</sup>;
- Volume of spoil to be disposed off - 1500 m<sup>3</sup>;

The excess ground originated in the section is used for embankments, and only 1500 m<sup>3</sup> of excess ground remains in the fill.

In the construction stage, different types of waste are expected to originate. The principal sources of waste are construction sites and construction camps. Minor quantities of waste (polluted ground) are expected to originate along the access roads and routes of movement of the heavy machines.

### **Waste Classification**

During the construction of the bypass the following types of waste will be produced:

1. Household;
2. Hazardous industrial;
3. Non-hazardous industrial;
4. Inert.

### **Household Waste**

Both hazardous and non-hazardous household waste will be produced:

- Food waste (non-hazardous);
- Office waste (non-hazardous);
- Empty glass or plastic bottles (non-hazardous);
- Sewage (hazardous);
- Sweeping waste (proceeding from the object specifics, could be hazardous or non-hazardous);
- Bulb waste (hazardous);
- Medicinal waste (hazardous).

### **Non-Hazardous Industrial Waste**

- Packaging (wood, paper, carton, plastic);
- Expired or unusable metal parts;
- Damaged or expired tools;
- Personal safety means and clothes.

## Hazardous Industrial Waste

- Polluted soil;
- Polluted rags and oil absorbing fabric;
- Polluted water;
- Polluted industrial equipment in disrepair;
- Paint vessels and brushes;
- Lubricant vessels;
- Empty vessels of packaging;
- Polluted personal safety equipment and clothing.
- Contaminated personal protective equipment and clothing

## Inert Waste

- Natural materials (ground and stone-gravel, broken rock) – not expected to be significant in amount;
- Inert material from the decomposition of iron and concrete construction elements (infrastructure elements within the project zone);
- Wood (cut trees and shrubs in small amount).

Waste disposal sites will be selected accordingly.

The total number of allocated inert construction waste should not be significant, since then, depending on relief, there is no planned road cut (cut set), and it's not foreseen by project destroy existing artificial buildings of the road.

Waste disposal place selects contractor. EIA team's proposal in this regard is given in paragraph 8.1.1.3.

**Table 7.2. Anticipated Waste Generation**

Type of waste	Waste class	Quantity
Household waste	Non-hazardous	80-100 m <sup>3</sup> annually
Office waste -(sweeping waste, glass and plastic bottles, stationary waste, etc)	Non-hazardous	10-15 m <sup>3</sup> annually
Sewage	Hazardous	1500 m <sup>3</sup> annually
Bulbs in disrepair	Hazardous	50-70 units
Printer cartridges	Hazardous	2-3 units annually
Medicinal waste	Hazardous	0.1kg annually
Damaged or expired tools	Non-hazardous	1-2m <sup>3</sup> annually
Personal protection equipment and clothing	Non-hazardous	1 m <sup>3</sup>
Oil contaminated rags and absorbent materials	Hazardous	Depends on intensity of the leakage 1 m <sup>3</sup> annually
Cut wood	Non-hazardous	Minor.

### **7.3.2.2 Surface Water and Groundwater Pollution**

#### **Water Pollution**

Water pollution may result from a variety of sources, including the following:

- Spillages of fuel, oil or other hazardous substance, especially during refueling
- Silt suspended in runoff waters (“construction water”)
- Washing of vehicles or equipment or disturbance of watercourse banks and bed during watercourse crossings by heavy machinery
- Exposure of contaminated land and groundwater

Spillages etc may travel quickly downhill to a watercourse or water body. Once in a watercourse, it can be difficult to contain the pollution which can then impact over a wide area downstream. It is therefore vital that prompt action is taken in the event of any potential water pollution incident.

Once the working width has been stripped of topsoil, the subsoil becomes exposed. During earthworks in a wet weather this may result in uncontrolled release of suspended solids from the work area. River Iori is the major receptor sensitive to the increased sediment load.

### **7.3.2.3 Biological Recontamination**

Recontamination by infectious biological materials (e.g. Anthrax) is a potential threat during earth works near the pest holes (i.e. not registered Anthrax sites). The risks are related to the fact that a large amount of the spontaneous burial sites is not registered by the relevant authorities.

### **7.3.3 Topsoil losses due to topsoil stripping**

- Losing topsoil as a result of mixing cutted humus and bottom layer of the soil;
- Topsoil washout due to improper storage and reinstatement
- Rainfall run-off in the ponds /rivers/channels;
- Soil contamination

### **7.3.4 Impacts on Flora.**

Most part of affected landscapes are strongly transformed as a result of anthropogenic impact (agricultural activity, grazing, industrial sites). However, within the planned footprint there are some small patches of partly degraded natural landscapes that should be treated with certain care and mitigation measures provided. The field survey has not revealed any project affected site, which could be considered as sensitive area due to existence of red data and endangered species. There is only one site of medium

sensitivity (site No 15) - degraded alder (*Alnus barbata*) forest covering a 300m strip in this section. 50m wide strip of the forest is to be cut down.

### 7.3.5 Impacts on Fauna

The following sites are sensitive to the Samtredia-Grigoleti Highway **construction and residual impacts**

- **Kolkheti National Park (the minimal distance from the borders of KNP to the project road is 2km).**
- Crossings of drainage channels and sites near the r. Supsa. The main receptor – ichtyofauna and ornitofauna
- **The Khidmagala fish ponds.** The Khidmagala fish ponds – at the section of the Highway situated between Grigoleti and Khidmagala village.

#### **Kolkheti National Park;**

Impact factors:

- Pollution of the water by the oil or fuel, and by litter (household refuse). Ecological receptors are all groups of hydrobiontes, and the ecosystem of the swamped forest and, especially, the peat bog. This type of impact can be mediated by the drainage channels, which cross the project area and connect it with the National Park. However, the likelihood and intensity of the impact is low due to the long distance to the KNP (more than 2km). This gives also sufficient time for implementing efficient mitigation measures.
- Animals' disturbance on the key-sites. This is especially significant in case of disturbance of migratory bird species during autumn migration and wintering.
- Illegal hunting and the vandalism acts - by members of the construction crews or by locals. Ecological receptors, mainly, birds and fish, but not only. Especially unfavorable this will be during autumn passage and wintering, and in lesser extent – during spring passage.

#### **The channel crossings and site near r. Supsa;**

Impact factor:

- Pollution of the water by the oil or fuel (diesel) and by litter or waste products. Ecological receptors are all groups of water-dwelling animals (hydrobiontes), especially endemics and protected by law – Colchis crayfish, larva of dragonflies and fish (freshwater and anadromous).
- Water turbidity increasing during river crossing process. Ecological receptors are all groups of hydrobiontes, especially fish (freshwater and anadromous) during spawning time and downstream-migrant fish fries( especially for sturgeons and Black Sea salmon).

### **The Khidmagala fish ponds**

The Khidmagala fish ponds – at the section of the Highway situated between Grigoleti and Khidmagala villages sensitive from the ornithological point of view. The area holds during seasonal passages and in winter numerous flocks of various bird species, mostly waterfowl, waders and birds-of-prey, including rare and endangered species, protected at national and international levels by law.

Impact factor:

- Birds' disturbance on the key-sites. Disturbance of migratory bird species during autumn migration on stop-over sites and during wintering
- public lighting on the highway section at the Khidmagala fishponds

### **7.3.6 Protected Areas**

The last section of the project road passes at a distance of about 2km from Kolkheti National Park. There are no impacts of project envisaged on protected areas. The less probable and intense impacts are described in p. 7.3.5.

### **7.3.7 Landscape.**

The project design does not envisage substantial changes of valuable landscape. However, certain impact is imposed at the sites where land clearance is required within the small areas of natural landscape described as sensitive zones in p. 4.4.2. The existing and licensed borrow and quarry sites are proposed for material supply, thus no new impacts are envisaged on the landscape due to borrow pit and quarry exploration.

### **7.3.8 Water use.**

Water will be required for maintenance works and for dust protection measures (water bowers). The amount of required water is not high and the sources exist in the vicinity of the project sites (river Supsa; groundwater resources). Water intake for construction works and particularly for the camp operations could be made from surface water sources or from groundwater sources (wells). No Water Intake Permit is needed for surface water intake, however special form should be filled to demonstrate that the terms of surface water intake (including indication of intake volumes) are in compliance with the Technical Regulations ( Technical Regulations approved by the Order No 745 of MoE, issued on 13.11.2008). Intake of the groundwater for camp operations does not require obtaining of License for Use of Groundwater (according to the Law on Licenses and Permits, 2008). Wastewater discharge in surface water objects needs development of special document – Maximum Admissible Discharge Limits, which should be agreed with MoE and which determines limits for discharging wastewater with given concentrations of pollutants. The agreed values (Limits) are determined for each particular facility in order to comply with the Sanitary Norms for surface water. Sanitary

Norms for Surface Water is the generic regulation issued by the Ministry of Labor, Health and Social Protection, while the Discharge Limits are calculated for each polluter of the surface water objects.

### **7.3.9 Impacts on Archaeological Sites.**

Land clearance works, grading and excavations are associated with the risks of damaging underground archaeological remnants. Most expected archaeological sites are listed in the Annex 2 (p.2.6). However, not listed sites could be as sensitive as already known archaeological sites. The known sites have been identified just during major construction works, particularly during construction of the existing highway. The other sites have not been studied systematically. During construction of the roads in Soviet times some archaeological artifacts have been destroyed. Therefore, special care should be taken not only at the new construction sites, but also at the sites where the existing motor road will be upgraded and widened.

### **7.3.10 Transport related impacts**

Heavy trucks are required to deliver required amount of inert materials to the needed sites within the construction corridor. Different types of impacts are anticipated in that regard:

- Noise & Vibration Impacts
- Traffic congestion (nuisance)
- Air pollution (dust; emissions)
- Mud on roads
- Refueling, maintenance and vehicle cleaning and related risks of soil and water contamination

### **Traffic Disruption.**

Intensive runs of heavy trucks are required to deliver required amount of inert materials amount of materials to the needed sites within the construction corridor. The construction sites impose certain safety risks for the population and, therefore, compliance with safety rules is important. Local traffic can be impacted by transport activities related to the project. The mentioned impact is temporary, insignificant and manageable. Long-term impact on local traffic should be beneficial.

### **7.3.11 Infrastructure.**

The project envisages that all the infrastructure elements crossed by the road will be relocated prior to start up of road construction activities.



### **7.3.12 Impact related to quarries**

It will be bring from pits:

- Gravel materials – 2240570 m<sup>3</sup>
- Rocky materials – 873030 m<sup>3</sup>

The exploration of the borrow pits should be conducted by the licensed companies or the Constructing Contractor has to obtain its own license. The list of existing licensed quarries is provided in p. 2.12. However, potential impact of the increased quarrying activities on river bed and floodplain landscape, ichthyofauna and groundwater should be considered.

The dust and emission impacts should be considered during planning mitigation measures, as well as potential river contamination due to improper fueling and vehicle operations. These additional potential impacts should be subject for the management plan.

### **7.3.13 Construction Related Impacts at the Camp Site**

According to the experience of organization of construction works on the other sections of E-60 highway, we can anticipate that a Complex of Ancillary Construction Facilities will be constructed including Camp for accommodation of 200 workers (app. 1.5 ha area), Vehicle and Equipment Yard for 100 vehicles and 150 units for heavy construction machinery (app. 2ha) and (backhoes, excavators, cranes etc.) and Concrete Plant (app. 3ha).

The exact location will be selected by the constructing contractor. The potential impacts related to the construction and operation of the camp could be summarized as follows:

- Potential damage of topsoil
- Contamination related to fuel storage and fuelling operations
- Waste and wastewater management

In chapter 8.1.1.13 of the EIA related to mitigation measures we specify procedures and conditions to be met during designing and operation of the mentioned Ancillary Construction Facilities and propose optimal sitting options

### **7.3.14 Impacts Related to Asphalt Plant and Gravel Braking Mounting**

Road will be faced with asphalt. Asphalt Plants and Gravel Breaking sections direct impacts contain landscape degradation, emissions, dust, noise and others. Gravel and other subsidiary materials for production of asphalt and concrete will be bought from licensed operations. The construction contractor takes decision will they install their own mobile asphalt plant or use existing suppliers. In case Environmental Impact Permit is required. This is the obligation of the Contractor.



## **8. MITIGATION & ENVIRONMENTAL MANAGEMENT PLAN**

### **8.1 Mitigation Measures**

#### **8.1.1 Mitigation Measures related to construction works**

##### **8.1.1.1 Prevention and Mitigation of Geohazardous Processes**

The design is prepared considering 7 degree seismic zone and is relevant to existing seismic risks.

From visual inspection, on this section of route not exists any important physical-geological condition or process. It's necessary only regulate surface waters foreseeing micro-relict conditions.

Due to the weak ground, local subsidences are expected. This fact led to the choice of non-rigid (bituminous concrete) road pavement when considering the road pavement alternatives, as this will allow doing repair and restoration works on the subsided sites.

The bituminous concrete plant must be located at least 100 m from the river. During the construction of bridges, the settling basins for erosive silt and cement mortar are necessary.

Mostly, no negative impact on ground waters in the working areas is expected. The depth of ground waters from the ground surface along the roadbed is 5 m. The storm waters need drainage.

##### **8.1.1.2 Pollution Prevention Measures:**

###### **Water/ Soil Pollution.**

Specific mitigation measures should be implemented at the construction site for prevention of water and soil pollution:

Prevent operation of vehicles in the river and if there is no alternative, inspection of vehicles will be required to ensure that there is no leakage of fuel and lubricating materials.

Contractors will ensure the proper handling of lubricants, fuel and solvents. Fuel and lubricant storage tanks will not be located within 50m of any watercourse, well or dry gorges. All tanks will be placed in a bund of at least 110% of the tank's maximum capacity. If more than one tank is stored within the bund, the system must be capable of storing 110% of the biggest container's capacity or 25% of their total capacity, whichever is greater. The bund will be impermeable (e.g. concrete-lined), without drainage points or other breaches. Accumulated rainwater in bunds will be pumped out of the bund to either drains or the ground if uncontaminated. In case of fuel spillage the spilled fuel should be recollected and contaminated bund treated by the absorbents: sawdust, sand or straw.

All fuel / hydrocarbon dispensing nozzles are to be of a drip control design and securely locked when not in use.

No fuel storage or refueling of vehicles or equipment will be allowed within 50m of any watercourse, water body, well, dry gorge or within any designated wetland area or aquifer. Vehicles will not be left without supervision during refueling process. All refueling operations on the working sites will use absorbent pads and/or straw to minimize spills, which will be put in place prior to the commencement of refueling operations. Ground water and surface water pollution risk will be reduced or eliminated in case of immediate removal of polluted ground. Soiled ground and absorbents will be removed, stored and treated as hazardous waste. In case of significant spill authorized and responsible person will be informed, works will be stopped till the elimination of pollution risk. Refueling will always be carried out with the correct equipment (i.e. nozzles of the appropriate size), and only by suitably trained and experienced Refueling Operators. Fuel supply equipments will be regularly revised to prevent leakage due to inappropriate condition of refueling equipments. Equipment and storages will be isolated and guarded to prevent pollution due to cases of stealing or vandalism. All mobile plant, including but not limited to cranes, compressors, generators, bulldozers, excavators etc. and storage tanks will be maintained and operated such that all leaks and spills of materials will be minimized. Daily plant checks (Vehicle Maintenance Procedure) will be undertaken to ensure no leaks or other problems are apparent. Vehicle maintenance, cleaning, degreasing etc will be undertaken in designated areas of hard-standing, not over made unstable ground (embankments etc.). Water Tanks with sprinklers are envisaged for watering roads and machinery maintenance. Maintenance points will not be located within 50m of any watercourse, well or dry gorge. The storage of potentially polluting materials, refueling and maintenance of mobile plant within 50m of all watercourses/water bodies, dry riverbeds and within designated wetlands and aquifers will be prohibited.

Erosion control measures will be applied during construction activities to prevent increased runoff into the watercourses.

Contractor will plan all excavations, topsoil and subsoil storage so as to reduce to a minimum any runoff. Contractors will be required to organize and cover material storage areas and to isolate wash down areas from watercourses by selecting areas that are not free draining into any watercourse.

Where any area of the spread is at risk from silt pollution washing off into a watercourse of water body, effective measures will be put in place to ensure that such pollution does not occur. Such measures may include:

- Use of silt fences
- Use of straw bales to deflect and filter water
- Use of a system of bunds and grips to prevent water from entering watercourses, etc.
- Use of holding/settling lagoons to store water running off the spread. It is intended to use natural settling rather than flocculants to facilitate sedimentation following which clean water can be disposed.

Wet cement and/or concrete will not be allowed to enter any watercourse, pond or ditch.

The asphalt and concrete plants should be located at a distance of 100m and more from the surface water objects (rivers, channels, lakes). Near the bridge construction sites sediment catchment structures should be installed to prevent water pollution.

Wet cement and/or concrete will not be allowed to enter any watercourse, pond or ditch.

Significant impacts on groundwater are not envisaged as no blasting operations and deep cuts are planned. Ground water pollution risks related to fuel leakages are minimal and will be eliminated in case of immediate removal of polluted ground.

### **8.1.1.3 Construction Waste Management**

The anticipated types and amounts of waste are described in p. 7.3.1.1

#### **Inert construction waste handling**

Generally, it is recognized that the best option has always been the avoidance of waste generation resulting in minimizing the quantities and hazard. Then it is recognized that it is better to reuse, restore and recycle the waste rather than to process it, and the placement is the last resort.

The total amount of the Inert Construction Waste (rocks, spoil, remnants of demolished structures) generated during the planned construction activities hardly could be quantified due to the fact that no cuts are envisaged in the project and no existing road structures are to be demolished. Relocation of existing infrastructure (gas pipelines, electric power lines, optical cables) is not connected with generation of any significant amounts of inert waste. The amount of inert waste to be disposed of is estimated negligible.

However, following the peculiarity of the route area, a certain amount of ground and stones and detritus is expected to accumulate. A great part of the accumulated inert remains can be used in construction of embankments and dyle/revetment.

The stripped topsoil layer must be stored on the pre-selected sites as maximum 2-meter-high embankments. Main part of top-soil could be used for covering embankment slopes enabling its revegetation. Considering the fact that the design route will run adjacent to the villages with extensive greenhouses needing great amounts of fruitful soil, the rational use of the topsoil remains (if any) will be its distribution among the local population.

Great size inert remains formed on the design road Samtredia-Grigoleti's Km 42.0 – Km 51.570 section may be located on the right bank of river Supsa at the site, where earlier fish ponds were located (see fig. 8.1). The rest part of the inept construction waste could be disposed at the Poti and Samtredia Municipal Landfills.



**Picture. 8.1 Presumable place of inert remains location**

### **Other Construction Wastes**

The Waste Management Procedures for Camps is elaborated as separate document and is provided in the annex 7.

The personnel involved in the handling of hazardous and non-hazardous waste will undergo specific training in:

- Waste handling
- Waste treatment; and
- Waste storage.

Burning of waste on any construction site is forbidden with the exception of stub and small branches from felled trees and bushes, which is better to be burned in order to avoid pest dissemination. Wood and timber resources obtained as a result of tree cuttings within the projected area should be used in accordance with the Georgian legislation, particularly, envisaged by the regulation #242 of the government of Georgia, issued on August 20, 2010 concerning “affirmation of the rule for forest utilization”. The unprocessed wood resource extracted from the state forest stocks and obtained as a result of tree-cutting within areas subjected to special purpose, is stored according to species within the territory specified by the legal entity - National Forestry Agency with the purpose of further utilization;

### **Hazardous Construction Wastes**

According to local legislation (Order #36/N of the Minister of Labor, Health and Social Protection of 24.02.2003) small amounts of listed types of hazardous wastes could be

disposed on municipal landfills. Disposal of the most part of hazardous wastes should be agreed with the MoE and local authorities. Constructing Contractor shall collect hydrocarbon wastes, including lube oils, for safe transport off-site for reuse, recycling, treatment or disposal at the temporary storage sites and further at the locations approved by MoE or pass it to the licensed operator (e.g. Sanitari Ltd), having environmental permit on operation of the hazardous wastes.

#### **8.1.1.4 Noise, dust and emissions**

The settlements are not affected significantly by the construction related emissions. However, emissions of heavy machinery involved in the construction should be managed by proper engine maintenance practice and usage of good quality fuel. The work of engines in a no-operation mode should be excluded.

Relatively high impact is connected with the dust emissions, which hardly can be quantified. However, it is obvious that the earth works and transportation of gravel and other inert materials from borrow-pits will impose nuisance related with dust. This is temporary impact, and should be mitigated by periodical watering of the work sites.

As a result of rough estimation of construction related noise, we can assume that the noise impact will not exceed radius of 60-100m. Temporary increase of the noise level near the construction ground within the 300m radius is acceptable impact. The residential houses in the villages are not so densely concentrated near the road.

Mitigation of this minor impact is possible by engine maintenance practice and avoidance of engine work in non-operational mode. The only limitation that could be recommended is to deploy high noise devices, like crushers, outside the residential zone and exclude the night-time works in v.Supsa, Khidmagala or Grigoleti. The night-works at other sites could be carried out without limitation.

All vehicles shall be maintained so that their noise and emissions do not cause nuisance to workers or local people. Near the settlements, the rehabilitation activities will be limited to daylight working hours to reduce impacts. All vehicles will be checked and repaired in case of need to eliminate increased level of noise due to damaged parts.

Regular maintenance of diesel engines will be undertaken to ensure that emissions are minimized, for example by cleaning fuel injectors. Routine maintenance will be to a high standard to ensure that vehicles are safe and that emissions and noise are minimized. All plant used on site will be regularly maintained so as to be in good working order at all times to minimize potentially polluting exhaust emissions.

Vehicle refueling will be undertaken so as to avoid fugitive emissions of volatile organic compounds through the use of fuel nozzles and pumps and enclosed tanks (no open containers will be used to stored fuel).

If deemed necessary in dry conditions or where significant quantities of dust are being or are likely to be produced mitigation measures will be arranged with the Construction Manager. Mitigation measures will include:

- Damping down using water bowsers with spray bars or other technical means; Minimum 2 bowsers will be required for that purpose. However, the constructing contractor should not be limited by this figure, and if required additional bowsers should be engaged.
- Sheeting of construction materials and storage piles; and
- Use of defined haulage routes and reductions in vehicle speed where required. Materials will be transported to site in off peak hours.
- Materials transported to site will be covered/ wetted down to reduce dust. The construction site will be watered as appropriate. Protective equipment will be provided to workers as necessary. All vehicles will be checked and repaired in case of need to eliminate increased emission due to damaged parts

Such measures will be used, where human or animal receptors lie within 300 m of the No noise barriers are required as the road does not cross residential areas.

#### **8.1.1.5 Quarrying Sites**

Generally quarry sites are the major sources of environmental impact due to dust and noise pollution, loss of biodiversity, and generation of spills. Operation of the quarries above the approved limits may cause change of floodplain hydrology and trigger erosion and landscape degradation. The operating procedure for borrow pits shall consider following principles: (i) maximize the amount of fill that can be effectively used from the pit, (ii) minimize erosion and sedimentation, (iii) preserve the water quality of the rivers, (iv) protect air quality during excavation, (v) prevent wildlife from falling into the pit, and (vi) reinstatement of the site after construction. Only approved borrow and quarry sites will be used by the contractors and produce copy of necessary government licenses to the client before procurement.

The mitigation plan to be followed by the Contractor at the borrow sites is: (i) only borrow areas approved by the environmental authority will be used for the project; (ii) pits management, (including restoration if it will follow the completion of certain works) shall be in full compliance with all applicable environmental standards and specifications; (iii) the excavation and restoration of borrow areas and their surroundings, in an environmentally sound manner to the satisfaction of the MoE and RD; (iv) borrow pit areas will be graded to ensure drainage and visual uniformity or to create permanent tanks/dams. Additional borrow pits, if necessary, will not be opened without the restoration of those areas no longer in use, and without the approval of MoE. Topsoil from the opening of borrow pits will be saved and reused to revegetate the pits to the satisfaction of the MoE.

General principles recommended for borrow pit and quarries management:



- Do not use borrow excavation until all suitable roadway excavation is used. Use select borrow and select topping as shown on the plans.
- Develop and restore Government located and provided borrow sources as approved by the Engineer.
- Do not excavate beyond the established limits.
- The borrow pit shall be landscaped after the excavation.

After the closure of the borrow pits, reinstatement and landscaping plan should be implemented by Construction Contractor.

Local roads will be damaged during transportation of borrow materials and by the construction equipment. In order to reduce impact on all borrow sites and local roads, contractors will water the local roads close to the settlements used by the borrow trucks and rehabilitate the local roads to their original conditions.

The measures aimed on mitigation of the dust and emission impacts, as well as potential river contamination due to improper fueling and vehicle operation, should be the same as above described pollution prevention measures, but control on this sensitive site should be more strict. Road Department and Constructing Contractor's environmental personnel should pay more attention to the quarrying site during monitoring.

The MoE and Environmental Inspectorate are in charge to control compliance of the quarrying company's performance. The Road Department will control the licenses of Construction Contractors in case they are exploring some quarries and borrow pits.

The licensed borrow pits and quarries proposed by the EIA team are described in p. 2.12.

#### **8.1.1.6 Soil Protection and Antierosion Arrangement**

##### **Topsoil Protection**

Topsoil of cultivated land used for temporary work areas will be stripped off and stockpiled, to be replaced when the construction is completed and the cultivated land rehabilitated. The top soil along the Project road will also be stripped, preserved for reuse. There may potentially be some topsoil washout due to improper storage and reinstatement. Contractors will be encouraged to minimize usage of productive agricultural land and convert them to their original state after completion of civil works. Embankments should be monitored during construction for signs of erosion; long-term material stockpiles will be covered to prevent wind erosion.

The storage of topsoil in stockpiles, no more than 2m high with side slopes at a maximum angle of 45°, will take into consideration the following:

- Dedicated storage locations that prevent the stockpiles being compacted by vehicle movements or contaminated by other materials;
- Segregation from subsoil stockpiles;
- No storage where there is a potential for flooding;
- No storage at less than 100 m from river/streams, subject to site specific topography.

Contractor will protect the stockpiles from flooding and run-off by placing berms or equivalent around the outside where necessary. Topsoil stockpiles will be monitored and should any adverse conditions be identified corrective actions will include: (i) anaerobic conditions - turning the stockpile or creating ventilation holes through the stockpile; and (ii) erosion - temporary protective silt fencing will be erected;

Topsoil removed from the construction sites will be used for reinstatement of the topsoil on the embankments or in the adjacent construction corridor affected by the project activities. Topsoil will be reinstated separately from subsoil, with care taken to avoid mixing of the materials. The topsoil reinstatement will be sufficient to restore the fertile depth to the initial conditions as judged by the topsoil strip during visual observation and comparison of the reinstated site and adjacent land. When replacing the topsoil Contractor will program the works such that the areas farthest away from the stockpiles are reinstated first with reinstatement getting progressively closer to the stockpiles, thus reducing the number of vehicle movements over the reinstated topsoil. The reinstated topsoil will then be harrowed, where practical, to protect the stability and promote vegetative growth.

### **Subsoil Storage**

The storage of subsoil in stockpiles, no more than 3m high with side slopes at a maximum angle of 60<sup>0</sup>, will take into consideration the following:

- Dedicated storage locations where the stockpiles will not be compacted by vehicle movements or contaminated by other materials; and
- Segregation from topsoil stockpiles.

In the event that the subsoil stockpiles experience significant erosion Contractor will institute corrective action such as installing erosion matting over the stockpiles.

### **Temporary Erosion Control Measures (During construction)**

The measures, by which Contractor will address the protection of “slopes” adjacent to the highway against erosion before permanent reinstatement, are outlined in this section. Temporary erosion control measures will be introduced as necessary, paying special attention to:

- Construction activities that increase the potential for erosion from the slope sides and/or sediment mobilization in watercourses;
- Straw bale barriers in locations requiring small volumes of sediment interception;

Temporary erosion control measures will be left in place until the slopes are stabilized to the approval of Road Department. The purpose of temporary erosion control measures is to:

- Interrupt surface water run-off;
- Slow the velocity of water runoff to the extent practical;
- Divert water off exposed check dam areas;
- Prevent and minimize sediment transportation off the construction sites.
- Straw bale barriers in locations requiring small volumes of sediment interception;

#### **8.1.1.7 Final Reinstatement and Long-term Anti-erosion Measures**

All the work sites (except permanently occupied by the road and supporting facilities) should be reinstated to its initial conditions (relief, topsoil, vegetation cover). So far as very limited bush clearance and no woodcutting is required for the highway upgrading, preservation of top-soil is sufficient for reinstating the natural grass vegetation cover as well. Replanting of bushes and trees is considered below in a section "Landscaping and planting of greenery".

#### **8.1.1.8 Landscape Reinstatement and Protection of Flora**

As it has been demonstrated in p. 4.4.2 there are no ecologically sensitive zones crossed by the project corridor. The design sections of the road corridor are strongly transformed landscapes and have no ecological value.

In order to protect the sensitive habitats and endangered flora species, following actions are needed:

- Preentry survey in these sensitive zones prior to construction start up, in order to quantitatively assesses the red data species presented within the zone and all trees to be felled. All possibilities, including micro-rerouting and route refining, will be utilized to avoid removal of red data species.
- Exact demarcation of those trees that are subject for felling (to exclude cutting of other trees)
- Detailed taxation of the trees to be felled needed to comply with the procedure of Excluding the Project Land parcels from the Forestry Land Fund.
- In case if the red-data tree species are damaged, removal of such species should be agreed with Moe according to legal procedures (see Annex 6) and in

addition to that compensatory planting of the species should be facilitated with the proportion of 1:10, so 10 trees should be planted instead of 1 cut tree.

All these actions should be incorporated into the Construction Contract as part of the Environmental Management Plan.

The construction Contractor and RDMRDI, based on the preentry survey data, should apply all efforts to minimize the impacts on the red list species and accordingly refine the route. Inventory of each single specimen of the red data tree species remaining under the impact after the route refining should be conducted. The extraction of the red data tree species from the natural environment should be conducted according to the requirements of the Georgian Law on Red List and Red Book. According to the EIA field studies, no red-data species fall under the impact.

Tree felling should be conducted in accordance with the procedures requiring change of category of lands attributed to the Forestry Fund. Wood and timber resources obtained as a result of tree cuttings within the projected area should be used in accordance with the Georgian legislation, particularly, envisaged by the regulation #242 of the government of Georgia, issued on August 20, 2010 concerning “affirmation of the rule for forest utilization”. The unprocessed wood resource extracted from the state forest stocks and obtained as a result of tree-cutting within areas subjected to special purpose, is stored according to species within the territory specified by the legal entity - National Forestry Agency with the purpose of further utilization;

The rule and procedures of the change of category of the State Forest Fund are implemented according to the rule of conduct approved by the order of the Minister of the Environment Protection and Natural Resources N5 (15<sup>th</sup> February, 2010) on “the The decision on the assignment of special forest use right within the State Forest Fund as well as special tree felling was made by the Ministry of the Environment Protection and Natural Resources upon agreement with other interested agencies, except for the cases as stipulated by Part 3, Article 33 of the Forest Code of Georgia (on the latter the decision is made by the Government of Georgia, while this part of the Forest Code implies the following: any change, which is aimed at the decrease of the State Forest Fund, should be well-grounded. Accordingly, the below mentioned “Ministry” and Agency responsible for this specific issues presumably imply the Ministry of Environment and Natural Resources Protection.

RDMRDI as an entity interested in special forest use applies to the appropriate Ministry. This Ministry sends the application and supplemented documents to the bodies with the right of State Forest Fund management (Ministry of Energy and Natural resources) for approval. In case of positive response the Ministry sends the full documentation to the Ministry of Economy and Sustainable development of Georgia and the Ministry of Culture and Monuments Protection of Georgia for approval and if positive response is given by these Ministries, it starts the procedure of the review of the application and relative documentation.

For the assignment of right of special forestry use within the State Forest Fund the application should contain the list of supplemented documents:

1. The motivation of the necessity of special forestry use, its goal and term;
2. For Legal Entities of Private Law and individual entrepreneurs – statement from the register of entrepreneurs and non-profit (non-commercial) legal entities, for physical persons – copy of the personal ID card of Georgian citizen or passport, for Legal Entity of Public Law – authenticated copy of founding documents;
3. Precise measuring drawing of the area selected for special forestry use in UTM coordinate system. The drawing should be authenticated by the executor of the measuring drawing;
4. Copy of the document (if applicable), according to which and proceeding from the determined activity, the implementation of special forestry use is necessary or/and needed;
5. Rationale of the necessity of tree felling;
6. Information on the presence of the species protected by the Red List within the selected area.

In case of decision on special forestry use within the State Forest Fund respective individual administrative-legal act of the Minister is issued. On the bases of this act the body with the right of State Forest Fund management signs special forestry use agreement with the stakeholder (RDMRDI) and delivers the territory selected for special forestry use with the act of delivery-acceptance. In case of the expiry of the term of the agreement (or termination) the forest user returns the territory selected for special forestry use to the incumbent body with the act of delivery-acceptance.

If wood processing is required during special forestry use, the trees to be felled are marked by the stakeholder and assigned by the body with the right of State Forest Fund management.

The Rule of extraction of the red data tree species and Rules of Assigning Category of Special Purpose to State Forest Fund” are given in annex 6.

#### **8.1.1.9 Protection of Fauna**

##### **Construction Phase Mitigation Measures:**

Potential impact on ichthyofauna is related to the possible pollution of the river Supsa by increased sediment runoff during earthworks and contamination due to improper fuel and waste management. Accordingly, antierosion and pollution prevention measures discussed above are considered as measures mitigating impacts on ichthyofauna.

Pollution prevention and fuel spill response measures are important to prevent pollution of the channels crossed by the road. The drainage channel following in parallel with the road should be connected with the simple oil/water segregation catchment to enable periodical clean up of fuel contaminated storm water.

Preentry survey within the road corridor should be conducted by construction contractor in order to check existence of bird nests or holes and diggings of animals. Neither home range in construction corridor should not be damaged or disturb without survey and allowances of experts. It had to carry out the field research to locate of borders of individual sites (home range) of animals for applying preventive measures before the start up of construction works. The field research should be carried out after the demarcation of the construction corridor, but before of any preparation of area to work (land clearing and etc). In case if the nests of protected birds, waterfalls, bats or small animals are identified, the “smooth” methods of scaring off should be applied (e.g. acoustic methods for bats) before the start up of construction works. The scarring off activities should be carried out with the participation of qualified zoologist. The requirements should be included in detailed construction program.

Mitigation measures would be required to prevent low probable and small scale impacts on bats during demolition of any existing infrastructure elements and buildings. The structures must be inspected by qualified ecologists and “soft methods” of deterrence should be applied to scare off the detected bats, bird species or small animals.

Artificial shelters (in 100-300 m) should be arranged instead of the shelters of birds and mammals on the cut trees.

Pits, trenches and similar should be limited by some barrier to prevent falling of animals into them – i.e. large band of color distinctive to the species, any flat material for small animals: tin, polyethylene, etc. Long boards or logs should be put in pits and trenches at night so that small animals are able to get out. Pits and trenches should be checked prior to land filling

Noise, emission and dust minimization actions, as well as prevention of poaching by the workers should be included in the EMP as mitigation procedures.

Impacts related to road operation will be permanent and can be partly mitigated.

Construction of underground passages for small animals is sometimes applied. The underpasses and culverts incorporated in design are sufficient for that purpose.

#### **8.1.1.10 Protection of the cultural heritage**

Despite the fact that the project footprint is mostly limited to the existing road and construction sites are not located near any known subterranean monuments or areas of an archeological interest, destruction of archeological layers during the construction process is possible (although unlikely). To avoid this risk, archeological supervision during the earth-works is necessary. Supervisory procedures and all other necessary measures should be agreed with the Ministry of Culture when obtaining the construction permit, in accordance with the rules of the permit issuance. According to the article 14 of the Law on Cultural Heritage, Permit on conducting quarrying activities in Georgia, as well as construction of an object of a special importance as it may be defined under

the legislation of Georgia, is issued by a competent authority based on the positive decision of the Ministry of Culture, Monument Protection and Sport of Georgia. The basis for the conclusion is the archeological research of the proper territory to be carried out by the entity wishing to accomplish the ground works. The entity wishing to do the earth-works is obliged to submit the Ministry the documentation about the archeological research of the territory in question. The preliminary research should include field-research and laboratory works. In case of identifying an archeological object on the territory to study, the conclusion of the archeological research should contain the following information: (a) a thorough field study of the archeological layers and objects identified on the study territory by using modern methodologies, (b) recommendations about the problem of conservation of the identified objects and planning of the building activity on the design territory, on the basis of the archeological research. According to the established practice, the archaeological studies are conducted under the detailed design contract at the stage of obtaining the Construction Permit.

At the construction stage archaeological monitoring should be ensured by the constructing contractor under the supervision of the Ministry of Culture, Monument Protection and Sport of Georgia. The budget necessary for the archeological supervision and other agreed works should be fixed under the construction works appraisal.

#### **Chance Finds Procedure:**

Construction Contractor engages 1 especially dedicated archaeologist (archaeological supervisor) for conducting daily supervision activities during the earthwork operations. Good practice is to agree the candidature of person assigned for that task with the Ministry of Culture and Monument Protection.

The Ministry of Culture and Monument Protection may also assign a person or company for periodical supervision of construction works, although this is practiced only in exclusive cases of sensitive projects.

Archaeological supervisor conducts daily monitoring at all construction sites, where the earthworks (land clearance; grading; excavations etc.) are planned according to the schedule.

391. Besides that, archaeological supervisor instructs the workers to report him immediately in case of any chance finding of potential archaeological relics.

In case of finding any artifacts of potential archaeological value, following steps are taken:

1. Construction workers are obliged to stop works and immediately report to the Archaeological Supervisor.
2. Archaeological supervisor reports to the Chief Engineer at site and requests to stop activities at the site of finding. Archaeological supervisor executes first checking of the finding and the site where finding was made

3. In case the finding has no potential archaeological value, the Archaeological Supervisor reports to the Chief Engineer and the works are restarted. Appropriate record regarding the case is made in record book.
4. In case if the finding is estimated as potential archaeological relic, the Archaeological Supervisor reports to Chief Engineer of the Construction Contractor and to MDF Environmental Specialist (and supervising company / Engineer) requesting to stop construction activities and to inform the Ministry of Culture and Monument Protection about the incident.
5. Chief Engineer of the Construction Contractor also reports to MDF informing about the stopped operations and requesting immediate engagement of the Ministry of Culture and Monument Protection.
6. Ministry of Culture and Monument Protection will assign expert or group of experts and conduct necessary archaeological works at the site to identify the problem.
7. In simpler cases, after removal of the movable artifacts, fixing materials and conducting other required works, the experts of the Ministry of Culture and Monument Protection will issue decision on recommencement of stopped construction works.
8. In exclusive cases of valuable and spatially spread findings, the Ministry of Culture and Monument Protection may issue request to relocate the RoW shifting it on a safe distance from the archaeological site.

#### **8.1.1.11 Protection of the Infrastructural Elements**

During the mobilization and preconstruction stage required activities are planned to remove the existing local transmission lines and other minor infrastructure elements.

The mentioned above works correspond to content and scope of repair / rehabilitation works and should not require the separate EIA report; moreover, environment impacts related to the described work and the appropriate mitigation measures are given in the presented EIA (see). In case provided by the environment permission, preparation of additional EIA reports for the mentioned above sub-projects will be still required, these conditions will be reflected in the agreement of the construction contractor who should complete the details of the denoted sub-projects and carry out transfer works.

All of these infrastructural systems should be uninterruptedly functional during and after completion of construction activities. Permanent monitoring is required to avoid damage of the infrastructure systems, which are not removed. All the damaged systems should be reinstated.

Relocation, replacement and rerouting of all utilities located on the Project:

- The contractor is responsible for working closely with any utility company having their infrastructure located within the public right-of-way.



- Before any construction is begun the Contractor shall notify the utility companies of the proposed work area and request that they mark the location of any types of equipment in the area.
- The Contractor shall establish the position of existing services such as pipelines, sewers, surface water drains, cables for electricity and telephones, overhead lines and water mains, before starting any excavation or other work likely to damage them.
- The Contractor shall be responsible for arranging in liaison with the appropriate Authority, the moving of or alterations to services such as pipelines, power and telephone lines, water mains, sewers and surface water drains which are affected by the Works. The arrangements for such moving or alteration shall be subject to the agreement of the Engineer and the appropriate Authority.
- The Contractor is responsible for any and all damage caused to any utility during construction and shall repair them with his equipment or, if the utility company desires, they shall be allowed a free use of his equipment and personnel as required in order to complete repair works.
- Should the utility company chose to repair the damaged utility themselves costs incurred shall be the responsibility of the Contractor.
- If any utility equipment is encountered in the proposed work area the Contractor shall submit to the Engineer for approval his proposal to relocate the utility outside the construction limits in writing. This proposal shall include, but not be limited to the proposed duration of the works, plans and details of a new utility route, materials to be used, together with any required certification that the material meets the utility company's specification and details of protection methods to be used for any utility materials to be left in place. After the utility has been rerouted the interested utility company shall be notified to inspect the work prior to commencing the backfill operation.

#### **8.1.1.12 Health and Safety**

It is required to observe safety measures, industrial sanitation and fire precaution measures and instructions whilst performing the works, as well as to train the staff. The Contractor is required to instruct the staff on safety measures prior to the commencement of works.

Road vehicles shall have small turning radius, equipped with sound signals and light signals which should be in good operating conditions. Parking place shall be fenced with barriers and equipped with red signals of emergency stop during the day and with red signal floodlight at night.

Roadmen shall be provided with special uniforms and special footwear. It is required to observe overall safety measures such as fencing of work site, various safety activities.

The Contractor should ensure special shelter for protecting workers from unfavorable weather conditions.

Alternate access will be provided for vehicles and pedestrians. Appropriate lighting and signs will be employed.

The Contractor is responsible to perform the works in accordance with labor protection and safety requirements as well as industrial sanitation requirements.

### **8.1.1.13 Complex of Ancillary Facilities (Concrete Plant, Camp, Vehicle Fleet)**

#### **General information**

In order to efficiently organize the works, it is necessary to build the auxiliary buildings and premises to be designed and built by the contractor.

In line with the legislation of Georgia, they are not subject to the environmental permit. Designing on the selected territory must be undertaken under the following normative documents effective in Georgia:

- Resolution No. 57 of the Government of Georgia of March 24, 2009 “About the rule of issuance of a building permit and terms of permit”.
- Decree No. 1-1/1254 of the Minister of Economic Development of Georgia of July 8, 2009 “Relating the approval of the principal provisions to regulate the use and accommodation of the territories with settlements”.
- Decree No. 1-1/251 of February 18, 2010 of the Minister of Economics and Sustainable Development of Georgia “On the use of the norms, rules and other of documents of technical regulation in the field of technical supervision and construction on the territory of Georgia effective before 1992”.
- SNiP2.07.01.–89 Urban planning
- SNiP2.08.02.–89 Public buildings and premises
- SNiP2.09.03.–85 Premises of the industrial enterprises
- SNiP2.09.04.–87 Administrative and domestic buildings.

The complex of auxiliary buildings includes a living camp, fleet and concrete plant.

#### **Asphalt Plant**

The civil works Contractor has a choice to install its own asphalt plant or to use materials provided by other licensed suppliers. In case if the Contractor takes decision to install asphalt mixing plant, relevant EIA should be developed and the environmental permit on plant operations should be obtained.

The technical report of inventory and norms of maximum allowable emissions for the air polluting sources and harmful substances emitted from them, which is the

supplementary document for the EIA package, will be drafted and agreed with relevant bodies. When building the object, the requirements of the following normative documents must be taken into account:

- SNiP 2.09.03.–85 “Premises of industrial enterprises”
- Georgian Law “On the protection of atmospheric air”
- Decree No. 704 of the Minister of Environment Protection and Natural Resources of Georgia of October 20, 2008 “On approving the provision about the rule of inventory of the stationary sources of atmospheric air pollution”
- Decree No. 705 of the Minister of Environment Protection and Natural Resources of Georgia of October 20, 2008 “On the method to calculate the maximum allowable emissions and/or temporarily agreed emissions of harmful substances in the atmospheric air”.

### **The Worker’s Camp**

The camp has an office, living, domestic and catering units.

When building the living camp, drinking and domestic water-supply should be considered. A pipe or pit well can be made on the selected territory and the camp can be supplied with fresh underground water. In line with the effective legislation, an underground water intake license is necessary for this purpose.

A reserve reservoir will be arranged on the territory supplying the camp units with water by gravity.

The waste waters will be collected in the sewage system on the camp territory and discharged via a common collector from the camp area.

The waste waters will be polluted with organic substances and therefore will need biological treatment. A technically relatively simple premise, a septic is to be provided to treat the waste waters.

A septic is a premise, where the mechanical and biological treatment of waste waters and sludge mineralization take place at the same time. After the septic, the waste water will be disinfected and discharged into the surface water facility.

A waste container for domestic waste will be placed on the camp territory. The waste will be removed from the camp site under the agreement concluded with local services.

The requirements of the following normative documents must be considered when arranging the unit:

- Georgian Law “On water”;
- Georgian Law “On ore deposits”
- Georgian Law “On permits and licensing”

- Decree No. 745 of the Minister of Environment Protection and Natural Resources of Georgia of November 13, 2008 “On the technical environmental regulation”
- Construction Regulation Standards Building Code (MTS 07.01-09) - “Water supply and sewerage outer networks and premises”
- Construction Regulation Standards Building Code 2.1.4. 000 – 00 “Drinking water and water-supply of settled areas”
- Construction Regulation Standards Building Code 2.04.01–85 “Internal water pipeline and sewerage norms”
- Construction Regulation Standards Building Code 3.0.01–85 “Internal sanitary-technical systems”
- Construction Norm 496–77 “Temporal instruction to design the surface waste water treatment plants”.

### **Vehicle Fleet Depot**

The fleet includes a car park and repair boxes for construction techniques.

The tanks to collect the broken-down car parts will be placed on the territory of the repair boxes, in particular the metal boxes for oily parts, reservoirs for amortized tires and other polyethylene or rubber parts; the given remains will be removed from the territory under the agreement with local services. Plastic reservoirs will be placed for used oils and other oil product residues, and the contractor will be made responsible for their removal from the territory and rendering them harmless.

In order to avoid the expected risk of pollution of the soil or water reservoirs with oil products, the territory of the fleet will be flattened and a storm water collection system will be provided.

There is a risk of the storm waters pollution with suspended materials and oil products and therefore, the oil products retaining unit for the collected storm waters will be provided.

The amount of storm waters is calculated by the following formula:

$$Q=10 \times F \times H \times K$$

where Q is the volume of storm water, m<sup>3</sup>/day (m<sup>3</sup>/year)

F is the area of the territory, ha

H is the amount of precipitations, mm and is taken from the existing literary sources

K is the coefficient, which depends on the type of the cover.

According to the volume of storm waters, the treatment plant calculations will be made.

When building the unit, the requirements of the following normative documents must be taken into account:

- Georgian Law “On water”
- Building Norm 496-77 “Temporal instruction to design the surface waste water treatment plants”
- SNiP 2.11.04.–85 – “Underground reservoirs for oil, oil products and liquid air”
- Decree No. 1-1/2935 of the Minister of Economic Development of Georgia of December 8, 2008 “On gas filling stations and approving the rules of safety of gas filling complexes”.

The selection of the location and size of a camp is the contractor’s prerogative and responsibility, but the interaction between the construction staff and the environment and local population must be considered.

During the territory selection, an important factor was that the design route is divided into two with the crossings of the river Rioni, and besides, the areas along Rioni crossing-Lanchkhuti section are wet and often almost bogged.

By considering the above-mentioned, the camp was decided to make on a former industrial polygon, north of Lanchkhuti (See Figure 8.1 and Picture 8.3), which was leveled in the past and is equipped with filtering channels (around coordinates 255183/4665710)

**Waste Management Plan for Construction Camp is given in annex 7. Here below we provide brief summary.**

The following categories of waste are expected during object exploitation:

- Household waste;
- Office waste (paper, cartridges, bulbs, etc.);
- Packaging (wood, paper, etc.);
- Oil contaminated clothes, filters, absorption pillows;
- Oil contaminated soil;
- Polymer waste;
- Medical waste.

The amount of household waste produced during plant functioning is connected with the staff number. According to the preliminary data, up to 200 people shall be employed. Following the accepted norm, 0.70 m<sup>3</sup> of household waste is produced per employee annually. Proceeding from the above, the amount of household waste per year will be: 0.70 X 200 = 140 m<sup>3</sup>. The installation of closed containers is planned for household waste at the object. The removal of this waste and disposal at the grounds will be conducted on the basis of the contract with the municipal cleaning service.

Oil contaminated mass as well as other hazardous waste shall be temporarily allocated within the plant in accordance with environmental and hygienic requirements and

proceeding from the collection passed to the organization with appropriate environmental impact permit for further processing/disposal/treatment.

Wooden packaging material shall be passed to the local population for further re-use.

**The management of waste produced at the object (classification, inventory, segregation, collection, storage, passing and transportation) and monitoring shall be conducted in accordance with the principles, procedures and rules described in Annex 7.**

#### **8.1.1.15 Resume**

Commitment of Construction Contractor to adhere the environmental management requirements described in the present EIA should be incorporated into the contract (e.g. the present EIA or only EMP could be attached as annex and essential part of the contract).

The Constructing Contractor is obliged to assign environmental specialist for managing environmental issues and produce Contractor's Implementation Plan (based on the present EMP) with further description of details (schedule, involved personnel, required resources etc.).

The offset tree planting project (if required and as requested by MoE) should be elaborated by constructing contractor and relevant costs should be reflected in the overall construction budget. Offset tree planting Plan should be included in the final EMP (Contractor's Implementation Plan). The final version of the plan should be agreed with the Road Department.

**Only legally registered suppliers having all required permits and licenses will be used.** This is relevant to the borrow pit operators, as well as to the other material suppliers. Checking of compliance with the permit and license requirements is the only way that the project may have influence and mitigate impacts related to the suppliers' operations. In case if the constructing company decides to explore borrow pits, appropriate licenses should be obtained from the MoE. The constructing contractor may take decision to install concrete mixing plants to produce concrete for their operations. In that case special EIA and obtaining of the Environmental Impact Permit is not required, however the contractor should be in compliance with the Technical Regulations.

#### **8.1.2 Mitigation of Long-term and Operation Related Impacts**

Here we would mention the mitigation measures to be implemented at operational stage. Most of these measures (predominantly maintenance works) should be implemented by Road Department utilizing funds from the state budget, lawns, grants and other financial sources.

**Erosion and land stability control and landscaping.** Road Department should ensure permanent erosion and land stability control and monitoring of landscape restoration after completion of construction works, as well as timely implementation of corrective actions. Corrective actions include, but are not limited to maintenance of drainage systems and implementation of anti-erosion measures (breams, vegetation cover etc.) whenever required.

**Roadside litter and fuel pollution.** RDMRDI should coordinate with the local Governmental institutions and private companies and facilitate arrangement and proper functionality of supporting facilities and services (fueling stations, waste management services)

**Air emissions, noise and pollution during the maintenance works.** RDMRDI should ensure incorporation of environmental considerations in the maintenance contracts and monitor implementation.

**Landscaping and planting of greenery.** In a long-term perspective and in relation with the entire length of highway RDMRDI should plan development of the roadside zone applying proper landscaping and greenery planting strategies. Visual and aesthetic, as well as emission screening aspects should be taken into consideration.

**Protection of Fauna.** Impacts related to road operation will be permanent and can be partly mitigated. Construction of underground passages for small animals is sometimes applied. The underpasses and culverts incorporated in design are sufficient for that purpose.

**Prevention and mitigation of accident risks associated with vehicular traffic and transport, which may result in spills of toxic materials injuries or loss of life Emergency preparedness.** RDMRDI in conjunction with the Ministry of Interior (Department for Managing Emergency Situations) should facilitate development of legislation and emergency response plans regulating transportation of hazardous materials. The system of measures may include but not limited to:

- Design and implement safety measures and an emergency plan to contain damages from accidental spills.
- Designate special routes for hazardous materials transport.
- Regulation of transport of toxic materials to minimize danger.
- Prohibition of toxic waste transport through ecologically sensitive areas.

The abovementioned measures and plans should be elaborated in accordance with the Law of Georgia on Hazardous Substances and Regulations of the MoE on “Norms of Usage of Chemicals in the Environment and Rules of Transportation, Storage and Usage of Chemicals”. Regulations of other countries (e.g. Order of the Minister of Transport of Russia # 73 issued 08.08.1995 as amended in 1999) could be used as supporting materials.

### **Prevention of Proliferation of Human, Animal and Plant Diseases.**

The Customs Services, the National Center for the Disease Control and Medical Statistics (NCDC) and the “National Service for the Foodstuffs Safety, Veterinary and Plant Protection” of the Ministry of the Agriculture are responsible entities to prevent proliferation of human, animal and plant diseases due to transportation of people and goods.

## **8.2 Monitoring and enforcement**

### **Institutional Framework for EMP Implementation**

Construction contractor is obligated to follow EMP and good construction practice. In order to meet this obligation, a contractor shall have at least one environmental specialist on the team, who is able to fully understand recommendations of EMP and professionally apply prescribed mitigation measures to the contractor’s daily operations.

Technical supervisor of works commissioned by RDMRDI is responsible to establish strong field presence in the Project area and keep a close eye on the course of works. Along with ensuring consistency with the design and ensuring quality of works, the supervisor is mandated to track implementation of EMP by the contractor, reveal any deviations from the prescribed actions, as well as identify any unexpected environmental issues should they emerge at any stage of works.

RDMRDI provides a general oversight on the environmental compliance of works through ensuring quality performance of the technical supervisor and of the contractor. RDMRDI also liaises with the World Bank, ensures availability of all environmental information, and facilitates environmental supervision of the Project by the World Bank.

Ministry of Environment is not obliged to carry out permanent monitoring but the Environmental Inspection of MoE, as well as similar structures in Ministry of Energy and Natural Resources, has legal right and competence to perform inspections of construction activities on compliance with the Environmental Expertise conditions and licenses for quarrying.

### **Reporting on EMP Implementation**

Contractor, through the environmental specialist on the team, shall prepare monthly status reports on the EMP implementation. Such reports must carry information on the



main types of activities carried out within the reporting period, status of any clearances/permits/licenses which are required for carrying out such activities, mitigation measures applied, and any environmental issues emerged in relations with suppliers, local authorities, affected communities, etc. Contractor's monthly status reports shall be submitted to the technical supervisor and RDMRDI.

Technical supervisor prepares monthly reports on the status of EMP implementation and environmental performance of the contractor. These reports shall be based on the contractor's reports and carry analysis of their contents. Technical supervisor shall assess how accurate is the factual information provided in the contractor's reports, fill any gaps identified in them, and evaluate adequacy of mitigation measures applied by contractor. Technical supervisor must highlight any cases of incompliance with EMPs, inform on any acute issues brought up by contractor or revealed by supervisor himself, and propose corrective actions.

RDMRDI must ensure that monthly reports from the contractor and from the technical supervisor are made available for the environmental specialists of the Department promptly upon their arrival in RDMRDI administration. The Department, through its environmental specialists, shall report each semester to the World Bank on the status of environmental compliance of construction works. Such reporting shall contain information on all violations identified and the actions taken for fixing of such cases. RDMRDI shall inform the World Bank on any major environmental issues at any time, independently from the schedule of regular reporting.

### **Remedies for EMP Violation**

RDMRDI, as a client of construction works, will be responsible for enforcing compliance of contractor with the terms of the contract, including adherence to the EMP. For minor infringements, an incident which causes temporary but reversible damage, the contractor will be given 48 hours to remedy the problem and to restore the environment. If restoration is done satisfactorily during this period, no further actions will be taken. If it is not done during this period, RDMRDI will arrange for another contractor to do the restoration, and deduct the cost from the offending contractor's next payment. For major infringements, causing a long-term or irreversible damage, there will be a financial penalty up to 1% of the contract value in addition to the cost for restoration activities.

### **Institutional Capacity of RDMRDI**

Within RDMRDI, in the Department of Technical Policy (Design) there is Environmental Protection Unit. Currently, besides the head of the Unit there are two environmental specialists in this staff, who received professional on-the-job training as a part of the World Bank's technical assistance to the RDMRDI. Current environmental capacity of the RDMRDI needs strengthening to ensure full environmental compliance of the Project. Although day-to-day quality control of works will be outsourced to the

engineering supervisor of works, RDMRDI should have in-house human resources to oversee performance of such technical supervisor and to work out decision to address issues which the supervisor may bring up for RDMRDI's attention.

### **8.3 Costs of Implementation**

The costs of environmental activities associated with the construction will be included in the contract for construction.

Costs of constructing 800m length noise barriers should be considered by Constructing Contractor.

Costs of spoil and rock disposal is variable and could not be precisely defined before elaboration of the concrete plan. However, due to extremely low amount of spoil and need of spoil and rock materials for embankment and dike construction, these expenses are considered as negligible.

Additional archaeological studies may be required for obtaining Construction Permit. Possible need for financing these studies should be considered under the "design and build" contract.

Some not significant expenses are foreseen with respect to the following public consultation on the EIA and EMP and will be borne by the Roads Department.

In case if the red-data tree species are damaged, compensatory planting of the species should be facilitated with the proportion of 1:10, so 10 trees should be planted instead of 1 cut tree.

**The permanent expenses during construction are associated with the need to hire environmental and H&S specialists. Related costs are approximately 60,000 Gel annually.**

## 8.4 Environmental Management Plan

### Mitigation Measures to be Implemented During the Construction Phase

Impacts	Sites	Mitigation Measures/Costs	Timeframe	Responsibility for Implementation	Responsibility for Monitoring
<p>Destruction of natural landscape (relief, soil cover, vegetation, eco-systems, habitats and wildlife) in the Right-of-Way occupied by the highway.</p> <p>Activities: land clearance, topsoil stripping and excavations</p>	Whole alignment of road construction	<p>Pre-entry survey for preventing damage to fauna will be conducted prior to start up of land clearance (inspection of bat living sites; inspection of nests in RoW)</p> <p>Sticks will be installed in pits and trenches for escaping small mammals.</p> <p>Proper top-soil storage practice, as described below, will be applied and stored topsoil will be used for reinstatement and landscaping;</p> <p>Compensatory planting of the red data tree species (oak etc.) should be facilitated with the proportion of 1:10;</p>	<p>prior to start up of land clearance</p> <p>Excavation period</p> <p>From land clearance – till reinstatement</p> <p>Develop planting plan before construction start up.</p> <p>implement before completion</p>	Constructing Contractor	<p>RDMRDI</p> <p>Inspectorate of MoE</p>
<p>Destruction of natural landscape (relief, soil cover, vegetation, eco-systems, habitats and wildlife) on the access roads, in the <b>borrow pit</b> sites, <b>waste dumps</b>,</p>	<p>Camp site;</p> <p>Quarry sites; (e.g. r. Supsa and Rioni floodplain).</p>	<p>Pre-entry survey will be conducted for preventing damage to flora and fauna;</p> <p>In case of unavoidable impact on rare or protected species of flora, replanting program will be planned and executed;</p> <p>Sticks will be installed in pits and trenches</p>	<p>prior to start up of land clearance</p> <p>Excavation period</p> <p>From land</p>	Constructing company.	<p>RDMRDI</p> <p>Inspectorate of MoE</p>

Impacts	Sites	Mitigation Measures/Costs	Timeframe	Responsibility for Implementation	Responsibility for Monitoring
<p><b>construction camps and equipment yards.</b></p>	<p>Waste dumps, construction camps and equipment yards.</p>	<p>for escaping small mammals</p> <p>Proper top-soil storage practice, as described below, will be applied and stored topsoil will be used for reinstatement and landscaping;</p> <p>Landscaping plan will be developed and implemented;</p>	<p>clearance – till reinstatement</p> <p>After completion of civil works</p>		
<p>Lateral erosion of river bank</p>	<p>channel network and r. Sups near the estuary</p>	<p>Construction of the dike with riprap revetment is incorporated in Design. Contractor should construct the dike according to this design.</p>	<p>Construction period</p>	<p>Constructing company.</p>	<p>RDMRDI</p> <p>Inspectorate of MoE</p>
<p>Erosion stimulated from fresh road cuts and fills and temporary sedimentation of natural drainage ways.</p> <p>Erosion of lands below the road bed receiving concentrated outflow from covered or open drains.</p>	<p>Along the whole section of the road</p>	<p>Permanent and temporary anti-erosion measures will be implemented according to the Detailed Design (temporary drainage, biomatting or geo -textile cover, breams etc.)</p> <p>For mitigation of sedimentation impact following measures will be implemented:</p> <ul style="list-style-type: none"> <li>- Limitation of earth moving to dry periods.</li> <li>- Protection of most susceptible soil surfaces with mulch.</li> <li>- Protection of drainage channels with breams, straw or fabric barriers.</li> <li>- Installation of sedimentation basins</li> </ul>	<p>Construction period</p>	<p>Constructing Contractor</p>	<p>RDMRDI</p> <p>Inspectorate of MoE</p>

Impacts	Sites	Mitigation Measures/Costs	Timeframe	Responsibility for Implementation	Responsibility for Monitoring
		<p>For mitigation of induced erosion following measures will be implemented:</p> <ul style="list-style-type: none"> <li>- Appropriate sized rain-storm-water channels will be constructed.</li> <li>- Drain outlets designed so as to avoid cascade effect.</li> <li>- Provision for cross drainage structures will be made.</li> </ul> <p>Water receiving surfaces to be lined with stones, concrete.</p>			
<p>Increased suspended sediment in streams affected by erosion at construction sites and fresh road cuts, fills and waste dumps. Declined water quality and increased sedimentation</p>	<p>channel network and r. Sups near the estuary</p>	<p><b>Mitigation strategy:</b> prevention through implementing temporary anti-erosion measures – temporary drainage, temporary sediment catchments etc.</p> <ul style="list-style-type: none"> <li>- Protect susceptible surfaces with r fabric,</li> <li>- Establishment of retention ponds to reduce sediment loads before water enters streams</li> </ul>	<p>Construction period</p>	<p>Constructing Contractor</p>	<p>RDMRDI  Inspectorate of MoE</p>
<p>Topsoil losses due to improper storage and handling  Earthworks will impact the</p>	<p>Whole alignment: the sections of road;</p>	<p>The Contractor shall</p> <ul style="list-style-type: none"> <li>- Strip the top soil to a depth of 15 cm and store in stock piles of height not exceeding 2m and with a slope of 1:2</li> <li>- Spread the topsoil to maintain the</li> </ul>	<p>Construction period: starting from topsoil stripping and ending with reinstatement;</p>	<p>Constructing Contractor</p>	<p>RDMRDI  Inspectorate of MoE</p>

Impacts	Sites	Mitigation Measures/Costs	Timeframe	Responsibility for Implementation	Responsibility for Monitoring
fertile top soils that are enriched with nutrients required for plant growth or agricultural development		<p>physico-chemical and biological activity of the soil. The stored top soil will be utilized for covering all disturbed area and along the proposed plantation sites</p> <ul style="list-style-type: none"> <li>- Topsoil stockpiles will be monitored and should any adverse conditions be identified corrective actions will include: <ul style="list-style-type: none"> <li>• Anaerobic conditions - turning the stockpile or creating ventilation holes through the stockpile;</li> <li>• Erosion - temporary protective silt fencing will be erected;</li> </ul> </li> </ul>			
<p>Soil and surface water contamination by oil, lubricants, fuel and paint in the RoW, bridge sites and equipment yards caused by construction activities and operation of construction equipment;</p> <p>Materials used in construction have a potential to be a source of contamination. Improper</p>	<p>Soil - the whole alignment;</p> <p>channel network and r. Sups near the estuary</p>	<p>The Contractor shall</p> <ul style="list-style-type: none"> <li>- Prepare spill control procedures and submit the plan for RD approval.</li> <li>- Train the relevant construction personnel in handling of fuels and spill control procedures.</li> <li>- Store dangerous goods in bounded areas on a top of a sealed plastic sheet minimum 100 m away from watercourses. Do not store any hazardous waste in the in the restricted areas, which include</li> </ul>	Construction period	Constructing Contractor	<p>RDMRDI</p> <p>Inspectorate of MoE</p>

Impacts	Sites	Mitigation Measures/Costs	Timeframe	Responsibility for Implementation	Responsibility for Monitoring
<p>storage and handling of fuels, lubricants, chemicals and hazardous goods/materials on-site, and potential spills from these goods may harm the environment or health of construction workers.</p>		<ul style="list-style-type: none"> <li>• within 100m from the banks of r Supsa or other streams</li> <li>• within 500m from any residential areas, cultural or archaeological sites</li> </ul> <p>- All refueling operations on the working sites will use absorbent pads and/or straw to minimize spills, which will be put in place prior to the commencement of refueling operations. Ground water and surface water pollution risk will be reduced or eliminated in case of immediate removal of polluted ground. Soiled ground and absorbents will be removed, stored and treated as hazardous waste. In case of significant spill authorized and responsible person will be informed, works will be stopped till the elimination of pollution risk Refueling will always be carried out with the correct equipment (i.e. nozzles of the appropriate size), and only by suitably trained and experienced Refueling Operators.</p>			
<p>Construction waste generation alongside the RoW :</p>	<p>Construction sites</p>	<p>Assess and, if required, develop spoil and rock disposal plan</p> <p>Use spoil and excess rocks for</p>	<p>Mobilization stage</p>	<p>Constructing Contractor</p>	<p>RDMRDI</p> <p>Inspectorate of</p>

Impacts	Sites	Mitigation Measures/Costs	Timeframe	Responsibility for Implementation	Responsibility for Monitoring
<ul style="list-style-type: none"><li>- Excess soil and rock, demolished structures, packaging materials etc.)</li> <li>- Concrete and metal constructions</li></ul>		<p>construction of embankments and dike with riprap revetment.</p> <p>Provide for disposal facilities agreed with local municipalities;</p> <p>Allow local communities to utilize any excess rock, which may be left following reuse.</p> <p>Transport any further material to the nearest spoil disposal sites agreed with the municipal services. The main purpose is not to damage valuable landscapes or soil deposits and other ecological sensitivities.</p> <p>Demolished metal constructions should be disposed as a scrap.</p> <p>The personnel involved in the handling of hazardous and non-hazardous waste will undergo specific training in:</p> <ul style="list-style-type: none"><li>- Waste handling</li><li>- Waste treatment; and</li><li>- Waste storage.</li></ul> <p>Burning of waste on any construction site is forbidden with the exception of stub and small branches from felled trees and bushes, which is better to be burned in</p>	<p>Construction period</p>          <p>Construction period</p>          <p>Mobilization phase and Construction period</p>	<p>Constructing Contractor</p>	<p>MoE</p>



Impacts	Sites	Mitigation Measures/Costs	Timeframe	Responsibility for Implementation	Responsibility for Monitoring
		order to avoid pest dissemination.			
Emission from Construction Vehicles & Equipments causing air pollution	the whole alignment  near and v. Sups, Khidmagala, Grigoleti	<ul style="list-style-type: none"> <li>- Emission levels of all construction vehicles &amp; equipment will conform to Georgian emission standards.</li> <li>- Any crushing &amp; concrete plants will be away from populated areas.</li> <li>- Adherence to engine maintenance schedules and standards &amp; repair</li> <li>- All vehicles and plants shall be maintained so that their emissions do not cause nuisance to workers or local people.</li> <li>- Regular maintenance of diesel engines will be undertaken to ensure that emissions are minimized, for example by cleaning fuel injectors. Routine maintenance will be to a high standard to ensure that vehicles are safe and that emissions are minimized.</li> <li>- Vehicle refueling will be undertaken so as to avoid fugitive emissions of volatile organic compounds through the use of fuel nozzles and pumps and enclosed tanks (no open containers will be used to stored fuel).</li> </ul>	Construction period	Constructing Contractor	RDMRDI

Impacts	Sites	Mitigation Measures/Costs	Timeframe	Responsibility for Implementation	Responsibility for Monitoring
<p>Dust generation from construction sites, material stockpiles and access roads.</p> <p>Dust is a nuisance in the environment causing health impacts for workers and local population;</p>	<p>The whole alignment near and v. Sups, Khidmagala, Grigoleti</p>	<ul style="list-style-type: none"> <li>- All precautions to be taken to reduce dust level emissions from batching plants &amp; portable crushers with spraying of water and containment measures.</li> <li>- During dry conditions material delivery vehicles and haul vehicles carrying sand and fill material will be covered with tarpaulin. The construction site and any local roads will be watered as appropriate.</li> <li>- Protective equipment to be provided to workers as necessary e.g. at quarries, stone crushers.</li> <li>- Use of defined haul routes and reductions in vehicle speed where required with appropriate traffic management planning</li> <li>- Sheeting of construction materials and storage piles; and</li> </ul>	<p>Construction period</p>	<p>Constructing Contractor</p>	<p>RDMRDI</p>
<p>Noise pollution from vehicle operation during construction in populated areas traversed by the highway, notably metropolitan areas or densely settled rural areas.</p>	<p>Near v. Sups, Khidmagala, Grigoleti</p>	<p>Install two 400m length sections of noise barriers near v. Akhalsopeli – between Km 21 -23</p> <p>Install and maintain mufflers on equipment.</p> <p>Routine maintenance will be to a high standard to ensure that vehicles are safe</p>	<p>Construction period</p>	<p>Constructing Contractor</p>	<p>RDMRDI</p>

Impacts	Sites	Mitigation Measures/Costs	Timeframe	Responsibility for Implementation	Responsibility for Monitoring
Local noise.		and that emissions and noise are minimized. All plant used on site will be regularly maintained so as to be in good working order at all times to minimize noise.  Prohibit night works near the settlements			
Creation of temporary breeding habitats for mosquito vectors of disease e.g. sunny, stagnant pools of water. Creation of stagnant water bodies in borrow pits, quarries, etc. suited to mosquito breeding and other disease vectors.	whole alignment	Remove all created pools till spring-time. Reinstate relief and landscape.	Construction period	Constructing Contractor	RDMRDI
Health hazards by noise, air emissions and dust raised and blown by vehicles during construction activities.	Near v. Sups, Khidmagala and Grigoleti	Dust control by application of watering. Use as minimum as 2 browsers;  Noise control, installation of mufflers on equipment, daytime works;  See points 11 - 13	Construction period	Constructing Contractor	RDMRDI
Impacts on archaeological sites and remnants	Whole alignment,	Permanent monitoring during land clearance and excavation activities.  Stoppage and suspension of construction activities in case of archaeological findings. Completion of required archaeological works before restarting	Before start up of construction;  Construction	Archaeologist from CAS  Constructing Contractor	RDMRDI  Archaeologist from CAS

Impacts	Sites	Mitigation Measures/Costs	Timeframe	Responsibility for Implementation	Responsibility for Monitoring
		construction activities. Conservation of remnants.	period		
Biological recontamination during earthworks near pest-holes of soil infections (e.g. anthrax);	Whole alignment,	Permanent monitoring during land clearance and excavation activities. Stoppage and suspension of construction activities in case of burial site findings. Notification to the local division of Veterinary Department. Veterinary clearance before start up.	Construction period	Constructing Contractor	RDMRDI
Hazardous driving conditions where construction interferes with pre-existing roads.	Near v. Sups, Khidmagala and Grigoleti	Provide in design for proper markers and safety signs on roads, including lights. Instruct the drivers	Construction period	Constructing Contractor	RDMRDI
<b>Final Reinstatement and Long-term Anti-erosion Measures</b>	Whole alignment	All the work sites (except permanently occupied by the road and supporting facilities) should be reinstated to its initial conditions (relief, topsoil, vegetation cover). So far as very limited bush clearance is required for the highway upgrading, preservation of top-soil is sufficient for reinstating the natural grass vegetation cover as well		Constructing Contractor	RDMRDI
<b>Tree cutting and Offset tree planting program.</b>	Such sections aren't manifested yet	Offset tree planting program should be agreed with the Moe. We propose to apply tree planting ratio 1:10 for felled red data tree species and ratio 1:2 for other (non-red data) tree species.  Apply procedures for extracting Red List	Develop before construction start up.  Implement before	Constructing Contractor	RDMRDI

Impacts	Sites	Mitigation Measures/Costs	Timeframe	Responsibility for Implementation	Responsibility for Monitoring
		Species From Natural Environment and procedures for exclusion of the land plots from the Forestry Fund, where appropriate	completion		
<p>Accident risks associated with vehicular traffic and transport, that may result in spills of toxic materials, detonation of explosive load, injuries or loss of life(see WB Environmental Sourcebook: 'Hazardous Materials Management' section), injuries or loss of life (see 'Public Health and Safety section)</p> <p>Accidents due to construction related vehicles and heavy machinery or traffic interference with construction activities.</p>	The whole alignment	<ul style="list-style-type: none"> <li>- Provide in design for proper markers and safety signs on roads, including lights. Instruct the drivers</li> <li>- Design and implement safety measures and an emergency plan to contain damages from accidental spills.</li> <li>- Designate special routes for hazardous materials transport.</li> <li>- Regulation of construction transport in terms of traffic interference.</li> <li>- Prohibition of toxic waste transport through ecologically sensitive areas and densely populated areas.</li> </ul>		Constructing Contractor	RDMRDI
<p><b>Quarrying Sites</b></p> <p>Taking of Borrow and Quarry Materials for construction of embankments for road, bridge approaches with</p>	Presumably, r. Supsa, and Rioni floodplains	Quarry and borrow pit materials will be obtained from existing operating sites with proper licenses & environmental clearances. Control of validity of licenses. (The license is given with description of exploration limits and	Construction period	Constructing Contractor	RDMRDI  Inspectorate of MoE

Impacts	Sites	Mitigation Measures/Costs	Timeframe	Responsibility for Implementation	Responsibility for Monitoring
<p>potential for loss and degradation of land;</p> <p>Potential impact of the increased quarrying activities on ichthyofauna, groundwater and landscape</p>		<p>reinstatement commitments).</p> <p>In case of need for opening new borrow areas, all required licenses will be obtained from the Ministry of Energy and Natural Resources;</p> <p>Measures will be taken to conserve top soil. At close of use the area to be reclaimed according to licensing conditions.</p> <p>Control of vehicle operations at quarry sites. Avoid traverse of watercourse. Exclude leakage of oil or fuel. Check the condition of vehicles.</p>			
<p><b>Asphalt plants.</b></p>	<p>Plant site</p>	<p>Contract only licensed supplier having all required environmental permits.</p> <p>In case if the Constructing Contractor takes decision to install and operate its own plant, specific EIA should be prepared and Environmental Impact Permit obtained</p>	<p>Construction period</p>	<p>Constructing Contractor</p>	<p>RDMRDI</p>
<p><b>Construction Camp, equipment yard and Vehicle Fleet Site</b></p> <p>The potential impacts related to the construction</p>	<p>camp site</p>	<ul style="list-style-type: none"> <li>- Proper waste management (see appendix XX Waste Management Procedures for Camps)</li> <li>- Apply regulations relevant to the camp sites and referred in p. 8.1.1.13</li> <li>- Arrange accommodation of personnel</li> </ul>	<p>Construction period</p>	<p>Constructing Contractor</p>	<p>RDMRDI</p> <p>Inspectorate of MoE</p>

Impacts	Sites	Mitigation Measures/Costs	Timeframe	Responsibility for Implementation	Responsibility for Monitoring
<p>and operation of the camp could be summarized as follows:</p> <ul style="list-style-type: none"> <li>- Clearance of vegetation cover during camp construction</li> <li>- Potential damage of topsoil</li> <li>- Contamination related to fuel storage and fuelling operations</li> <li>- Sewerage related contamination</li> <li>- Waste related contamination</li> </ul>		<p>in villages. In case if large camp will be constructed for the workers accommodation, organize sewerage according standards.</p> <ul style="list-style-type: none"> <li>- Pollution prevention measures: proper organization of fueling, waste management;</li> <li>- Proper storage of topsoil</li> <li>- Reinstatement of topsoil and vegetation cover;</li> </ul>			

<b>Mitigation Measures to be Implemented During the Operation Phase</b>					
<b>Impacts</b>	<b>Sites</b>	<b>Mitigation Measures</b>	<b>Timeframe</b>	<b>Responsibility for Implementation</b>	<b>Responsibility for Monitoring and Enforcement</b>
<p>Erosion from road cuts and fills and sedimentation of natural drainage ways. Erosion of lands below the road bed receiving concentrated outflow from covered or open drains. <b>Character of impact:</b> long-term. Change of relief, drainage patterns, land clearance, may cause gradual but stable intensification of erosion</p>	Whole alignment	<p>Mitigation strategy: long-term – remediation; reinstatement of relief and landscape; Installation of long-term drainage systems and anti-erosion structures.</p> <ul style="list-style-type: none"> <li>- reinstatement of relief, soil and vegetation cover</li> <li>- Installation of long-term drainage system and permanent monitoring.;</li> <li>- Installation of sedimentation basins, seeding or planting of erodible surfaces as soon as possible</li> <li>- Increase number of drain outlets.</li> <li>- Place drain outlets so as to avoid cascade effect.</li> <li>- Line receiving surface with stones, concrete.</li> <li>- Long-term monitoring and maintenance</li> </ul>	<p>Construction stage;</p> <p>Maintenance after completion of construction</p>	<p>Constructing contractor</p> <p>RDMRDI in long-term perspective</p>	<p>RDMRDI</p> <p>Inspectorate of MoE</p>
<p>Landscape disfiguration by embankments and deep cuts, fills and quarries. Marred landscape (scars from road cuts, induced landslides and slumps etc.).</p>	New cut sites.	<ul style="list-style-type: none"> <li>- Maintenance and and/or restoration of roadside vegetation</li> <li>- Use an architectural design to 'blend with the landscape.</li> <li>- Replant disfigured surfaces.</li> </ul>	<p>Construction stage;</p> <p>Maintenance after completion of construction</p>	<p>Constructing contractor</p> <p>RDMRDI in long-term perspective</p>	<p>RDMRDI</p> <p>Inspectorate of MoE</p>



<p>Increased suspended sediment in streams affected by erosion at construction sites and fresh road cuts, fills and waste dumps. Declined water quality due to increased sedimentation.</p> <p><b>Character of impact:</b> long-term.</p> <p>Change of relief, drainage patterns, land clearance, may cause gradual but stable intensification of erosion</p>	<p>r. Sups and channel crossing sites</p>	<p><b>Mitigation strategy:</b> long-term – remediation; Reinstatement of relief and landscape; Long-term monitoring; Installation of long-term drainage systems and anti-erosion structures. Reinstatement of vegetation cover.</p> <p>Establishment of vegetative cover on erodible surfaces as soon as possible</p>		<p>Constructing contractor</p> <p>RDMRDI in long-term perspective</p>	<p>RDMRDI</p> <p>Inspectorate of MoE</p>
<p>Soil and water contamination by oil, grease, fuel and paint alongside the highway</p>	<p>whole alignment</p>	<p>Install oil traps at large bridges ; Facilitate installation of standard refueling stations and repair shops along the highway</p>	<p>after completion of construction</p>	<p>RDMRDI in long-term perspective</p>	<p>RDMRDI</p>
<p>Air pollution from mobile asphalt plants during maintenance works.</p>	<p>whole alignment</p>	<p>Install and operate air pollution control equipment.</p>	<p>During Maintenance Works</p>	<p>RDMRDI supervising works and Maintenance Contractor</p>	<p>RDMRDI</p>

<p>Air pollution from vehicle operation, in populated areas traversed by the highway, notably metropolitan areas or densely settled rural areas. Local dust.</p>	<p>near villages</p>	<ul style="list-style-type: none"> <li>- Monitoring of air quality and traffic related emissions (including inspection of vehicle emissions)</li> <li>- Development of policy and regulations limiting traffic related emissions (regulations on fuel quality etc.)</li> <li>- Require adherence to engine maintenance schedules and standards (or use alternative fuels) to reduce air pollution.</li> <li>- Plant trees along the roadside to screen and smoothen emission impacts on the close located villages</li> </ul>		<p>MoE</p> <p>Constructing contractor</p> <p>RDMRDI in long-term perspective</p>	<p>MoE</p>
<p>Noise pollution from vehicle operation, in populated areas traversed by the highway, notably metropolitan areas or densely settled rural areas.</p>	<p>near villages</p>	<ul style="list-style-type: none"> <li>- High solid walls – wooden or stone/brick</li> <li>- Require adherence to engine maintenance schedules and standards</li> <li>- Plant trees along the roadside to screen and smoothen noise impacts on the close located villages</li> <li>- Enhance public transportation and traffic management capability</li> </ul>		<p>Maintenance contractor</p> <p>RDMRDI in long-term perspective</p>	<p>MoE</p>
<p>Roadside litter.</p>	<p>whole alignment</p>	<ul style="list-style-type: none"> <li>- Provide for disposal facilities.</li> <li>- Encourage anti-littering laws and regulations.</li> </ul>		<p>Local Government authorities and RDMRDI provide facilities and Regional services of MoE tracks compliance with standards</p>	<p>RDMRDI Inspectorate of MoE</p>

Creation of a new pathway for disease vectors affecting humans and animals. Creation of a transmission corridor for diseases, pests, weeds and other undesirable organisms	whole alignment	Establishment of plant and animal sanitation service and related checkpoints (not locally on the current project but in general, to control the whole highway	Operation period	<u>Customs Services</u> , "Sanitary Supervision Inspection of the MLHSP", and the "National Service for the Foodstuffs Safety, Veterinary and Plant Protection" of the Ministry of the Agriculture	RDMRDI
Health hazards by dust raised and blown by vehicles.	whole alignment	Impact is minimal on asphalt paved highway. Dust control by application of water.	Operation period	RDMRDI	RDMRDI
Obstruction of routes from homes to farms, etc, increasing travel time.	near villages	Design of interchanges (in average each 3 km) has mitigated this potential impact. See in RAP	Design stage	Constructing Contractor	RDMRDI

## 8.5 Environmental Monitoring Plan (Matrix)

### Construction Phase

Phase	What? (parameter is to be monitored)	Where? (is the parameter to be monitored)	How? (Is the parameter to be monitored /type of monitoring equipment/?)	When? (is the parameter to be monitored – frequency of measurement or continuously)	Why? (is the parameter to be monitored (reply is not obligatory))	Cost	Responsible Institution
Material supply	Possession of official approval or valid operating license	Supplier of materials (asphalt, cement and gravel)	Inspection	Before an agreement for the supply of materials is formalized	Assure compliance with HSE requirements	N/a	Plant operator;  Constructing Contractor RDMRDI  Supervising Agency (SA)
Material transport according to the schedule and routes defined for deliveries	Truck loads covered/ wetted Air pollution due to the dust and fumes related to the Material Transport	Construction site and access road	Supervision	Unannounced inspections during work hours	Assure compliance with HSE requirements. Ensure safety, and minimize traffic disruption.	Minimal Included in supervision contracts	Constructing Contractor;  RDMRDI SA
Top-soil stripping stage. Final reinstatement.	Top-soil storage. Reinstatement. Erosion control. Landscape destruction; Visual impacts;	Construction site	Supervision	Periodic (Unannounced inspections during work hours); From top-soil stripping – to completion of the works.	Assure compliance with, construction standards, environmental norms and EMP provisions;	Minimal Included in supervision contracts	Constructing Contractor  RDMRDI SA
Construction work	Noise levels; Equipment;	Construction site	Inspection; compliance monitoring (engine maintenance, usage of	Periodic (average once per month);	Assure compliance with HSE requirements.  Good condition of standard	Minimal Included in supervision contracts	Constructing Contractor  RDMRDI SA

<b>Phase</b>	<b>What?</b> <i>(parameter is to be monitored)</i>	<b>Where?</b> <i>(is the parameter to be monitored)</i>	<b>How?</b> <i>(Is the parameter to be monitored /type of monitoring equipment/?)</i>	<b>When?</b> <i>(is the parameter to be monitored – frequency of measurement or continuously)</i>	<b>Why?</b> <i>(is the parameter to be monitored (reply is not obligatory))</i>	<b>Cost</b>	<b>Responsible Institution</b>
			mufflers, night time work limitations and other provisions of EMP.)  noise measuring device	Only in case of complaints	construction machinery and limiting the works near settlements to the site-related works is the only way for efficient noise control		SA MoE
Construction work	Vibration	Construction site	Supervision	Unannounced inspections; following complaints	Assure compliance with HSE requirements.	Minimal Included in supervision contracts	Constructing Contractor  SA
Construction work	Dust and Air pollution (solid particles, suspended solids, flying heavy metal particles)	At or near construction site	Visually	During material delivery and periodically in dry periods during construction	Assure compliance with HSE requirement, Assure compliance with environmental norms and EMP provisions.	Minimal Included in supervision contracts	Constructing Contractor  RDMRDI SA
Whole construction period.	Traffic safety/ Vehicle/ pedestrian access Visibility/ appropriate signs	Construction site	Observation	Once per week in the evening	Assure compliance	Minimal Included in supervision contracts	Constructing Contractor;  RDMRDI SA
Whole construction	Material and waste storage, handling, use Water and soil	Material and waste storage sites;	Observation	During material delivery and	Assure pollution abatement; Assure	Minimal Included	Constructing Contractor;

<b>Phase</b>	<b>What?</b> <i>(parameter is to be monitored)</i>	<b>Where?</b> <i>(is the parameter to be monitored)</i>	<b>How?</b> <i>(Is the parameter to be monitored /type of monitoring equipment/?)</i>	<b>When?</b> <i>(is the parameter to be monitored – frequency of measurement or continuously)</i>	<b>Why?</b> <i>(is the parameter to be monitored (reply is not obligatory))</i>	<b>Cost</b>	<b>Responsible Institution</b>
period.	quality (suspended solids, oils, etc)	Run off from site; material storage areas; wash down areas		periodically during construction (average 1/week), especially during precipitation (rain/snow/ etc).	compliance with, construction standards, environmental norms and EMP provisions;	in supervision contracts	RDMRDI; SA
Whole construction period.	Waste Management	All construction sites; Camps;	Observation	Once per week	Assure pollution abatement; Assure compliance with, construction standards, environmental norms and EMP provisions	Minimal Included in supervision contracts	Constructing Contractor; RDMRDI SA
Whole construction period.	Equipment maintenance and fuelling Water and soil quality (suspended solids, oils, fuel, etc)	Refueling and equipment maintenance facilities; Run off from site; material storage areas	Observation	During material delivery and periodically during construction (average 1/week), especially during precipitation (rain/snow/ etc).	Assure pollution abatement	Minimal Included in supervision contracts	Constructing Contractor; RDMRDI SA
Whole construction period.	Impacts on archaeological sites and remnants	All earthwork sites	Observation	Permanent/daily	Assure cultural heritage protection	Minimal	CAS represent. Constructing Contractor; SA

<b>Phase</b>	<b>What?</b> <i>(parameter is to be monitored)</i>	<b>Where?</b> <i>(is the parameter to be monitored)</i>	<b>How?</b> <i>(Is the parameter to be monitored /type of monitoring equipment/?)</i>	<b>When?</b> <i>(is the parameter to be monitored – frequency of measurement or continuously)</i>	<b>Why?</b> <i>(is the parameter to be monitored (reply is not obligatory))</i>	<b>Cost</b>	<b>Responsible Institution</b>
Whole construction period.	biological recontamination during earthworks near pest-holes of soil infections (e.g. anthrax);	All earthwork sites	Observation	Permanent/daily	Assure health protection	Minimal Included in supervision contracts	Construction Field officer;  RDMRDI SA  Veterinary Department of the NSFSVPP
Whole construction period.	Protection of infrastructure elements	Crossings of power lines, pipelines;	Observation	During construction activities at the sites of concern	Assure infrastructure protection	Minimal Included in supervision contracts	Constructing Contractor  RDMRDI SA
During Construction period	offset tree planting Program	Selected sites	Observation	During Construction period	Assure offset of damage to flora and landscape	Minimal Included in supervision contracts	Constructing Contractor;  RDMRDI SA MoE
During Construction period	Reinstatement of work sites	work sites, road alignment, used quarries, camp sites	Observation	During Construction period, after completion of works at concrete site	Reinstatement of work sites not taken by RoW		Constructing Contractor;  RDMRDI SA

<b>Phase</b>	<b>What?</b> <i>(parameter is to be monitored)</i>	<b>Where?</b> <i>(is the parameter to be monitored)</i>	<b>How?</b> <i>(Is the parameter to be monitored /type of monitoring equipment/?)</i>	<b>When?</b> <i>(is the parameter to be monitored – frequency of measurement or continuously)</i>	<b>Why?</b> <i>(is the parameter to be monitored (reply is not obligatory))</i>	<b>Cost</b>	<b>Responsible Institution</b>
During Construction period	Disposal of construction wastes	work sites, road alignment, used quarries, camp sites	Observation	During Construction period, after completion of works at concrete site	Ensure pollution prevention and landscape protection;		Constructing Contractor;  RDMDI SA
Whole construction period.	Personal Protective equipment. HSE issues Organization of traffic by-pass	Construction site	Inspection	Unannounced inspections during works	Assure compliance with HSE requirements	Minimal Included in supervision contracts	Constructing Contractor;  RDMDI SA



## Operation Phase

Phase	What? <i>(parameter is to be monitored)</i>	Where? <i>(is the parameter to be monitored)</i>	How? <i>(Is the parameter to be monitored /type of monitoring equipment/?)</i>	When? <i>(is the parameter to be monitored – frequency of measurement or continuously)</i>	Why? <i>(is the parameter to be monitored (reply is not obligatory))</i>	Cost	Responsible Institution
Whole operation period	<b>Lon-term degradation of natural landscape</b> at land strips and slopes adjacent to highway. Development of landslides, rockfalls and other natural hazardous processes. Visual impacts. Change of drainage patterns, erosion, degradation of vegetation	Whole alignment	Observation	Quarterly	Assure erosion protection, reinstatement and mitigation of visual impacts;	N/a	RDMRDI personal responsible for engineering and environmental monitoring ;
Whole operation period	Increased suspended sediment in streams affected by erosion	Near rivers;	Observation	Quarterly	Assure water protection;	Minimal	RDMRDI Field officer;
During maintenance works	Air pollution from asphalt plants during maintenance works.	Whole alignment	Observation; Checking technical compliance of plant;	Once during start up of maintenance works	Pollution abatement;	Minimal	
Whole operation period	Routine waste and pollution management; Roadside litter and minor fuel contaminations;	Whole alignment	Observation	Monthly	Waste management and pollution abatement;	Minimal	RDMRDI Field officer;
Whole operation period	Air pollution from vehicle operation	Near settlements	Observation; Sampling/analyses	Quarterly/Annually	Pollution abatement;	Minimal	MoE
Whole operation period	Noise pollution from vehicle operation	Near settlements		Quarterly/Annually	Noise protection and compliance with HSE requirements;	Minimal	MoE

<b>Phase</b>	<b>What?</b> <i>(parameter is to be monitored)</i>	<b>Where?</b> <i>(is the parameter to be monitored)</i>	<b>How?</b> <i>(Is the parameter to be monitored /type of monitoring equipment/?)</i>	<b>When?</b> <i>(is the parameter to be monitored – frequency of measurement or continuously)</i>	<b>Why?</b> <i>(is the parameter to be monitored (reply is not obligatory))</i>	<b>Cost</b>	<b>Responsible Institution</b>
Whole operation period; Especial attention during epidemics and plant disease expansion;	Plant/veterinary sanitation measures	Special check-points	Checking cargo certificates; special procedures;		Prevention of disease spread;	Minimal	Plant Protection Inspection of the NSFSVPP
Whole operation period	Emergency preparedness	Emergency team offices; Simulation trainings;	Emergency team offices; Simulation trainings;	Annually	Emergency preparedness; Rescue and salvage operations;  Pollution abatement;	Minimal	MoE; Mol RDMRDI

## 9. PUBLIC CONSULTATIONS

The public consultations will be conducted in accordance with the Georgian legislation and the requirements of the EIB and other IFIs.

### 9.1. Georgian legislation and requirements

In April of 2000, Georgia ratified Aarhus Convention, which secures the public right of the information availability, availability of public participation and justice, participation in the governmental decision-making process about local, national or trans-boundary environmental issues. The Convention accents the relationship between the society and the public authority.

Law of Georgia “On Environmental Permit” (2008) sets up the procedures of consultation in the EIA and fixes the terms of public reviews and consultations, in particular:

1. A developer, before presenting the EIA report to the permit-issuing administrative body, is responsible for organizing a public hearing (if the proposed development needs a building permit, the developer is obliged to organize the public hearing before the second stage of issuing the building permit under the Georgian Law “On the Licenses and Permits” is started by the building permit-issuing administrative body).

2. Aiming at organizing the EIA review, a developer is obliged to ensure public information about the development proposal; The developer is obliged to ensure publishing information on a planned activity in the central and the local periodicals of the central administrative areas (if any) where the developer plans to accomplish his activity.

3. The notification should include following:

- The name, aims and place of the development
- The address, where public representatives can obtain an EIA report and relating materials, as well as send remarks and comments
- The deadline for submitting comments
- Time and venue of the public hearing

4) A developer is obliged to:

a) Submit hard and electronic copies of the EIA report to the permit-issuing administrative body within one week after publishing the information about the proposed development in printed media (to the building permit-issuing administrative body in cases envisaged by clause 3 of article 4 of this Law).

b) Within 45 days after publishing the announcement, developer is obliged to ensure receiving written comments and remarks from the public.

c) Not earlier than 50 days, and no later than 60 days after publishing the announcement, developer is obliged to organize a public hearing of the EIA report.

d) Ensure written invitations for the representatives of relevant local self-governing bodies, Ministry of Environment Protection and Natural Resources of Georgia, Ministry of Economic Development of Georgia and other concerned administrative bodies.

5) Any public representative has the right to attend the public review of the EIA document.

6) EIA review is held at the administrative center of the self-governing body being the venue of the proposed development.

Under Article 7 of the Law,

1. The developer is obliged, within 5 days after the public hearing, to work out a public hearing protocol, which has to be including all written or orally expressed comments. The protocol is to be signed by the developer (or his authorized representatives) and the representatives of relevant local self-governing bodies, Ministry of Environment Protection and Natural Resources of Georgia and Ministry of Economic Development of Georgia (if they attend the EIA report review).

2. The developer gets acquainted with the written remarks and views of the public representatives and considers their arguments in the final EIA report.

3. The developer has to consider those in the final EIA report, or give a written substantiation, if not doing so. In addition, developer should send a written explanation to all authors of the comments. Such a written argumentation (together with written remarks and views) together with the EIA review report shall be forwarded to the permit-issuing administrative body by the developer. The documents referred to in the present clause are an integral part of the EIA report.

4. The developer, after holding the EIA report public review, fixing its findings and drafting the final EIA report, is entitled to submit a statement requiring the issuance of the permit (or building permit) to the permit-issuing administrative body within one year under the procedure envisaged by the Law above and legislation of Georgia.

## **9.2 EIB requirements for public reviews**

An EIA process requires appropriate public consultation and information disclosure.

Verification that this has been/will be undertaken forms an integral part of the Bank's due diligence process. The EIA should be completed and its main findings and recommendations must satisfy the requirements of the Bank prior to disbursement.

Member States shall ensure that:

- any request for development consent and any information gathered pursuant to Article 5 are made available to the public,
- The public concerned is given the opportunity to express an opinion before the project is initiated.

- The detailed arrangements for such information and consultation shall be determined by the Member States, which may in particular, depending on the particular characteristics of the projects or sites concerned:
- determine the public concerned,
- specify the places where the information can be consulted,
- specify the way in which the public may be informed, for example by bill-posting within a certain radius, publication in local newspapers, organization of exhibitions with plans, drawings, tables, graphs, models,
- determine the manner in which the public is to be consulted, for example, by written submissions, by public enquiry,
- Fix appropriate time limits for the various stages of the procedure in order to ensure that a decision is taken within a reasonable period.