



**Ministry of Regional Development and Infrastructure of Georgia.
Roads Department of Georgia.**

**CONTRACT: CONSTRUCTION OF
POTI-GRIGOLETI-KOBULETI BYPASS.
SECTION OF INTERNATIONAL E-70 SENAKI-POTI (DETOUR) -
SARPI (BORDER OF TURKISH REPUBLIC) ROAD**

LOT 1: GRIGOLETI – KOBULETI BYPASS

**ACTIVITY 2 (DETAILED DESIGN LOT 1)
FINAL REPORT
ENVIRONMENTAL AND SOCIAL IMPACT
ASSESSMENT REPORT
VOL. 15**

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LIST OF ACRONYMS

AASHTO	American Association of Highway and Transportation Officials
ACC	Automatic counts (traffic)
AH	Affected households
AP	Affected people
EA	Environmental Assessment
EIB	European Investment Bank
CLS	Core Labour standards
EMP	Environmental Management Plan
ESIA	Environmental and Social Impact Assessment
EU	European Union
FS	Feasibility Study
GoG	Government of Georgia
HGV	Heavy Goods Vehicle
HSE	Health, Safety, Environment
HS	Health and Safety
ILO	International Labour Organisation
KP	Kilometre Post
LA	Land Acquisition
LV	Light vehicle
MCC	Manual Classification Counts (traffic)
MCMP	Ministry of Culture and Monument Protection of Georgia
MENRP	Ministry of Environment and Natural Resources Protection of Georgia
MESD	Ministry of Economy and Sustainable Development of Georgia
MLHSA	Ministry of Labour, Health and Social Affairs of Georgia
MRDI	Ministry of Regional Development and Infrastructure of Georgia
NGO	Non-Governmental Organization
O/D	Original destination (traffic survey)
OP/BP	World Bank's Operational Policy/Bank Policy
PAP	Project affected person
PAH	Project affected household
pK	Reference point (piquet)
PR	EBRD Performance requirement
QC/QA	Quality Control and Quality Assurance
RAP	Resettlement Action Plan
RLG	Red List of Georgia Protected Species
RD	Roads Department of the Ministry of Regional Development and Infrastructure of Georgia
RoW	Right of Way

SEP	Stakeholder Engagement Plan
SNIP	Construction Norms and Rules
TEM	Trans-European Motorway
ToR	Terms of Reference
WB	World Bank
WHO	World Health Organisation

GLOSSARY

Accidental impact	Impact that results from accidental (unplanned) events within the Project (e.g. fuel spillage during re-fuelling) or in the external environment affecting the Project (e.g. landslide). In these cases the probability of the event occurring is considered.
Area of influence	Area of influence is the overall area affected by the Project, including, for example, construction camps and lay-down areas. The percentage of habitat impacted is by reference to the national area of such habitat. In practice it is not possible, nor is it intended to try, to calculate these percentages. Instead, this criteria is used to provide an approximate indication, based on professional judgement and available knowledge, of the proportion of any one type of habitat that may be affected, primarily for the purposes of highlighting where a large proportion of a habitat is affected
Cumulative impact	Impact that act together with other impacts, from the same or other Projects, to affect the same environmental or social resource or receptor
Direct (or primary)	Impact that results from a direct interaction between a planned activity and the receiving environment
Hazard	Potential impact
Impact	Any change to the physical, biological or social environment, whether adverse or beneficial, wholly or partially resulting from an organisation's activities, products or services
Indirect impact	Impact that results from other activities that are encouraged to happen as a consequence of the Project (e.g. new business set up to cater for increased traffic on roads)
Land acquisition	Land acquisition refers to the permanent and temporary loss of use of the land by a farmer and any other users of the land (e.g. graziers, people who use vegetation on the land for fuel,

etc.) and subsequent restrictions on use during operation.

Long-term impact	Impact that will continue over an extended period, but ceases when the Project stops operating. These will include impacts that may be intermittent or repeated rather than continuous if they occur over an extended time period
Magnitude of impact	Magnitude is used to encompass nature of the change (what is affected and how); size, scale or intensity; geographical extent and distribution; duration, frequency and reversibility.
Mitigation measures	Actions or systems that are used, or have been proposed, to avoid, eliminate, reduce or compensate for identified impacts.
Natural habitats	Natural habitats are land and water areas where the biological communities are formed largely by native plant and animal species, and where human activity has not essentially modified the area's primary ecological functions. Habitat may be considered to be critical by virtue of (i) its high biodiversity value; (ii) its importance to the survival of endangered or critically endangered species; (iii) its importance to endemic or geographically restricted species and sub-species; (iv) its importance to migratory or congregatory species; (v) its role in supporting assemblages of species associated with key evolutionary processes; (vi) its role in supporting biodiversity of significant social, economic or cultural importance to local communities; or (vii) its importance to species that are vital to the ecosystem as a whole (keystone species).
Negative impact	Impact that is considered to represent an adverse change from the baseline, or introduces a new undesirable factor
Permanent impact	Impact that occurs during the development of the Project and causes a permanent change in the affected receptor or resource (e.g. the destruction of a cultural artefact) that endures substantially beyond the project lifetime
Positive or beneficial	Impact that is considered to represent an improvement to the

impact	baseline or introduces a new desirable factor
Secondary impact	Impact that follows on from the primary interactions between the project and environment as a result of subsequent interactions within the environment (e.g. loss of part of a habitat affects the viability of a species population over a wider area)
Short-term impact	Impact that is predicted to last only for a limited period (e.g. during construction) but will cease on completion of the activity, or as a result of mitigation/reinstatement measures and natural recovery (e.g. temporary employment of unskilled workers during construction)
Social determinants of health (SDH)	SDH are the conditions in which people are born, grow, work, live, and age, and the wider set of forces and systems shaping the conditions of daily life. These forces and systems include economic policies and systems, development agendas, social norms, social policies and political systems.
Risk	Likelihood x consequence

1. INTRODUCTION

The Government of Georgia (GoG) is conducting a program to upgrade the major roads of the country, managed by the Roads Department (RD) of the Ministry of Regional Development and Infrastructure (MRDI). The program aims to improve transportation and transit of goods to surrounding countries, which is a significant and growing contributor to GDP. Transport of goods into and through Georgia has increased over the past 10-15 years as markets have expanded following the breakup of the Soviet Union, and Georgia is now a major transit country. Almost two-thirds of goods in Georgia are transported by road, and haulage by domestic and international truck companies is very evident on the country's highways. Many of the roads are however poorly equipped to cope with the volume of traffic and the proportion of heavy vehicles, and factors such as insufficient dual carriageways, routing through inhabited areas and inadequate maintenance and repair, hinder throughputs and increase transit times. This creates difficulties for haulage companies and their clients, truck drivers, Georgian motorists and local residents.

The main targets of the program for upgrading are major roads in Georgia such as E-60 and E-70. The World Bank, JICA and ADB have already providing series of loans to the Government of Georgia for construction/rehabilitation of the road infrastructure.

As a part of the program under the funding from European Investment Bank (EIB), construction of Grigoleti-Kobuleti bypass and Poti-Grigoleti sections of international Senaki Poti (detour) - Sarpi (border of Turkish Republic) road is planned.

Consortium represented by Getinsa-Payma-Eurostudios has been awarded a contract for the mentioned project. As defined under the Terms of Reference for this assignment, feasibility study of Poti-Grigoleti-Kobuleti bypass have been carried out. This stage was followed by development of detailed design, preparation of bidding document, elaboration of environmental protection and resettlement documents for Grigoleti-Kobuleti bypass. Design for the Poti – Grigoleti section is pending.

To deal with environmental and social (including resettlement) components of the assignment Georgian environmental consultancy company - Gamma Consulting Ltd (hereinafter – Gamma) has been hired by the Consortium. The tasks of Gamma under the contract include 1) preliminary impact assessment of the project alternatives and development of Resettlement Framework on Feasibility Study stage and 2) preparation of the full scale ESIA and Resettlement Action Plan (RAP) on the detailed design stage of the project.

This report presents draft Environmental and Social Impact Assessment (ESIA) for Grigoleti-Kobuleti bypass component of the project developed based on PESIA prepared during FS, detailed design and additional site surveys carried out by the team of environmental and social specialists.

1.1. NEED FOR ESIA

The project belongs to the types of activities capable to have significant environmental and/or social impact and requires full-fledged environmental impact assessment according to both the national and IFI environmental regulations (ref. Law of Georgia on Environmental Impact Permit; EU EIA Directive (DIRECTIVE 2011/92/EU as amended by Directive 2014/52/EU - Annex I); EBRD Environmental and Social Policy (Category A project); EIB statement of Environmental and Social principles and Standards; etc.).

The purposes of the ESIA are to:

- examine the project's potential negative and positive environmental and social impacts and recommend any measures needed to prevent, minimise, mitigate, or compensate adverse impacts and to improve environmental and social performance;
- analyse project alternatives;
- provide technical information and recommendations for selection and designing of the best option out of several alternatives;
- ensure that affected communities are appropriately engaged on issues that could potentially affect them; and
- develop an Environmental Management Plan, which will include a mitigation programme, a monitoring plan and assessment of institutional capacity for its implementation.

In the course of assessment the issues related to labour, health and safety – need for compliance with labour standards, occupational and community health and safety, population movement (including involuntary resettlement issues, with particular focus on vulnerable groups) was paid attention to. The process was carried out with active involvement of the stakeholders.

2. LEGAL AND POLICY FRAMEWORK

The ESIA has been carried out in compliance with the Georgian legislation and environmental standards, environmental and social safeguard policies of International Financial Institutions, as well as Core Labour standards (CLS) outlined in the ILO Declaration on Fundamental Principles and Rights at Work, and the relevant national labour laws.

During planning, implementation of the ESIA and development of this report a range of documents has been considered. The list, inter alia, includes:

- International Conventions and Directives (environment, social);
- European Investment Bank (EIB) Statement of Environmental and Social Principles and Standards (2009);
- EIB Environmental and Social Handbook (version 9 2013);
- Environmental and social safeguards of International Financial Institutions, such as:
 - World Bank Environmental and Social (2013);
 - EBRD Environmental and Social Policy (2014);
 - IFC Environmental and Social Performance Standards (2012);
 - General EHS Guidelines document (International Finance Corporation, WB group, April 30, 2007);
 - recommendations given in the WB technical paper No. 376 "Roads and the Environment. A Handbook" (1997).
- Recommendations given in the WB technical paper No. 376 "Roads and the Environment. A Handbook" (1997).

2.1. OVERVIEW OF GEORGIAN ENVIRONMENTAL LEGISLATION AND WB POLICY

2.2. ENVIRONMENTAL LEGISLATION OF GEORGIA.

Environmental legislation of Georgia comprises the Constitution, environmental laws, international agreements, by-laws, presidential decrees, ministerial orders, instructions, and regulations. Georgia is a party to international conventions, including the environmental ones. The **Table 1** presents a list of Georgia's environmental legislation as it pertains to the proposed project.

Table 1. List of environmental laws and regulations relevant to the project

Year	Law / Regulation	Last revision	Code
1994	Law on soil protection	16/07/2015	370.010.000.05.001.000.080
1996	Law on entrails	26/12/2014	380.000.000.05.001.000.140
1996	Law on environmental protection	01/06.2017	360.000.000.05.001.000.184
1996	On the system of protected areas	17/02/2016	360.050.000.05.001.000.127
1997	Law on wildlife	01/06.2017	410.000.000.05.001.000.186
1997	Law on water	26/12/2014	400.000.000.05.001.000.253
1997	Law on tourism and resorts	24/09/2013	460.070.000.05.001.000.192
1998	Law on protection zone of resorts and recreation areas	26/12/2014	470.210.000.05.001.000.339
1998	Law on establishment and management of Kolkheti protected areas.	01/06.2017	360.050.000.05.001.000.456
1999	Law on protection of atmospheric air	01/06.2017	420.000.000.05.001.000.595
1999	Forestry code of Georgia	01/06.2017	390.000.000.05.001.000.599
1999	Law on compensation of damage from hazardous substances	06/06/2003	040.160.050.05.001.000.671
2000	Law on regulation and engineering protection of the sea and river banks	05/05/2011	400.010.010.05.001.000.830
2003	Law on Red List and Red Book of Georgia	01/06.2017	360.060.000.05.001.001.297
2005	Law on licences and permits	29/06/2017	300.310.000.05.001.001.914
2003	Law of Georgia on conservation of soil and restoration-amelioration of soil fertility	19/04/2013	370.010.000.05.001.001.274
2007	Law on ecological expertise	01/06.2017	360.130.000.05.001.003.079
2014	Waste code	01/06.2017	360160000.05.001.017608
2017	Environmental Assessment Code	01/06.2017	360160000.05.001.018492

Laws and regulations related to social aspects and land ownership applicable to the project are presented in the **Table 2**.

Table 2. List of social and land ownership related laws relevant to the project

Year	Law / Regulation	Last revision	Code
1996	Law on agricultural land ownership	16/06/2017	370.030.000.05.001.000.132
1997	Civil code of Georgia	13/06/2017	040.000.000.05.001.000.223
1997	Law on compensation of land substitute costs and damages due to allocating agricultural ;and for non-agricultural purposes	25/12/2014	370.020.000.05.001.000.244
1999	Law on rules for expropriation of property for public needs	06/09/2013	020.060.040.05.001.000.670

2007	Law on cultural heritage	01/06/2017	450.030.000.05.001.002.815
2007	Law on public health	01/06/2017	470.000.000.05.001.002.920
2007	Law on entitlement of ownership rights to lands possessed (employed) by physical and legal persons of private law	03/06/2016	370.060.000.05.001.003.003
2010	Law on state property	04/05/2017	040.110.030.05.01.004.174

2.3. ENVIRONMENTAL REGULATIONS AND STANDARDS

Table 3. Regulations and standards

Last revision	Document	Document Code
02/03/2017	Technical Regulation – Fishing and fish stock protection	300160070.10.003.017645
05/05/2017	Governmental decree #136, on approval of Rules and conditions of issuance of mineral resources abstraction licence.	380050000.10.003.018178
29/03/2016	Technical Regulation – Special requirements referring to collection and processing of hazardous waste – approved by governmental decree #145	360160000.10.003.019210
04/08/2015	Technical Regulation – Review and approval of company's waste management plan – approved by order #211 of the Minister of environment and natural resources protection.	360160000.22.023.016334
11/08/2015	Technical Regulation – Arrangement, operation, closure and subsequent maintenance of landfills – approved by governmental decree #421	300160070.10.003.018807
17/08/2015	Technical Regulation – Specification and classification of waste inventory according to type and characteristics - approved by governmental decree #426	300230000.10.003.018812
05/06/2015	Decree on revision of the Technical Regulation – Method for determination (calculation) of damage to environment- approved by governmental decree #54 (14/01/2014)	300160070.10.003.018645
17/02/2015	Rules for implementation of the state control by Environmental supervision department under the Ministry of Environment and Natural Resources of Georgia - approved by governmental decree 61.	040030000.10.003.018446

Last revision	Document	Document Code
29/12/2014	The list of the green zones and resort areas of the state forest fund under the management of the National Forestry Agency – public legal entity of the Ministry of Environment and Natural Resources Protection of Georgia - approved by the decree #161 of the Minister of Environment and Natural Resources Protection of Georgia	360050000.22.023.016284
03/07/2014	Approval of the list and status of resorts – approved by governmental decree №428	460070000.10.003.018048
16/01/2014	Technical Regulation - Temporary regulation ruled for operation of Kolkheti National Park, Temporary regulation ruled for operation of Kobuleti protected areas - approved by governmental decree #84	300160070.10.003.017703
03/01/2014	Technical Regulation - Protection of the air environment in unfavourable weather conditions - approved by governmental decree #8	300160070.10.003.017603
06/01/2014	Technical Regulation - Method for inventory of Stationary Sources of Air Pollution - approved by governmental decree #42	300160070.10.003.017588
03/01/2014	Environmental Technical Regulation – approved by governmental decree #17.	300160070.10.003.017608
14/01/2014	Technical Regulation - Environmental damage determination (calculation) method - approved by governmental decree #54	300160070.10.003.017673
15/01/2014	Technical Regulation - Drinking water - approved by governmental decree #58.	300160070.10.003.017676
03/01/2014	Technical Regulation - Radiation safety standards within the territory of Georgia - approved by governmental decree #28	
03/01/2014	Technical Regulation - Sanitary rules of water sampling - approved by governmental decree #26	300160070.10.003.017615
31/12/2013	Technical Regulation – Methods of calculating maximum permissible discharges (MPD) of pollutants together with wastewater into surface water bodies - approved by decree #414	300160070.10.003.017621
31/12/2013	Technical Regulation –Protection of surface water contamination - approved by decree #425	300160070.10.003.017650

Last revision	Document	Document Code
31/12/2013	Technical Regulation – On approval of technical regulations for calculating threshold limit values of emission of harmful substances into the ambient air”, approved by governmental decree #408	300160070.10.003.017622
03/01/2014	Technical Regulation – Exploitation of gas-dust trapping devices – approved by governmental decree #21	300160070.10.003.017590
15/01/2014	Technical Regulation – on Maximum allowable concentrations of harmful substances in the air at the workplace – approved by governmental decree #70	300160070.10.003.017688
03/01/2014	Technical Regulation – on Radiation safety limits in Georgia – approved by governmental decree #28	300160070.10.003.017585
03/01/2014	Technical Regulation – Sanitary rules for water sampling – approved by governmental decree #26	300160070.10.003.017615
31/12/2013	Technical Regulation – on Calculation of air pollutant index and index values for air pollution with harmful substances of extremely polluted, highly polluted, polluted and non-polluted category regions according to the pollution levels with harmful substances - approved by governmental decree №448	300160070.10.003.017617
31/12/2013	Technical Regulation – Methods of calculating the actual amount of emissions according to instrumental methods for determining the actual amount of emissions in ambient air from stationary sources of pollution, list of special measuring and controlling equipment for determining the actual amount of emissions in ambient air from stationary sources of pollution and technological processes from stationary pollution sources - approved by governmental order #435	300160070.10.003.017660
31/12/2013	Technical Regulation - provisions on Determining Levels of Soil Fertility and Soil Conservation and Fertility Monitoring - approved by governmental decree #415	300160070.10.003.017618
31/12/2013	Technical Regulation - Topsoil Removal,	300160070.10.003.017647

Last revision	Document	Document Code
	Storage, Use and Cultivation - approved by governmental decree #424	
31/12/2013	Technical Regulation - water protection zones of small rivers in Georgia - approved by governmental decree #445	300160070.10.003.017646
31/12/2013	Technical Regulation - on Water Protection Strip - approved by governmental decree №440	300160070.10.003.017640
31/12/2013	Technical Regulation – on Quarries safety - approved by governmental decree #450	300160070.10.003.017633
31/12/2013	Technical Regulation – Fishing and protection of fish stock - approved by the governmental decree #423	300160070.10.003.017645
13/08/2010	Forest protection and restoration rules – approved by governmental decree #241	
20/08/2010	Rules of forest use – approved by governmental decree #242.	
11/08/2008	Governmental regulations (#132) on approval of rules and conditions for issuance of forest use licence, revised 17/07/2015	390.050.020.10.003.000.266
10/05/2007	Governmental regulations (#96, dated 10 May 2007) on approval of provisions for exclusion and inclusion of land from/into the state forest fund	390.040.050.10.003.000.737
4/04/2014	Resolution of the Government of Georgia (№271) on approval of technical regulations for reporting on compliance with licence conditions for use of natural resources, development of projects for use of natural resources, technological schemes for development of the deposits and mining plans and approval of statistical observation forms (№1-01, 1-02, 1-03 and 1-04)	300160070.10.003.017891

2.4. INTERNATIONAL CONVENTIONS RELEVANT TO THE PROJECT RATIFIED BY GEORGIA

List of key conventions on air quality and climate change, biodiversity and protection of ecology and habitats, cultural heritage, public consultation, labour issues and the dates of ratification by Georgia are listed below (see **Table 4**):

Table 4. Conventions (relevant to the project) ratified by Georgia

Natural environment	
1994	Rio Convention on Biological Diversity, 1992
1994	Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1973
1997	Ramsar Convention on Wetlands of International Importance Especially as Wildfowl Habitat, 1971
2000	Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) (CMS), 1983
2008	Convention on the Conservation of European Wildlife and Natural Habitats (Bern)
2010	European Landscape Convention
Climate	
1994	UN Framework Convention on Climate Change (UNFCCC), 1994
1996	Montreal Protocol on Substances that Deplete the Ozone Layer, 1987 (and its London, Copenhagen, Montreal and Beijing Amendments) 2000. 2011
1996	Vienna Convention for the Protection of the Ozone Layer, 1985
1999	Kyoto Protocol to UNFCCC, 1997
1999	International Convention to Combat Desertification, 1994
1999	Geneva Convention on Long-Range Transboundary Air Pollution
Cultural heritage	
Notification for succession	Paris Convention Concerning the Protection of the World Cultural and Natural Heritage, 1992
2011	Council of Europe Framework Convention on the Value of Cultural Heritage for Society, 2005
1997	European Cultural Convention, 1954
2000	Convention for the Protection of the Architectural Heritage of Europe, 1985
2000	European Convention on the Protection of the Archaeological Heritage, 1982
Public participation and information accessibility	
2000	Aarhus Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters, 1998
Labour issues	
1993	Discrimination (Employment and Occupation) Convention
1993	Employment Policy Convention
1996	Geneva Convention concerning Minimum Age for Admission to Employment

1996	Equal Remuneration Convention
1996	Abolition of Forced Labour Convention
1997	ILO Social Policy (Basic Aims and Standards) Convention
1997	Forced Labour Convention
1997	Freedom of Association and Protection of the Right to Organise Convention
1997	Social Policy (Basic Aims and Standards) Convention
1999	Employment Service Convention
1999	European Convention for the Protection of Human Rights and Fundamental Freedoms
2003	Labour Relations (Public Service) Convention

In addition to conventions listed above, the following EU directives will be taken into account:

- EU Environmental Impact Assessment (EIA) Directive [Directive 2014/52/EU of the European Parliament and Council, amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment];
- Habitats Directive [Directive 92/43/EEC (ref. Art. 6 of the Directive)];
- Bird Directive [Directive 2009/147/EC on the conservation of wild birds];
- EU Water Framework Directive [Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy];
- EU Waste Framework Directive [Directive 2008/98/EC on waste].

2.5. NATIONAL TECHNICAL REGULATIONS APPLICABLE TO THE PROJECT

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

- Law on Roads (310.090.000.05.001.000.089, last amended in 2013);
- Construction norms and regulations 2.05.03-84 - Design of bridges, viaducts, overpasses and pipes;
- Construction norms and regulations 2.05.02-85 - Motor roads (regulate traffic safety, environmental issues, set forth main technical and traffic operation norms, crossings and intersections, paving aspects, etc.)

According to these documents for category I roads the following environmental aspects are set:

- the distance to residential area must be at least 200m from the edge of the carriageway;
- along with technical and economic aspects environmental impacts must be taken into account;

- prior to set out of temporary infrastructure and preparation of road embankment, topsoil must be removed and stockpiled until subsequent use for recultivation after completion of construction and removal of all temporary facilities;
- roads along the rivers, lakes and reservoirs must be built with consideration of protection zone boundaries for the surface water bodies.

For OTL crossing and relocation/reinforcement of pipelines the following regulations will be observed:

- Rules for Electric Installations -2002, 7-th Edition;
- Rules of Safety for Operation of Electric Devices;
- SNIP III-4-80 Rules of Construction Safety;
- Construction Norms and Rules III-4-80" (SNIP III-4-80) -Construction Safety Rules.
- Government of Georgia, Decree 365 – on Establishment of the rules for protection of main pipelines (oil, oil products, oil by-products and natural gas and their transformation products) and their protection zones (24.12.2014)

2.6. ENVIRONMENTAL PERMITTING PROCEDURE – NATIONAL REGULATIONS

The permit application/issuance procedure for the planned development, including ESIA coordination, timeframes for information disclosure and public review are set in the law of Georgia on Environmental Impact Permit and include the following steps:

Table 5. Environmental impact permit issuance procedure

Step	Action	Comment	Timeframe
1	Publication of information on the project in central and regional newspapers.		Day 0
2	Submission of the draft ESIA report to the Ministry of Environment and Natural Resources Protection (MENRP)	Hard copy and electronic version of the report delivered to MENRP	within 3 days after announcement in the newspapers
	Feedback	Receiving public comments on the disclosed ESIA	45 days from announcement in the newspapers
	Organisation of public meeting(s) in regional centres within the project impact zone – publication of announcement	Advertisement is to include the project title, location, place and the date, time and venue of public disclosure meeting(s); locations	

Step	Action	Comment	Timeframe
		where the ESIA can be reviewed and where comments may be submitted.	
	Meetings with stakeholders including local community, NGOs, local authorities, etc.	All comments and questions must be documented and answers, minutes of the meeting(s) written up.	Between 50 and 60 days after publication of the advert
3	Development of final version of the ESIA and submission to the MENRP (together with Non-technical Summary, Technical Summary, reports on emissions and allowable limits) for the state ecological examination.	Comments received from the stakeholders considered in the report. Minutes of meeting(s) enclosed to the document as attachment.	After arranging a public review of the EIA report and development of final version of the ESIA, the developers is authorised to submit, within one year, an application to the permit issuing administrative body for a permit
4	Consideration of the documents by MENRP and issuance of conclusion		20 days after registration of an application for a permit and submission of the ESIA package to the MENRP.

Note: According to the national regulations (Law on Licenses and Permits and in compliance with Resolution of the GoG on rules and conditions for issuance of construction permit (#57, 24 March 2009, with amendments) construction/ modernisation of highways requires Construction Permit. According to the national legislation, administrative body issuing the permit (the Ministry of Economy and Sustainable Development) ensures involvement of the other Ministries including the Ministry of Environmental and Natural Resources Protection in the permitting process. For the project subjected to the construction permit, the authorisation (construction permit) incorporates elements of environmental impact permit.

2.7. PERMIT AND LICENCES FOR OFF-SITE WORKS DURING CONSTRUCTION

Off-site works will include extraction of construction materials or purchase of material from already existing licensed quarries. (The latter option is preferable.)

Licensing is regulated by the law of Georgia on Licences and Permits. The body responsible for licensing is the MENRP. Terms and rules of a license for material extraction are specified in the license along with the exact location of a site, volume of

permitted extraction and maturity of a license. Licences are issued through auctioning. According to the law, the licence is granted to the proponent presenting the best proposal that shall meet the criteria stipulated for resources and environmental protection, and recognized as the most economical acceptable. The validity of the licence for abstraction of construction materials may be up to 30 years, while short term licences may vary from 2 to 5 years. A licence holder is obliged to ensure sustainable use of the resources with due regard of environmental and resource protection rules; guarantee safety of works with consideration of ambient air, water, soil, forest, protected areas, protection norms for historical and cultural monuments and buildings. A licence holder is obliged to stop operation if any rare plant or object of aesthetic value is found. The fact must be immediately communicated to relevant governmental authorities.

The licence holder is responsible for restoration and reinstatement of the used plot. The licence can be terminated in case of non-compliance with licence conditions, including environmental requirements. Liquidation or conservation costs are covered by the resource user. In case of licence termination the owner automatically loses right to the land plot.

If the contractor decides to use own borrow pit/quarry the following requirements must be met:

- Sufficient resource in the proposed quarry must be insured to make a site financially viable; including rehabilitation expenses.
- Topsoil must be removed and stockpiled until reintroduction. The topsoil should not be buried, driven on, excessively handled, contaminated or stockpiled so as to hinder final land-use.
- If required, erosion protection must be provided.
- To ensure safe operation the access tracks must be of adequate width: the track should be twice the width of the widest vehicle in the case of one-way traffic and three times the width of the widest vehicle in the case of two-way traffic.
- Gates and fences should be designed, regularly inspected and repaired to prevent unauthorised entry; signs at any insecure locations on a site indicating the risk must be provided.
- Operation and decommissioning of the quarry/borrow pit must be performed in compliance with the conditions of the quarrying license and with due regard to environmental standards.
- Upon completion of the licence term, the quarry/borrow pit area affected by the development should be re-cultivated: the topsoil reinstated, the status of

the site restored to the state close to the initial state (for instance, the site may be planted with vegetation).

Should material be abstracted from the riverbed, the riverbed and the landform may not be adversely affected. Abstraction of gravel should not be carried out in high water period. The operation site must be protected by a gravel mound (up to 2m wide). In compliance with the national legislation (Law on Natural Resources) abstraction of inert material from a riverbed is prohibited in case the activity violates stability of any hydro technical structures (a dam, a retaining wall). Sourcing is not allowed from sections where solid drift is not sufficient for 'feeding' the banks. In such areas, inert material abstraction from the river terrace within 50 m strip from the riverbed and directly from the stream is strictly prohibited.

Risks associated with the licensing legislation currently in force are that it allows (i) extraction of material from the water stream given that sedimentation pattern is believed to be sufficient for natural reinstatement of the deformed river bed, and (ii) postponing site reinstatement of any part of the site till expiration of the license term. At the same time, construction machinery is not allowed to enter water stream, and license holders are not allowed to keep borrowing on hold for extended periods of time without reinstating a site and giving up the license even if its term has not expired. Department of Environment Supervision exercises control over the performance of extractive license holders and there are many precedents of the Department having fined operators of quarries for inadequate performance.

2.8. BRIEF COMPARISON OF THE NATIONAL ENVIRONMENTAL LEGISLATION AND IFI REQUIREMENTS

The following considerations reveal the main differences between the IFI guidelines and the national legislation:

- Screening. Environment Impact Permit, according to the Georgian Law is required only for notified activities. Whereas, the IFI funded projects are screened at initial stages of preparation and categorized according to significance of a project's potential environmental impacts.
- Preliminary ESIA. National environmental regulations do not request development of preliminary ESIA.
- Considering ecological risk, cultural heritage, resettlement and other factors, the IFI classifies projects supported by them under categories A, B and C. As mentioned, in the Georgian national legislation, ESIA is carried out only if a developer seeks to implement projects listed in the law on environmental

impact permit. This list is compatible with the Category A projects of the Bank's classification.

- Involuntary Resettlement: The national legislation does not take into account the issue of involuntary resettlement at any stage of environmental permit issuance. The Georgian legislation considers social factor only with regard to life and health safety (e.g. if a project contains a risk of triggering landslide, or emission/discharge of harmful substances or any other anthropogenic impact). Thus, the national legislation does not consider resettlement as an issue in the process of issuing environmental permits, unlike the Banks who take a comprehensive approach to this issue.
- Stakeholder Engagement Plan (SEP): Under the national regulations development of SEP is not obligatory.
- Responsibility for the ESIA: While the Bank's document establishes the responsibility of a Borrower for conducting the environmental assessment, the national legislation provides for the responsibility of a project implementation unit to prepare the ESIA and ensure its consultation. According to the Georgian legislation the MENRP is responsible for monitoring of project implementation and compliance with the standards and commitments provided in the ESIA with a less clearly defined role in relation to EMPs. The "Project Proponent" is responsible for implementing "self-monitoring" programs for the projects subject to the ESIA.
- Consultation: The IFIs provide for consultations for A and B Category projects (at least two consultations for Category A projects) and requires a timetable of consultations from the Borrower. Georgian regulations request one public consultation meetings on the stage when draft ESIA is disclosed.

2.9. INSTITUTIONAL FRAMEWORK

The GoG agencies undertaking supervisory, monitoring, project management, procurement or financial responsibilities are described below.

Roads Department (RD) responsibilities include, at a minimum, accepting the feasibility study and final designs and accepting road sections after completion of construction. Maintenance also falls under the responsibility of the RD, but is sourced out to private enterprises. (Note: Maintenance means winter maintenance, regular checks and repair of the road, including drainage facilities, bridges, guardrails, road signs etc.). Garbage collection alongside the road is also among the duties of the RD through a contracted company.

Ministry of Environment and Natural Resources Protection (MENRP) is in charge of issuing the Environmental Impact Permit for the Project, following the examination of the ESIA and the subsequent state ecological examination. The rights of the MENRP as the competent authority are the following:

- to intermit, limit or stop any activity which has or is likely to have adverse impact on the environment, as well as unreasonable use of natural resources;
- to issue a series of licenses (for natural resources use) and permits (for environmental pollution);
- to control the execution of mitigation measures by the developer; to receive free and unrestricted information from the developer about the utilization of natural resources, monitoring systems, waste management etc. and explanations from authorities concerning the Project.

The following ministries/departments of the government play a certain role in the approval/agreement process for the Project, including but not limited to:

- Ministry of Economy and Sustainable Development;
- Agency of Protected Areas under the MENRP;
- National Environmental Agency of the MENRP;
- National Agency for Cultural Heritage Preservation of Georgia (under the Ministry of Culture and Monument Protection);
- Department of Spatial Planning and Construction Policy of the Ministry of Economy and Sustainable Development;
- Ministry of Labour, Health and Social Affairs; and
- Ministry of Agriculture.

The Local Executive Bodies perform the main administrative functions in each district, including the local land-use issues and land allocation function.

3. DESCRIPTION OF THE PROJECT

The project is located in the Black Sea coastal area, Samegrelo-Zemo Svaneti and Guria Regions of west Georgia and comprises the area from Poti up to the Kobuleti bypass.

The studied section (Grigoleti-Kobuleti bypass) starts from the area north to Supsa terminal, left bank of the Supsa river, and connects to the newly constructed Kobuleti bypass, south to the Black Sea Arena. Based on functional conditions and agreed with the Roads Department, the start point of the design alignment connects directly the new highway Samtredia-Grigoleti.

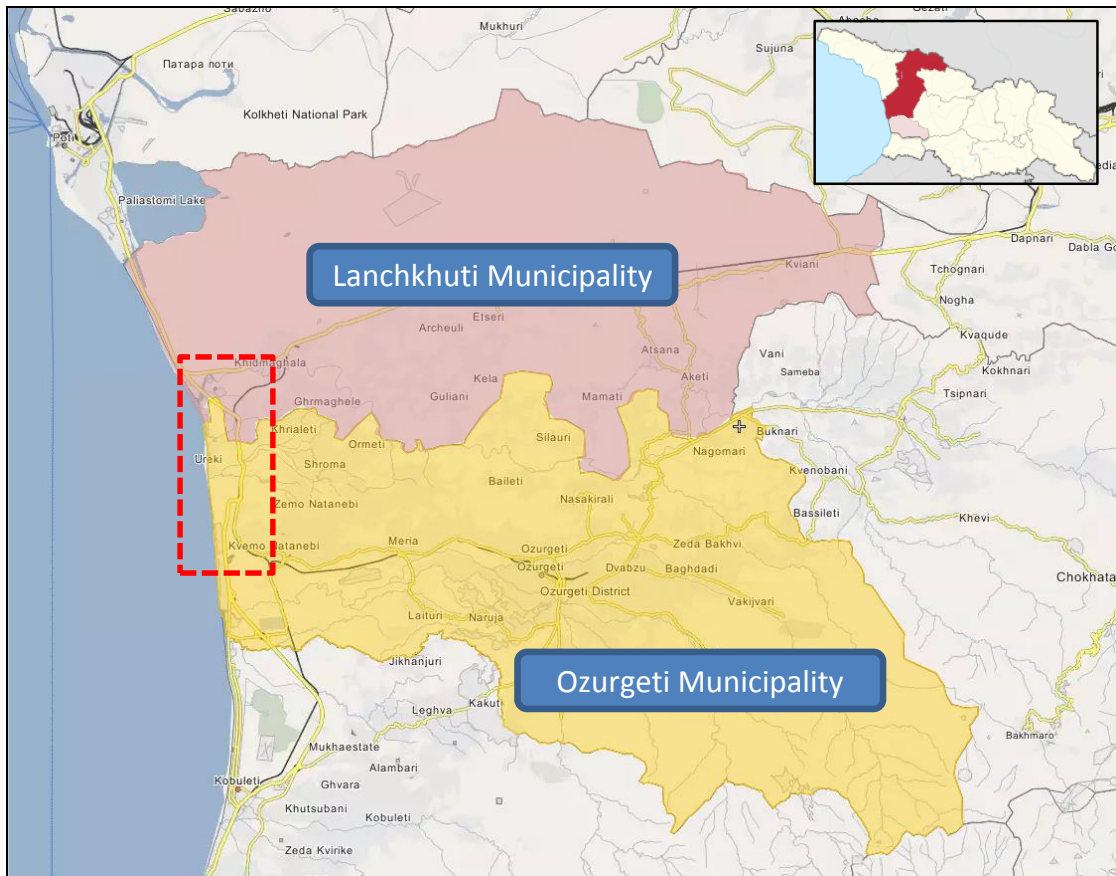


Figure 1. Location of the project

As stated in the Terms of Reference, detailed design of the 4 lane highway has been developed with consideration of the design speed 120 km/h. For interchanges (ramps and loops), depending on the type of the interchange and traffic flow 40 km/h, 60 km/h, 80 km/h or 100 km/h were set as the design values.

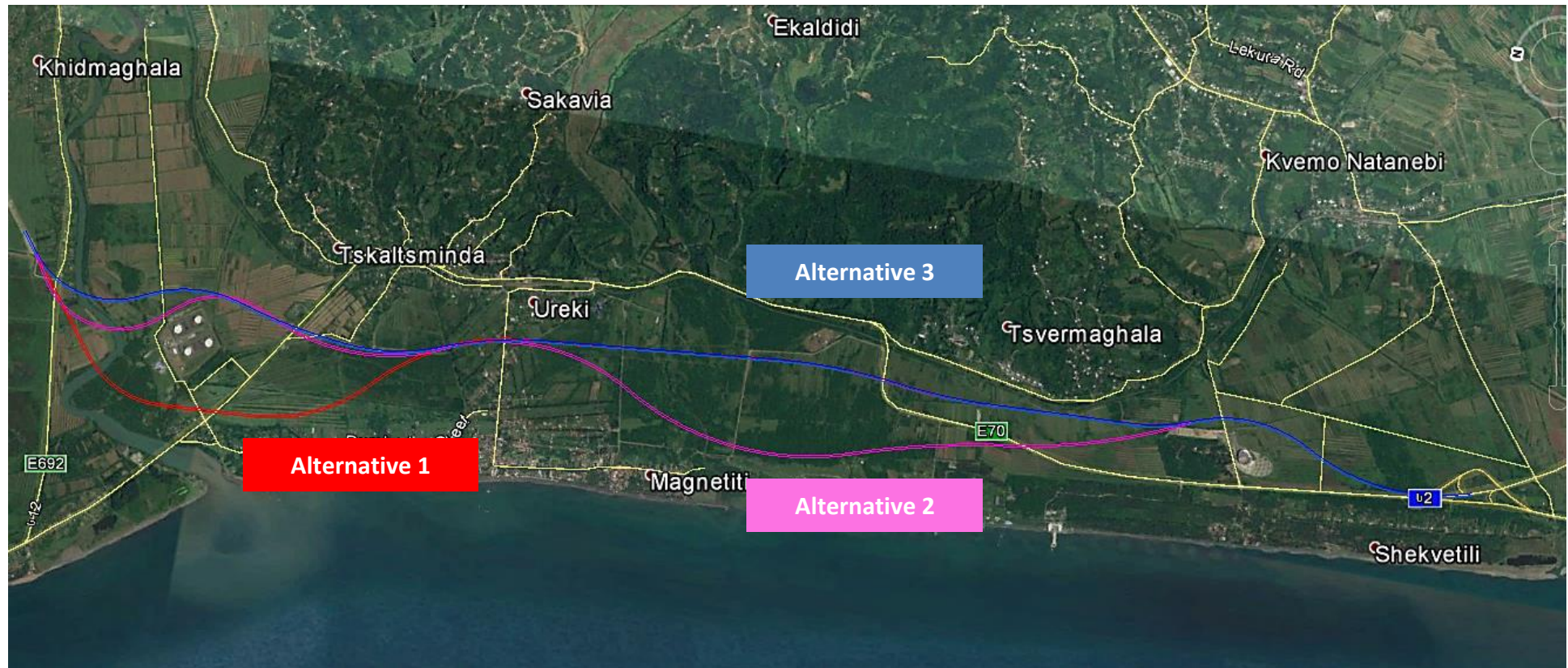


Figure 2. Alternative alignments

3.1. DESCRIPTION OF ALTERNATIVES

Along with 'no action' alternative, three alternative alignments have been considered on Feasibility stage of the project. Layout of considered option is shown in **Figure 2**, length of alignments is given in **Table 6**.

Table 6. Length of alternative alignments

Alternative	Total Length (m)
1	14.110,43
2	13.914,04
3	13.444,52

Alignments were selected so to minimize impact of existing infrastructure and reducing the need for its relocation.

3.1.1. ZERO ALTERNATIVE

The section of starts from the crossing of E-692 and E-70 highways. Crosses Supsa river in 178m wide section of the river, crosses residential area on the left bank of the river, bypasses Supsa terminal from the south-west, runs next to substation, crosses Tskhaltsminda village, runs through Ureki, almost parallel east to the railway line, turns west near Tsvermaghala and runs in about 530m distance from the coastline in the last section of alignment east to pine grove stretched along the coastal strip. (see **Figure 3**)

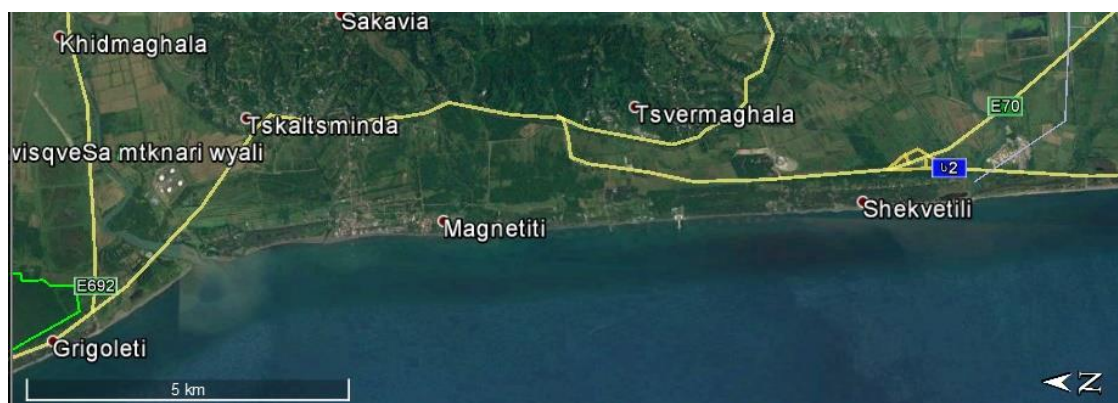


Figure 3. Existing road (zero alternative)

3.1.2. ALTERNATIVE 1

Alignment starts from Samtredia – Grigoleti road and follows existing road in the section from pk0+00 to pk 0+500. At 0+800 a trumpet type interchange (see **Figure 4**) is planned. After the interchange alignment curves and crosses the Supsa River.

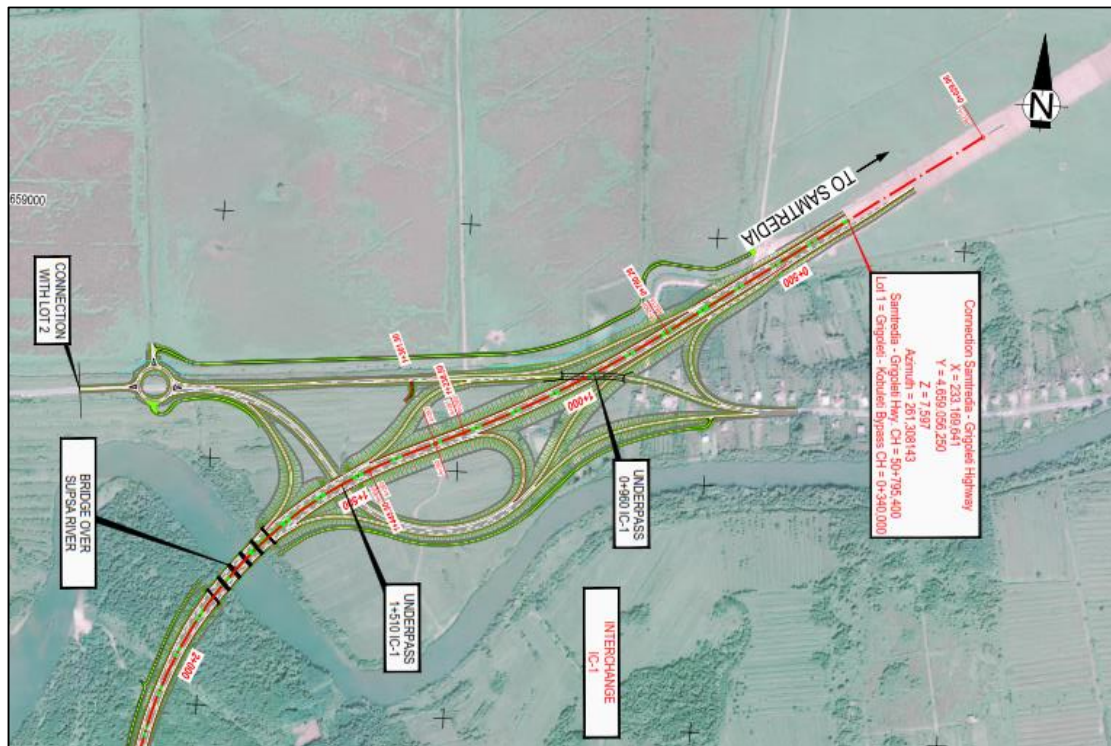


Figure 4. Starting section of the Grigoleti-Kobuleti alignment fragment, showing Alternative 1 and E-70 highway crossing area

From pk2+400 to pk 2+900 the road runs between the Supsa terminal and the residential buildings located west to the alignment. (Distance from the nearest building and the terminal area to the axle of the new road is 20m and 21m respectively).

In pk2+500 to pk2+700 alignment crosses small stream and overpasses old cemetery. After the bridge at pk 2+580, alternative crosses the road to terminal and the E-70 highway. In these section two underpasses (pk2+782 and pk2+960) are planned

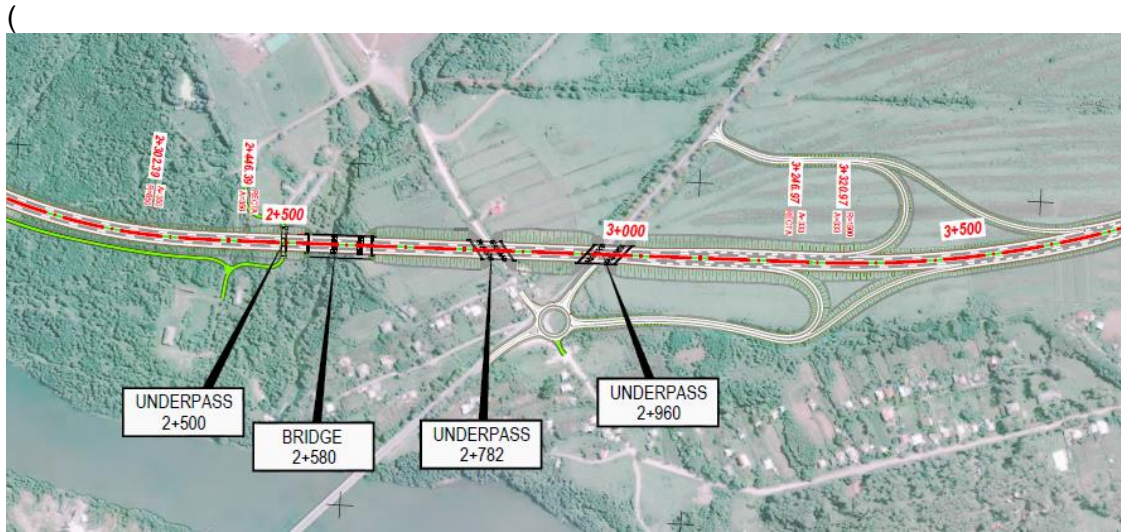


Figure 5).

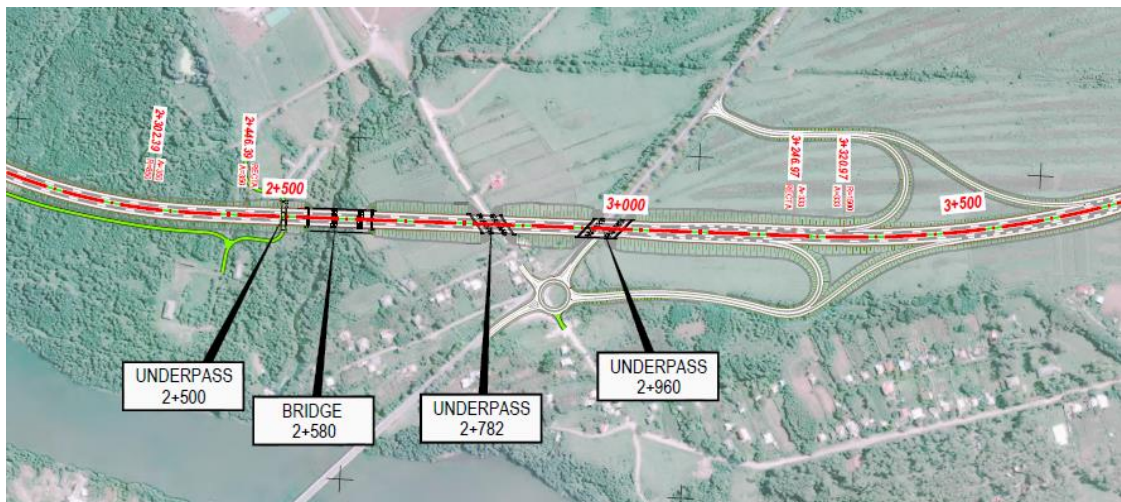


Figure 5. Underpasses near Supsa and interchange IC-1B

The straight section from pk2+500 to almost pk3+500 is followed by interchange and a left curve ($R=1,500\text{m}$). The curve leads to the local Ureki-Magnetiti road which is crossed by the design alignment at pk5+600 (**Figure 6**). This is the only point where impact on residential houses in the area can be avoided. Starting from the crossing site the road goes straight, has two curves ($R=5,000\text{m}$ and $R=-5,000\text{m}$).

At pk5+800 up to the end of alignment, Alternative 1 coincides with Alternative 3. At pk6+750 construction of overpass is planned. Farther the road crosses the Sepa River (at pk7+100) and its tributary (the section between pk7+600-pk7+700).

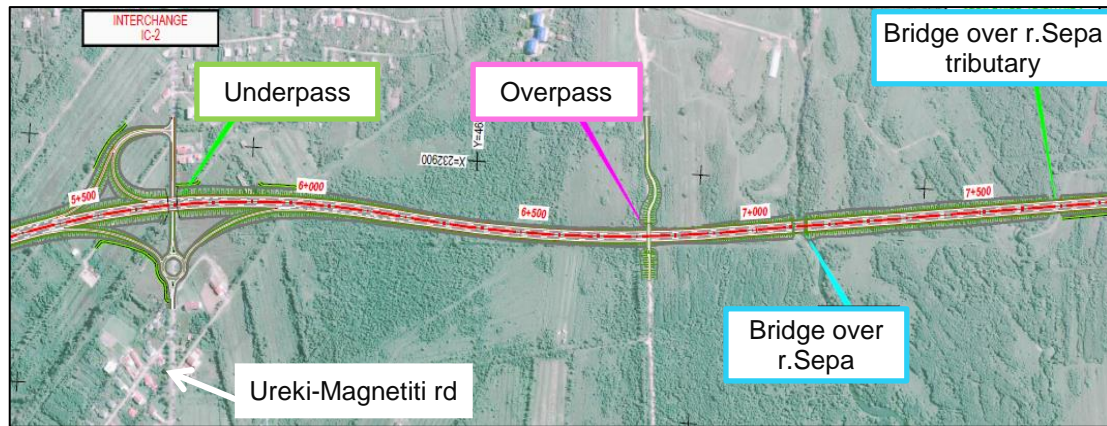


Figure 6. Layout of alternatives with indication of Ureki Magnetiti interchange (pk5+600) and road crossings



Figure 7. Layout of alignment in Ureki, interchange in E-70 crossing area

Alignment crosses E-70 highway at pk9+000 (**Figure 7**), overpasses the road at pk12+070, has another straight section, curves leftwards ($R=1,500\text{m}$), then has a right curve ($R=12,000\text{m}$), crosses road near the Black Sea Arena and connects to the Kobuleti bypass road at pk14+000. (**Figure 8**).

In connection with the Kobuleti bypass, existing interchange will be adapted - a new ramp and few changes in some ramps will be required.



Figure 8. Last section of alignment

3.1.3. ALTERNATIVE 2

Alignment starts from Samtredia–Grigoleti road and follows existing road in the section from pk0+00 to pk 0+500 (**Figure 9**). At 0+800 an interchange is planned (**Figure 10**).

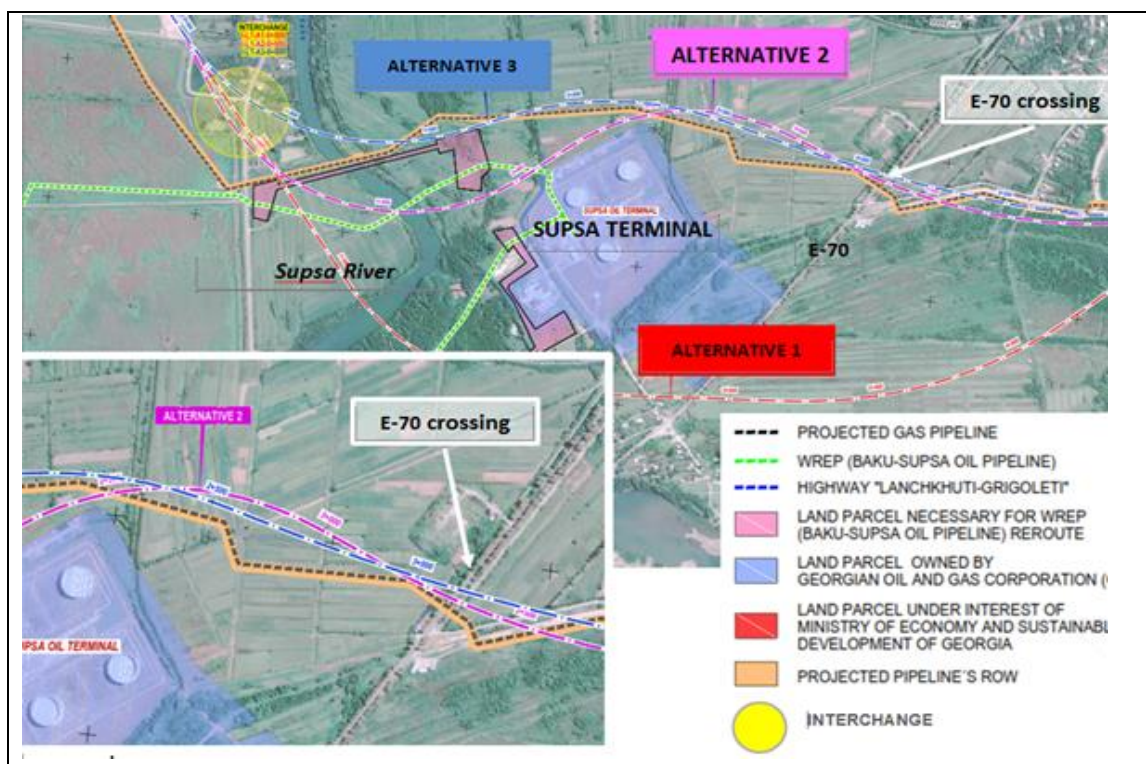


Figure 9. Starting section of the Grigoleti-Kobuleti alignment; fragment, showing Alternative 2, 3 and E-70 highway crossing area

Three options have been considered for the interchange, option b selected as preferable one:

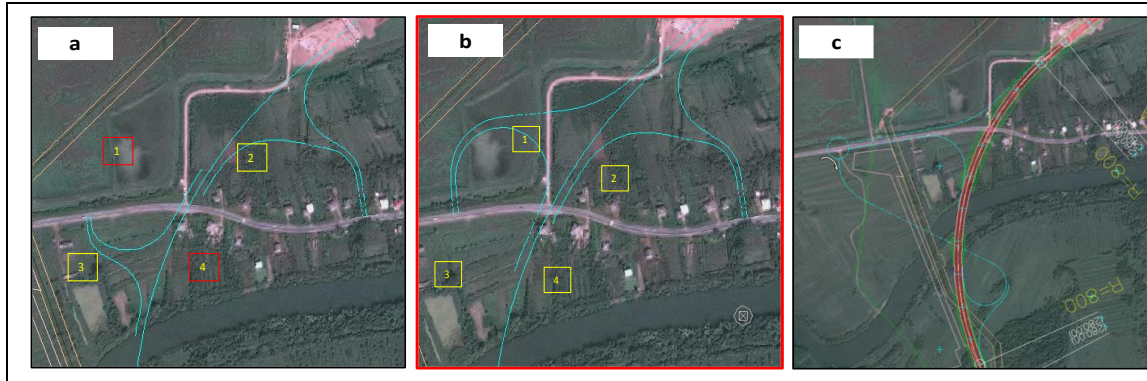


Figure 10. Interchanges at pk0+800 (Modified clover a - with opposite quadrants; b- with adjacent quadrants (1 and 2) and c - Interchange with a semi-direct movement, two direct movements, and a lacet ¹

After the interchange alignment curves right ($R=2,500\text{m}$) and crosses the Supsa River. The radius of the curve in the river crossing area equated $R=700\text{m}$. Then the road curves again ($R=700\text{m}$). This allows bypassing the Supsa Terminal area. (Distance of the design road axle to the boundary of the terminal area is about 23m). At about pk3+350 alignment crosses the E-70 highway.

In this section, in about 80m from the substation, the design road curves left ($R=1,800\text{m}$), and then curves again ($R=1,800\text{m}$) crossing Ureki-Magnetiti road at pk5+200. For the crossing modified clover type layout² is selected so to avoid impact on buildings.

Alignment goes South West curves twice ($R=2,500\text{m}$ and $R=8,000\text{m}$), crosses E-70 highway at pk10+200³ (**Figure 11**), curves again ($R=5,000\text{m}$). From pk11+700 Alternative 2 alignment coincides with Alternative 3, crosses the road near the Black Sea Arena and connect to the Kobuleti bypass road at pk14+000. (**Figure 8**).

¹ Radius for the lacet: 40 m, for 30 km/h design speed

² The radii of the lacets of the is 65 m; design speed 40 km/h). To minimize impact, in both sides two T junctions are recommended.

³ Clover modified using opposite quadrants. The minimum radii for the exit ramps are 65 m, for 40 km/h design speed

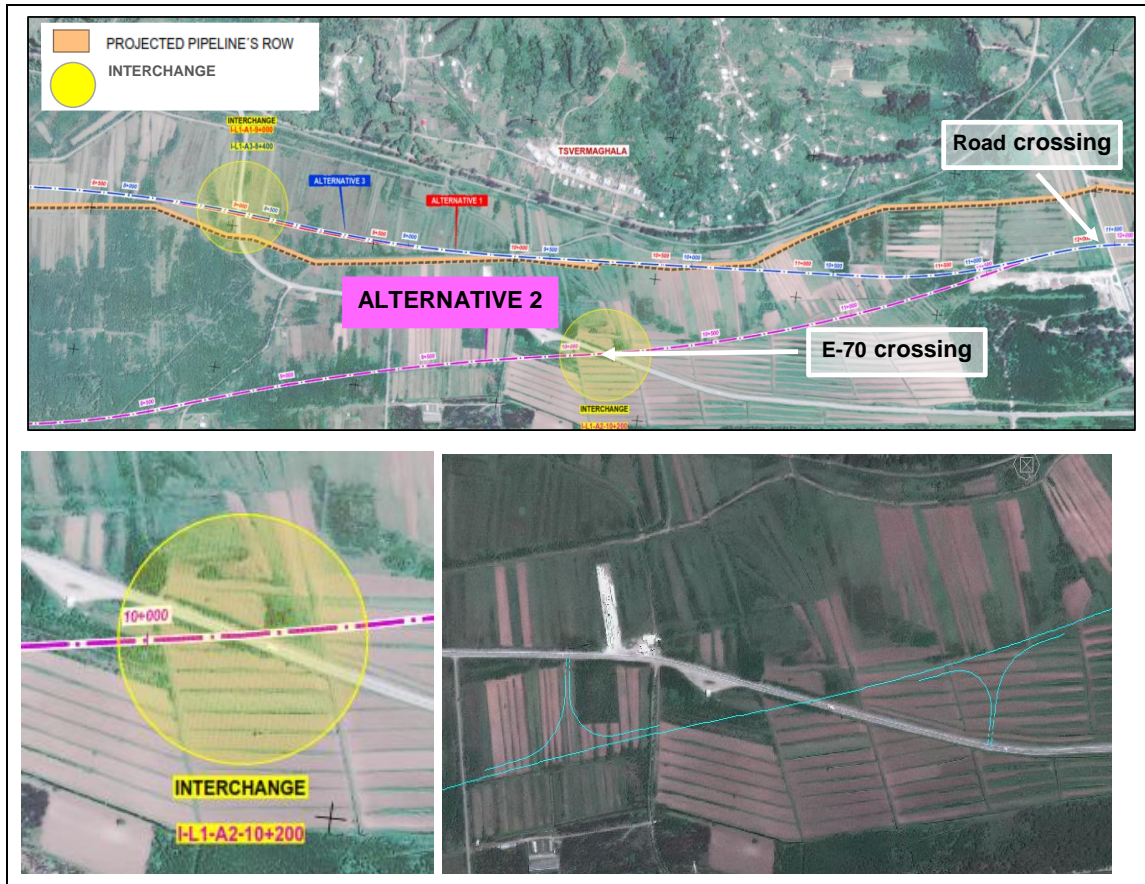


Figure 11. Layout of Alternative 2 in Ureki; interchange at pk10+200

3.1.4. ALTERNATIVE 3

Alignment starts from Samtredia–Grigoleti road and follows existing road in the section from pk0+00 to pk 0+500. At 0+800 an interchange is planned. Alignment crosses the Supsa River with a left curve ($R=800$ m). Then, with a right curve ($R=1,100$ m) bypasses the Supsa Oil Terminal from the East. (Distance from the axle of alignment to the Terminal area is 70 m), runs East to the substation. (**Figure 9**).

After that two curves ($R=5,000$ m and $R=1,800$ m) are designed. Alternative crosses the local Ureki-Magnetiti road with a right curve ($R=3,500$ m). Then coincides with Alternative 1 (straight section of alignment), and later with two curves of radii 5,000m and 5,000m crosses existing Grigoleti-Kobuleti road. Then the alternative has another straight alignment, followed by left ($R=1,700$ m) and right ($R=1,200$ m) curves. From pk11+700 Alternative 2 alignment coincides with Alternative 3, crosses the road near the Black Sea Arena and connect to the Kobuleti bypass road at pk14+000. (**Figure 8**).

3.2. DESIGN PARAMETERS AND GEOMETRIC STANDARD

The design was developed with consideration of TEM and Georgian standards. The list of parameters is given in **Table 7**.

Table 7. Parameters of the new alignment

Parameter	Description
Highway	
<u>Design Speed:</u>	120 km/h
<u>Spiral Transition Curves:</u>	TEM standards compliant
<u>Bend (Superelevation):</u>	Georgian standard – minimum crossfall and minimum bend of 2.5%. The value is in line with TEM standards where the value ranges from 2% to 7%.
<u>Expansion width in curves:</u>	No need in expansion, given each lane is 3.75 m wide.
<u>Main parameters</u>	TEM compliant <ul style="list-style-type: none"> Width of roadway: 26.5 m Number of lanes: 4 (2 lanes per direction) Width of carriageway: 2x7.5 m Width of lane: 3.75 m Width of central reserve: 4.0 m (median strip 2m as per Georgian standard) Width of right shoulder: 3.0 m Width of right paved shoulder: 3.0 m Width of wayside: 0.75 m
<u>Transitions:</u>	<ul style="list-style-type: none"> With the starting section (median strip of 6 m of the Samtredia-Grigoleti Highway cross section), a transition of the median strip is needed. In the ending section, it is needed to close the median strip and join both carriageways into one, linking the new Highway with the existing Kobuleti by-pass.
<u>Vertical Gradients:</u>	TEM standards Maximum vertical gradient: 4% Minimum vertical gradient (for drainage purposes): 0.30%
<u>Vertical Curves:</u>	TEM Standards sets 200m of stopping distance for 120 km/h design speed. Convex vertical curves: 22,600 Concave vertical curves: 7,700
Interchanges (ramps and loops)	
<u>Design Speed:</u>	40 km/h, 60 km/h, 80 km/h or 100 km/h depending on the solution adopted for the interchange and the traffic volume of the ramp. Loops have the lower design speed due to geometrical reasons.
<u>Spiral Transition Curves:</u>	TEM standards compliant
<u>Bend (Superelevation):</u>	Georgian standard – minimum crossfall and minimum bend of 2.5%, suggested maximum is 7%. The value is in line with TEM standards where the value ranges from 2% to 7%)
<u>Expansion width in curves:</u>	Georgian Standards , no indication is available in TEM
<u>Section Type:</u>	<ul style="list-style-type: none"> Width of roadway: 7.5 m Number of lanes: 1 (single lane) Width of lane: 4.00 m Width of paved shoulders: 1.0 m

Parameter	Description
	<ul style="list-style-type: none"> Width of wayside: 0.75 m (slope: 6%)
Vertical Gradients:	<p>TEM standards</p> <ul style="list-style-type: none"> Maximum 5% for a design speed of 100 km/h and Maximum 6% for lower design speeds <100 km/h. Minimum gradient, for drainage purposes: 0.30%. <p>Max longitudinal suggested values for longitudinal gradient suggested by design team is 7-8%. This is assumed to allow design of more efficient ramps from a cost-benefit point of view as the lower values need higher length of ramps.</p>
Vertical Curves:	<p>Georgian Standards</p> <p>The minimum radii for convex curves used are stated below:</p> <ul style="list-style-type: none"> For a design speed of 40 km/h, 400 m For a design speed of 60 km/h, 1,800 m For a design speed of 80 km/h, 5,000 m For a design speed of 100 km/h, 10,000 m <p>The minimum radii used for concave curves are:</p> <ul style="list-style-type: none"> For a design speed of 60 km/h, 1,700 m For a design speed of 80 km/h, 3,200 m For a design speed of 100 km/h, 4,900 m
Acceleration and Deceleration Lanes:	<p>According to the TEM Standards, parts 3.4.2 and 3.4.3, acceleration and deceleration lanes length should be calculated based on an average acceleration of 0.6-0.8 m/s² and an average deceleration of 1.5 m/s². The lengths obtained following these criteria, are much greater than other international standards and practices, leading to unnecessary higher construction costs.</p> <p>As in the case of maximum gradient values, in this way, we have adopted the following lengths, which are considered to be more realistic and widely used:</p> <ul style="list-style-type: none"> Acceleration lane: 200 m deceleration lane + 100 m lane of variable width (taper) Deceleration lane: 100 m deceleration lane + 80 m lane of variable width (taper)

3.3. STRUCTURES

Main structures along alternative alignments include interchanges, bridges over the rivers (Supsa, Sepa, tributary), overpasses and underpasses.

More details for Alternative 1 selected as preferable on feasibility stage of the project is given below.

Table 8. Bridges, underpasses and overpasses along alignment Alternative 1

Bridge nr.	Station	Bridge name	SPANS
1	0+960	Interchange underpass 0+960	10.50
2	1+480	Interchange underpass 1+480	16.50-25.00-16.50

3	1+680	Bridge over Supsa River 1+680	5 x 33.00
4a	2+500	Underpass 2+500	6.00
4	2+560	Bridge over watercourse 2+560	38.10-38.30-17.20
5	2+769	Underpass 2+782	12.50-19.65-12.50
6	2+960	Underpass 2+960	12.50-28.45-12.50
7	4+180	Pedestrian Underpass 4+180	4.00
8	5+200	Bridge over watercourse 5+200	1 x 33.00
9	5+600	Underpass 5+600	12.50-20-12.50
10	6+760	Overpass 6+760	15.00-33.00-15.00
11	7+072	Bridge over Sepa River 7+078	1 x 40.00
12	7+644	Bridge over Sepa River_Tributary 7+644	1 x 33.00
13	7+880	Pedestrian Underpass 7+880	4.00
14	9+000	Overpass IC-3	14.00-33.00-14.00
15	10+080	Overpass	15.00-33.00-15.00
16	12+080	Overpass 12+070	15.00-31.00-15.00

The following types of bridges are proposed, according to the main function of the structure:

Table 9. New structures along alignment Alternative 1

Type	Average width (m)	Total Length (m)	Number of spans (ea)
Road underpass	2 x 13,42	45,00	3
Wide interchange underpass	17,17+13,42	68,00	3
4-span interchange underpass	2 x 13,42	86,00	4
Road overpass	11,04	61,50	3
Interchange ramp Overpass	7,50	63,00	3
Bridge over river/lake	Var.	Var.	Var.

Several construction alternatives were studied for each engineering structure. Alternatives with best technical characteristics and cost efficiency were selected.

3.3.1. BRIDGES

The bridges over the rivers were designed with consideration of 100 year flow.

Superstructure - All bridges are precast pre-stressed concrete I-beams structures. This type of bridge enables easy and rapid construction. "I" shape precast beams are easy (cheap and fast) to fabricate and to erect in place. For the project "I" beams of the American Association of State Highway and Transportation Officials (AASHTO) have been chosen. (**Table 10**)

Table 10. AASHTO "I" beams

Type	H (mm)	A (m ²)	Recommended span lengths (m ²)
AASHTO TYPE I	711	0,18	9.1 - 13.7
AASHTO TYPE II	914	0,24	12.2 - 18.3
AASHTO TYPE III	1143	0,36	16.8 – 24.4
AASHTO TYPE IV	1372	0,51	21.3 – 30.5
AASHTO TYPE V	1600	0,65	27.4 – 36.6
AASHTO TYPE VI	1829	0,70	33.5 – 42.7

The deck is composed by several "I" shape precast pre-stressed concrete beams and a cast "in situ" concrete slab over them. Precast beam elements can be used for spans of up to 40 m.

Construction method includes manufacturing/procurement of precast pre-stressed beams; transportation to the site, installation over the bearings using cranes; casting upper slab in situ; using thin precast concrete slabs working as formwork to bridge gaps between beams. A simply supported scheme is used for the deck and every beam is placed over a neoprene bearing at each end. The slab over the beams links groups of spans to reduce pavement joints.

Abutments - For all bridges slab abutments will be used - short abutments at the top of the embankment, supported on piles with two wing walls on both sides.

Piers - The intermediate bents consist of a pier cap with 2 columns (in some cases 3). The piers are oblong form (short axis 1.5m, long axis 1.8m).

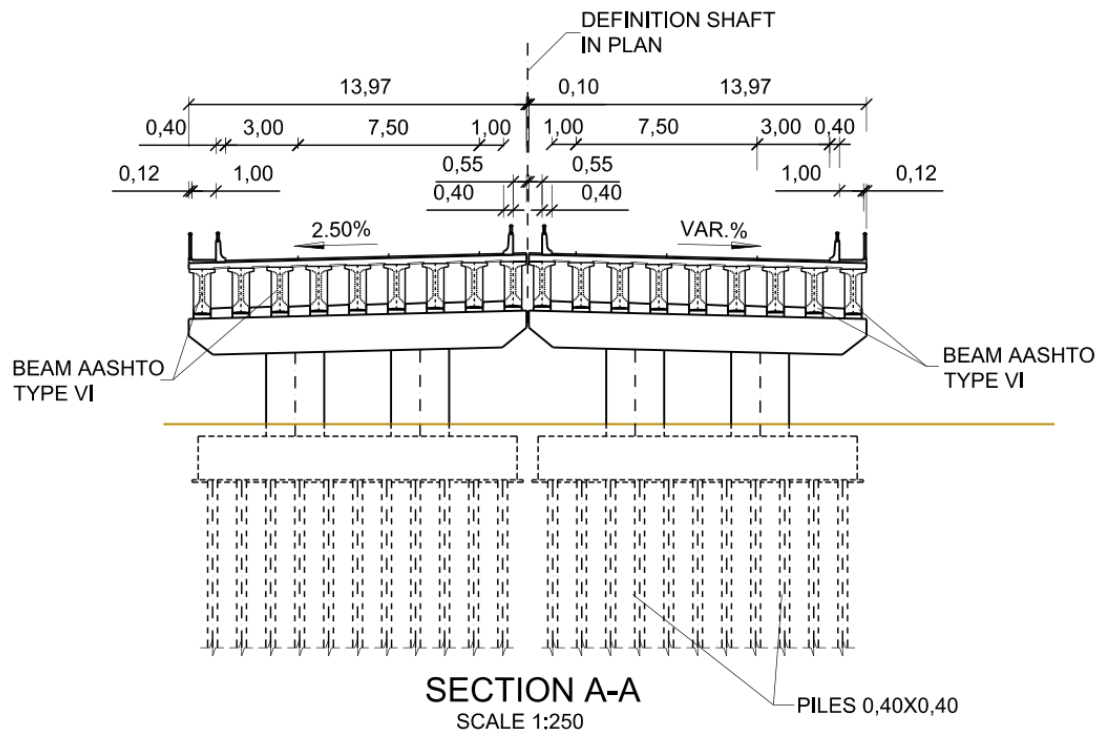


Figure 12. Typical pier

3.3.2. CULVERTS

Arrangement of 37 culverts (box culverts) is planned. Location of the culverts is given in **Table 11**.

Table 11. Culverts

NO.	STA	DIMENSIONS	AXE
1	1+125	2.0x2.0	Main Highway
2	0+900	2.0x2.0	Interchange 1 - Ramp 3
3	0+343	2.0x2.0	Path 0+900 Left
4	0+143	2.0x2.0	Interchange 1 - Ramp 8
5	0+017	1.5x1.0	Path 1+300 Right
6	0+156	2.0x2.0	Interchange 1 - Ramp 6
7	0+590	4.0x3.0	Interchange 1 - New access
8	4+150	2.0x2.0	Main Highway
9	0+094	1.5x1.0	Pedestrian path
10	0+310	1.5x1.0	Interchange 2 - Ramp 4
11	5+732	2.0x2.0	Main Highway
12	0+132	1.5x1.0	Interchange 2 - Existing Road
13	0+220	1.5x1.0	Path 5+700 Left

NO.	STA	DIMENSIONS	AXE
14	5+934	2.0x2.0	Main Highway
15	0+112	1.5x1.0	Path 5+900 Left
16	6+545	1.5x1.5	Main Highway
17	7+000	2.0x2.0	Main Highway
18	7+935	2.0x2.0	Main Highway
19	8+850	2.0x2.0	Main Highway
20	0+202	2.0x2.0	Interchange 3 - Ramp 1
21	9+055	2.0x2.0	Main Highway
22	0+055	2.0x2.0	Interchange 3 - Ramp 4
23	0+230	1.5x1.5	Interchange 3 - Ramp 2
24	9+290	1.5x1.5	Main Highway
25	0+390	1.5x1.5	Interchange 3 - Ramp 3
26	10+125	2.0x2.0	Main Highway
27	10+410	2.0x2.0	Main Highway
28	10+945	2.0x2.0	Main Highway
29	0+008	2.0x2.0	Path 11+800 Left
30	11+795	2.0x2.0	Main Highway
31	0+082	2.0x2.0	Road PK 12+070
32	12+450	2.0x2.0	Main Highway
33	12+850	2.0x2.0	Main Highway
34	13+155	1.5x1.5	Main Highway
35	0+215	4.0x3.0	Interchange 4 - Ramp 2
36	13+690	4.0x3.0	Main Highway
37	0+050	4.0x3.0	Interchange 4 - Connection Ramp

3.3.3. TYPICAL CROSS SECTIONS AND LONGITUDINAL PROFILES

Typical design drawings (plane view and longitudinal sections) of the bridges are shown in Figures 13-21.

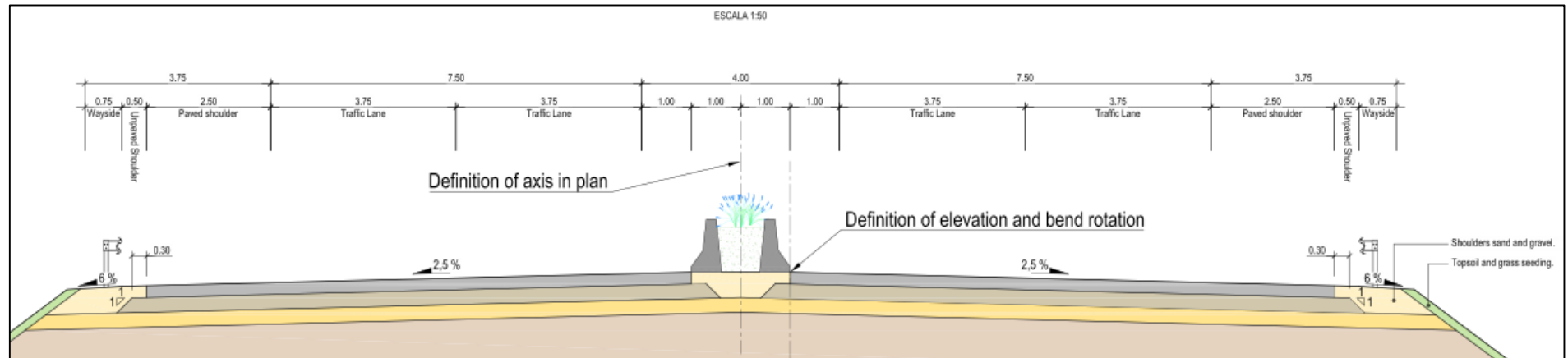


Figure 13. Double carriageway

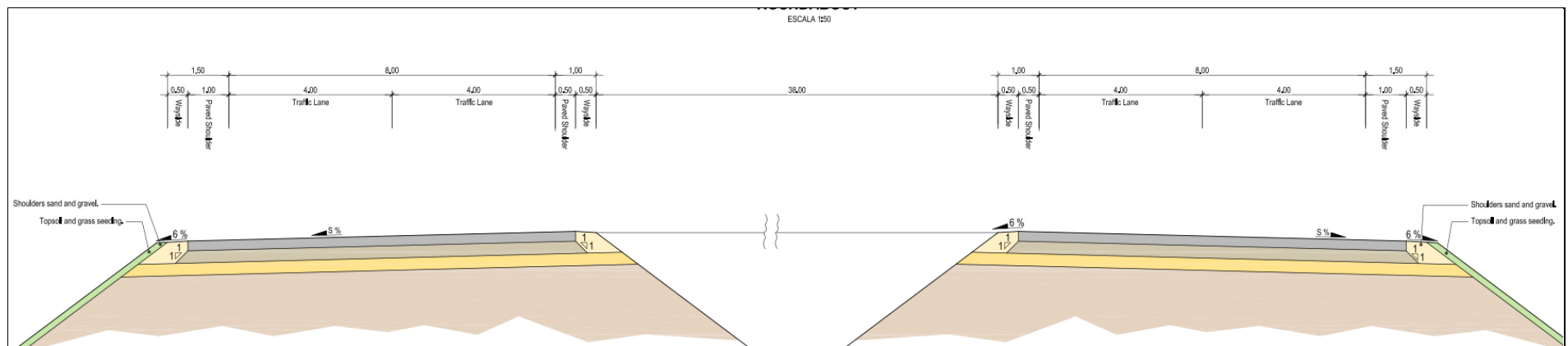


Figure 14. Roundabout

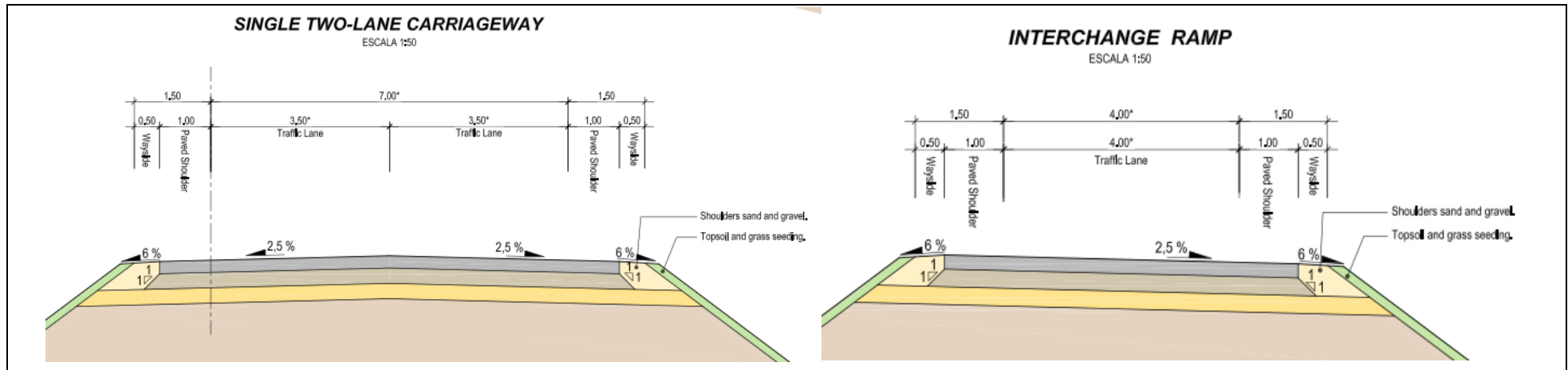


Figure 15. Single two lane carriageway and interchange ramp

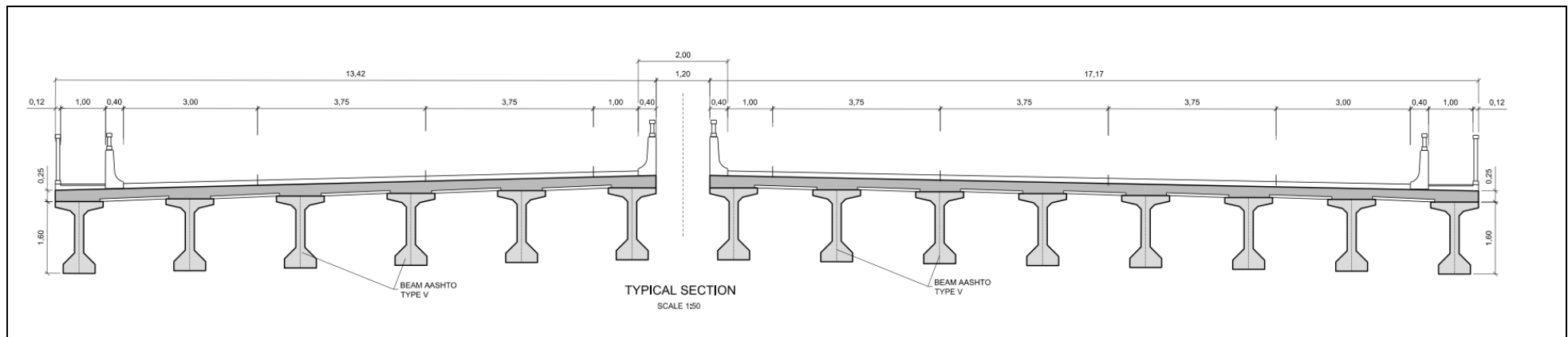
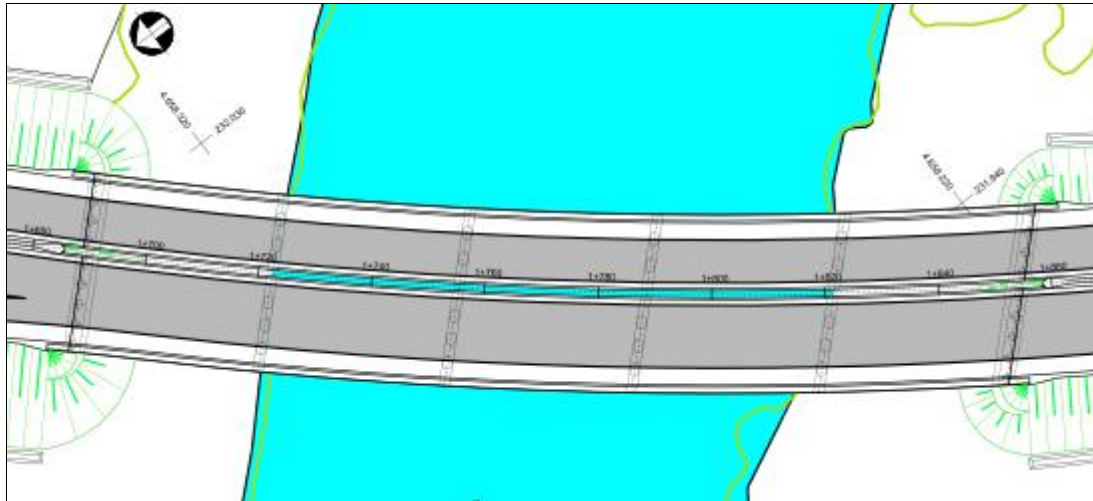
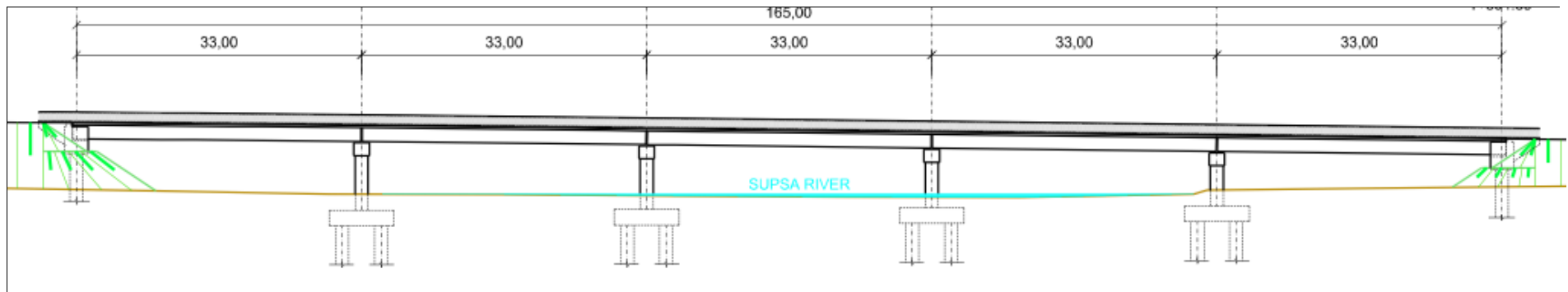


Figure 16. Typical cross section of a bridge

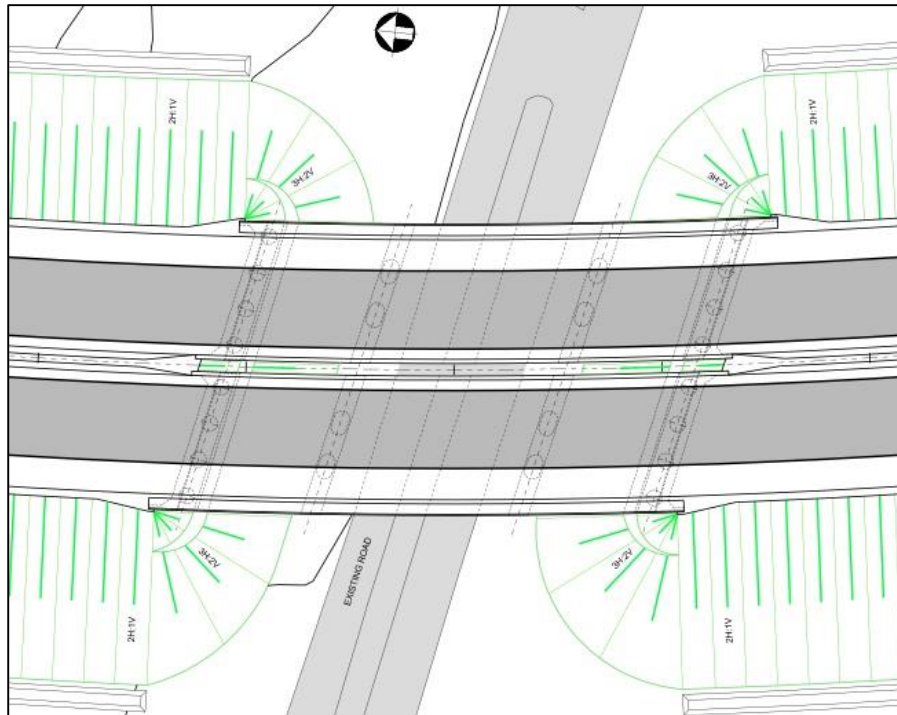


Plane view

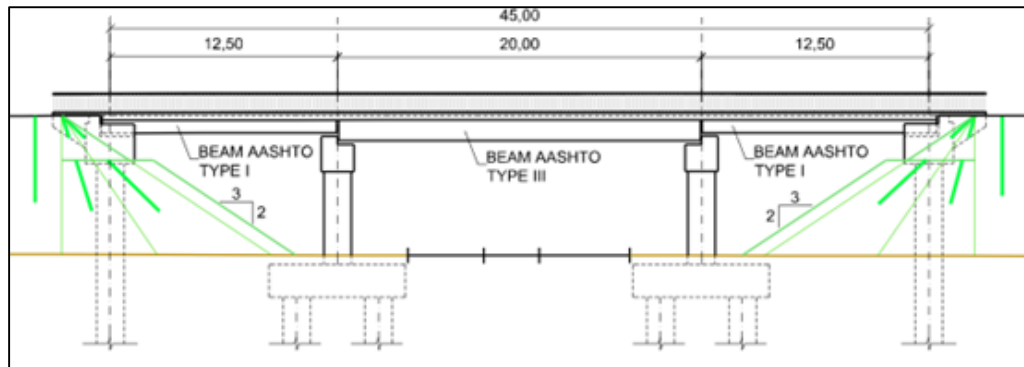


Longitudinal section

Figure 17. Bridge over the Supsa River

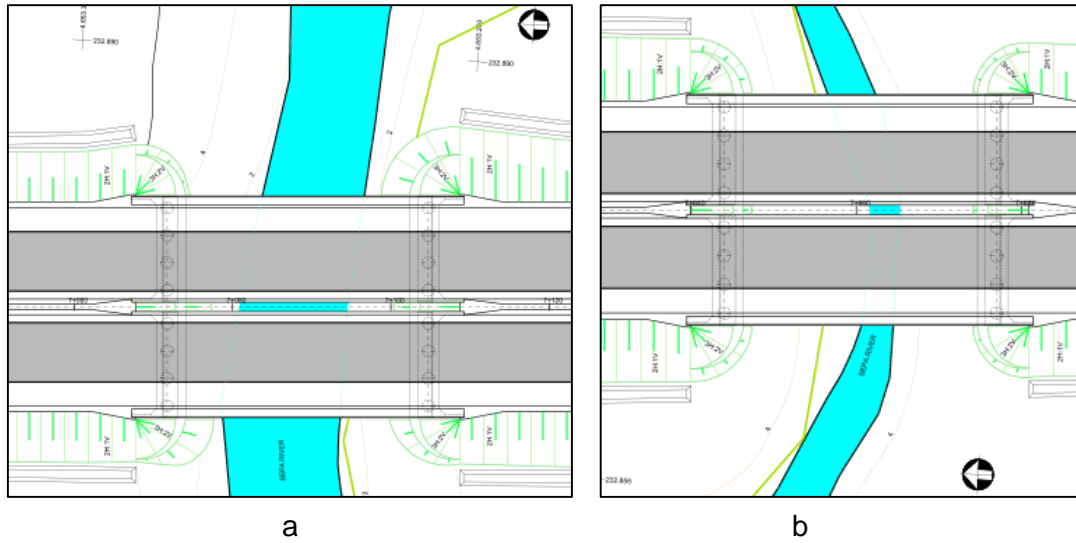


Plane view

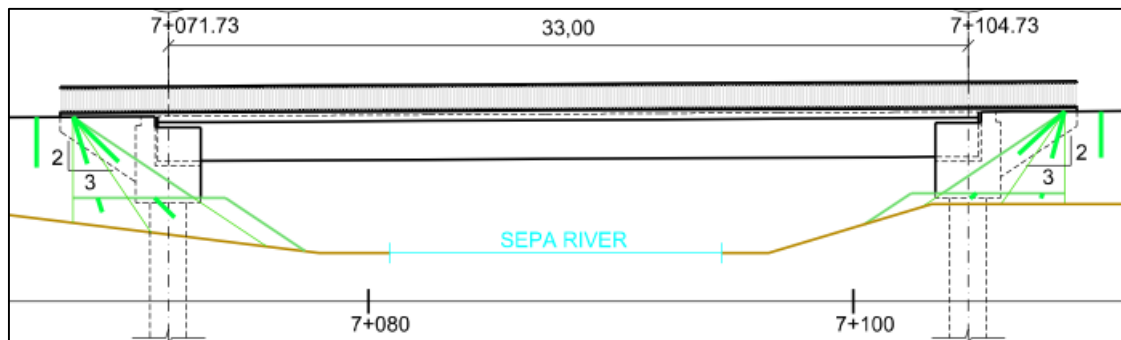


Longitudinal section

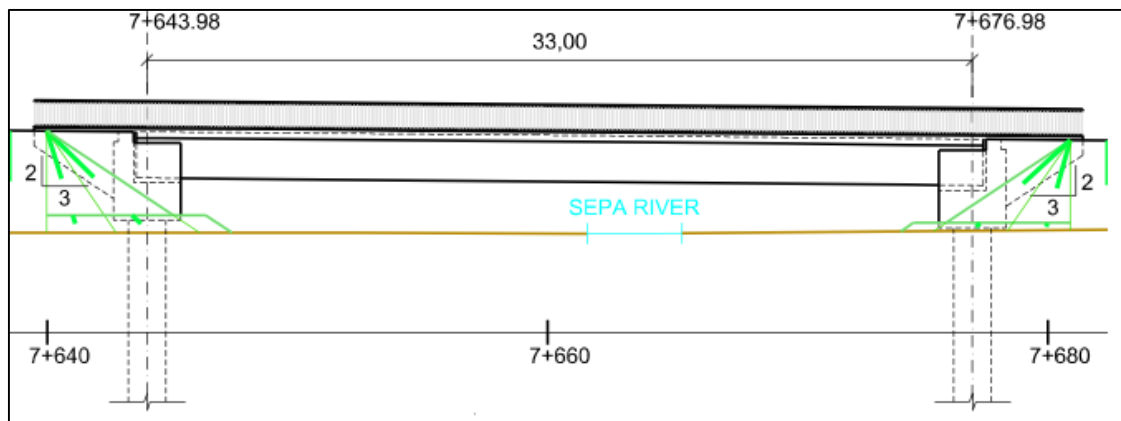
Figure 18. Typical underpass



Bridge over Sepa River (a); bridge over Sepa tributary (b) – plane view

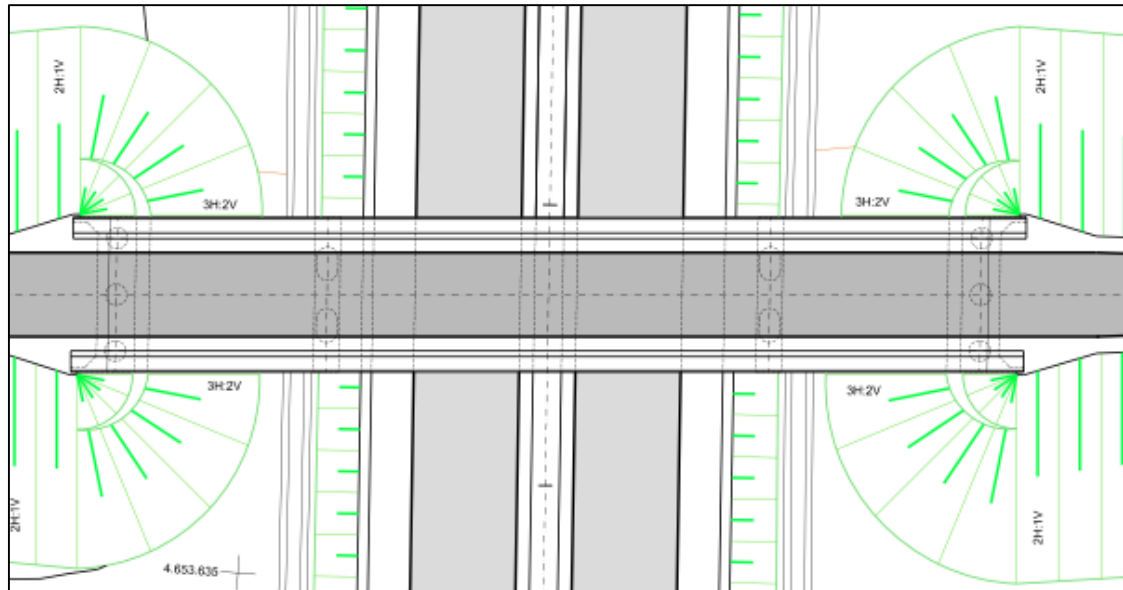


Bridge over Sepa River –Longitudinal section

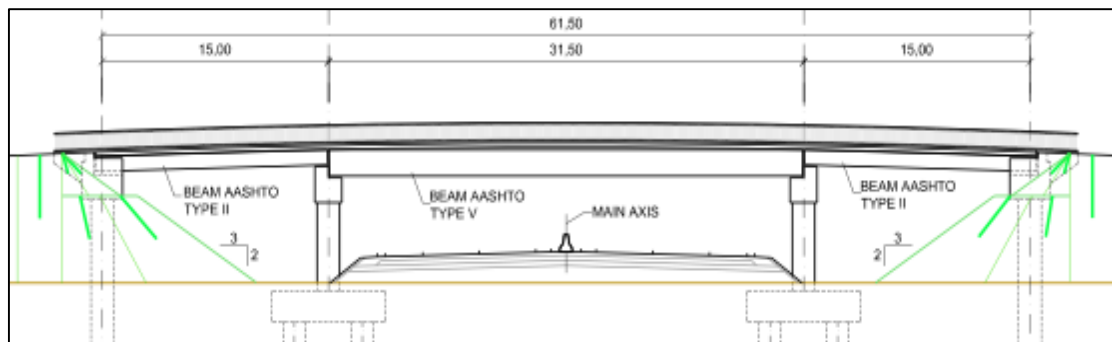


Bridge over Sepa River tributary –Longitudinal section

Figure 19. Bridge over the Sepa River and its tributary

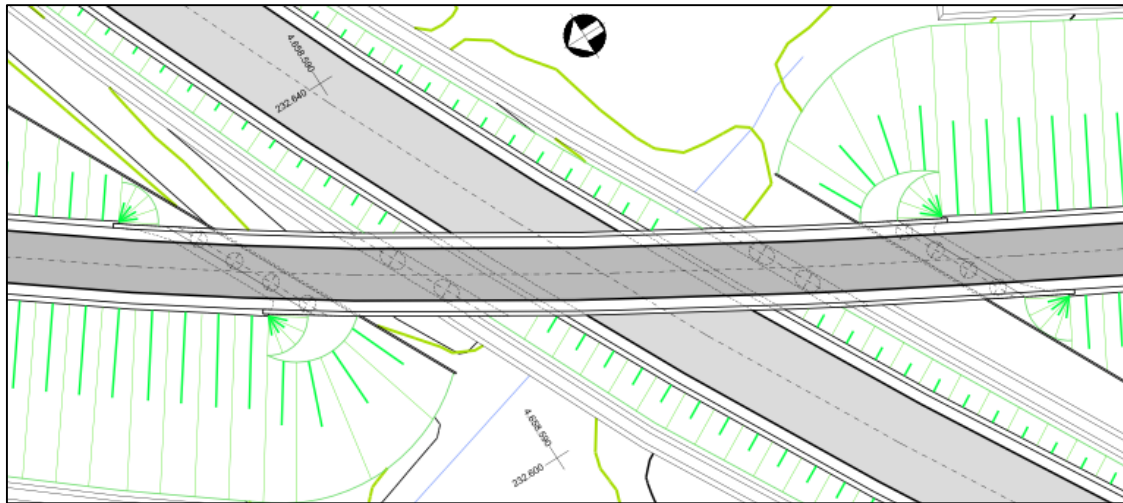


Overpass

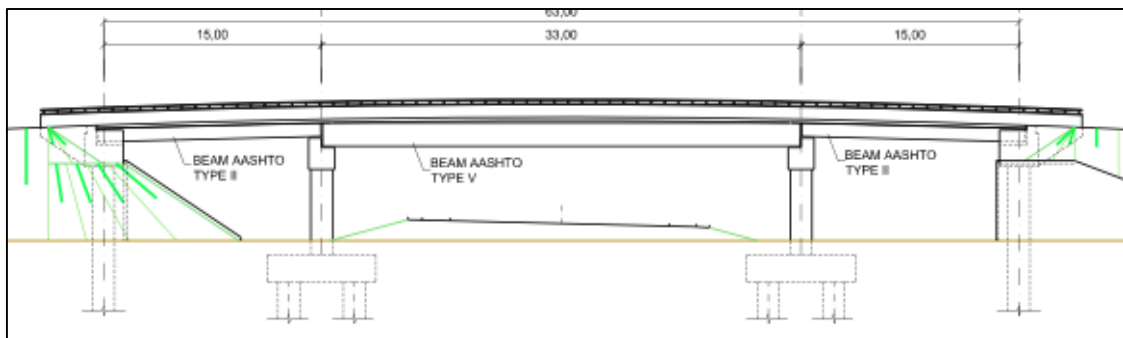


Longitudinal section

Figure 20. Typical road overpass



Plane view



Longitudinal section

Figure 21. Typical interchange overpass

3.3.4. INTERCHANGES

Locations of interchanges have been determined with consideration of the national and international standards taking into account:

- Traffic Intensity;
- Distance between interchanges;
- Size of urban areas;
- Land use;
- Cost of interchange construction;
- Maximum flood level.

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

- IC1-L1 (pk1+490) – Trumpet like;
- IC1-B (pk3+000) - Partial clover type;
- IC2-L1 (pk5+690) - Clover modified using nearby quadrants’;
- IC3-L1 (pk9+090) – Diamond type;
- I-L1-A1-14+400 - existing interchange adopted to the new conditions –adding one ramp and few changes of two ramps required.

3.3.4.1. INTERCHANGE IC1 WITH GRIGOLETI ROAD AND SAMTREDIA-GRIGOLETI HIGHWAY

IC1-L1 (pk1+490) (Figure 4)

The interchange is on the right bank of the Supsa River. Grigoleti-Khidmaghala road has been diverted to allow the lacet for the traffic from Lot 1 to Lot 2, north direction (ramp 3).

Configuration of the interchange has been developed according to expected traffic volumes of each direction, where the flow from and to Samtredia are the most important. Samtredia - Lot 1 traffic will be through the own highway and Samtredia-Lot 2 - through the ramps speeds.

- **Ramp 1** (Samtredia-Lot 2 direction). Alignment uses existing Samtredia-Grigoleti road ROW along the section which is going to be useless after the construction of the realignment projected for the road in this alternative.
- **Ramp 2** starts in the alignment of the Samtredia-Grigoleti road, crosses the main highway via the same underpass of the realignment, goes upward, overpasses Samtredia-Grigoleti road, and finally connects to Samtredia-Grigoleti highway.
- **Ramp 3** makes a lacet for Lot 1 to Lot 2 movement. The radius of the lacet is 45 m (the minimum used in the project). Geometry of this ramp alignment is constrained by limited area available between the highway and the river Supsa where the realignment of Samtredia-Grigoleti road and ramp 2 must be placed.
- **Ramp 4** (with a minimum radius of 120 m for a design speed of 60 km/h) heads to south joining the Lot 1 highway before the viaduct over Supsa River. Acceleration lane of the ramp is placed along the viaduct so, structure width in south direction is enlarged to allocate the additional lane.

3.3.4.2. INTERCHANGE IC-1B NEAR SUPSA TERMINAL

IC_1B

(pk3+000)

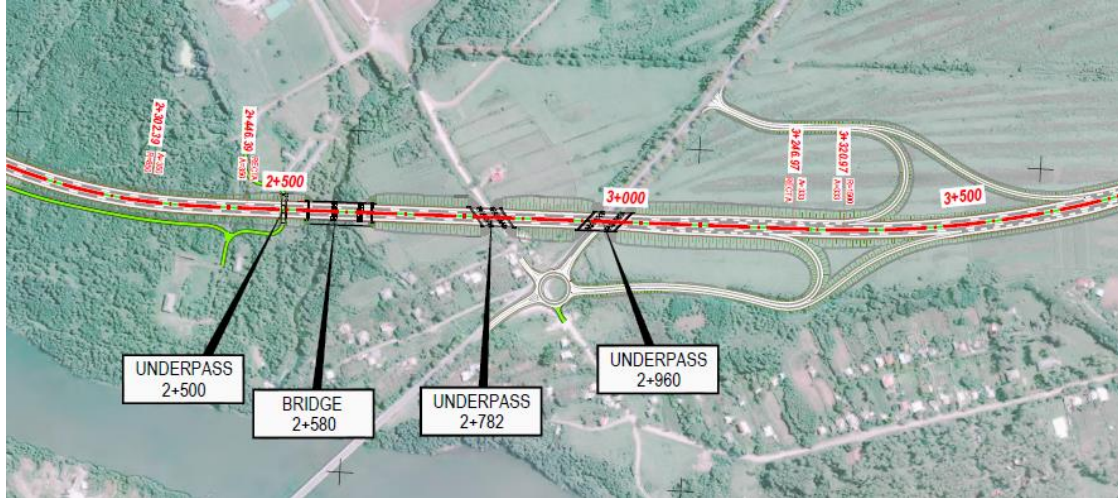


Figure 5)

The lacets have parameters for a design speed of 40 km/h, meanwhile the rest of the ramps have parameters for 60 km/h. A roundabout is necessary in the West side, because of the great number of existing connections. Nevertheless, eastbound of the interchange has been designed a T junction with the current road.

3.3.4.3. INTERCHANGE IC2 WITH UREKI-MAGNETITI ROAD

IC2-L1 (pk5+690) (Figure 22)

At this point the alignment has a 'fixed point' crossing the existing local road between Ureki and Magnetiti, which has a lot of buildings at both sides.

The design, avoiding impact on buildings on the Southern side, has been designed. This is a 'Clover modified using nearby quadrants' type of interchange in the eastbound, and direct ramps connected with a roundabout in the westbound.

Originally, the interchange has been thought to be developed as a single diamond interchange with two roundabouts in the intersection of ramps with Magnetiti-Ureki road. Nevertheless, to minimize impact on the buildings, eastbound of the interchange has been designed with a lacet and a direct ramp connected with the Magnetiti-Ureki road with a T junction in the north area of the local road, where there is more land available.

Direct ramps 1 and 2 have been developed for a design speed of 60 km/h, whereas ramps 3 and 4 are configured as a partial cloverleaf, with ramp 3 making the loop with

a minimum radius of 65 meters, according to permissible values for a design speed of 40 km/h.

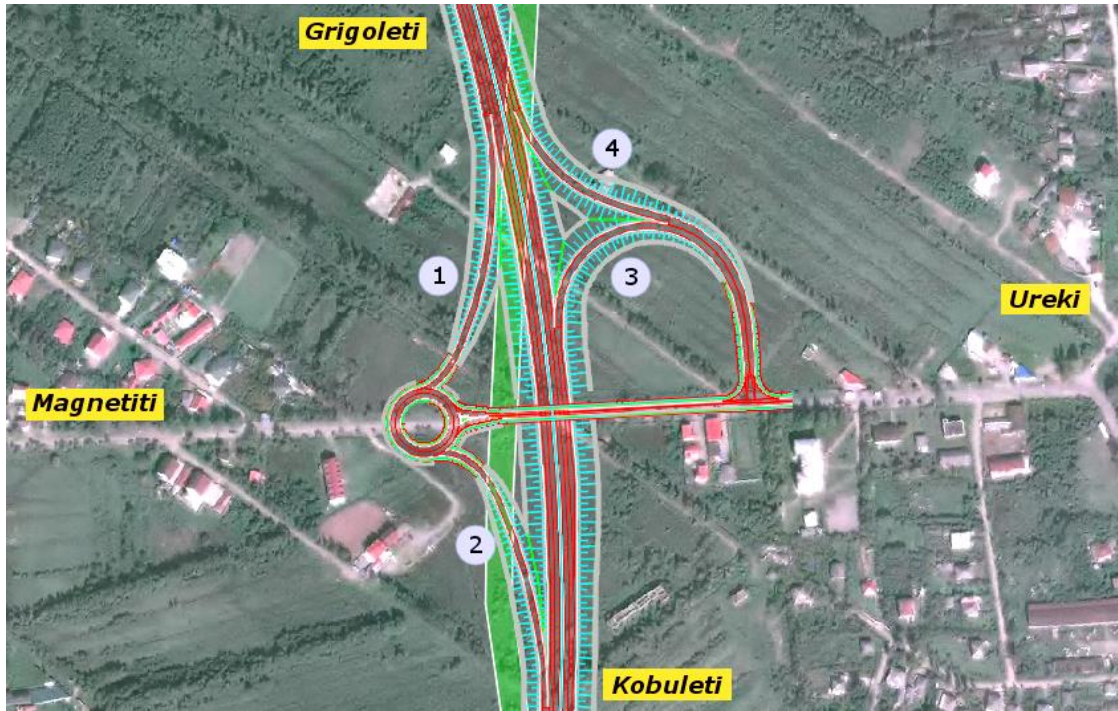


Figure 22. Ureki-Magnetiti interchange

3.3.4.4. INTERCHANGE IC3 WITH EXISTING GRIGOLETI-KOBULETI ROAD IC3-L1 (pk9+090) (Figure 23)

The third interchange is a full diamond interchange with double roundabout to solve intersections with the existing Grigoleti-Kobuleti road.

The design for the interchange has been done with the main alignment (with double carriageway) near the terrain, and elevating the road with an overpass, in order to decrease the earthworks, and the expensive soil geotechnical treatments, and then, minimizing the construction costs.

Design speed for all ramps is 60 km/h.

Roundabouts solution for the intersections has been chosen instead of T-junction due to safety reasons since the local road has a curved alignment in this zone. With the proposed solution, the same curved alignment could be used to reduce the velocity of vehicles arriving at the circular intersection

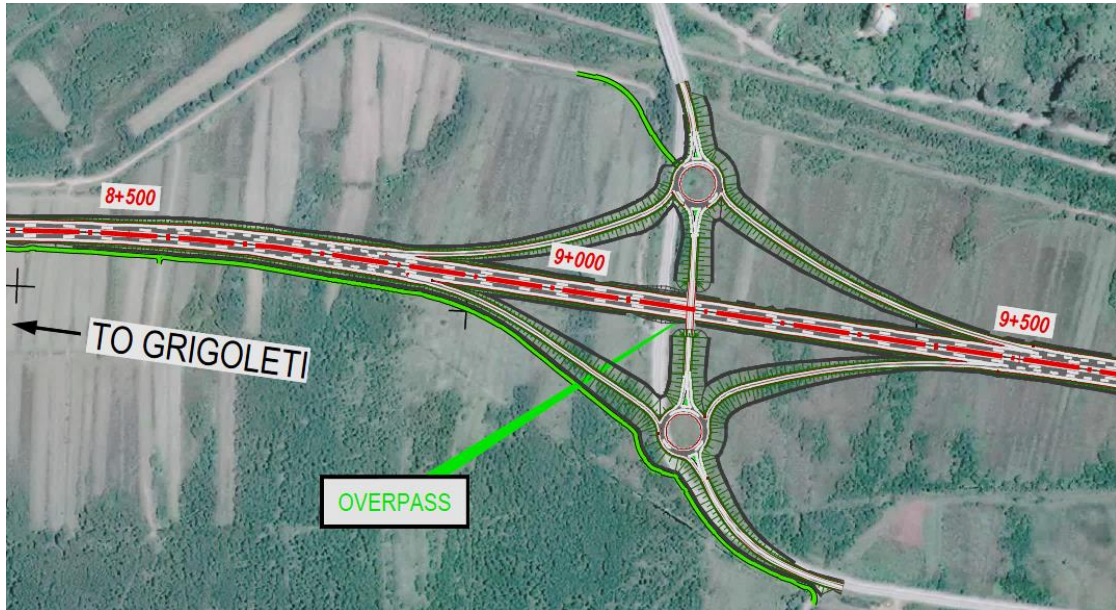


Figure 23. Interchange with existing Grigoleti-Kobuleti Road

3.3.4.5. INTERCHANGE IC4 WITH KOBULETI BY-PASS AND EXISTING GRIGOLETI-KOBULETI ROAD

I-L1-A1 (pk14+400) (Figure 24)

The continuity between the new highway and the Kobuleti by-pass is a clear requirement in order to provide the proper connectivity and functionality, so the interchange have been designed using existing interchange, and adopting it to the new conditions.

Only a new ramp (1) and few changes in other two ramps (2 and 3) are needed. as it is shown in the picture on the right side.

At km 13+300, the right lane separates, connecting with existing E70 Road (1). The acceleration lane joining the left roadbed is incorporated at km 14+100 (2), two left lanes on the carriageway are maintained until km 14+100. After this section, the road continues as conventional road, with only one lane in each direction. A stretch of about 800 m length has to be replaced to give continuity to the existing road (4).



Figure 24. Interchange with Kobuleti by-pass and existing Grigoleti-Kobuleti road

3.4. ROAD PAVEMENT

The software ALIZE-LCPC, developed by the IFSTTAR, representing a computation tool for admissible values (stresses and strains) according to the traffic and the materials was used for design of pavement structures. For Grigoleti-Kobuleti bypass alignment asphalt concrete in the whole project. The main alignment will be composed of three layers, using modified bitumen only in wearing course.

50 mm asphalt concrete wearing course – Fine grained dense asphalt

70 mm asphalt concrete binder course - Coarse grained porous asphalt

120 mm asphalt concrete upper layer of base course - Coarse grained porous asphalt

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 levelling and seeding of grass.

3.5. TRAFFIC VOLUME

Design was developed based on traffic flow data analysis. Information from the Roads Department for 2015, automatic counts (ACC), manual classification (MCC) counts and original destination survey (O/C). The field study was done in winter and summer periods. Traffic flow values (counted) are given below:

Table 12. Traffic flows (automatic count data) in winter and summer periods, 2016

Location	Winter, working day			Summer, working day		
	LV	HGV	Total	LV	HGV	Total
1 Lanchkhuti Grigoleti	5.819	655	6474	11437	1080	12517
2 Sanaki Zugdidi	8615	816	9431	6776	700	7476
3 Shekvetili Kobuleti	2687	98	2785	5563	93	5658
4 Kobuleti Batumi	13730	1144	14874	20750	1765	22515
5 Senaki Poti	5701	934	6635	13051	1608	14659

Note: for location of the control points see **Figure 25)**

Manual Classification Counts to collect information were undertaken at 1 location over a two-day period to collect information for expanding the O/D surveys and confirm existing traffic volumes and vehicle composition along the corridor. The following vehicle types were categorized:

- Car - private cars, and all other small vehicles such as 4-wheel drive vehicles, passenger vans, etc.
- Van - minibuses and small buses of up to 15 seats being used for the transport of fare paying passengers, vans and pick-ups used predominantly for the transport of goods.
- Bus - standard and large buses with more than 15 seats being used for the transport of passengers.
- Light goods vehicle (4-wheel).
- Light goods vehicle (6-wheel). Six-wheel vans used for the transport of goods.
- Two and three axes goods vehicle. Trucks with a total of two axes and six wheels, or three axle trucks with a single axle at the front and two axles at the rear.
- Four or more axes goods vehicles. Trucks or truck - trailer combinations with four or more axles in any formation.



Figure 25. Automatic traffic count sites

Both automatic and manual counts showed that traffic in summer nearly double the winter traffic in the coast corridor and some of its access roads. Light cars dominate,

Modelling of future traffic was done for various scenarios (up to year 2050). It was observed that Grigoleti-Kobuleti section has a very similar demand in all scenarios.

The analysis has been made by means The Highway Capacity Software (HCS), based on the Highway Capacity Manual 2010 methodology for two lane highways.

3.6. MOBILIZATION AND CONSTRUCTION PHASE

3.6.1. MOBILIZATION

Works will be carried out by the contractor selected through international tendering. Prior to the commencement of works, the contractor will specify location of the camp, equipment stationing area, material stockpiling sites and agree on/receive a permit for

its use from the state or the land owner. Potential sites suggested for this purpose are indicated on the map (**Figure 26**).

Table 13. Location of the sites for temporary use during the project

Site	Location	Area, m ²
Area 1	pk1+400	12.880
Area 2	pk5+600	9.245
Area 3	pk9+200	7.275

After selection of construction company through tendering, *preconstruction activities* connected with the highway construction works to be implemented by the latter include the following:

- Preparation of temporary camp sites in the vicinity of the road bed in accordance with environmental requirements;
- Selection of temporary disposal sites for construction debris of the highway and materials;
- Selection of temporary sites for separate stockpiling of topsoil and subsoil, obtaining approval from local administration and environmental authorities;
- Land acquisition/compensation;
- Obtaining permits (Environmental impact permit issued by the MENRP) for the operation of asphalt plants (in case contractor plans to run his own plants);
- Approval of quality characteristics (allowable limits of discharge) of waste water by MENRP (part of Environmental impact permit) – if discharge into any water body is planned;
- Obtaining mining licenses by contractor or concluding sub-contracts for the supply of aggregate materials (use of licensed suppliers rather than development of new quarries is advisable);
- Developing waste management plan;
- Developing traffic management plan;
- Developing work camp or construction yard site map;
- Relocation/protection of existing infrastructure.

3.6.2. CONSTRUCTION STAGE

The construction process involves a variety of activities, such as:

- Removal of vegetation from the RoW;



Figure 26. Location of site for camp, machinery stationing and material stockpiling areas

- Stripping and stockpiling of topsoil until reuse during reinstatement of temporarily disturbed sites (Note: a) the height of the stockpile must not exceed 2m, b) all sites temporarily disturbed/used for the needs of the project must be reinstated);
- Removal and stockpiling of subsoil to agreed location until reuse;
- Grading of the area and laying of cross-drain pipes/culverts. In fill areas, the grading is brought up in layers and compacted. In cuts, the excavation is carried on until the subgrade elevation is reached, and then the earth is compacted;
- Reinforcement of soil with gravel columns and/or Prefabricated Vertical Drains (PDV);
- Base course forming on the subgrade. Soil rolling with machinery. Import of inert materials with trucks, roll (around 500-800 mm) for bed formation;
- Surface course forming over the base. This material may be sand, asphalt, blacktop, concrete, or similar materials;
- Concrete works, arrangement of foundations and bridge structures, including arrangement of sheet piles for construction of the piers in the riverbed;
- Construction of span bridges;
- Providing of road furniture and marking in accordance with international standards;
- Landscape harmonization and tree planting/grass seeding of temporarily disturbed areas according to the reinstatement plan.

Volume of earthworks is calculated in accordance with the design cross-sections.

Table 14. Volume of earthworks

	Unit	Quantity	Total quantity
Volume of topsoil to be removed	m ³	262,677.6	262,677.6
Cuts	m ³	Main road: 434,541.59 Interchanges: 146,573.78	581,115.37
Embankments	m ³	Main road: 1,416,723.44 Interchanges: 449,667.91	1,866,391.35

Construction works will be carried out in conformity with valid standards, norms, recommendations and instructions, in accordance with typical technological diagrams, design specifications, following the Best Available Technology practice.

The construction phase is anticipated to take up 18 months.

3.6.3. OPERATION STAGE

Operation of the road involves activities, such as maintenance of the pavement and the road infrastructure/markings, clean up and management of roadside waste, maintenance of compensatory plantations (if the case).

3.6.4. OFF-SITE WORKS

Off-site works will include extraction of construction materials. Purchase of material from already existing licensed quarries will be preferable as opposed to opening of new quarries by contractor. Material purchase will be allowed from an authorised, licensed providers only.

Contractor will be requested to provide copies of licences obtained from material provider to the client before commencement of works.

During the design stage licensed quarries were defined in 40 km from the site. The inert material in the project area, in general, fits the requirements for fillers, pavements and base materials, but may need sieving. There is a range of sand gravel sourcing sites in the area (**Figure 27- Figure 29**), Licences for abstraction of gravel and sand from these areas has expired or will expire soon.

Table 15. List of sand-gravel abstraction sites in the region

#	Municipality	Area, ha	License #	Issued	Period	Owner	Total abstraction
1	Lanchkhuti	1.25	00715	13.07.2007	5	JMM Ltd	79600
2	Lanchkhuti	3.1	0000147	21.12.2005	10	I Betoni Ltd	135300
3	Lanchkhuti	0.7	0000147	21.12.2005	10	I Betoni Ltd	
4	Lanchkhuti	16.4	498	14.11.2002	10	Bako Ltd	200000
5	Lanchkhuti	5.1	00302	12.09.2006	15	Kvachadze Shromis Ubani	180000
6	Lanchkhuti	1.28	00473	19.02.2007	5	Vakhtang Rokava	75000
7	Lanchkhuti	0.52	00473	19.02.2007	5	Vakhtang Rokava	
8	Ozurgeti	4.9	00315	19.9.2006	10	International company 2005	10000
9	Ozurgeti	9.35	100835	2.06.2008	5	Nino Ltd	10500

#	Municipality	Area, ha	License #	Issued	Period	Owner	Total abstraction
10	Ozurgeti	0.37	01107	30.01.2008	5	Giga Makharadze	11100
11	Ozurgeti	1.7	100841	28.03.2006	10	Kartuli cementi Ltd	50000
12	Ozurgeti	5.7	00503	05.04.2007	5	Union Association ATU	100000
13	Ozurgeti	1.47	01008	31.1.2008	5	Giga Makharadze	83100
14	Ozurgeti	1.3	01108	30.01.2008	5	Giga Makharadze	
15	Ozurgeti	7.25	100010	05.08.2007	5	Gza Ltd	217500
16	Ozurgeti	1.4	00444	29.01.2007	5	Nino Ltd	134000
17	Ozurgeti	2	00444	26.01.2007	5	Nino Ltd	
18	Ozurgeti	1.5	100758	11.10.2006	20	VA-Go Ltd	
19	Ozurgeti	0.74	100322	30.10.2008	5	VA-Go Ltd	29700
20	Ozurgeti	0.59	01096	25.01.2008	5	Emzar Makharadze	17708
21	Ozurgeti	2.25	100592	30.10.2008	5	VA-Go Ltd	89700
22	Ozurgeti	0.89	01106	30.01.2008	5	Giga Makharadze	26700
23	Ozurgeti	5	621	07.06.2005	10	Tengo Ltd	
24	Ozurgeti	1.72	0005	20.12.2007	5	Gabroni Ltd	103200
25	Ozurgeti	1.96	00444	26.01.2007	5	Nino Ltd	134000
26	Ozurgeti	3.95	100361	22.08.2006	10	Gora Ltd	130000

The contractor may run own quarry, but in this case obtaining licence from MENRP will be required. Contractor may decide to use the same sites indicated above (under condition that MNRP licence is obtained). Location should comply with requirements set out in the Law on regulation and engineering protection of the sea and river banks and Governmental decree #136, on approval of Rules and conditions of issuance of mineral resources abstraction licence. Only a licensed quarry may be used. (For additional information see sub-section 2.7).

Material removed in cut section can be used for embanking.

Several cement plants have been identified in the project area (**Figure 30**).

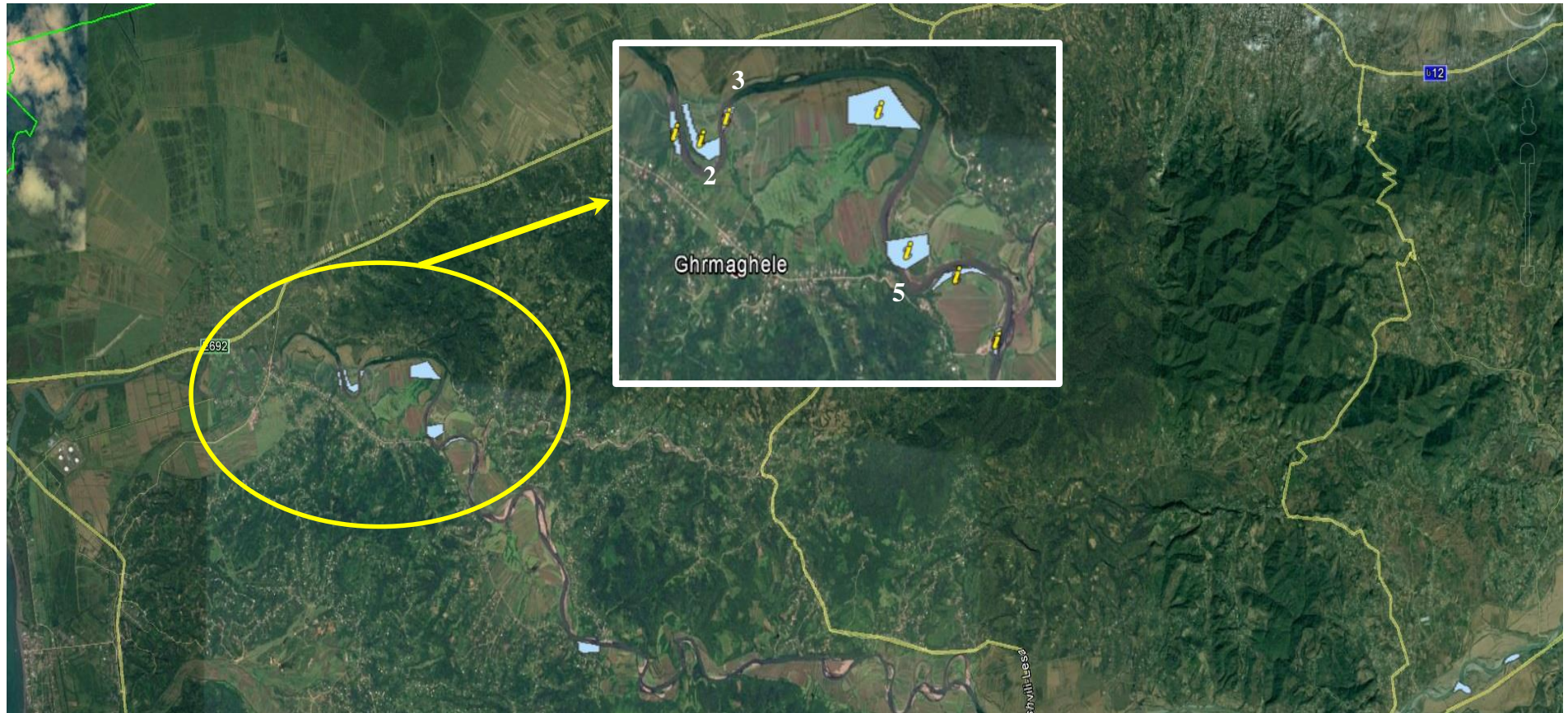


Figure 27. Licenced sites of gravel-sand abstraction - Supsa River (Lot 1)



Figure 28. Licenced sites of gravel-sand abstraction - Natanebi River (Lot 1)



Figure 29. Gravel and sand extraction areas (licenced)



CP1



CP2



CP3



CP4



Figure 30. Cement plants within 40km from the project area

4. METHODOLOGY

The ESIA process included two stages – Preliminary ESIA at Feasibility stage of the project and ESIA during development of detailed design. The process consisted of six main activities that are common to most ESIA studies conducted to the national and international standards comprising the following:

- 1 Collection of baseline data describing the existing environment (physical, biological and anthropogenic aspects) within the area of the proposed project; desk studies and field surveys conducted to address important gaps in the existing data, update of information on topics and areas where impacts are expected.
- 2 Identification of impacts, assessment of their significance and development of impact avoidance, reduction and/or mitigation measures (avoidance of impacts is preferred over mitigation by both IFI safeguards and Roads Department policy.).
- 3 Analysis of alternatives in terms of location, technology, design and operation, including the "zero" alternative.
- 4 Development of the environmental management plan (EMP).
- 5 Stakeholder consultation and disclosure.
- 6 Drafting of the ESIA report.

Activities implemented by the team included desktop studies and field work for verification of available reference/literary data and additional data gathering, followed with analysis of information. Boundaries of project impact zone/survey boundaries have been set.

Field surveys involved sampling for soil and surface water quality analysis, measurements of background noise and radiation, faunistic and flora surveys, socio-economic data gathering and analysis.

Impact recipients and impact factors/sources have been identified. Assessment of impact significance have been carried out throughout the area of influence of the Project and its component activities. In each case the spatial boundaries comprise the areas within which significant impacts are likely to occur and take into account the physical extent of the planned activities, and the baseline status of recipient environment as well as ability of impact to propagate beyond the project boundary. Therefore these boundaries turned to vary depending on the type of impact being considered.

The temporal boundaries of impacts have been identified and assessed for all phases of project development (mobilisation, construction, operation).

For the purpose of this ESIA, the area of influence has been defined as the area in which a direct and/or indirect impact on the biophysical and social (including cultural heritage, occupational health and safety issues) environment might occur.

The areas of influence have been set as 100m to 500m (depending on the type of impact; location, type and sensitivity of recipient). For impact on archaeological heritage 50m corridor along the RoW was considered as the area of influence.

It was considered that the settlements/population within 1 km from the project sites will be most significantly affected by direct impacts (resettlement, infrastructure and transport system, reduced environmental quality).

Description of impact assessment methodology is given in Annex 1.

5. BASELINE DATA

5.1. PHYSICAL CONDITIONS

5.1.1. Climate and meteorology

Western Georgia has prevailing subtropical climate, influenced mainly by dry air masses from the Caspian and Central Asia in the east, and humid air from the Black Sea in the west. The Caucasian ridge, located north-east to the site protects the area from cold air masses coming from the north. At the same time high ridges favour condensation and therefore humidity is rather high. The area is known for high level of precipitations.

According to construction-climatic characterizations the project region belongs to III-b climatic sub-region.

Seasonal pattern of wind direction is predetermined by location of Lesser Caucasus and Likhi ridges which are responsible for regulation of air circulation regime. Winds directions are characterised by seasonal variations and depend on topography of the area. According to the meteorological station of Supsa, in the Supsa area north-east and south-west winds dominate. The winds have a seasonal character: in winter is characterized north-east whereas in summer south-west winds are prevailing.

Climatic characteristics of the project area, based on Construction Climatology (PN 01.05-08, Tbilisi 2009) are given below:

Table 16. Air temperature

Location	Average monthly												Aver. Annual
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
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	13.5
Ureki	5.8	6.4	8.6	11.8	16.2	20.3	22.6	23.0	20.0	16.4	12.3	8.1	14.3
Kobuleti	4.8	5.5	7.6	10.9	15.4	19.5	22.4	22.6	19.5	15.4	10.7	6.7	13.4

Location	Abs min	Abs max	Aver max, hottest month	Coldest month 5-day aver	Coldest month aver	Coldest period average	Period with average monthly T<8C		Aver T at 13:00	
							Duration day	Aver T	Coldest month	Hottest month
Supsa	-13	41	26.8	-4	-6	4.2	106	5.5	6.5	25.3
Ureki	-16	40	26.9	-2	-5	5.5	84	6.3	7.2	25.1
Kobuleti	-16	41	26.6	-3	-6	4.6	109	5.8	7.5	25.1

Air temperature amplitude

Location	Average monthly °C												Max monthly °C											
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
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	15.0	17.9	19.6	20.4	21.2	20.0	19.0	18.8	21.2	21.5	20.5	16.0
Ureki	7.1	7.5	8.0	9.0	9.1	8.1	7.0	7.3	8.3	8.8	8.3	7.1	15.2	16.2	17.5	18.0	18.2	17.4	15.5	16.0	17.9	18.2	18.0	16.2
Kobuleti	8.3	9.0	8.7	9.0	8.6	8.5	7.5	8.0	9.0	10.2	9.8	9.5	17.0	17.8	17.5	17.8	17.0	16.7	19.0	16.6	17.7	21.1	20.0	19.5

Table 17. Relative humidity

Location	Relative air humidity, %													Average relative humidity at 13:00		Aver.daily amplitude of relative humidity	
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Aver Annual	Coldest month	Hottest month	Coldest month	Hottest month
Supsa	80	80	79	79	80	82	84	86	86	84	80	78	82	72	74	12	19
Ureki	72	73	76	78	81	80	81	82	81	78	76	72	78	66	73	9	14
Kobuleti	80	80	79	80	82	80	80	82	84	84	82	80	81	69	71	16	21

Table 18. Precipitations

Location	Precipitation per year, mm	Daily maximum, mm
Supsa	2379	260
Ureki	2078	227
Kobuleti	2352	240

Table 19. Snow cover

Location	Weight of the snow cover, kPa	Number of days with snow	Water content, mm
Supsa	0.50	10	-
Ureki	0.50	7	-
Kobuleti	0.50	7	-

Ground freezing depth, 0

Table 20. Wind characteristics

	Max speed possible once in 1,5,10,15,20 years, m/sec					Recurrence of direction (%) January, July								Average max and min velocity, m/sec		Wind direction and calm recurrence (%) per year									
	1	5	10	15	20	N	NE	E	SE	S	SW	W	NW	Jan	Jul	N	NE	E	SE	S	SW	W	NW	Calm	
Supsa	21	26	29	31	32	1/1	71/7	2/1	2/5	4/19	10/37	8/28	2/2	6.4/1.2	4.0/0.5	2	42	2	2	10	24	16	2	51	
Ureki	17	21	23	25	26	3/0	24/3	30/12	12/16	12/17	9/3	7/17	3/4	4.7/3.0	3.9/2.6	3	15	20	13	14	20	11	4	5	
Kobuleti	18	22	24	25	26	2/3	36/8	15/11	8/10	7/9	23/40	5/17	4/2	4.4/1.5	5.1/1.7	2	23	13	8	7	30	11	6	20	

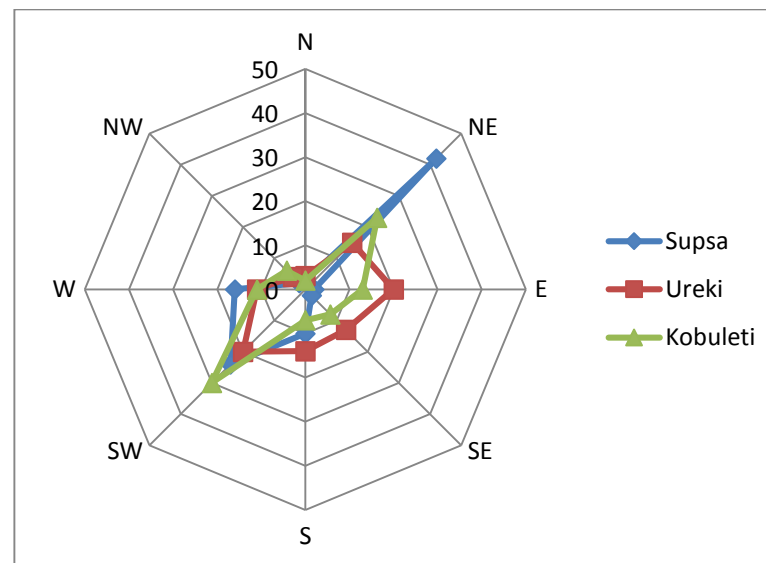


Figure 31. Wind rose

During the last 50 years average annual temperature on the whole territory of Georgia showed growing trend. Its maximum increment in West Georgia was (+0.6°C) was registered in Poti. According to forecast, by 2050, as compared with 1986- 2010, warming will mostly occur in coastal zone and mountainous regions of Adjara (1.6-1.7°C), and by 2100 the biggest increment of temperature (+4.2°C) is anticipated in Batumi. In general, precipitation increased in most regions of West Georgia. Up to 2050, according to the forecast, sustainable trends of increase of precipitation is anticipated. Decrease by 10-20% will begin till 2100. Relative humidity of air in the period of 1961- 2010 increased by 2% on the entire territory of Georgia, although change of this trend in declining direction is anticipated in the region under consideration in 2050-2100. Average annual wind speed significantly decreased on the whole territory and according to the forecast, this decrease will continue till the end of the century.

5.1.2. AIR QUALITY

The air quality is likely to be generally good in the study area, given its rural character, the predominance of agriculture as the major land use, and the absence of heavy industry. Vehicle emissions are comparatively low because of low traffic volumes, and air pollution is rapidly dispersed due to winds. However, the residents of the settlement closest to the highway may be exposed to elevated levels of pollutants from vehicle emissions.

There are no permanent air quality observation points in the project area. Background values in Ureki, Tskhaltsminda and Kvavilnari are of the following range: nitrogen dioxide - 0.008 mg/m³; sulphur dioxide - 0.02 mg/m³; carbon oxide - 0.4 mg/m³ and dust 0.1 mg/m³.

5.1.3. NOISE

The rural character of the study area also means that the noise environment is generally quiescent, and there are few sources of anthropogenic noise in and around most villages. There are no stationary noise and vibration source within the study area. The road and the railway are likely to be the main sources of noise in the study area. In some sections of the highway in condition of increase traffic the noise level may exceed acceptable daytime/night-time noise level in adjacent residential areas, but keeping in mind that sound is attenuated rapidly by intervening buildings and vegetation, and levels generally decrease quite quickly with distance from the source, exposure to elevated levels will probably limited to people living within a few hundred meters of the road.

Background noise was measuring using ИБШ-1 device. The measurements were done in daytime (from 10:00 to 18:00 hr). Average values measured three times in each of 3 control points are given below.

Table 21. Noise levels (daytime) measured in the study area

#	Description	Noise level and equivalent noise level, dBA
1	Kvavilnari Settlement	32.0
2	Tskaltsminda Village	36.0
3	Ureki	40.0
4	Magnetiti	32.0
5	Shekvetili	38.0

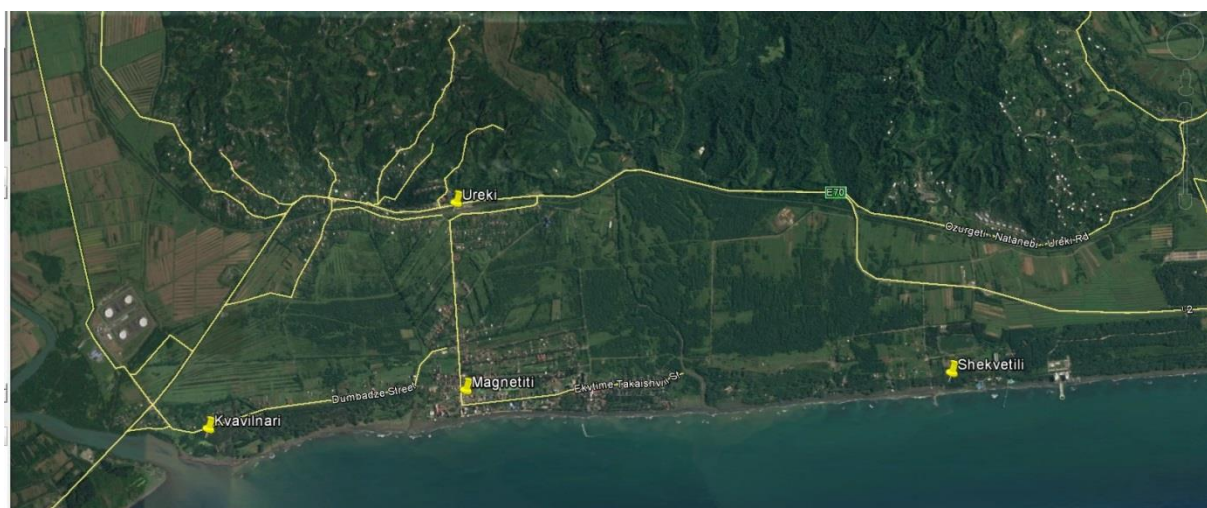


Figure 32. Air quality and noise measurement points

The obtained results show that noise levels are significantly below permissible values⁴. It should be mentioned that traffic on the roads was low. During the summer season higher noise levels are expected.

5.1.4. NATURAL BACKGROUND RADIATION

Background radiation of the investigated area was measured to check gamma-background and detect uncontrolled radioactive sources if any. Measurements were done with scintillation dosimeter СРП-68-01, allowing to measure gamma-radiation current within 0-

⁴ Sanitary Standards on Noise at Work Places, Residential and Public Buildings and Residential Territories.

10000 S-1 and exposition dose within 0-3000 $\mu\text{R/hr}$. Measured values of gamma radiation were found to be within the range of 7-15 $\mu\text{R/hr}$. The value is in the natural background limits for the area (which in Poti and the area equated 8-15 $\mu\text{R/hr}$). No uncontrolled radioactive sources and radioactive pollution were registered.

5.1.5. LANDFORM

The study area is located within the limits of Kolkheti lowland. The landform of the area is flat. Geotechnologically it is a depression where a lot of surfacial origin terrigenous matters are accumulated. The main terrain types within the Kolkheti lowland are:

- (a) the coastal dune strip, which follows the sea coast and consists of 1-3 m high and 30-100 m wide sand dunes;
- (b) alluvial lowland of the Rioni River, with flat, slightly westwards descended (0.0003-0.0005) terrain and absolute altitudes of 0-18 m; and
- (c) alluvial and alluvial-marine lowland with almost flat surface dissected by old river beds and interfluvial depressions, slightly outlined riverbeds and drainage canals.

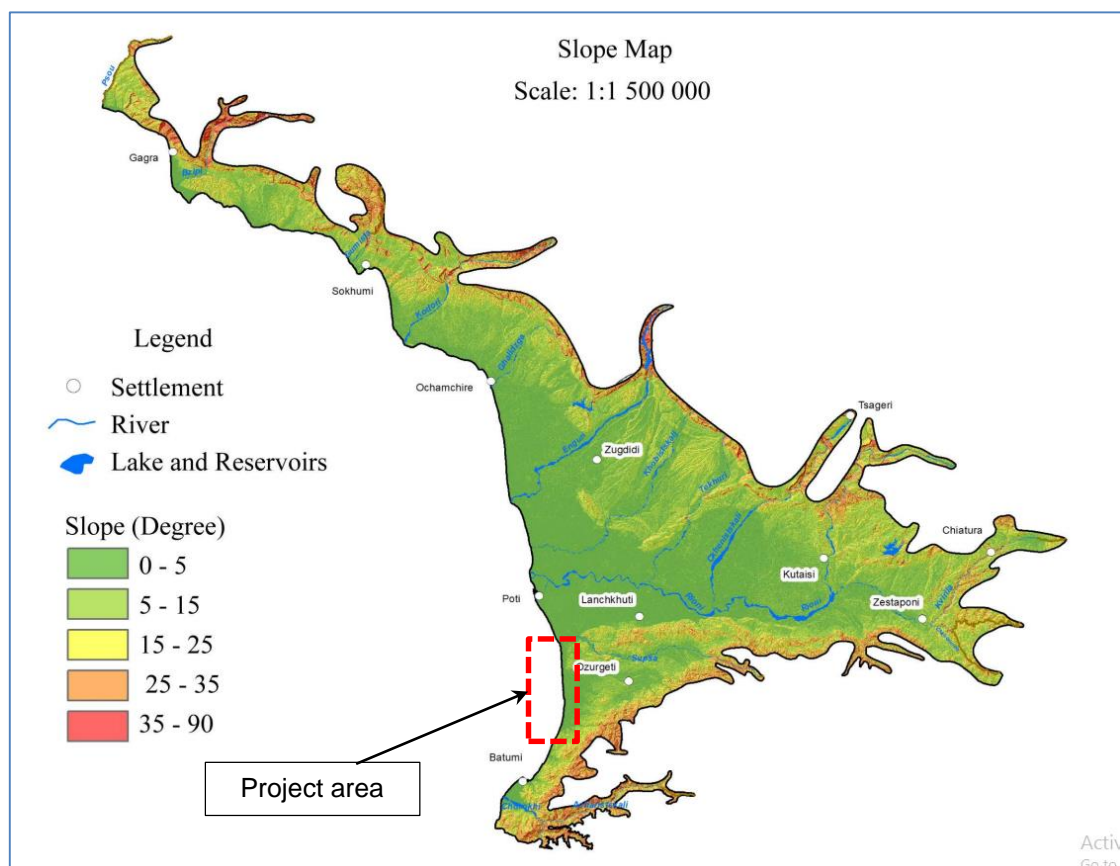


Figure 33. Slope map

The lowland is slightly descended towards the sea with average gradient of 0.0005. Its western part is composed of wetland. The absolute altitudes vary from 10-18 m to 0-3 m from the east to the west. Within the zone of boggy deposits, the terrain is composed of the peat domes elevated above the wetland surface.

Many areas in Kolkheti Lowlands are prone to subsidence, which is exacerbated by human activity, such as drainage of peatland and river impoundment. The subsidence rate of the region varies from 2 to 6 mm per year. Subsiding cities like Poti and Batumi are facing inundations by the sea already. In the section of interest subsidence is not observed.

For the area south to the Supsa River historically terrain uplift trend is observed. The strip from Rioni city channel up to the environs of Maltakva, because of the deficit in sediments is subject to wash-out. The wash away rate totals 4-5m/sec. Near Maltakva and farther up to Grigoleti the coast is stable. Starting from Grigoleti to the Supsa River mouth, about 3-4km, the coast is being washed away. Erosion rate equals 2-3m per year.

5.1.6. GEOMORPHOLOGY AND GEOLOGY

Geologically, most of Kolkheti lowland is built of Quaternary alluvial and fluvioglacial sediments, derived from massifs of Eocene volcanics in the Anticaucaus and the complex folds of the Main Caucasus Range.

Geotectonically, the area belongs to the Kolkheti sub-district of the western depression zone of the Georgian Block. The geological structure of the district is represented by Quaternary deposits - marine and continental accumulations. Marine sediments are met mainly in the coastal zone and are overlaid with alluvial, proluvial and morass sediments. In east direction these accumulations are substituted for continental faces. Alluvial sediments are met north of the coastal area, while morass sediments are presented in the coastal strip of the Black Sea and Rioni River lowland.

Marine sediments - Chaudian strata (Q1cd) lithology consists of grey clays, sandstones, seldom conglomerates. In lowlands the upper part of the mentioned strata is composed of dark and grey clays, sandstones with coarse grain sandy interlayers. Capacity of Chaudian layers is raising in the east to west direction with a maximum in the outskirts of Poti. Lower Euxinic layers overlay Chaudian strata and consist of sandy clays and fine grain sands. Capacity attains 100 m and increases in the north to south and the east to west direction. Uzunlar horizon in Poti city area is 6 m thick. Caragane layers are found in Paliastomi lake environs. The stratum is composed of sandy clays and is 27 m thick. Upper Euxinic horizon

is presented by grey and black clays and sands (Capacity 80-100m). Lower Black Sea stratum is composed of clays, black sandy clays and pebbles (20-25m).

Continental sediments - Quaternary sediments (Q1-3) consist of pebble – boulders, sandy clays and clay formations. In the east part of Kolkheti lowland pebble – boulders are widespread. In sea direction these formations are dipping. They are covered with clayeys and dismembered. Capacity – 10-70 m. At the same time, the rocks are substituted for sands and clay formations. Similar pattern is characteristic for Paliastomi lake area (up to 70-80 m depth). Dominating are sandy and clayey formations. Overall capacity of the Quaternary sediments is 300 m and higher. Capacity raises from the periphery towards the central area and in east to west direction, where capacity is changing in compliance with the structure of pre-Quaternary sediments.

Modern alluvial sediments are widespread in the ravines of Supsa and Rioni rivers. 15-20 m capacity pebbles, sands, clays, clayeys are met here. Upper Quaternary alluvial and alluvial marine sediments are covered with morass lowland sediments composed of silt and sandy clayey formations substituted with humus substances. Peat lenses and layers are formed. The latter are met at 10-12 m depth.

Overall capacity of these sediments is 30-40 m. Modern alluvial-marine formations are located along the littoral strip. Lithologically they are presented by medium and large grain sands and pebbles, whereas in river confluences clayey small grain sands and clays are met. The dunes are 3-4 m high. Frequent winds cause in land transition of dunes, their surface is wavy. Dunes are wedging in marshes.

The geology of Kolkheti depression (Poti and Supsa area) is dominated by sedimentary deposits from the Holocene period which are of lacustrine origin. These sediments form the entire central part of the lowland and reach several hundred meters in thickness. Lithologically, these formations consist of clays, silts and peat, whereas the underlying strata include sands, silty sands and silts. The main founding strata of the structure are the silts with occasional lenses of sand and peat.

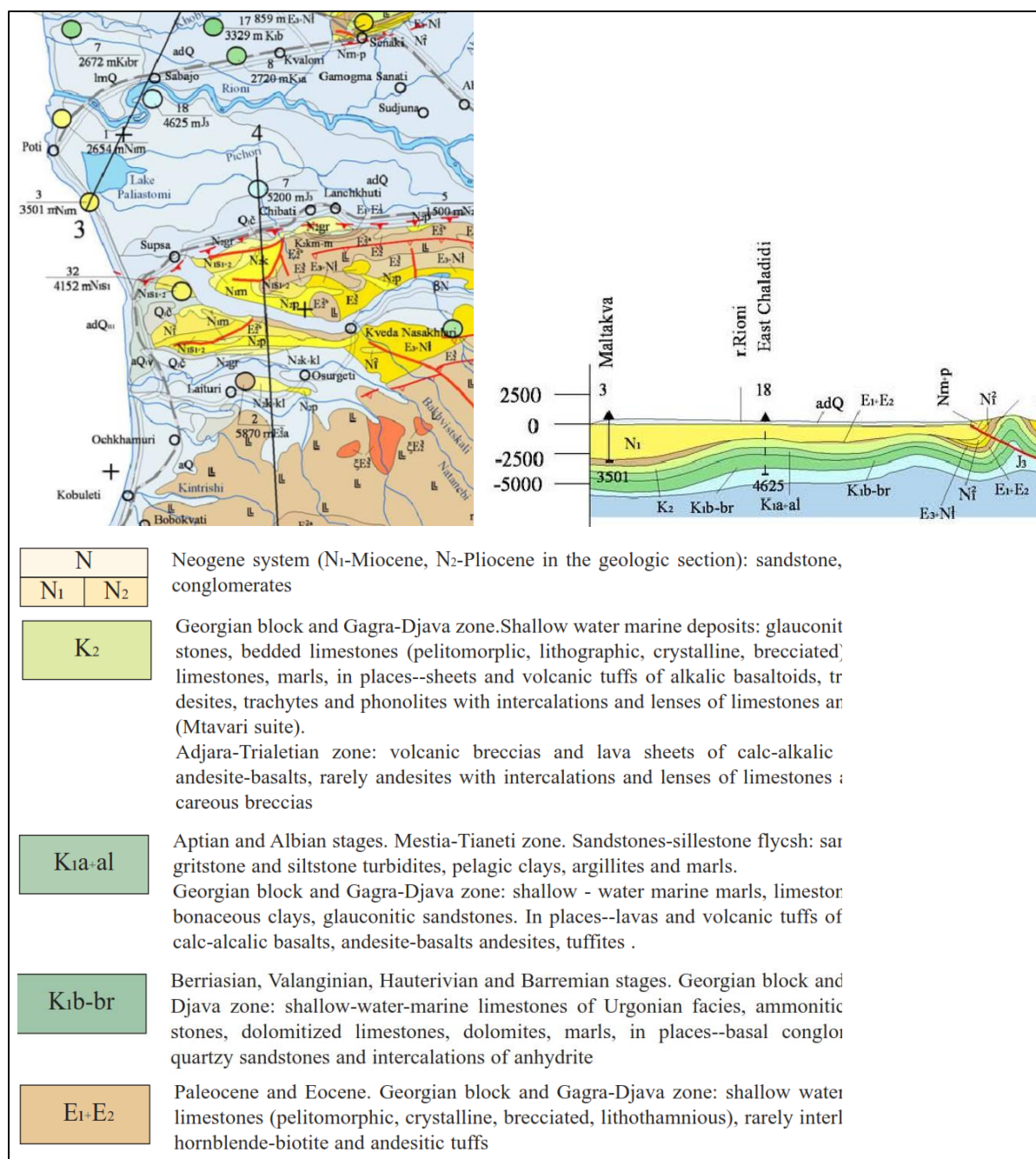


Figure 34. Fragment of geological map of Georgia

5.1.7. LITHOLOGY

In the course of the design in order to obtain information of lithology in along the project alignment 58 boreholes (including 27 – 15m deep, 22 – 30m deep and 4 – 40 m deep) and 52 pits were arranged, penetration tests carried out in 34 locations. (Maps with indication of the survey points are given in Annex 2).

The area is built of the by recent (Q4) contemporaneous alluvial marine, Holocene (sand and silty sand) and Upper Quaternary Q3 new Euxine, beach and deltaic loose sediments. Accumulation of the sediments in the area was conditioned by transgression and regression processes. 30m to 100m stratum represent result of new Euxine regression, the younger deposits (from 15-30m) are connected to Pontic and Colchic regressions; whereas the upper layer 0m to 15m is related to Lazian transgression. Natural soil, especially in the boundaries of the residential areas, is covered by 0.15-1.3m thick technogenic soils (cobbles, gravel, sand). Clays are characterized by local distribution. In addition to the soils mentioned above, several types of various density and grain size sand is observed.

Lithological description of the study area is given below:

MIOCENE. Molasse deposits (Mm)

These deposits are formed by marine and continental molasse: sandstones, clays and conglomerates. On the slopes around 10 cm thick sandstone with clay interlayers are visible.



Sandstones

QUATERNARY. Delta deposits (QD)

Represent the products of erosion and drift from the hills. They are composed of gravel, sands and silt. The lithological column greenish grey muddy clay with interleaves of vegetal rest, fine sands with gravel interlayers have been observed.



Grey sand (BH-5).

QUATERNARY. Coastal deposits (QC)

These formations are represented by medium to fine grain sands with gravel, forming coastal bars, due to the action of the tides.



Grey sand, pit-5

QUATERNARY. Paludal deposits (QP)

These deposits have formed in anoxic conditions which favoured degradation and conservation of organic matter. They are represented mainly by peat. Peat and moisture loving plants are spread on the surface.



Peat, pit-8

QUATERNARY. Alluvial deposits (Qal)

These deposits are found in the fluvial courses (such as the Rioni, Supsa and Natanebi rivers). They are formed by gravel, sands, silt and clays



Grey sand - the Supsa River.



Gravel - the bed and terraces of the Natanebi River

QUATERNARY. Alluvial fan deposits (QAF)

These deposits are formed by eroded material carrying in from the surrounding hills. They are represented by gravel, sands, clay and silt. Depending on distance from the source the size of particles varies. The finest grain is material carried in from the remote areas. The upper stratum formed by greyish silty clays overlays several tens of meters strong fine- to medium- grain greyish sands. Decimetre and/or centimetre thick layers of shells are also observed.



Grey sand with broken shells from BH-1

QUATERNARY. Glacis deposit (QG)

The deposits are represented by gravel, sand, clay and the silt, grey and brown silty clays. Underlaid by a layer of coarse to fine gravel with argillaceous matrix. Beneath this gravel stratum greyish fine sand, with interlayers of crumbled shells is found.



Gravel and sand from BH-2.

QUATERNARY. Valley bottom deposits (QFB)

They are located inside narrow valleys, located in the relief tertiary, next to the coast. They are formed by sands, silt and clays.

FILLS

Two types of fillings are distinguished:

- **Infrastructure fillings (FI).** Corresponding to linear infrastructures like roads, highways or railroads.
- **Construction fillings (FC).** Corresponding to those zones used for the construction of buildings, esplanades, etc.

Groundwater levels in the project area ranges from 0.3 to 2.0 m depths.

Description of several geotechnical groups (Feasibility Study)

- Group QD

Lithology. The lithologic column of the delta deposits is characterized by the greenish grey muddy clay presence with interleaves of vegetal rest. Underneath, the presence of fine sands has been observed grey. Gravel interleaves have also been detected.

The geotechnical parameters of QDc are :

Particle Size Distribution #0,008)	70.2
Liquid Limit	53.2
Plastic Limit	27.9
Plasticity Index	25.4
Humidity (%)	66.9
Dry Density (T/m ³)	1.5

Organic Matter (%)	6.1
CBR (100% PN)	10.5
Unconfined Compression (kp/cm ²)	3.4
Shear Strength c' (kp/cm ²)	0.5
Shear Strength ϕ (kp/cm ²)	17
Shrinkage (%)	1.53
Cv (Oedometer) (cm ² /s)	0.00073

The geotechnical parameters of QDs are:

Particle Size Distribution (#0,008)	25.8
Liquid Limit	49.4
Plastic Limit	32.7
Plasticity Index	24
Humidity (%)	29.5
Dry Density (T/m ³)	1.4
Organic Matter (%)	0.8
Unconfined Compression (kp/cm ²)	2.7
Shear Strength c' (kp/cm ²)	0.5
Shear Strength ϕ (kp/cm ²)	16.7
Shrinkage (%)	2
Cv (Oedometer) (cm ² /s)	0.00035

- Group QG

Lithology. The materials that form the slope deposits characterize by grey and brown silty clays. Underneath, a layer of coarse to fine gravel is observed with enough argillaceous matrix. Under gravel, there appear greyish fine sand, with interleaves of rest of shells.

The geotechnical parameters of QGc are:

Particle Size Distribution (#0,008)	92.1
Liquid Limit	57.2
Plastic Limit	27.7
Plasticity Index	29.5
Humidity (%)	48
Organic Matter (%)	4.4
CBR (100% PN)	14.2

The geotechnical parameters of QGs are:

Particle Size Distribution (#0,008)	20.2
Liquid Limit	34.7

Plastic Limit	16.8
Plasticity Index	18.5
Humidity (%)	26.3
Dry Density (T/m ³)	1.5
Organic Matter (%)	0.1
CBR (100% PN)	28
Unconfined Compression (kp/cm ²)	2.6
Shear Strength c' (kp/cm ²)	0.4
Shear Strength ϕ' (kp/cm ²)	17.3
Shrinkage (%)	2.4
Cv (Oedometer) (cm ² /s)	0.0021

- Group QAF

Lithology. The deposits of alluvial fan are characterized by a superior layer, formed by greyish silty clays. Underneath, it appears a thickness of fine-medium sands of greyish colour of several tens of meters. Levels of shells of decimetre and centimetre thickness have been observed.

The geotechnical parameters of QAF are:

Particle Size Distribution (#0,008)	31.9
Liquid Limit	44.7
Plastic Limit	25.2
Plasticity Index	19.5
Humidity (%)	22.3
Dry Density (T/m ³)	1.5
Organic Matter (%)	
CBR (100% PN)	
Unconfined Compression (kp/cm ²)	1.8
Shear Strength c' (kp/cm ²)	0.4
Shear Strength ϕ' (kp/cm ²)	12.5
Shrinkage (%)	2.1
Cv (Oedometer) (cm ² /s)	0.00085

5.1.8. SOIL

Georgia is notable for diversity of soils. According to the features of soils, 3 different soil areas, with sub-areas, zones and regions may be distinguished. The Western Georgia soils are represented by:

I. Sub-area of Intermountain Plains - Zone of podzol and swampy soils:

- The region of swampy soils of the western lower part of the Kolkheti lowland;
- The region of podzol and alluvial soils of Abkhazia-Samegrelo;
- The region of podzol and alluvial soils of the eastern part of the Kolkheti plain (Imereti);
- The region of podzol and alluvial soils of the southern part of the Kolkheti plain (Guria-Adjara).

II. Sub-area of the Greater Caucasus:

1. The zone of red and yellow soils of hilly foothills;

- The region of yellow and humus-carbonate soils of the foothills of Abkhazia;
- The region of yellow, red and humus-carbonate soils of the foothills of the southern Abkhazia-Samegrelo;
- The region of red soils of the Okriba depression;
- The region of humus-carbonate soils of the Imereti hills.

2. The zone of mountain-forest soils:

- The region of humus-carbonate soils of the karst-limestone belt of the southern slope of the Greater Caucasus;
- The region of mountain grey and podzol soils of the medium mountainous zone of the western part of the Greater Caucasus;
- The region of grey, podzol and humus-carbonate soils of Zemo Imereti and the Surami ridge;
- The region of humus-carbonate and forest grey soils of Racha-Lechkhumi.

3. The zone of mountain-meadow soils:

- The region of mountain-meadow turf, turf-peaty and primitive soils of the high mountainous crystal massif of the western part of the Greater Caucasus (Abkhazia, Svaneti);
- The region of mountain-meadow soils of the Samegrelo-Racha ridges (Zemo Imereti).

III. Sub-area of Transverse Ridges of the Southern Highlands - The zone of red and yellow soils of hilly foothills:

- The region of yellow, mountain grey and humus-carbonate of the northern slope of the Meskheta ridge;
- The region of red soils of hilly foothills of Adjara-Guria;
- The region of mountain grey soils of the medium mountainous zone of the Meskheta ridge;
- The region of mountain grey soils of the medium mountainous zone of Adjara-Guria and the Shavsheta ridge;

- The region of mountain-meadow turf and turf-peaty soils of the high mountainous zone of the Adjara-Imereti and Shavsheti ridges.

In the project area the soils are represented by Sub-area of intermountain plains – the region of podzol and alluvial soils of the southern part of the Kolkheti Lowland (Guria-Adjara). In the area of interest gleysols dominate, in narrow strip along the Supsa River – Eutric fluvisols are present.

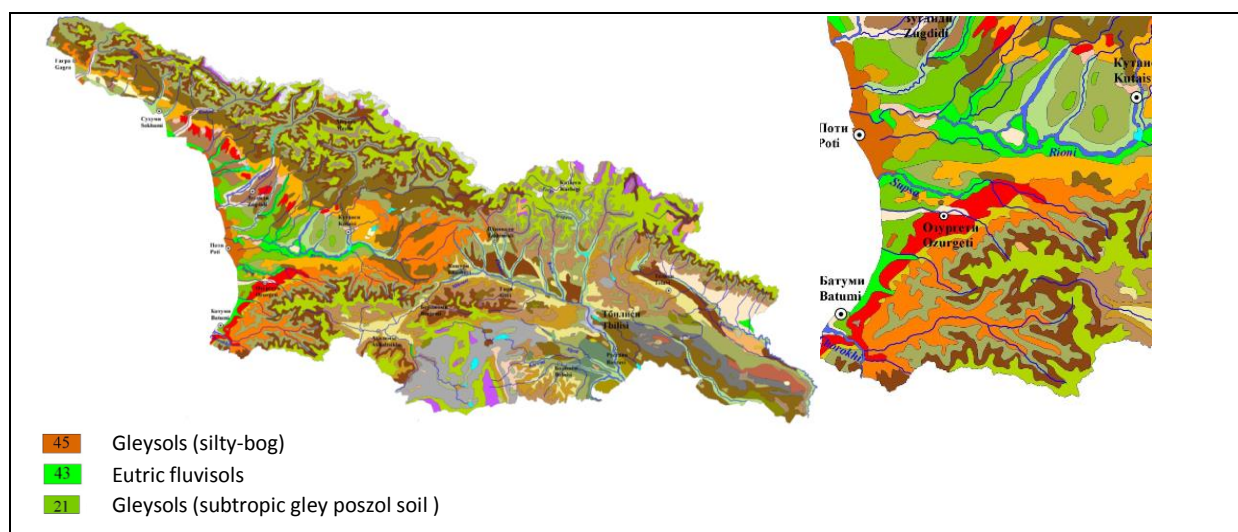


Figure 35. Soil map

Gleysols (subtropic gley podzol soil) account for 1.8% (119.04ha) of the total area of Georgia. Humus content is moderate. Moderate is content of hygroscopic water. Specific weight is in 1.24-1.41 interval. Content of hydrolyzable nitrogen is moderate or low. Soils are rich in absorbed phosphorus and poor in exchangeable potassium. Pollution with radionuclides is often observed.

Gleysols (silty-bog) are typical for Kolkheti lowland. They account for 0.6% (417km²) of the total area of Georgia. Are poor with total nitrogen, moderately or rich in hydrolysable nitrogen, poor or moderately contain in phosphorus, poor in total and exchangeable potassium. Pollution with radionuclides is often observed.

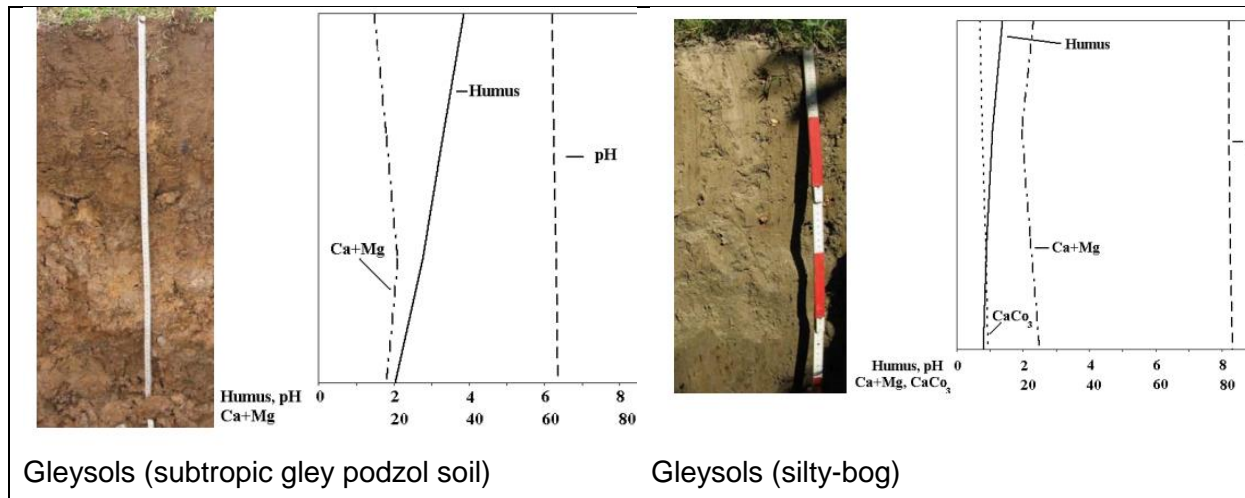


Figure 36. Soils in the project area

According to the suitability (source: Cadastre and land register project co-funded by KfW) for agriculture (crops such as citrus and tea) soil belongs to medium class.

The survey revealed that the topsoil in most of the areas is 0.3m thick.

Silty podzol soils are typical for the uplift areas of Kolkheti lowland. In Grigoleti, Maltakva and towards the north, peat fen soils are registered. North and south to the Supsa delta, in the narrow strip along the coastline, meadow sod sandy soils are present. Within the terraces of the riverbeds alluvial soil dominates. All of the mentioned soils in flat areas are water saturated or waterlogged.

Soil quality in the project area differs depending on location of the sampling point. In vicinity to existing road (near Supsa crossing 1, Ureki-Magnetiti 2, Kobuleti bypass 3). Typical soil quality data are given below.

Table 22. Soil quality data

	SP- 1	SP- 2	SP -4	Allowable limit, mg/kg
Cu, mg/kg	40	35	40	2-50
Zn, mg/kg	170	100	130	10-300
Pb, mg/kg	50	30	26	0.1-20
Ni, mg/kg	30	30	30	1-100
Co, mg/kg	30	30	30	1-50
As, mg/kg	0.9	0.8	0.7	1-50

Except for the lead (Pb), concentration of other elements meet the requirements of international standards. All values are within allowable limits. High lead content is believed to be due to traffic related pollution.

5.1.9. GEOHAZARDS

Natural disasters take place on quite a large scale in Georgia and with a high frequency of recurrence due to the complex geological and geographical conditions in Georgia. The frequency of natural disasters has increased in the recent past and this increase is considered to be a consequence of the effects of global climate change as well as human activities, such as deforestation, overgrazing of pastures, land use changes without proper evaluation etc. In general information on geohazards is available from reference information. For the area of interest flooding is the main hazard.

Kolkheti lowland and respectively the study area have negative tectonic movement (see section 5.1.5.). Ingression of the sea caused by reduction and deficit of sediments introduced by the rivers in to the Black Sea is also worth to mention.

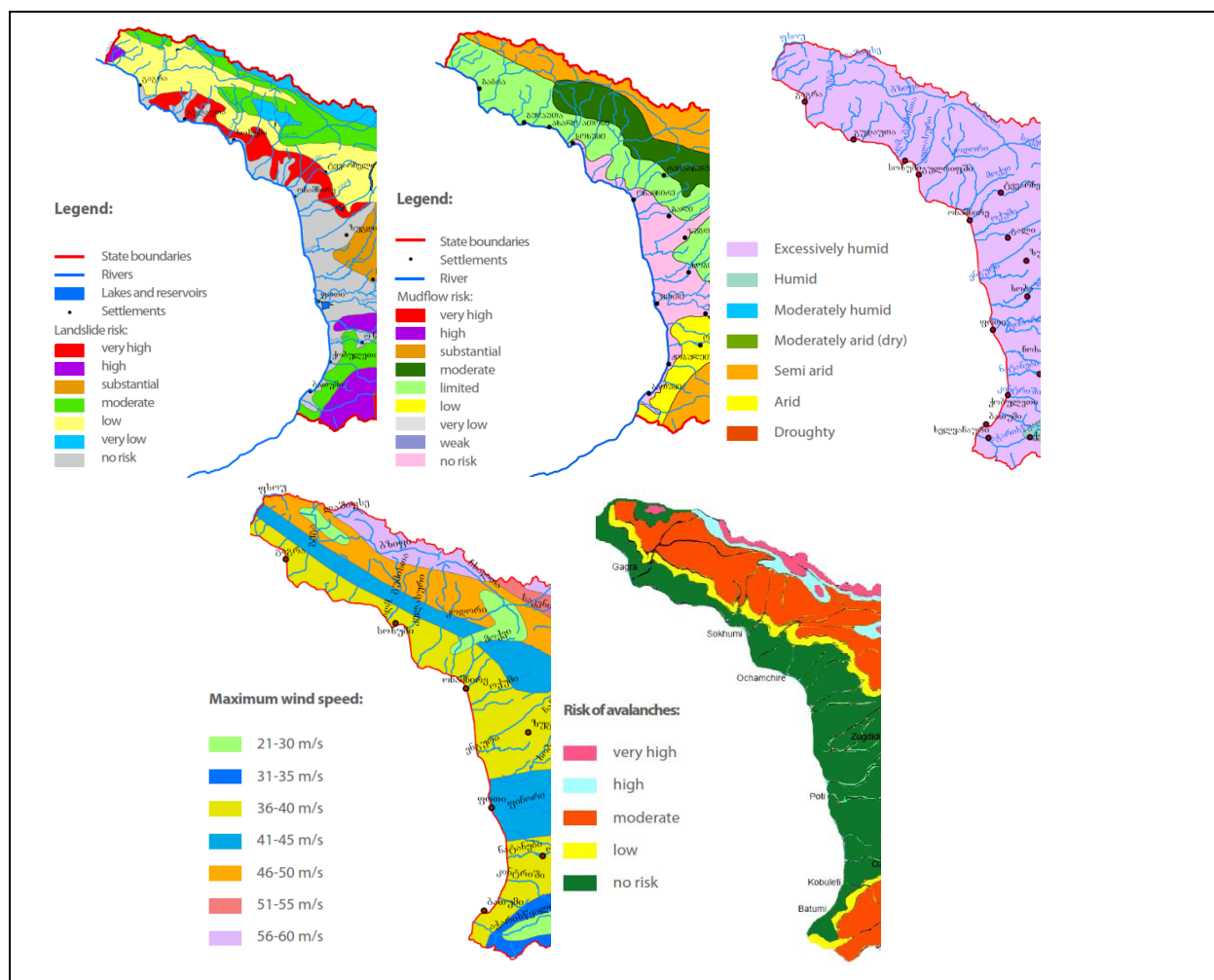


Figure 37. Landslide, mudflow, drought, high wind speed, risk of avalanches

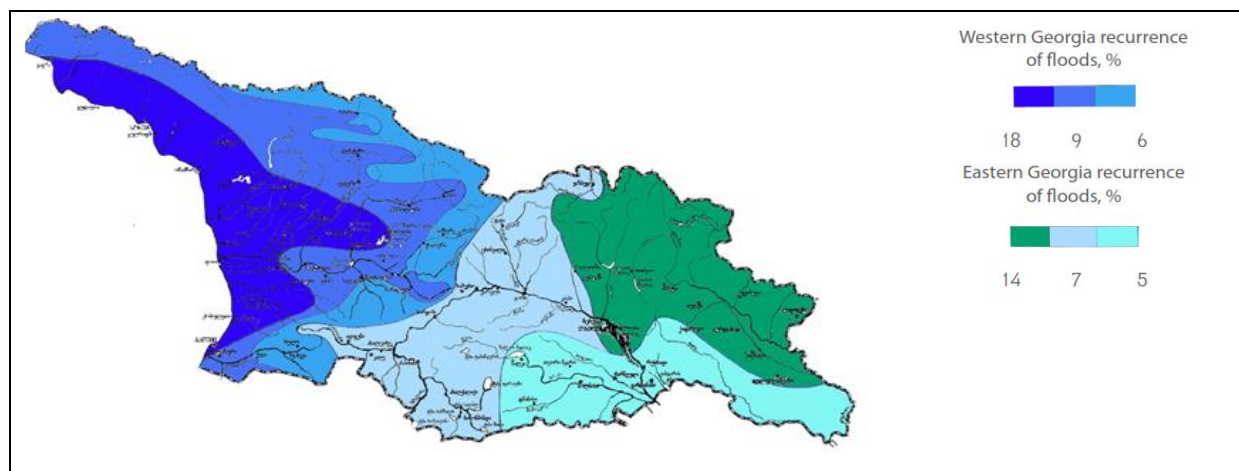


Figure 38. Flooding risk

Seismic conditions. Kolkheti depression which, from the tectonic point of view, is the western end of the Georgian depression is bounded by major folds and active faults.

Georgia is located within the Mediterranean seismic belt, in the active seismic zone of the Caucasus. Its architectural movement and activity is connected with the movement of the neighbouring Eurasian and Afro-Arabic rocks. Seismicity magnitude in the project area varies from 7 to 8 units MSK64 scale. (see **Figure 39**)

Table 23. Seismicity within the project area

Settlement	Region	Municipality	Community	A- Seismicity coefficient	Magnitude (MSK64 scale)
Ureki	Guria	Ozurgeti	Ureki	0.12	8
Shekvetili	Guria	Ozurgeti	Natanebi	0.14	8
Tskaltsminda	Guria	Lanchkhuti	Grmaghele	0.11	7

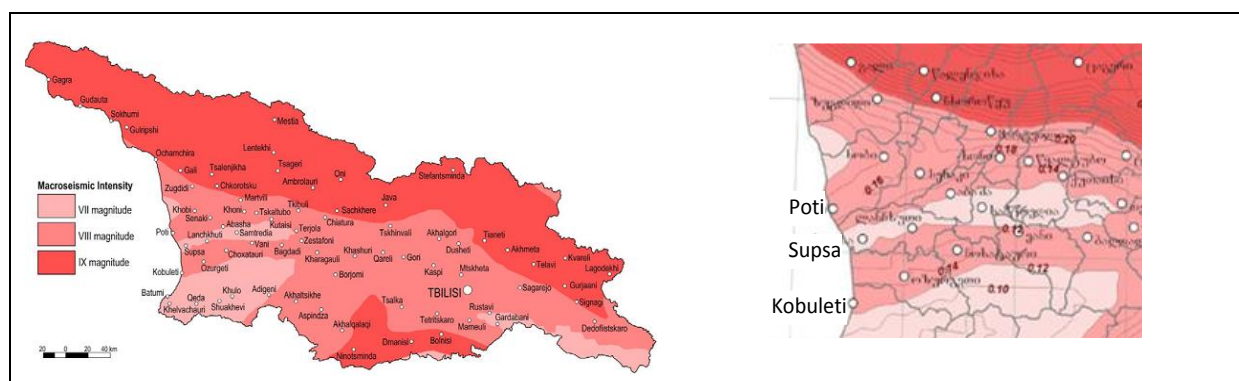


Figure 39. Seismic zoning map

5.1.10. HYDROGEOLOGY

According to hydrogeological zoning of Georgia, the project area belongs fractured and fractured/karstic artesian water basin of Georgian Block. In particular: III5 Porous, fractures and fractured/karstic artesian basin of Kolkheti (Poti area) and III6 Porous and fractures water artesian basin of Guria. Area of artesian basin is 1500km². The basin comprises Guria hilly depression and adjacent lowland. Quaternary sediments (sands and pebble) overtop Cretaceous, Palaeocene and Miocene formations and are the most water abundant. In Supsa area aquifers of alluvial sediments are widely met. Capacity of the aquifers of Kolkheti lowland and the coastal area is 40-50m and 300m respectively.

აღნიშნული (გურიის) არტეზიული აუზის ფართობია 1500კმ², იგი მოიცავს გურიის გორაკ-ბორცვიან დეპრესიას და მიმდებარე სანაპირო დაბლობს. ამ აუზის ფარგლებში მძლავრი მეოთხეული საფარი (ქვიშები და რიყნარის) ხასიათდება ყველაზე მაღალი წყალშემცველობით. მეოთხეული საფარი განლაგებულია ცარცული, პალეოცენური და მოიცენური ქანების ზემოთ. აღსანიშნავია, რომ მდ.სუფსა ხასიათდება თავანდროვე ალუვიური დანალექების წყალშემცველი ჰორიზონტის ფართო გავრცელებით. კოლხეთის დაბლობზე ამ ჰორიზონტის სიმძლავრე 40-50მ, სანაპიროზე - 300მ.

In contrast to the waters of shallow aquifers, deep circulation (500-4500m) ground waters of Kolkheti lowland are linked to basic rock (Mesozoic and Quaternary sediments) and do not crop out.

კოლხეთის დაბლობზე არსებული მიწისქვეშა წყლები დაკავშირებულია დედაქაებთან (მეზოზოური და მესამეული ნალექები) ღრმა ცირკულაციის წყლები (500-4500მ). ეს წყლები არ გამოდიან ზედაპირზე. თუმცა არსებობს არაღრმა (დელუვიური, ალუვიური, მეოთხეული ნალექები) ცირკულაციის გრუნტის წყლებიც.

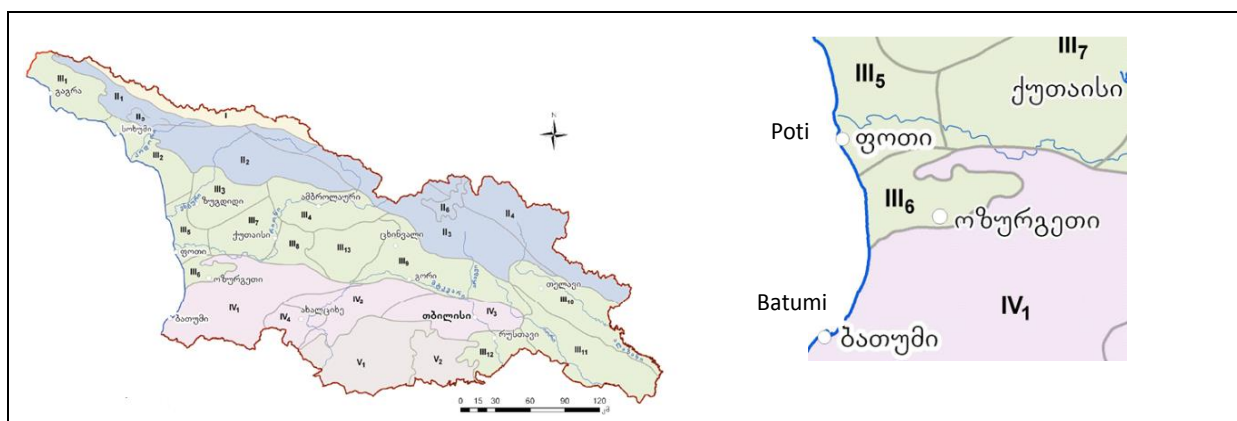


Figure 40. Hydrogeological zoning map

Aquifers of the southern part of Kolkheti arterial basin include: a) aquifer of modern alluvial formations (aIQIV); b) Black Sea coastal aquifer of modern marine and alluvial deposits (amQIV); c) aquifer of modern marsh formations (bQIV). Ground water level in the project area varies from 20cm to 2m, depending on the site. In Ureki area the ground water level ranges from 1.5 to 7m.

Although groundwater is considered to be naturally protected from human impact, pollution of this water has been observed. Pollution is due to hydraulic connection of the groundwater with polluted surface waters, landfills or stocks of industrial wastes, fertilized agricultural lands, etc.

Similarly to other lowlands and intermountain regions, Kolkheti lowland, in particular the shallow subsoil and pressure waters, within the boundaries of the lowland are at risk of pollution caused by industrial, infrastructure development and other developments in the area. In Guria artesian basin, for instance, concentrations of phenols, nitrates and nitrites was found to exceed the maximum permissible levels. In areas like Poti, Supsa risk of pollution with petroleum products exist.

5.1.11. HYDROLOGY

Kolkheti lowland has dense network of rivers with the various types of feeding, morphology and catchment capacity. Over 150 large and small rivers with their numerous tributaries discharge to the Black Sea. The rivers play vital role for the functionality of Kolkheti wetlands. The large rivers like The Rioni and Khobi, run next to the Kolkheti National Park territory. The small ones including the Pichora, Dedabera, Tsiva, Churia, originate in the lowland marshes or in the band of hills or small mountains and are mainly fed by rain water. The other surface water bodies include Paliastomi, Imnati, Patara Paliastomi, Parto Tskali Lakes, etc.

The main surface water bodies in the section between Grigoleti and Kobuleti bypass are Supsa, Tskaltsminda, Sepa and the tributaries.

Supsa River is the third according to the length river in west Georgia. The river originated at 2,800m, near the mountain Mepistskaro, the north slope of Meskheta ridge. It flows into the Black Sea near vil. Tskaltsminda. The river is 108km long and has average inclination 28‰, the catchment area totals 1,130 km², average elevation is 970 m. The Supsa River basin comprises 790 rivers. Of them the largest are the rivers of Baramidzetskali (21 km long), Gubazeuli (47 km long), Bakhvistskali (42 km long), Shutiti (12 km long). Density of the river system is 1.26 km/km².

The upper reaches area has complex mountain topography with narrow and deep canyons. Within the rest of the basin, below the vil.Bukistsikhe, the landform is smoother, hilly, however deep with numerous canyons of the tributaries. The upper part of the basin is built of tuffs, granular quartzite, sandstones and sand-clayey slates. In the rest of the basin sand-conglomerates and clays with marl, pebble and sand layers dominate. The base rocks are mainly topped with clayeys. In the upper reaches of the river alpine vegetation is observed. Below 2000 m mixed forest (fir, pine, beech and oak) are found. Lower, below vil.Bukiskhevi, the lands are arable. Forest accounts for about 70% of vegetation within the basin.

Supsa belongs to the Black Sea river basin. For the river frequent high water events are typical (around 15-27 events per year are generally observed). Average water level is 1.0-1.5m in the head area, 1.5-2.0m in the mid- and 2.5-3.0m in the lower flow.

Table 24. Number of floods by seasons

Winter	Spring	Summer	Autumn
3-4	4-8	2-3	6-12

Floods are mainly observed in autumn. Water level uses to increase the average value by 0.1-0.9 m. High water starts in mid-March and lasts until the end of May. Highest flows are as follows: near Chokhatauri - 246 m³/sec, near Khidmaghala - 692 m³/sec. The lowest, totals 0.4 m³/sec in the upper and 4.08 m³/sec in lower flow respectively.

Flow near vil.Chokhatauri and vil.Khidmaghala by seasons distributes as follows:

Table 25. Total flow %

Location	Winter	Spring	Summer	Autumn
Chokhatauri	15-17	36-50	18-25	17-23
Khidmaghala	26	20-34	12-20	20-43

Several peaks use to be observed, water level increases by 0.3-0.6m and lasts from 5 to 10 days. Summer flood is unstable. Amplitude of level variation in this period reaches 0.2-0.6 m.

Flow regime depends on precipitation level and intensity. Average modulus of the flow in the upper and the lower reaches totals 44.3 l/sec.km² and 41.1 l/sec.km².

In January-February, in the upper flow, water near the banks freezes. The ice “persists” for a short time only. Temperature of the coldest month is from 1.4 to 8.5C°. Maximum temperature, 24.2C° is observed in August.

Major hydrological characteristics of the river are given in **Table 27**.

For the ESIA studies of the surface water quality in Supsa River have been carried out. The samples were collected near the river mouth. The analysis of the waters include: total nitrogen (TN), total phosphorus (TP), total petroleum hydrocarbons (TPH). In addition physicochemical parameters such as temperature, pH, conductivity have been measured. Results are presented below.

Table 26. Water quality data

Parameter	Value	Parameter	Value
pH	7.2	Mg, mg/l	3.9
Turbidity, FTU	0.35	Na, mg/l	4.4
Ec, mS.cm	0.08	K, mg/l	0.4
Cl, mg/l	5.1	DO, mg/l	7.9
HCO ₃ , mg/l	41.0	TDS, mg/l	75
SO ₄ , mg/l	10	TN, mg/l	8
Ca, mg/l	13	TPH, mg/l	<0.2

Sediments of Supsa River. Annual sediment flow may vary from 110 to 230 thou t. The highest turbidity makes 2,300g/m³. The sediments form along the longitudinal profile of the river. Formation of sediments is conditioned by modern tectonic movement as well as related seismicity and gravity processes. The river brings sandy sediments in the estuary, however in contrast to the Khobistskali, Rioni and Natanebi Rivers its sediments are coarse-grained and contain significant amount of magnetite sands.

Characteristics of sediment flow of the main rivers in the project area are given in **Table 28**.

Table 27. Major hydrological characteristics of the Supsa River

Parameter	Control station										
	Elevation 1337.5 m	Zemo Surebi	Elevation 300 m	Elevation 259.8	Chokhatauri	Up to Gubazeuli River mouth	Below Gubazeuli mouth	Before Bakhvistskali mouth	After Bakhvistskali	Khidmagala	River mouth
Catchment area, km ²	54.0	186	254	277	316	360	722	842	959	1100	1130
Average elevation of the basin, $\bar{\theta}$	2090	1670	1300	1270	1250	1100	1200	1050	1095	970	970
Average annual flow, m ³ /sec:											
• average long-term	2.56	8.52	11.2	12.1	13.8	15.3	31.1	35.2	40.5	44.8	46.0
• assurance 75%	2.14	7.12	9.36	10.1	11.5	12.8	26.0	29.4	33.8	37.4	38.5
• assurance 97%	1.58	5.26	6.91	7.46	8.51	9.44	19.2	21.7	25.0	27.6	28.4
Maximum flow, m ³ /sec:											
• average long-term	-	-	-	-	135	-	-	-	-	514	-
• assurance 1%	170	340	404	423	459	492	726	795	849	1436	1458
• assurance 2%	147	295	350	367	398	426	629	689	735	1244	1264
• assurance 5%	113	227	269	282	306	328	484	530	566	957	972
• assurance 10%	96.0	193	227	240	260	279	411	450	481	813	826
Aver. minimum monthly flow in winter, m ³ /sec:											
• assurance 75 %	0.46	1.70	2.68	2.91	3.30	3.85	7.46	8.80	10.30	11.2	11.5
• assurance 97 %	0.27	0.99	1.55	1.69	1.91	2.23	4.33	5.10	5.95	6.5	6.67
Long-term amplitude of level variation, max, highest, m	-	-	-	-	1.36/1.82	-	-	-	-	3.32/4.56	-

Table 28. Sediment flow in the rivers in the area

River	Suspended sediments, ths.t	Bottom sediment, thou.t	Total Sediments			
			including fractions, thou t		Σ ths.t	Σ ths.m ³
			d> 2 mm	d> 20 mm		
Khobi	198.8	74.8	90.1	0.0	273.6	156.3
Rioni	7 843.5	1 129	1125.1	0.0	8972.5	4946.1
Supsa	217.4	87	30.4	0.0	304.4	170
Sepa and other small rivers	9.8	4.6	7.11	4	14.3	9.7
Drift	131	65.1	79.2	53.3	191	105.6

Table 29. Grain size of suspended sediments %%

River	1-0.5	0.5-0.25	0.25-0.1	< 0.1
Khobi	1.5	10.9	12.6	75
Rioni	1.1	9.8	13.5	75.6
Supsa	0.7	9.9	14.0	75.4
Sepa	7.2	11.5	37.8	43.5
Natanebi	0.5	6.4	25.0	68.1

(Source: Sh.Jaoshvili)

Table 30. Annual volume of the beachforming sediments

River	Suspended sediments, thou m ³	Bottom sediments, thou. m ³	Annual, thou m ³	Annual volume of beachforming sediments, ths.m ³
Khobi	120	13	133	39
Rioni	4 000	400	4 400	1 350
Supsa	103	14.8	117.8	39
Sepa	1.1	0.55	1.65	0.7
Natanebi	34	7	41.9	18

(Source: Sh.Jaoshvili)

Tskaltminda River originates at a south-west piedmont of Meskheta ridge, at 85 m asl and falls into the Black Sea, north to Ureki. The river is nourished by atmospheric (snow, rain) and groundwater.

Sepa River originates on the western slopes of west branch of the Meskheta ridge, at 220 m asl and falls into the Black Sea at the vil.Magnetiti. For the river spring floods are typical. The river is fed by rainfall, snowmelt and ground water. Therefore high-water is observed in spring and autumn. During other periods of the year water level is low.

Table 31. Baseline water quality – Sepa River

#	Parameter	Value
1	Suspended solids, mg/l	40
2	BOD, mg/IO ₂	105
3	Total N, mg/l	0.47
4	Total P, mg/l	<0.1
5	TPH, mg/l	<0.04

Drainage system.

In the past, in accordance with the general plan to dry the marshy, excessively damp lands of the Kolkheti lowland a network of drainage canals were arranged. Similarly to the area north to Grigoleti the project area is dissected with drainage canals.

5.1.12. LAND USE AND LANDSCAPES

The landscape of the lowland and adjacent hillock strip (up to 600masl) belongs to plain-hilly subtropic region. It comprises the lowland landscapes with swamp alder forest and sphagnum bogs and foothill Kolkheti lowland with hornbeam oak forest alternating with beech-chestnut, oak-zelcova and poly-dominant forest with evergreen underwood.

In 1992, the process of privatization of agricultural lands has been introduced in the country. Since then, in many areas soil erosion due to the lack the necessary background to implement a sustainable agriculture is observed. The situation is worsened by the poor economic conditions of the majority of farmers which force them to meet the immediate needs rather than adopting a longer-term vision towards the environment.

Climatic conditions are favourable for agriculture. Arable lands make 2/5 of Kolkheti lowland. However, land per capita in the area is lower than average for Georgia. The main crops are cereal, beans, maize, tobacco, vegetables. The share of perennial plants accounts for about 34%.

5.2. BIOLOGICAL ENVIRONMENT

5.2.1. KOLKHETI PROTECTED AREA AND RAMSAR SITE.

Protected areas in the Poti-Kobuleti bypass area borders with Kolkheti National Park, Ramsar site and IBA.

These sensitive areas are located on the main migration routes for African and Eurasian waterfowls and waders. According to reference information over 194 different bird species, including 21 species of migratory birds, are found in the region. (see sub-chapter 5.2.2.2.)

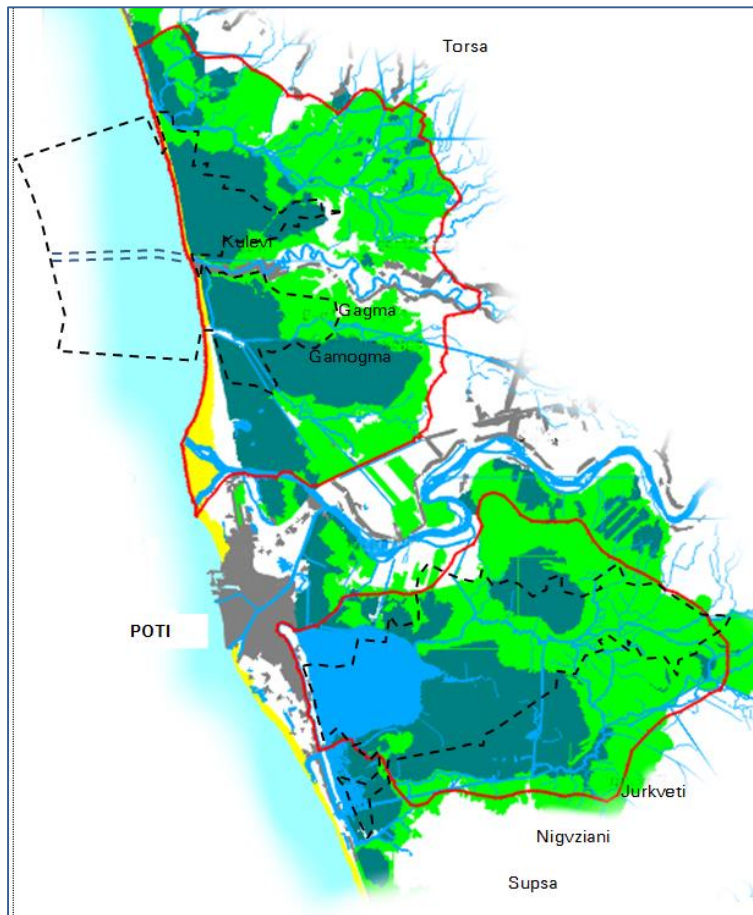
In 1935 unique Kolkheti wetlands were designated as protected. Now the area of Anaklia-Churia, Nabada, Imnati mires, Ispani peat lands, swamp forests, dunes, lake Paliastomi and marine area represents Kolkheti National park (IUCN category II – land and marine area), Kobuleti National Reserve (IUCN category I) and managed area (IUCN category IV). Recognized as an important natural area, a 500-hectares of the swampy forest and mire between the Rioni and Pichori Rivers was established as Kolkheti Nature Reserve.

The wetland areas within the Kolkheti lowland important for wintering, nesting and migratory birds were identified as Ramsar sites of international importance. “Ispani-II” mire, later became Kobuleti Nature Reserve and “Wetlands of Central Kolkheti”, later became Kolkheti National Park. In 1999 law on the creation and management of the Kolkheti protected areas was enacted. The national park began full-scale operation in 2000.

Kolkheti National Park includes the areas with well-preserved wetland ecosystems: Anaklia-Churia (13713ha, between the coastline sections of ravines of the Churia River and the Khobistskali River), Nabada (10697ha, between the western sections of the ravines of the Khobistskali River and the Rioni River) and Imnati (19903ha, between the western sections of the ravines of the Rioni and the Supsa rivers). Besides, the protected area includes the sea water area located between the estuaries of the rivers of Rioni and Churia. In total, the land area of the National Park is 28571 ha, and the sea water area – 15 742 ha. Geographically the national park area belongs to five administration districts – Zugdidi, Khobi, Senaki, Abasha and Lanchkhuti municipalities.

Paliastomi lake (a part of the protected area), former gulf of the Black Sea isolated from the sea by sand dune several thousand years ago, provides a vital environment for many fish species, invertebrates and plankton.

Kolkheti mires, first of all, are important for their relict origin. This lowland is a remainder of the tropical and subtropical landscapes, which were stretched along entire Eurasian continent as continuous belt in Cenozoic age about 10 million years ago.



- a) Red line – Ramsar site; Dotted black line – Kolkheti National Park
- b) Green line – Kolkheti National Park; violet contour – Important Bird Area (IBA)

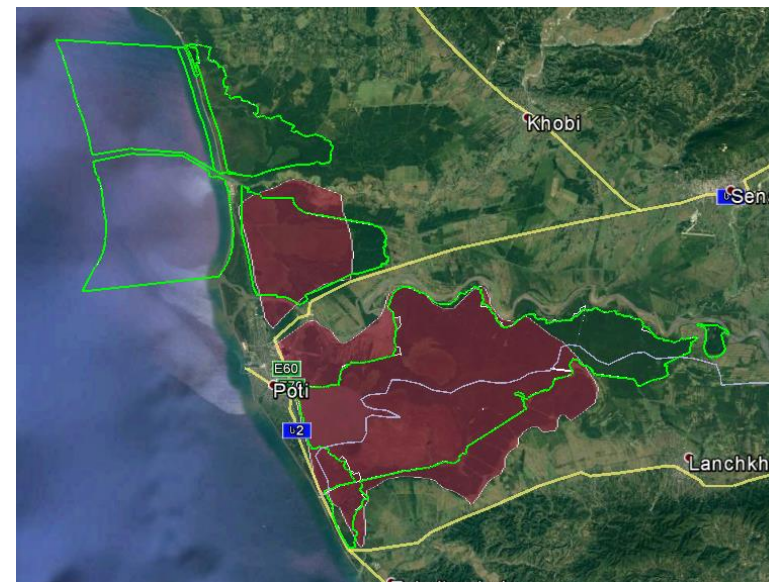


Figure 41. Kolkheti protected area, Ramsar site and IBA

The Kolkheti national park area is notable from botanic point of view. The complexes of phytocenosis rich in quite diverse, relict and endemic species, and various compositions have remained there till present – they are the different plant communities of the mires, swampy forests and sand dunes located along the coastline. Vegetation characteristic for swampy ecosystems of tundra and taiga of the far North; boreal species such as Sphagnum mosses (*Spagnum imbricatum*, *Sp. palustre*, *Sp. acutifolium*), Round-leaved sundew (*Drosera rotundiflora*), Woollyfruit sedge (*Carex lasiocarpa*); plants of alpine zone - Sedge and Pontic rhododendron (*Rhododendron ponticum*), etc. are widely met.

Swampy and humid forests include: Alder trees, Caucasian wingnut, Imeretian oak and Colchis oak with well-developed evergreen underbrush. In the sandy zone of dunes grow Sea-buckthorn and Jerusalem thorn. Composition of species of algae is diverse. Plant species include: Spurge, Eringo, Colchis sedge, Imeretian cogongrass, Astragalus, Marsh woundwort, Catchfly, etc. Along the lakes and marsh rivers in the wetlands: Colchis water-lily and Yellow water-lily, Colchis water chestnut and Lesser duckweed are present. In the peaty mires together with the north tundra species Royal fern and Imeretian sedge can be met.

The area is the place where Georgia Red List species: Yellow poppy, Water lily, Colchis oak (*Quercus hartwissiana*), Caucasian wingnut (*Pterocarya pterocarpa*), Colchis box-tree (*Buxus colchica*) is preserved. Tree species are represented by Maple (*Fraxinus excelsior*), Georgian oak (*Quercus iberica*) and Alder (*Alnus barbata*). In the forest, along the peripheral belt of peaty mires and the ravines of the marshrivers Colchis-Hyrcanic alder groves, sometimes mixed with Wingnut, Imeretian oak or Maple, Beech, Ash-trees and Hornbeam are registered.

The section of the highway under consideration (Grigoleti-Kobuleti bypass) starts in 1.4km south to the boundary of Kolkheti Protected area. In other section of alignment neither of alternatives border to protected sites.

5.2.2. PROJECT CORRIDOR- GENERAL DESCRIPTION (FIELD SURVEY DATA)

5.2.2.1. VEGETATION/FLORA

Vegetation/flora survey was carried out by the project team in summer (August) and autumn (October) 2016 and early spring 2017. 200-300m wide strip along all alternative alignments have been studied. Objective of the survey was to identify sensitive communities and habitats within the project impact area.

Alternative alignments run through semi-waterlogged and swampy alder, shrub, sedge, rush and reed areas and grasslands; agricultural lands; residential areas; rivers and altered/transformed area.

Vast areas in the north-west and south sections of the project corridor, as well as in the coastal area are waterlogged. The mentioned areas are rich in relict and endemic Colchic flora species.

Natural vegetation in the area of interest has been transformed because of man-caused impact and development of the area. The natural floristic composition is strongly altered: part of phytocenosis became impoverished; in other areas vertical and horizontal structures are violated; in some – native floristic composition is ousted by alien advent species. In most cases primary phytocenosis are fully 'replaced' by grasses, shrubs and weeds - secondary cenosis, agricultural lands, elements of industrial landscapes or abandoned. Among introduced species, *Amorpha truticosa*, *Ambrosia artemisiaefolia*, *Amaranthus retroflexus*, *Sorghum halepense*, *Setaria glauca*, *Digitalis*, *Plantago maior*, etc. are to be mentioned.

However, despite of the negative man-caused impact Kolkheti wetlands are still rich in biodiversity. In the project corridor wetland, water, forest and secondary meadow plant communities are found.

The situation in the project area (based on the reference information and the site survey data) is described below.

Wetland vegetation: wetlands are located in the lowest-sited sections of the river basins, in depression adjacent to the littoral dune and other areas where drainage is poor or does not happen at all. Wetland vegetation is represented by grasses, shrub-grass and grass-forest ecosystems.

Waterlogged areas within the project corridor are mainly found along Grigoleti-Supsa road (on the north-west side to the latter) and near Kobuleti. In the wetland areas Narrow-Leaved Cattail (*Typha angustifolia*), Common cattail (*Typha latifolia*), Marsh horsetail (*Equisetum palustris*), Arrowhead (*Sagittaria sagittiifolia*), Knotgrass (*Paspalum paspaloides*), Frogbit (*Hydrocharis morsus-renae*), Flowering rush (*Butomus umbellatus*), Branched bur-reed (*Sparganium neglectum*), Triangular Club-rush (*Scirpus triquetus*) are known to be present. In addition to mentioned above, in the 'narionali' area wetland vegetation is dominated by: Sedge (*Carex gracilis*), paleyellow iris (*Iris pseudacorus*), Common rush (*Juncus effusus*), Water-pepper

(*Polygonum hydropiper*), Dropmore Purple (*Lythrum virgatum*), summer snowflake (*Leucojum aestivum*), etc. Wetlands with domination of Common Reed (*Phragmites communis*), broadleaf cattail (*Typha latifolia*), sedge (*Carex gracilis*), common rush (*Juncus effusus*) are also met. Bi-dominant wetlands (common reed-bulrush, bulrush iris, *Juncus* Rush) swamps are seldom.

Peat wetlands near Kobuleti are worth mention. In these area peat moss is present.

In the area near Supsa terminal grasses like *Juncus effusus*, *Polygonum thunbergii*, *Lonicera* sp. are widely met. Shrubs are represented by *Rhamnus frangula*, *Gleditsia triacanthus*, *Morus nigra*, *Ficus carica*.

Aquatic vegetation of lakes and canals is particularly diverse, small communities are present in almost all, even shallow surface water bodies and bank of the rivers in the latent flow areas. These are 'floating' and/or 'dipped' plants. The floating plants sometimes use to 'combine' with lemna (*Lemna minor*, *Spirodela polyrrhiza*, *Salvinia natans*, *Hydrocharis morsus ranae*, etc.). These groups are generally found in latent flow water sections of the river, edges of canals and ponds mixed with marsh vegetation.

Aquatic plants are met in the project area and Kolkheti lowland. In this zone two ecological groups can be marked out:

- 1) holophytic - ditch grasses (*Ruppia spiralis*, *R. maritima*, *Zostera Marina*), found in ponds and water bodies of the Black Sea coastal area;
- 2) fresh water plants widely spread in Kolkheti lowland - Eurasian Water-Milfoil (*Myriophyllum spicatum*), pondweed (*Potamogeton pusillus*, *P. natans*, *P. crispus*, *P. perfoliatus*), water lily (*Nymphaea colchica*) (Red List), yellow water lily (*Nuphar luteum*) (Red List), Colchis Water-Chestnut (*Trapa colchica*) (IUCN_CR, Red List), Maleev's Water-Chestnut (*Trapa maleevii*) (IUCN_VU, Red List).

During the site survey aquatic plants were found to be widely met in the project impact area.

Forest vegetation. Forest in the project corridor is hygrophilic type – a kind of forested wetland. Vegetation is mainly represented by Alder (*Alnus barbata*) developed on the humid alluvial ecotopes, which distinguishes this kind of forest from the bog-peat alder one. Floristic composition is poor, represented by trees such as: willow, poplar, hornbeam, hazelnut, hawthorn, pear; lianas: blackberry (*Rubus* sp.),

greenbrier (*Smilax excelsa*) and ivy (*Hedera*). In other area: fern (*Pteridium tauricum*), dane weed (*Sambucus ebulus*), and other grasses unfit for cattle grazing are found.

During the site survey in the underbush and shrub area *Lythrum vulgatum* and *Dictamnus caucasicus* (Georgian endemic species) were registered. In underbush sedge (*Carex gracilis*) dominates. The cutover areas are regrown with blackberry (*Rubus sp.*) and greenbrier (*Smilax excelsa*). Along with wetland and forest grasses in the edges of forests and meadows advent plants – in particular *Paspalum dilatatum* and *Oplismenus undulatifolius* are widely met.

Secondary grass and bushes. Secondary vegetation is developed in the lowland forest cutover areas. Dominant are alder shrubs, wing nut, blackberry, amorpha, ferns, meadow and forest herbaceous plants. Waterlogged meadows with rush-knotgrass vegetation and knoggrass filling up the spaces between sedge are to be mentioned. In the areas like that south Caucasian endemic - *Rhamphicarpa medwedewii* can be found. Knotgrass swamped meadow community uses to develop in the cutover sites, roadside areas, near the homesteads. For this communities dominance of weeds, in particular white-felted thistle (*Cirsium incanum*), Johnson grass (*Sorghum halepense*), rough cocklebur (*Xanthium strumarium*), Iberian knapweed (*Centaurea iberica*) and Moor grass (*Molinia litoralis*) is typical.

In the project corridor the landform of the meadow-like landscapes is raised and poorly drained. On the clay and podzol soil dallisgrass (*Paspalum dilatatum*) is dominant. These meadows have been formed in the formerly forested and with the course of time felt Colchic forests. Now the meadows are used as hayfields, for keeping and grazing cattle.

In Kolkheti lowland various citrus species and ornamental plant have been introduced. Along the roads lines of pine, plane tree, cedar, oleander, eucalyptus, cypress and ornamental shrubs are planted. Some of these plant have been introduced to drain the waterlogged areas. Some of the mentioned plants (*Eucalyptus sp.*) are used for healing purposes and, on the same time, act as windbreak.

Photos showing vegetation and landscape view within the project corridor are shown overleaf.



Alder with rush and sedge meadows



Drainage canal overgrown with amorpha



Blackberry – smilax



Alder with weeds



Larch alley



Swampy area - Grigoleti



Eusj-sedge waterlogged area near Supsa



Drainage canal and abandoned cornfields near the Black Sea Arena



Sepa River



Field area



Kaprovani (Ureki)



Kaprovani (area under the project impact)

5.2.2.2. FAUNA

Avian fauna is rich. The Black Sea coastal region is important for avian fauna – including migratory raptors and waterfowls (see **Figure 42**). As mentioned above 194 species of birds inhabit the Kolkheti National Park. The area is the resting place for migratory birds. The birds species use to be registered in the park area include: Small watercocks, Herons and Bright blue kingfisher. Common buzzards, Black kites, Common and Lesser kestrels, Eurasian hobbies, other falcons, European honey-buzzards, White-tailed, Steppe and Imperial Eagles.

From spring and late summer the bird species found in the area include quail (*Coturnix coturnix*), European turtle dove (*Streptopelia turtur*, IUCN_VU), Eurasian Goshawk (*Accipiter gentilis*), Eurasian Sparrowhawk (*Accipiter nisus*), Short-eared Owl (*Asio flammeus*), Common Moorhen (*Gallinula chloropus*), Eurasian Woodcock (*Scolopax rusticola*), Baillon's Crake (*Porzana pusilla*), Northern Lapwing (*Vanellus vanellus*, IUCN_NT), Grey Heron (*Ardea cinerea*), ducks (*Anas sp.*), gulls (*Larus sp.*), cormorants (*Phalacrocorax sp.*), etc. Passerines are represented by: Common blackbird (*Turdus merula*), Great tit (*Parus major*), European robin (*Erythacus rubecula*), Common starling (*Sturnus vulgaris*), Common raven (*Corvus corax*), carrion crow (*Corvus corone*), Barn swallow (*Hirundo rustica*), etc.

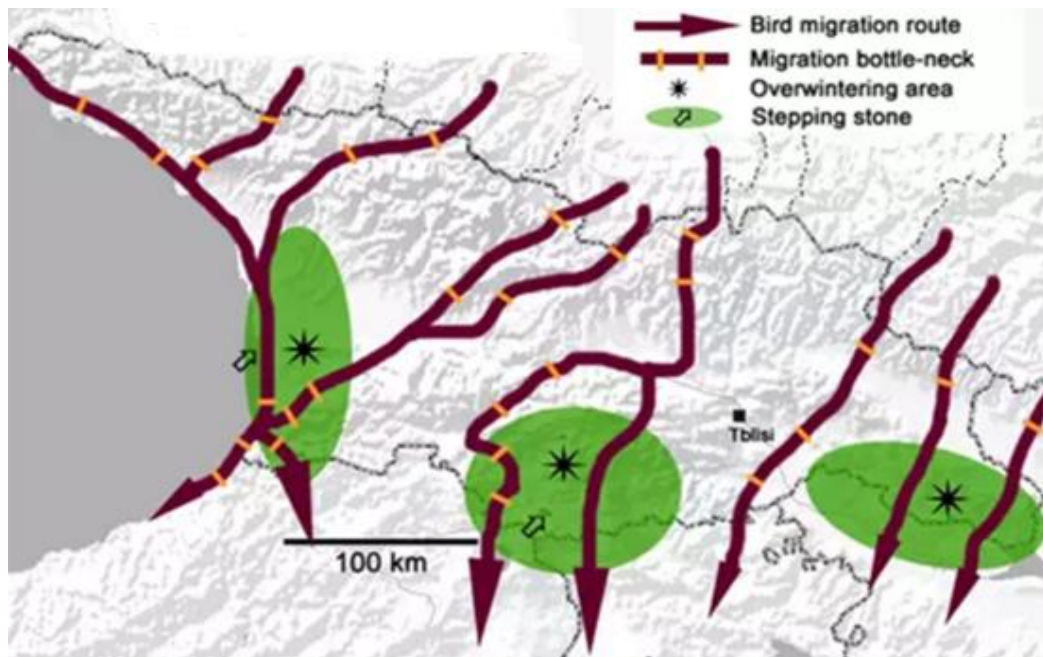


Figure 42. Transcaucasian flyway of migrant birds (raptors, passerines and waterfowl) (Source: EcoNatura)

During the migration period (October) a wide diversity of sea birds use to be detected. A similar situation verifies in spring (April-May) however the quantity of individuals is lower. A rough figure indicates that from 25000 to 1 million birds winter in the Black sea and the near Mediterranean (Rose & Scott, 1994). Hereafter only the species occurring along the coastal sea waters are mentioned while there is no reference to those living in the wetland areas formed by the main rivers (and which are the most precious from a natural conservation point of view) since these are not going to be present in the study area.

The number of species which are potentially reproducing in the study area is quite low. These are presumably Great crested grebe (*Podiceps cristatus*), Great cormorant (*Phalacrocorax carbo*) and Mallard (*Anas platyrhynchos*), Tufted duck (*Aythya fuligula*). The mentioned species reproduce in fresh water reservoirs located nearby. All of them feed in sea water.

Mediterranean shearwater (*Puffinus yelkouan*, IUCN_VU) has large feeding area and is often detected here. The area belong to recreation zone, thus there are no conditions for reproduction of Sternidae therein. (Andrews, 1996).

Black-throated loon (*Gavia arctica*) appears in the study area during the migration, while *G. stellata* winters there. Usually these birds do not live in large groups and are distributed along the coast making difficult to quantify their abundance, however larger groups can be found where there is abundance of food.

Representatives of Great crested grebe (*Podiceps cristatus*) are met along the shore in winter. Large flocks accumulate near the confluence of rivers, Mediterranean shearwater is met along the whole Black Sea littoral, far from the coast, seldom in the nearshore water and Great cormorant (*Phalacrocorax carbo*) usually inhabits the sea coast area.

Other migrating visitors include members of the Charadriidae family.

Several species of gulls (*Laridae*) are present in the Black Sea they include Pallas's gull (*Larus ichthyaetus*), common gull (*Larus canus*), Little gull (*Larus minutus*) Slender-billed gull (*Larus genei*), Mediterranean gull (*Larus melanocephalus*). Except during the reproduction period presence of Black-headed gull (*Larus ridibundus*) and Caspian gull (*Larus cachinnans*) is detected. The latter follow fishing boats.

In winter, the groups of ducks, geese, and swans fly in from the north. Besides, the following species: Woodcock, Eurasian curlew, Common coots, Grebes, White-

fronted geese, Mute and Whooper swans, Dalmatian Pelican, Greater Spotted Eagle (IUCN_VU, Red List), etc. can be also found in the area. Pheasant is present, but seldom seen.

During the site visits (October) European honey-buzzard (50% of registered raptors), Steppe buzzards, Black kites, Booted eagles and a range of unidentified raptors have been registered. Grey herons (*Ardea cinerea*), Pygmy corcorants (*Phalacrocorax pygmaeus*) and Little egrets (*Egretta garzetta*) were met in various sections of the project area.

During the site visits, neither roosting places for bats, nor burrows have been identified within the 200m (each side from the central line) wide corridor.

Among **mammals** in the swampy floodplains, forests and shrubs of Kolkheti Jackal (*Canis aureus*), Wild boar (*Sus scrofa*), Roe deer (*Capreolus capreolus*) and Eurasian otter (*Lutra lutra*, Red List), Coypu (*Myocastor coypus*) can be found. Swamp cat (*Felis chaus*, Red List) can be seldom registered. Of small mammals Striped field mouse (*Apodemus agrarius*), European water vole (*Arvicola terrestris*), Caucasian mole (*Talpa caucasica*), Least weasel (*Mustela nivalis*), European hedgehog (*Erinaceus europaeus*).

The **marine mammals** are presented by 3 species of dolphins (Aphalina – the Bottle-nose Dolphin (*Tursiops truncatus*, Red List), White-sided Dolphin (*Delphinus delphis*) and Herring hog (*Phocoena phocoena*).

Among **amphibians** Common tree frog (*Polypedates leucomystax*) and Marsh frog (*Pelophylax ridibundus*), European tree frog (*Hyla arborea*), European green toad (*Bufo viridis*) are registered. Besides, Smooth newt (*Triturus vulgaris*) and Banded newt (*Triturus vittatus*) Newts can be found.

Ichthyofauna. The area of the marine part of Kolkheti National Park is considered as one of the most productive sections of the Georgian Black Sea coast, being important wintering, feeding and breeding grounds for many valuable fish species, including sturgeon, anchovy, flounder, red mullet to name a few. Ichthyofauna of the area is presented by 88 species, out of which 23 are transiting, 21 species live in fresh water and 44 species live in the Black Sea.

Among the cartilaginous fish the Atlantic sturgeon and beluga can be distinguished, and among the bony fish – the Black Sea salmon Herring, Striped mullet, Pike, Bonito, etc are present. Fish species protected internationally and included in

Georgia's Red List - Beluga (*Huso huso*), Sea sturgeon (*Acipenser sturio*), Sevruga sturgeon (*Acipenser stellatus*), ship sturgeon (*Acipenser nudipectus*), Russian sturgeon (*Acipenser gueldenstaedti*), Persian sturgeon (*Acipenser persicus*) are registered in particular in Rioni River. Sand goby (*Pomatoschistus minutus*) protected under the Red List of Georgia is often met.

The list of fish species in the rivers in the project impact zone is given below.

Table 32. List of fish species in the project impact zone

	Common name	Latin name	Protection Status
Supsa River			
1	European eel	<i>Anguilla Anguilla</i> (Linnaeus, 1758)	IUCN_CR A2bd+4bd
2	Tench	<i>Tinca tinca</i> (Linnaeus, 1758)	IUCN_LC
3	Zarte	<i>Vimba vimba</i> (Linnaeus, 1758)	IUCN_LC
4	Colchian sturgeon	<i>Acipenser colchicus</i> (Marti, 1940)	
5	Persian Sturgeon	<i>Acipenser persicus</i> Borodin, 1897	Red List, CMS, IUCN_CR
6	European Sturgeon	<i>Huso huso</i>	Bern Convention (appendix III), IUCN_CR, Red List
7	Trout	<i>Salmo trutta fario</i> (Linnaeus, 1758)	Red List, VU, A1d
8	Bream	<i>Abramis brama</i> (Linnaeus, 1758)	IUCN_LC
9	Leaping Mullet	<i>Liza saliens</i> (Risso, 1810)	IUCN_LC
10	Wild Common Carp	<i>Cyprinus carpio</i> (Linnaeus, 1758)	IUCN_VU A2ce
11	Flathead Mullet	<i>Mugil cephalus</i> (Linnaeus, 1829)	IUCN_LC
12	Wels Catfish	<i>Silurus glanis</i> (Linnaeus, 1758)	IUCN_LC
13	Bitterling	<i>Rhodeus sericeus</i> (Pallas, 1776)	IUCN_LC
14	Transcaucasian nase	<i>Chondrostoma colchicum</i> (Derjugin, 1899)	IUCN_LC
15	Northern Pike	<i>Esox lucius</i> (Linnaeus, 1758)	IUCN_LC
16	Dace	<i>Leuciscus leuciscus</i> (Linnaeus, 1758)	IUCN_LC
17	Palaeostome shad	<i>Alosa caspia palaeostomi</i> (Sadowsky, 1934)	Red List, VU, D2
18	Perch	<i>Perca fluviatilis</i> (Linnaeus, 1758)	IUCN_LC
19	Monkey goby	<i>Neogobius fluviatilis</i> (Pallas, 1814)	IUCN_LC, Red List, VU, B2a
20	Caspian shemaya	<i>Chalcalburnus chalcoides</i> (Guldenstadt, 1772)	IUCN_LC
21	Gudgeon	<i>Gobio lepidolaemus caucasica</i> (Kamensky, 1901)	

22	Barbus	<i>Barbus tauricus rionica</i> (Kamensky, 1899)	
23	Asp	<i>Aspius aspius</i> (Linnaeus, 1758)	IUCN_LC
24	Caucasian scraper	<i>Capoeta capoeta</i> (Guldenstadt, 1773)	IUCN_LC
Sepa River			
25	Crucian Carp	<i>Carassius carassius</i> (Linnaeus, 1758)	IUCN_LC
26	Round goby	<i>Neogobius (Apollinaria) melanostromus</i> (Pallas, 1814)	IUCN_LC
27	Leaping Mulle	<i>Liza saliens</i> (Risso, 1810)	IUCN_LC

Key: LC-Least Concern, VU-Vulnerable, EN-Endangered, CR-Critically endangered

VULNERABLE (VU)

A taxon is Vulnerable when the best available evidence indicates that it meets any of the following criteria (A to E), and it is therefore considered to be facing a high risk of extinction in the wild:

A. Reduction in population size based on any of the following:

1. An observed, estimated, inferred or suspected population size reduction of $\geq 50\%$ over the last 10 years or three generations, whichever is the longer, where the causes of the reduction are: clearly reversible AND understood AND ceased, based on (and specifying) any of the following: (a) direct observation; (b) an index of abundance appropriate to the taxon; (c) a decline in area of occupancy, extent of occurrence and/or quality of habitat; (d) actual or potential levels of exploitation; (e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.
2. An observed, estimated, inferred or suspected population size reduction of $\geq 30\%$ over the last 10 years or three generations, whichever is the longer, where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.
3. A population size reduction of $\geq 30\%$, projected or suspected to be met within the next 10 years or three generations, whichever is the longer (up to a maximum of 100 years), based on (and specifying) any of (b) to (e) under A1.
4. An observed, estimated, inferred, projected or suspected population size reduction of $\geq 30\%$ over any 10 year or three generation period, whichever is longer (up to a maximum of 100 years in the future), where the time period must include both the past and the future, and where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.

CRITICALLY ENDANGERED (CR)

A taxon is Critically Endangered when the best available evidence indicates that it meets any of the following criteria (A to E), and it is therefore considered to be facing an extremely high risk of extinction in the wild:

A. Reduction in population size based on any of the following:

1. An observed, estimated, inferred or suspected population size reduction of $\geq 90\%$ over the last 10 years or three generations, whichever is the longer, where the causes of the reduction are clearly reversible AND understood AND ceased, based on (and specifying) any of the following: (a) direct observation; (b) an index of abundance appropriate to the taxon; (c) a decline in area of occupancy, extent of occurrence and/or quality of habitat; (d) actual or potential levels of exploitation; (e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.

2. An observed, estimated, inferred or suspected population size reduction of $\geq 80\%$ over the last 10 years or three generations, whichever is the longer, where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.

3. A population size reduction of $\geq 80\%$, projected or suspected to be met within the next 10 years or three generations, whichever is the longer (up to a maximum of 100 years), based on (and specifying) any of (b) to (e) under A1.

4. An observed, estimated, inferred, projected or suspected population size reduction of $\geq 80\%$ over any 10 year or three generation period, whichever is longer (up to a maximum of 100 years in the future), where the time period must include both the past and the future, and where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.

B. Geographic range in the form of either B1 (extent of occurrence) OR B2 (area of occupancy) OR both:

1. Extent of occurrence estimated to be less than 100 km², and estimates indicating at least two of a-c:

a. Severely fragmented or known to exist at only a single location.

b. Continuing decline, observed, inferred or projected, in any of the following:

(i) extent of occurrence; (ii) area of occupancy; (iii) area, extent and/or quality of habitat; (iv) number of locations or subpopulations; (v) number of mature individuals.

c. Extreme fluctuations in any of the following:

(i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals.

2. Area of occupancy estimated to be less than 10 km², and estimates indicating at least two of a-c:

a. Severely fragmented or known to exist at only a single location.

b. Continuing decline, observed, inferred or projected, in any of the following:

(i) extent of occurrence; (ii) area of occupancy; (iii) area, extent and/or quality of habitat; (iv) number of locations or subpopulations; (v) number of mature individuals.

c. Extreme fluctuations in any of the following:

(i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals.

C. Population size estimated to number fewer than 250 mature individuals and either:

1. An estimated continuing decline of at least 25% within three years or one generation, whichever is longer, (up to a maximum of 100 years in the future) OR

2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals AND at least one of the following (a-b):

(a) Population structure in the form of one of the following:

(i) no subpopulation estimated to contain more than 50 mature individuals, OR; (ii) at least 90% of mature individuals in one subpopulation.

(b) Extreme fluctuations in number of mature individuals.

D. Population size estimated to number fewer than 50 mature individuals.

E. Quantitative analysis showing the probability of extinction in the wild is at least 50% within 10 years or three generations, whichever is the longer (up to a maximum of 100 years).

Red List of Georgia

D2-very limited habitat

A1d-significantly reducing habitat

B2a - small, fragmented habitat

Reptiles. The area is not rich in reptile species. The species registered here are mainly those related to water reservoirs. Out of 53 species registered in Georgia 9 can be found in the project region. These are: Slow worm (*Anguis fragilis*), Sand lizard (*Lacerta agilis*), Derjugin's Lizard (*Lacerta derjugini*) (IUCN NT), Dice snake (*Natrix tessellata*), Grass snake (*Natrix natrix*), Aesculapian snake (*Elaphe longissima*), Large-headed water snake (*Natrix megalcephala*), Smooth snake (*Coronella austriaca*). In all ponds and wetland area European Pond Turtle (*Emmus orbicularis*) (IUCN_NT) can be found.

Invertebrates. The following groups can be found in the project area: Nematoda, Hirudinea, Mollusca, Crustacea, Arachnida (lites, ticks, scorpions, spiders) and Insecta. Worth to mention are endemic - *Euscorpius migrelikus*, and migrant form - Italian Scorpio (*Euscorpius italikus*), which is met only in narrow coastal strip of the Black Sea. The area is rich in the representatives of the double-wings, in particular blood-sucking insects-mosquitoes and the carrion and faecal flies.

5.3. THE SOCIOECONOMIC AND CULTURAL ENVIRONMENT

5.3.1. POPULATION

The project area includes Ozurgeti, Lanchkhuti municipalities, Guria Region. The main settlements in the project area include: Tskaltsminda, Ureki (Magnetiti), Shelvetili.

According to the census of 2014, by the state of January the 1st, population in Guria region was 138.8 thousand.

Table 33. Population by Municipalities for the beginning of the year (thous)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
GEORGIA	4,394.7	4,382.1	4,385.4	4,436.4	4,469.2	4,497.6	4,483.8	4,490.5	3,713.7	3,720.4
Guria total	139.0	138.8	138.8	139.8	140.3	140.3	139.2	138.8	113.3	113.0
Municipalities										
Lanchkhuti	38.8	38.7	38.7	38.9	38.9	39.0	38.7	38.6	31.5	31.5
Ozurgeti	77.4	77.3	77.2	77.9	78.4	78.5	77.9	77.7	62.8	48.0
Chokhatauri	22.8	22.8	22.9	23.0	23.0	22.8	22.6	22.5	19.0	18.9

Majority of population is rural.

Table 34. Main settlement and population in the project impact zone

	Settlement	Region	Municipality	Population
1	Ureki Magnetiti	Guria	Ozurgeti	1422
2	Tskhaltsinda	Guria	Lanchkhuti	1352
3	Grigoleti	Guria	Lanchkhuti	235
4	Shekvetili	Guria	Ozurgeti	66

5.3.2. MIGRATION, IDPS

Statistical data on migration from the region are not available. Migration includes economical migration to other regions/towns and abroad, migration of youth for education. Main destinations for economic migrants are Turkey, Greece, Spain. Seasonal migration is also observed.

According to the Ministry of Internally Displaced Persons from the Occupied Territories, Accommodation and Refugees of Georgia number of IDPs currently living in municipalities of Guria region is as follows:

Table 35. Main settlement and population in the project impact zone

	Locality (municipality)	Number of IDPs	Number of families
1	Chokhatauri	105	38
2	Lanchkhuti	166	51
3	Ozurgeti	219	76

Source: <http://www.mra.gov.ge>

5.3.3. GENDER ISSUES

Out of interviewed residents males dominate with 50.6%, Households are headed predominantly by males. In general in the region, the number of female household heads is higher (16%) in towns than in villages (11.5%).

Women are mainly employed in shops, education establishments, and administration offices. Share of women in agriculture is also high. In the study area, female earnings were found to be approximately 50% lower than male.

5.3.4. EMPLOYMENT, SOURCES OF INCOME

Unemployment rate is estimated as 9.8%.

Majority of population is self-employed. Employment in industry is shown in *Table 36*.

Table 36. Employment in industry (persons)

	2013	2014	2015	2016	2017
Georgia	550,885	592,147	626,739	620,775	604,984
Tbilisi	344,982	372,009	395,716	408,665	392,898
Adjara	49,759	54,655	57,555	55,630	54,850
Guria	4,243	4,959	5,724	5,437	5,520
Imereti	43,122	46,897	46,934	42,939	41,191
Kakheti	17,791	18,402	19,414	17,093	17,288
Mtskheta-Mtianeti	6,687	7,539	8,348	8,705	8,609
Racha-Lechkhumi and Kvemo Svaneti	2,018	1,771	2,489	1,204	1,419
Samegrelo-Zemo Svaneti	24,004	26,709	27,304	22,501	23,583
Samtskhe-Javakheti	9,188	7,925	8,636	8,240	8,193
Kvemo Kartli	34,214	34,864	36,600	34,270	33,691
Shida Kartli	13,725	15,287	16,844	14,887	16,590

Source: National Statistics Office of Georgia

Information about the status of employment in the project area is given in *Table 37*.

31.77% of interviewed 724 residents are employed, 23.76% is unemployed, 5.52% is student (school, higher educational institutions) and 20.58% is pensioner. Number of self-employed is high.

Table 37. Employment status

Type	Number	%
Employed in the public service	69	9.53
Employed in the private sector	123	16.99
Self-employed	36	4.97
Farmer	2	0.28
Unemployed	172	23.76
Student/pupil	40	5.52
Pensioner	149	20.58
Housewife	104	14.36
Other	29	4.01
Total	724	100.00

According to the survey carried out in the project impact zone, average monthly income of population is 638 Gel. Main sources of income are salaries, income from agriculture. Most of income is used for food and drink and healthcare,

Table 38. Average monthly expenses

#	Type of expenses	Average monthly expenses
1	Food/drink	298
2	Health Care	163
3	Clothing/shoes	92
4	Utility bills	50
5	Education	19
6	Lease payments	0
7	Total/total	622

In every second household at least one member has loan from bank, micro finance organization or from private person. Two households have all three types of the loan mentioned above. Four households of 203 receive money (at least 3 times a year) from family members living abroad.

5.3.5. INDUSTRY AND BUSINESSES

The region ranks 9th among the 10 regions by number of employed in industry.

Industries in Guria region comprise food and construction materials production facilities. Local small businesses include essential goods outlets, chemist's shop, fuelling and maintenance stations. Other possibilities of employment are administration offices, schools, etc.

According to available statistics the number of businesses Guria region ranks 8th after Tbilisi and by regions (2017 data) .

Table 39. Businesses

Regions	Quantity of business units	Active	%
Total	652046	172532	100
Tbilisi	284129	72430	43.6
Imereti	89756	23864	13.8
Adjara	55217	16985	8.5
Samegrelo-Zemo Svaneti	51467	13172	7.9
Kvemo Kartli	48850	13200	7.5

Kakheti	41242	10861	6.3
Shida Kartli	28865	8448	4.4
Samtskhe-Javakheti	18832	4990	2.9
Guria	16056	4359	2.5
Mtskheta-Mtianeti	12034	2968	1.8
Racha Lechkhumi-Kvemo Svaneti	5427	1240	0.8
Abkhazeti	171	15	0

Source: National Statistics Office of Georgia

5.3.5.1. AGRICULTURE

The agricultural land used in the region is as follows: 22.3 thou ha – plough land, 19.7 thou ha – pasture; 1.2 thou ha – grassland, 5.5 thou ha – not developed. Majority of the plough lands are located within the Kolkheti lowland. Significant problem is waterlogging of the land. In Ozurgeti and Lanchkhuti municipalities network of drainage canals used to cover 17.4thousand ha. The canals are silted and overgrown with shrubs and grasses. The system needs rehabilitation and maintenance. Efficiency of the system diminished leading to secondary waterlogging of some areas.

Due to prevailed climatic conditions, the major production sector is an agriculture and related processing industry. Subtropical agriculture is a leading production sector, and includes crop husbandry, tee growing, citrus growing, viticulture, cattle breeding, poultry and beekeeping. The main crops cultivated in the region are: tea, citruses, beans, potatoes, grapes, hazelnuts, persimmon, kiwi, feijoa, laurel, other fruits and vegetables. The trout farms have been developed since the late 1980s on the mountain rivers of the district (rivers Bzhuzha, Natanebi, Supsa and their tributaries), cattle breeding, poultry and beekeeping are also developed.

Access to technical facilities and machinery is limited. In regional centres microfinance organisations are available.

Land reform started in 1991, later on in 1992 resolution allowing privatization of land was enacted. In 1996 the Parliament of Georgia passed the law on the proprietary rights on agricultural land. Each household, permanent resident of the rural area, was allowed to privatise 1.25ha plot, while the quota for employees was set as 0.75ha. However, in some villages, because of the shortage of land, households received smaller plots (around 0.7ha).

Land registration process finished in 2002, when relevant certificates were handed over to the owners. The majority of arable land is private. Pastures were not privatized and are under common ownership. Besides, farmers were allowed to lease or buy land from the state.

Ozurgeti municipality (total area 676.35 km²). Municipality is mainly agriculture oriented, though arable land resources are rather sparse. Size of land plot per household does not exceed 0.75ha. The major crops include: maize, tea, citrus fruit, kiwi, persimmon and hazelnut. Households are involved in poultry breeding, cattle breeding, fishing. Beekeeping actively develops. Products are sold by sub purchaser at the farmers markets in the region. There are two agrarian markets in Ozurgeti municipality, several dozen markets and shops.

Lanchkhuti municipality (total area 498.609 km²). Citrus-growing, cattle-breeding and nut-growing are leading agricultural branches. Products are sold by sub purchaser at the farmers markets in the region.

Project area. According to survey, 161 family has access to the arable land. Average acreage of land plots owned by the project affected households equates 3032m². Some families own several plots. 96% of the land is agricultural, only 4% - non-agricultural. 95% of land is registered, the rest – private, not registered. The list of cultivated crops (according to the social survey data) is given below:

Table 40. Agricultural crops

	Product	Number households
1	Corn	133
2	Fruit	173
3	Potatoes	73
4	Vegetables	126
5	Nuts/nuts	158
6	Grapes	140
7	Hay	54

59% of the project affected interviewed households own cattle. One family owns in average 1 cow, bull or buffalo, 10 chicken (hen, turkey, other). 9 households have pigs, two – sheep or goat, four – horse or donkey.

5.3.5.2. INDUSTRIES

Ozurgeti municipality. Main industries in Ozurgeti municipality are - tea and hazelnut processing plants, dried fruits, beer and soft drinks productions, bentonite clay processing in vil.Askana.

Lanchkhuti municipality is rich in mineral resources. There are several peat quarries in the region, with Imnati quarry (east to Paliastomi lake) being the largest one; quarries in Maltakva, Grigoleti, Dedebera and Supsa. The coastline (Tskaltsminda, Grigoleti, Maltakva) contains magnetite. Sapropel – in Paliastomi area. There are chalk-stone mines in Shukhuti and Junjuati; brick clay mines in Lanchkhuti and Sameba; gravel mine – in Supsa; sulphur water - in Guliani and Jurukveti and hydrocarbon sodium water - in Baghlebi. Baku-Supsa oil pipeline and Supsa terminal play an important role in the economics of the municipality.

Project area. Ureki and Shekviteli population is in hospitality business. Number of hotels, cafeteria/restaurants and small shops in 'permanently' growing. Of business facilities Supsa oil terminal is worth to mention.

5.3.6. VULNERABLE GROUPS

(individuals below poverty level, women (widows, single mothers) led families, IDP).

Table 41. Recipients of subsidence aid

Location	Number of recipients of subsidence		Percentage of subsidence recipients from total population	
	Household	Individuals	Household	Individuals
Lanchkhuti municipality	1,748	6,399	19.6	20.4
Ozurgeti	827	2,391	12.6	10.4
Ozurgeti municipali	1,306	5,027	11.6	12.7
Chokhatauri municipali	1,260	4,893	24.7	25.6
Guria region	5,141	18,710	16	17

Source: Social Service Agency

According to information published by the Ministry of Labour, Health and Social Affairs of Georgia, total number of persons receiving social aid in the region of interest, by the state of December 2016, is 5595. The split by category is given in **Table 42**.

Table 42. Number of persons receiving social aid – breakdown by groups

Location	Handicapped	Families headed by women	Politically repressed	State compensation recipients	Household subsidies recipients	Total
Lanchkhuti municipality	1,745	194	6	33	26	2,004
Ozurgeti	487	80	1	27	25	620
Ozurgeti municipality	1,660	324	11	39	68	2,102
Chokhatauri municipality	746	97	3	14	9	869
Guria region	4,638	695	21	113	128	5,595

Project area. Socio-economic survey showed that 20 families out of interviewed 203 are vulnerable. In the direct impact zone of the project there are 12 persons below poverty line, 3 lonely pensioners, 6 internally displaced person, 12 individuals with disability, 2 veterans. 3 families are is receiving state allowance for large families, two - orphanhood pension. There are war veterans in 4 families. .

5.3.7. EDUCATION

In Ozurgeti municipality there are 34 pre-schools, 37 public schools, 5 vocational and 2 higher (Ozurgeti Institute of Environmental Management, Guria Branch of Ivane Javakhishvili Tbilisi State University), education facilities, 11 libraries, 1 theatre and 1 museum. One school is located at 7 Takaishvili str., Ureki with 411 pupils and 39 teachers. According to data of the Ministry of Education of Georgia, no public school exists in village Shekvetili and this village children go to school located in village Natanebi.

In Lanchkhuti municipality there are 25 public school (total number of students 3719), 1 secondary vocational school and 32 libraries.

Table 43. Number of schools and student (by the state of beginning of 2016 school year)

Location	Number of schools		Number of pupils	
	2014/2015	2015/2016	2014/2015	2015/2016
Guria region	101	101	14649	14405
Lanchkhuti municipality	25	25	3779	3719
Ozurgeti municipality	44	44	8353	8206
Chokhatauri municipality	32	32	2517	2480

Source: Education management information system

**Table 44. Number of private and public schools by municipalities of the region
(2016 data)**

	Number of schools, unit	
	Public	Private
Lanchkhuti	24	1
Ozurgeti	42	2
Chokhatauri	32	1

Source: Education management information system

Project area. 41% of interviewed individuals (affected persons) have secondary education, 26% has higher education and 17% graduated the vocational college.

5.3.8. HEALTHCARE FACILITIES

Healthcare facilities available in Ozurgeti and Lanchkhuri municipalities include Medalfa LLC medical centres, Regional Health Centres. There is an outpatient clinic in each village. In addition PSP company builds a new private diagnostic centre in the city downtown. The healthcare facilities are financed from the central budget, by insurance companies or patients' payments.

There are 21 medical establishments in Lachkhuti, 25 in Chokhatauri and 42 in Ozurgeti municipality. According to the report of the Ministry of Labour, Health and Social Affairs there are 73 village physicians and 83 assistant doctor in Guria region. Each community is served by village doctor. The area is covered by Emergency aid service.

All large drugstore networks are present in the region.

5.3.9. CULTURAL RESOURCES

The area is interesting from archaeological point of view. There are typical ancient settlements in the Kolkheta lowland, called locally "Dikhagudzuba", which are still identifiable on aerial imagery. Their structure and physical dimensions were analysed from aerial and on site studies. Data from existing archaeological studies and recent field works were analysed to create a reliable database on the distribution of Bronze Age settlements.

A range of archaeological sites has been discovered in the late 20th century when Baku-Supsa oil pipeline was laid. These include: Burials dated 7th-6th centuries B.C. and remains of ancient settlements (vil.Nigvziani); medieval artefacts (vil.Akhalsopeli); remains of ancient settlements (vil.Tabanati, vil.Khidmaghala); remnants of the dune settlement and workshop, the 8th-7th-6th and 4th centuries B.C (vil.Grigoleti).

Presence of old settlements along Kulevi – Poti – Ureki coastal areas is known. These include: the Late Bronze – Early Iron period settlements in the estuary of the Khobi river (north of Poti); 6th– 4 th century B.C. settlement at the Tsiva river, at the estuary of the Supsa river, south to Poti.

Natekhebi, located south of Poti, near the small bay of Paliastomi lake is the place where some artefacts have also been unearthed, among them fragments of amphorae on the bottom of which semi-solid petroleum waste of asphalt-pitch was registered. An early period Sinopean amphora (rim diameter - 12cm) with tubular neck (15cm high), solid handles (ovoid in section) was uncovered near the Supsa river canyon in the sea. Another Heraclea Pontica amphora dating from the 4th century BC was found again in the sea at Maltakva.

Ureki and its surroundings are well-known with accidentally explored treasures (golden earring, necklace, buckle, rings, bracelets, coins and chains from late antique age).

Among the important architectural monuments of the project area are:

- Likhauri Church,
- Shemoqmedi Monastery complex,
- Petra settlement,
- Askana fortress (2nd-4th c.c.),
- Gurieli palace,
- King Tamara's Likhauri fortress,
- Vashnavi settlement,.
- ancient burials, settlements,
- remains of the metal casting workshops (e.g. Late Classic Period casting workshops in Askana);
- Medieval settlement and burial grounds in Baileti,
- Pre-Late Classic Period metal casting workshops and Medieval settlement in Bakhvi,
- burial ground, settlement and remains of metal casting workshop in Shemoqmedi,

- Otogvini cave of Middle Bronze Age in Vakijvari,
- Silver deposits in Pampaleti,
- Medieval cave in Jumati,
- Chinari treasure in Ureki,
- Shalva Radiani ethnographical Museum,
- Ekvtime Takaishvili Museum,
- Giorgi Salukvadze House Museum,
- Guriant Memorial Museum.

There are 2 theatres in Lanchkhuti municipality.

5.3.10. TOURISM

Tourism in Guria is sporadic and weakly contributes to the local economy. The basic tourism infrastructure needs improvement. Despite infrastructural inefficiencies, Guria region is suitable for hosting the new tourism trends, including rural tourism. Tourism development in the region is one of the main priorities for all three municipalities in the region.

Main directions for tourism development in this region include sea resorts, mountain tourism, balneology, hunting and adventure tourism. Potential of the resort towns of Grigoleti, Ureki, Bakhmaro and Gomismta is worth to mention in particular. The seaside areas – Tsksaltminda, Grigoleti, Maltakva, Grigoleti, Ureki are popular seaside summer resorts for Georgians.

Table 45. Main parameters and peculiarities of the resorts within the study area

Resort name	Elevation, m asl	Type of the resort	Medical profile	Main recreational resources
Kobuleti	5	c	c, p, pr	mb, c, ns
Ureki	4	c	p, n, arth	mb, c, ms
Grigoleti	3	c	pr, p, n	mb, ns, ms
Maltakva	3	c	p, pr	mb, ns, ch, wr

Key: c – climatic; b-balneological, cb -climatic – balneological;

Medical profile: arth _ arthrological; g _ gynaecological; cr _ cardiological; n _ neurological; pr _ prophylactic; p _ pulmonologic; Recreational resources: ns _ natural sightseeing; mb _ beaches; ch _ cultural-historical ; c _ climatic; mw _ mineral water; fr _ forestry; wr _ water reservoirs; ms _ magnetite (black) sands beach

There is a range of hotels and family hotels in the region. Most of them are in Ureki and Shekvetili. Hotels work seasonally – mainly in summer.

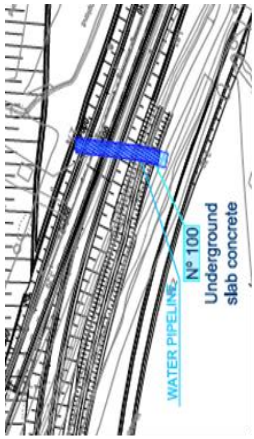

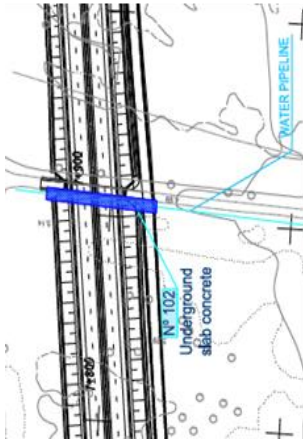
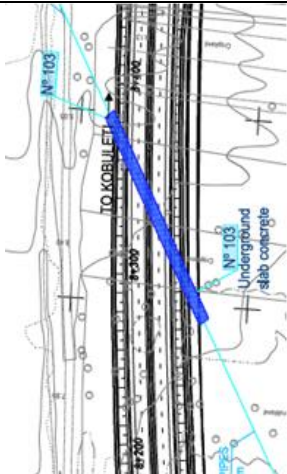

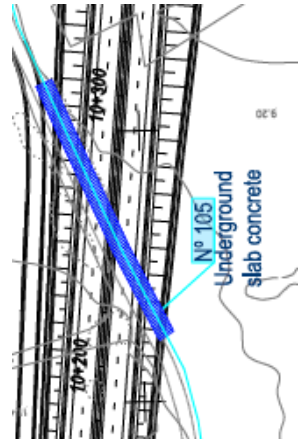
5.3.11. INFRASTRUCTURE

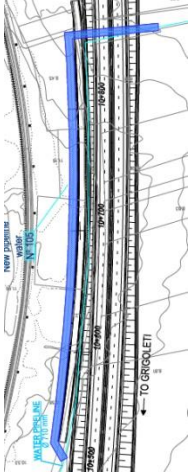
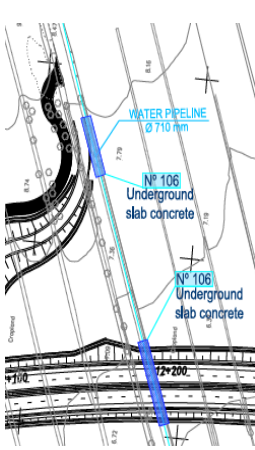
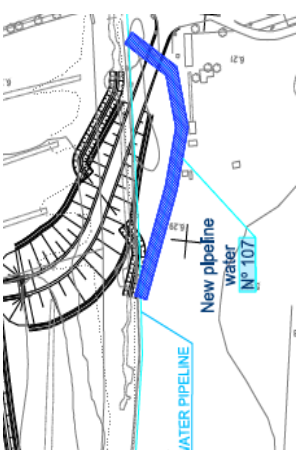

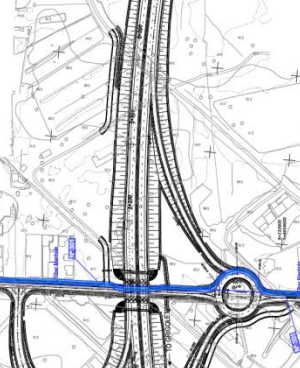
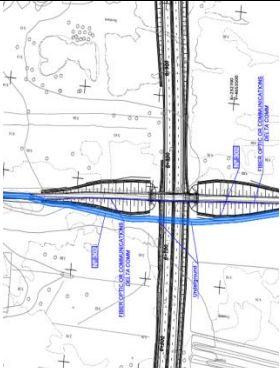
The area of the district is crossed by international importance roads E-692 and E-70. The district has well developed road network that in its most extent requires improvement of the surface course.

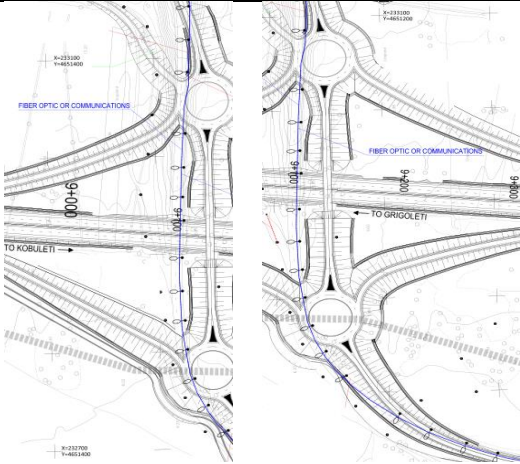
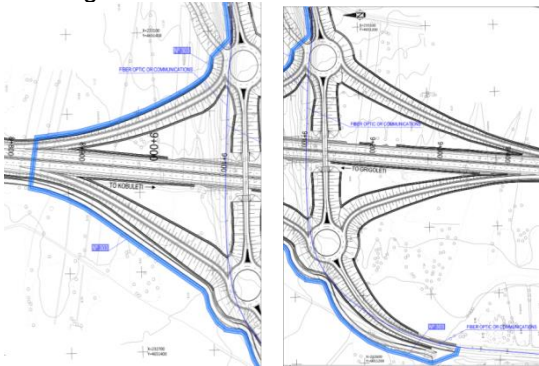
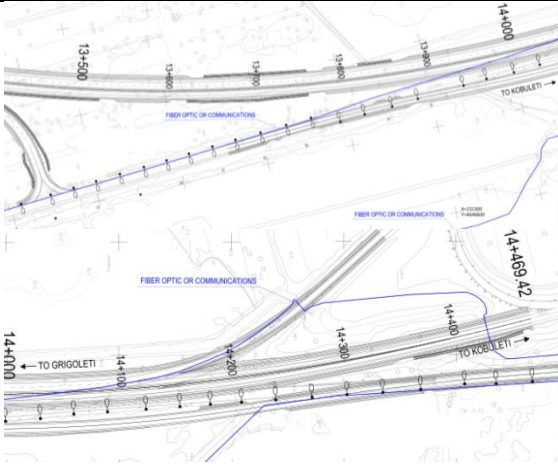
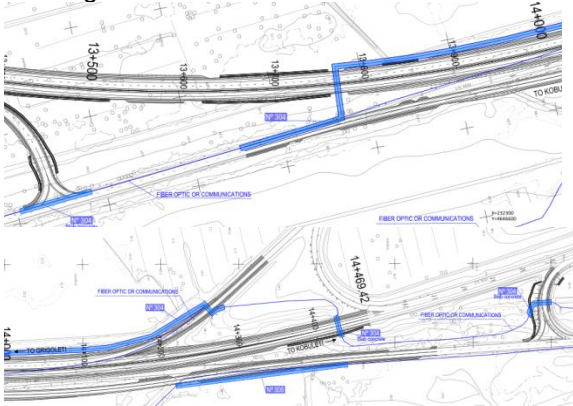
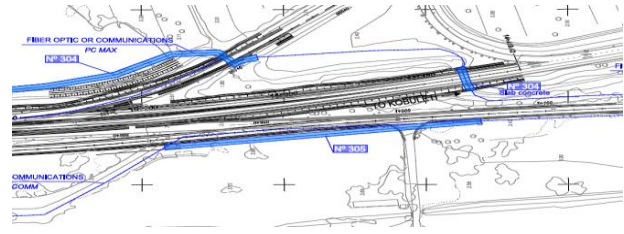
Other infrastructure includes – railways line, transmission lines, optic fibre cables, Supsa pipeline, gas pipeline, a network of drainage canals (see **Figure 43**). The list of infrastructure is given in **Table 46**.

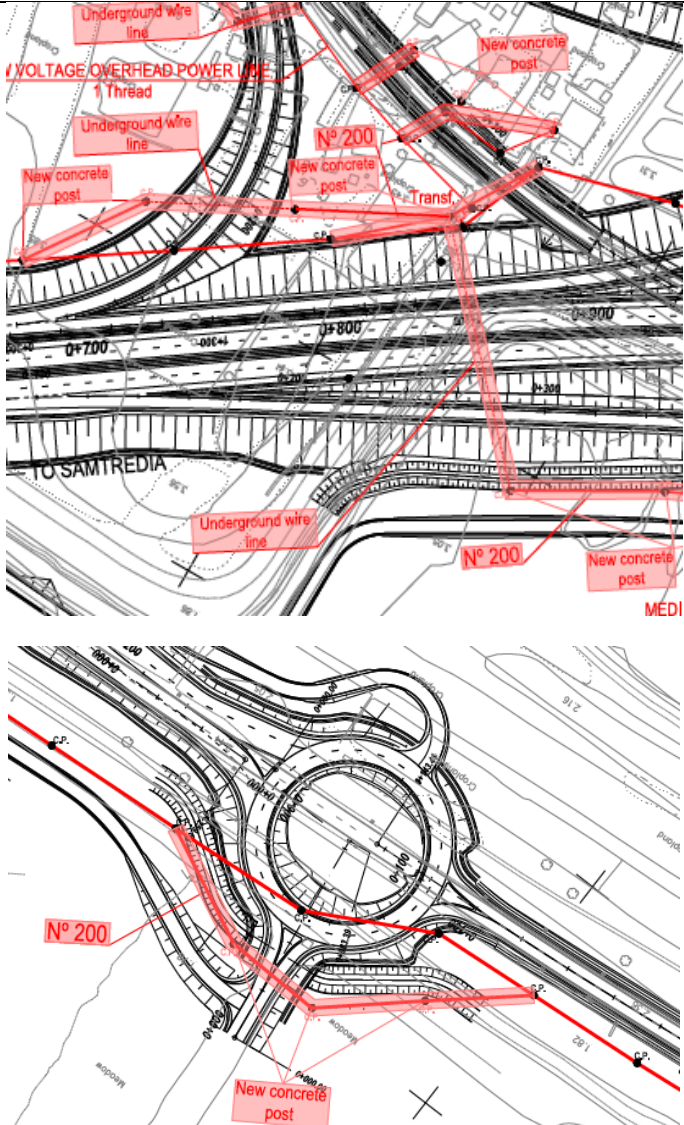
Table 46. Infrastructure in the project area

Water pipeline	High voltage OTL
P.K. 1+100	P.K. 2+720
P.K. 5+700	P.K. 5+600 – 6+360
P.K. 7+900	P.K. 6+760
P.K. 8+350	P.K. 8+100 – 9+500
P.K. 10+020	P.K. 11+000
P.K. 10+300 – 10+840	Communications (optic fiber line)
P.K. 12+200	P.K. 3+000
P.K. 12+100	P.K. 5+700
Medium voltage OTL	P.K. 6+760
P.K. 0+840	P.K. 9+100
P.K. 0+700 – 0+900	P.K. 13+500 – 14+400
P.K. 2+400	P.K. 14+200 – 14+400
P.K. 2+700	WREP (Baku-Supsa oil pipeline) – Projected gas pipeline and gas pipeline (Socar Georgian Gas)
P.K. 2+800	
P.K. 3+040	
P.K. 3+680	P.K. 1+300 – 2+036
P.K. 4+200	P.K. 3+000
P.K. 5+800	P.K. 5+550
P.K. 5+600 – 6+360	P.K. 5+700
P.K. 5+600 Underpass	P.K. 6+780
P.K. 6+320	P.K. 8+300
P.K. 9+120 – 9+400	P.K. 9+120 (Overpass IC-3)
P.K. 10+300 - 10+500 – 10+800 – 11+500 – 11+800 – 12+100	P.K. 12+200
P.K. 13+500 – 14+400	

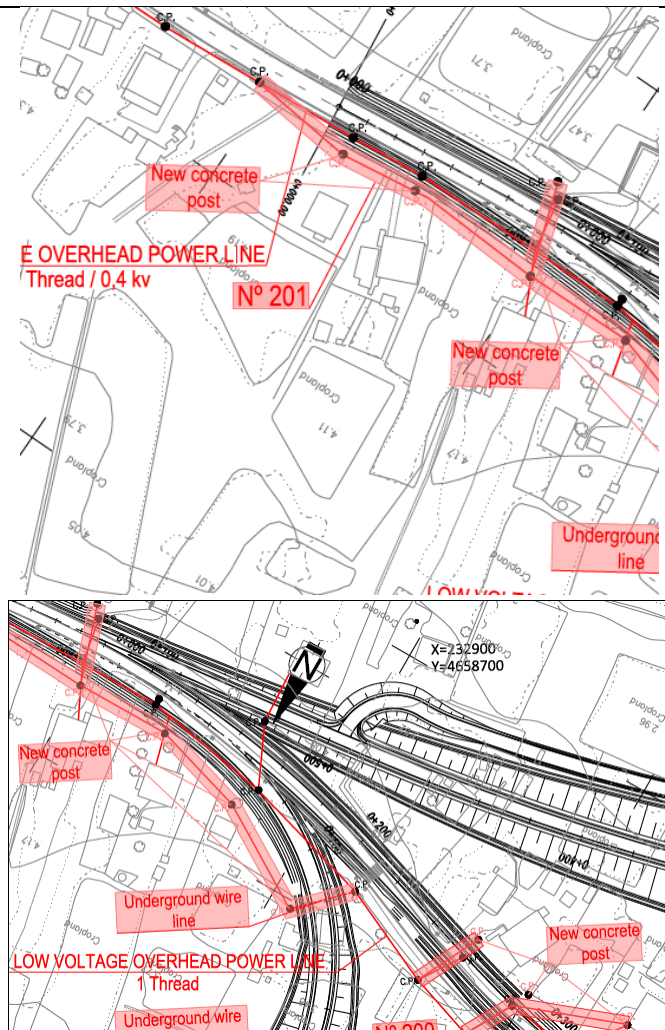
	Crossing #100 (KP -1+100)	Crossing #101 (KP -5+700)	Crossing #102 (KP -7+900)
Water pipeline	Water pipeline crossing existing road (perpendicular to it) will be affected by construction of an interchange. Reinforcement with 1.5 m wide, 1.5cm thick concrete slab is planned.	The new road will cross existing water pipeline in the interchange section. New water pipeline will be arranged along the design road.	Water pipeline crossing existing road (perpendicular to it) will be affected by construction of an interchange. Reinforcement with 1.5 m wide, 1.5cm thick concrete slab is planned.
			
	Crossing #103 (KP -8+350)	Crossing #104 (KP -10+020)	Crossing #105 (KP 10+300)
	Water pipeline crossing existing road (perpendicular to it) will be affected by construction of an interchange. Reinforcement with 1.5 m wide, 1.5cm thick concrete slab is planned.	Water pipeline (diameter 355 mm) crossing existing road (perpendicular to it) will be affected by construction of an interchange. Reinforcement with 1.5 m wide, 1.5cm thick concrete slab is planned.	Water pipeline (diameter 710 mm) crossing existing road (perpendicular to it) will be affected by construction of an interchange. Reinforcement with 1.5 m wide, 1.5cm thick concrete slab is planned.
			
	Crossing #105 (KP 10+840)	Crossing #103 (KP -12+200)	Crossing #103 (KP -12+100)
	Water pipeline (diameter 710 mm) crossing existing road (perpendicular to it) will be affected by construction of an	Water pipeline (diameter 710 mm) crossing existing road (perpendicular to it) will be affected by	Water pipeline (diameter 710 mm) will be affected by construction of interchange. New pipeline along the

	interchange. Arrangement of a new pipeline along the new road is planned.	construction interchange. Reinforcement with 1.5 m wide, 1.5cm thick concrete slab is planned.	design overpass is planned.
			
	Crossing #300 (KP 3+000)	Crossing #301 (KP 5+700)	Crossing #302 (KP 6+760)
Optic fibre cable	New optical cable will be placed along the new roundabout. Fibre cable and polyethylene pipe d-40 mm into polyethylene pipe d-90 mm, thickness 5 mm shall be used for crossing the road	New cable will be located along the new road. Fibre cable and polyethylene pipe d-40 mm into polyethylene pipe d-90 mm, thickness 5 mm shall be used for crossing the road.	Fibre cable and polyethylene pipe d-40 mm into polyethylene pipe d-90 mm, thickness 5 mm shall be used for crossing the road.
			

	Crossing #303 (KP 9+100)	Crossing #304 (K P 13+500-14+400)	Crossing #305 (KP -14+200-14+400)
Optic fibre cable	Existing optical cable will be relocated. Fibre cable and polyethylene pipe d-40 mm into polyethylene pipe d-90 mm, thickness 5 mm shall be used for crossing the road	Existing optical cable must be relocated. Fibre cable and polyethylene pipe d-40 mm into polyethylene pipe d-90 mm, thickness 5 mm shall be used for crossing the road.	Existing optical cable will be relocated along the new road. Fibre cable and polyethylene pipe d-40 mm in polyethylene pipe d-90 mm thickness 5 mm for crossing the road
	 <p>Existing</p>  <p>New</p>	 <p>Existing</p>  <p>New</p>	

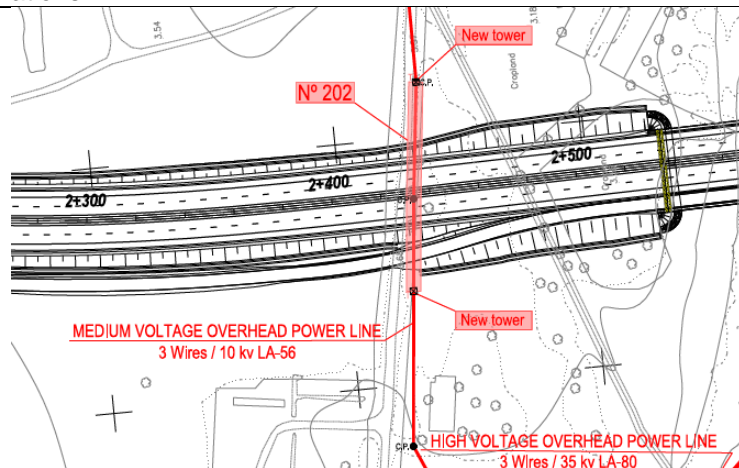
Electricity high, medium and lowvoltage overhead power transmission line	Crossing #200 (KP 0+840)
	<p>Route of new road crosses the existing 10 kV OTL. 6 concrete poles are located within the road construction area. Relocation is required. 8 concrete poles should be installed on both sides. At the end of the Interchange 5 concrete poles are required. Section of 10 kV overhead line should be replaced with underground cable line installed in pipes laid under the new road (one pipe for current cable and one spare pipe for future use) and New copper cable line (cross section 3x70mm²) between posts should be installed in trenches and pipes placed under the road, including connection of cables with existing conductors.</p>
	
	Crossing #201 (KP 0+700-0+900)
	<p>The new road crosses the existing 0.4kV OTL installed on concrete posts. 8 poleas are located within the area of road construction. Relocation is required. 12 concrete poleas (same type) should be installed outside on new road, including overhead connection of cables with existing conductors.</p>

Electricity high, medium and low voltage overhead power transmission line



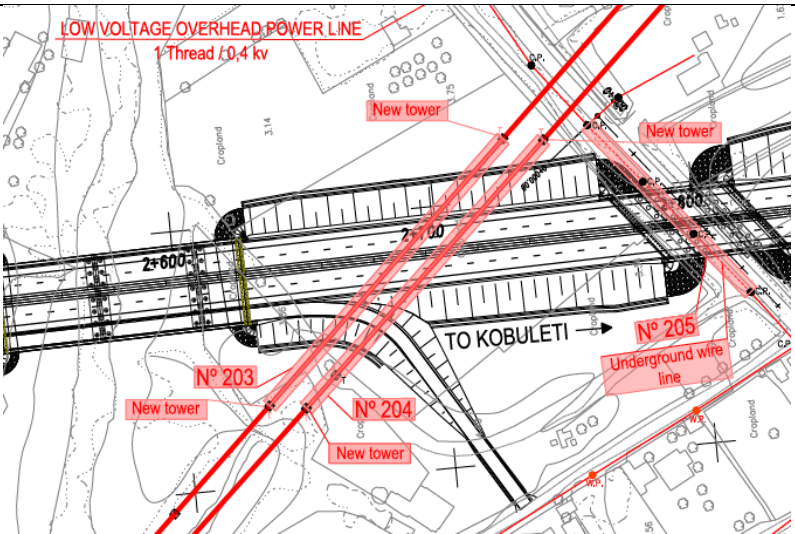
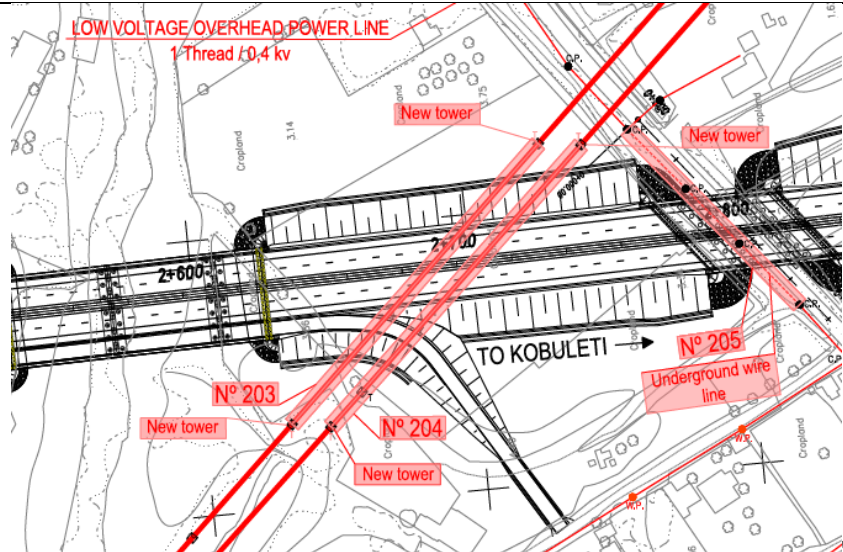
Crossing #202 (KP 2+400)

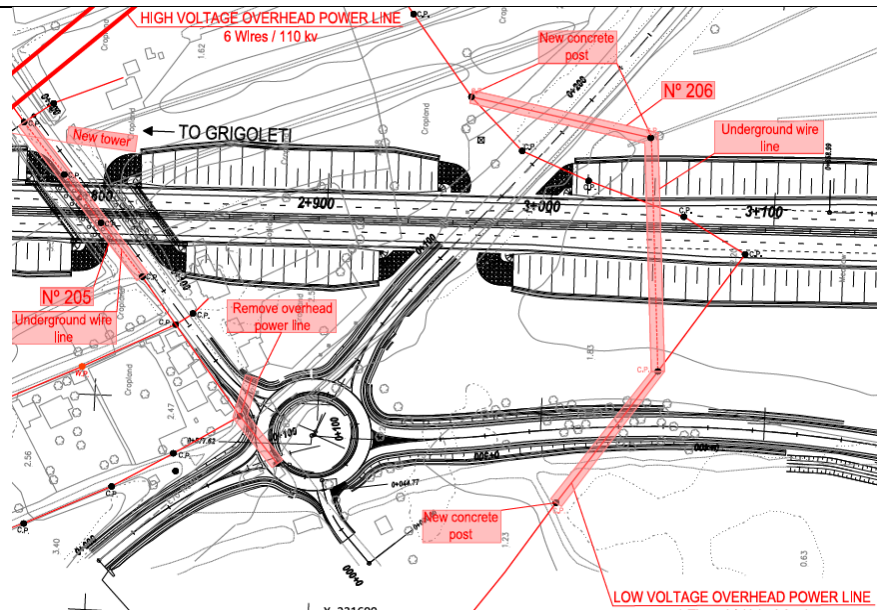
The new road crosses the existing 10 kV OTL installed on concrete posts. 1 polw is located within the area of road construction. Relocation is requires. 2 towers should be installed on both sides on new road with height compliant with requirements Rules for Electric Installations



Crossing #203 (KP 2+700)

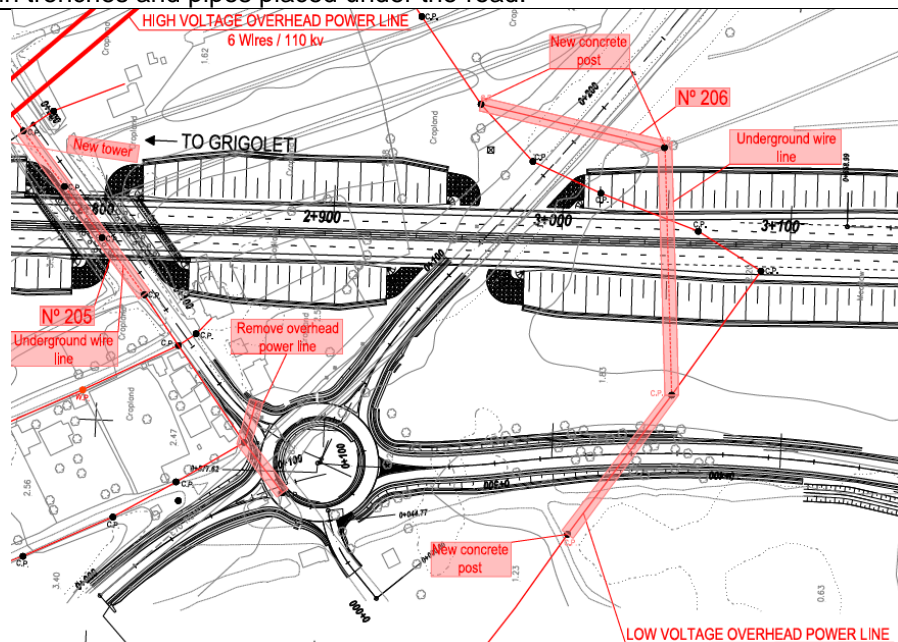
The new road crosses the existing 35 kV OTL. Height of 2 towers do not conform with requirements Rules for Electrical Installations and should be relocated. 2 tower should be

Electricity high, medium and low voltage overhead power transmission line	installed on both sides on new road
	
	<p>Crossing #204 (KP 2+720)</p>
	<p>The new road is crossed by the existing 110kV double-circuit OTL. The section of the OTL needs to be relocated. It is necessary to install two towers on both sides of span where 110kV overhead line crosses new road. Conductors on these towers should be installed on double-circuit insulator assemblies.</p>
	
	<p>Crossing #205 (KP 2+800)</p>
	<p>The new road crosses 0.4kV OTL installed on concrete posts. 4 posts are located within the road area and should be relocated. The line should be replaced with underground cable line installed in pipes and trenches under the proposed road. 2 concrete posts should be installed on both sides of the proposed road PK 2+800. Including connection of cables with existing conductors. Removal of two concrete post near roundabout is planned.</p>



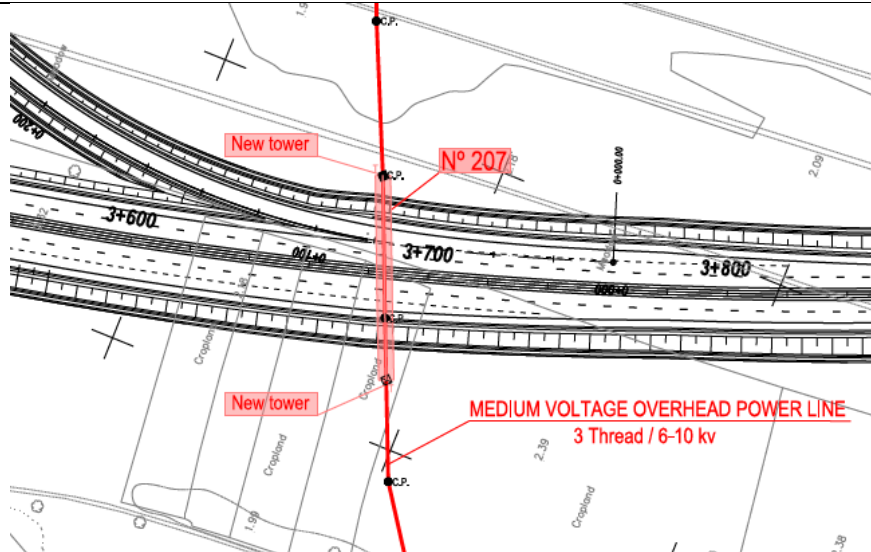
Crossing #206 (KP 3+040)

The new road crosses the existing 10 kV OTL installed on concrete posts where three concrete posts are located within the area of road construction so it is necessary to relocate. Section of 10 kV OTL should be replaced with underground cable line installed in pipes laid under the new road (one pipe for current cable and one spare pipe for future use) and new copper cable line (cross section 3x6mm²) between posts should be installed in trenches and pipes placed under the road.



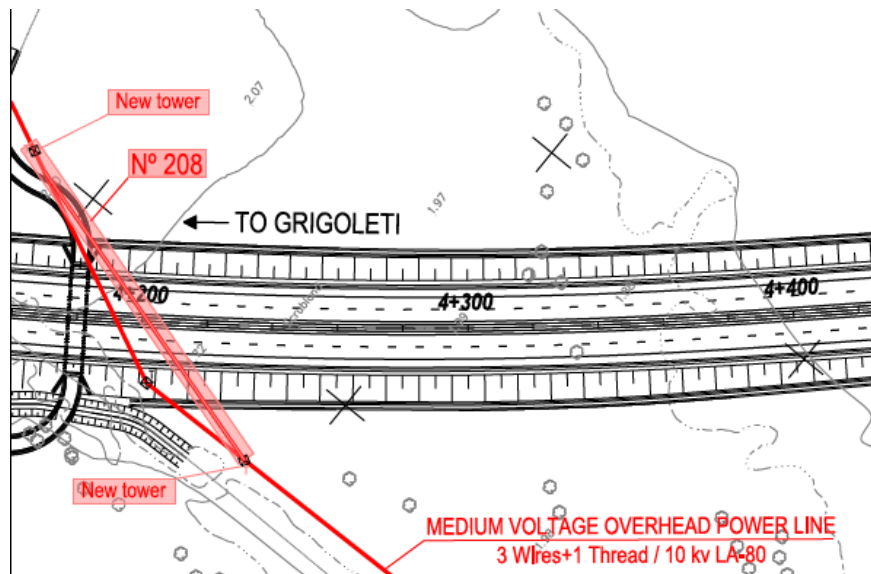
Crossing #207 (KP 3+680)

The new road crosses the existing 6-10 kV OTL installed on concrete posts where 1 concrete posts is located within the area of road. Relocation is required. 2 tower should be installed on both sides on new road with height adequate, conform to requirements Rules for Electric Installations, including overhead connection of cables with existing conductors.



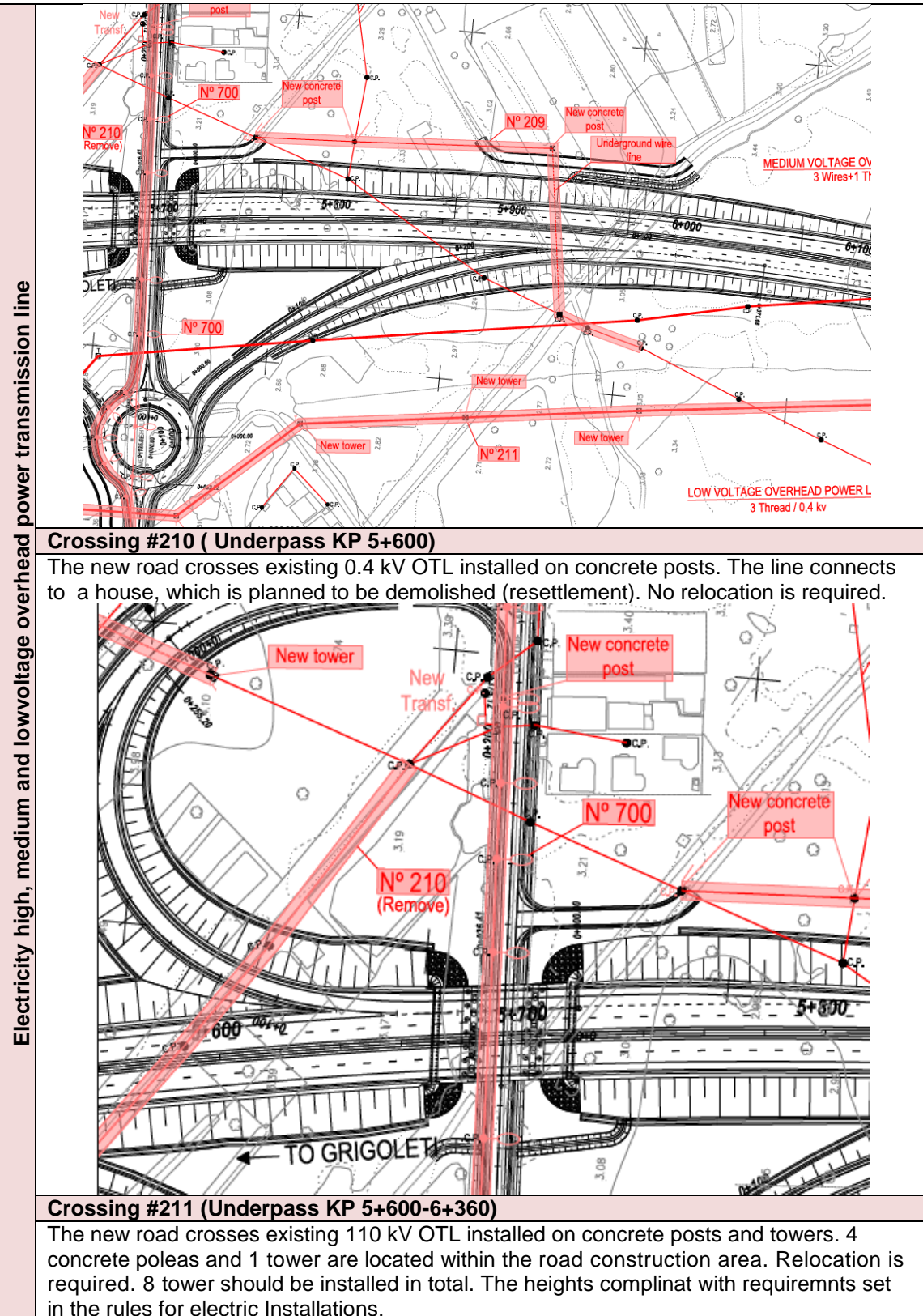
Crossing #208 (KP 4+200)

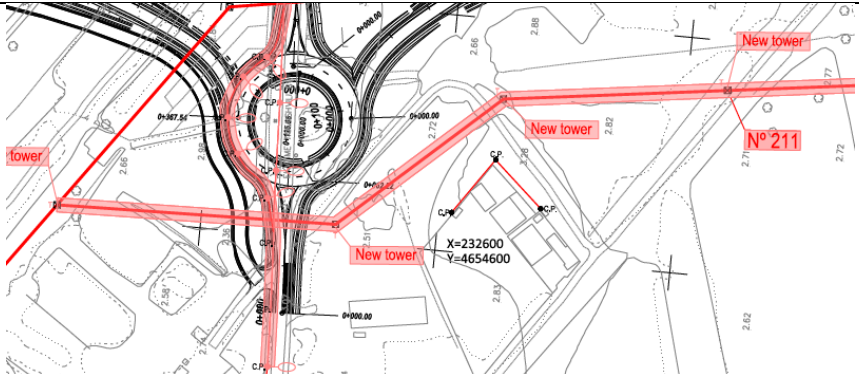
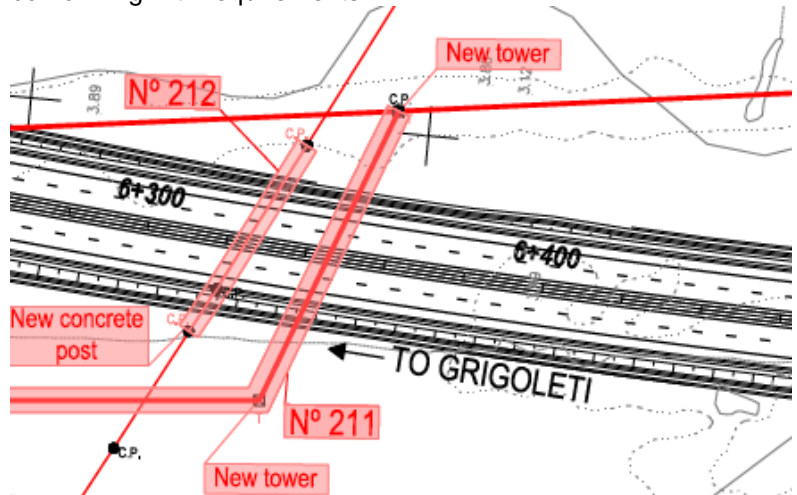
The new road crosses existing 10 kV OTL installed on concrete posts. One tower is located in the road construction area. Relocation is required. 2 tower should be installed on both sides of the new road with height conforming with requirements of the Rules for Electric Installations.

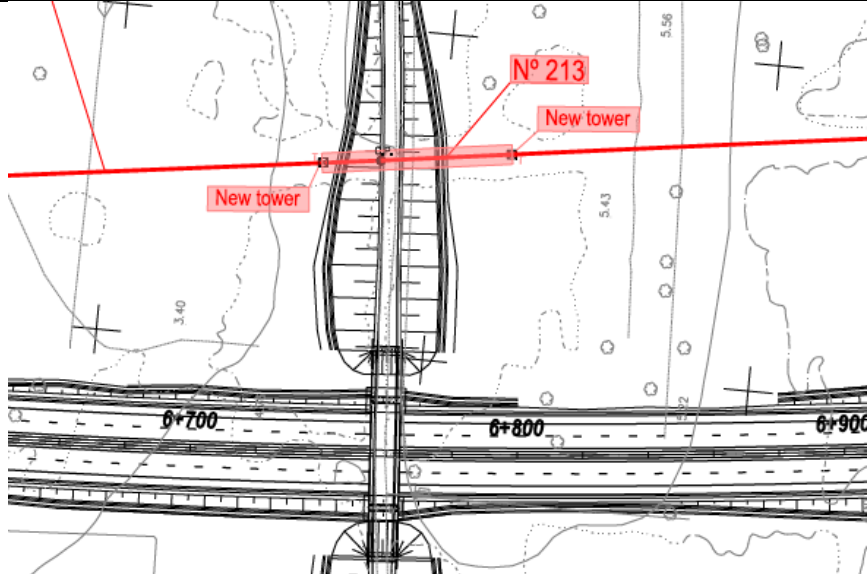
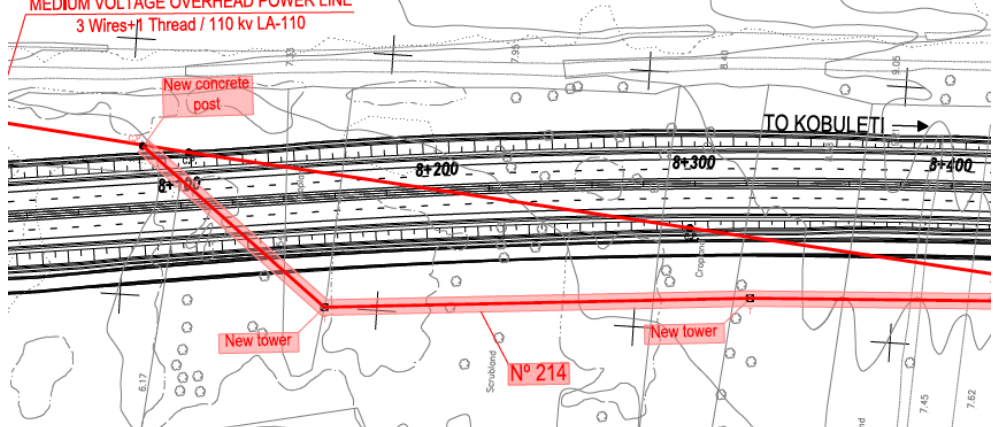


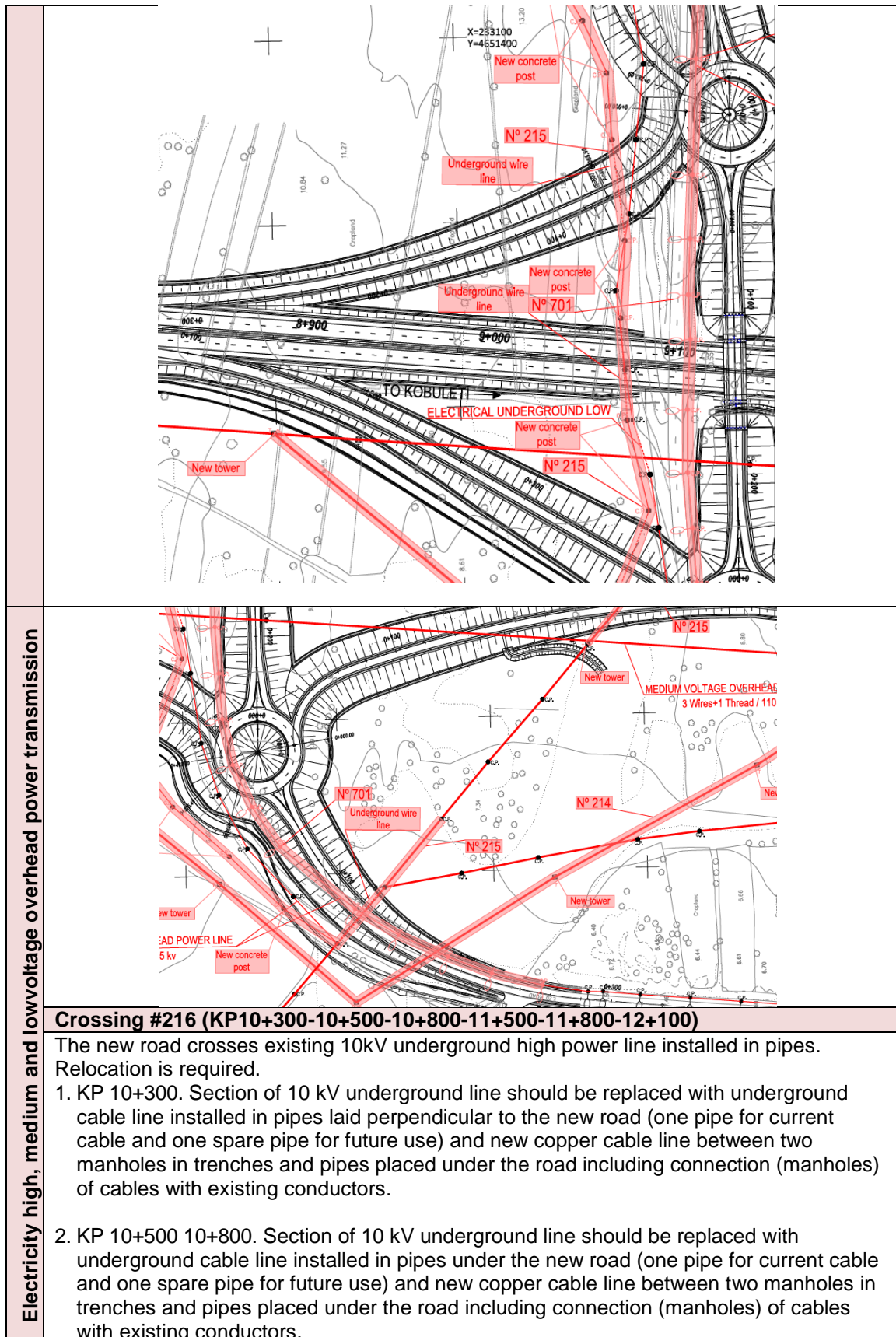
Crossing #209 (KP 5+800)

The new road crosses existing 0.4 kV OTL installed on concrete posts. 2 poles are located within the road construction area. In some sections the height is less than allowed under the rules for electrical installations. Relocation is required. In underpass (5+600) and road section 5+900, section of 0.4 kV overhead line should be replaced with underground cable line installed in pipes laid under the new road (one pipe for current cable and one spare pipe for future use) and New copper cable line (cross section 3x6mm²) between concrete posts should be installed in trenches and pipes placed under the road.



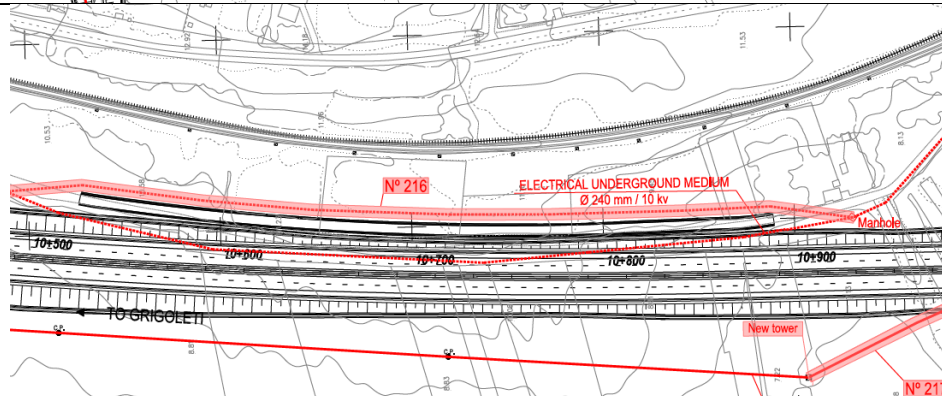
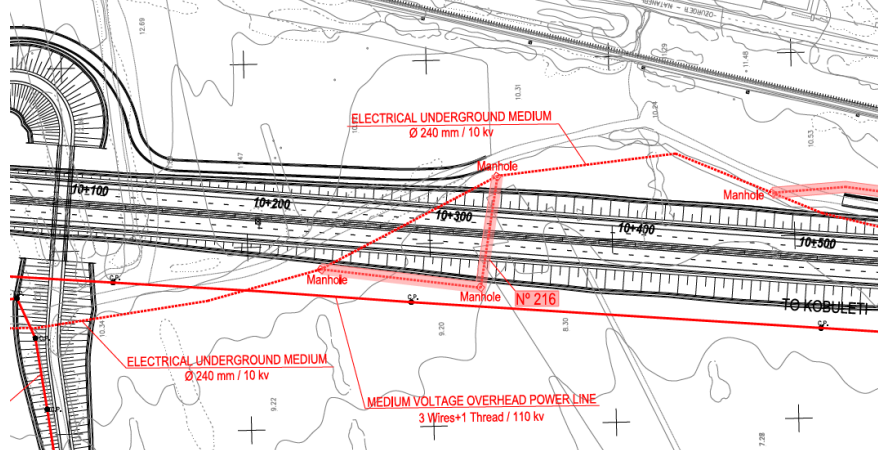
Electricity high, medium and low voltage overhead power transmission line	
	Crossing #212 (KP -6+320)
	<p>The new road crosses existing 0.4 kV overhead low power line installed on concrete posts where the height is less than allowed under the Rules for Electrical Installations. Relocation is required. 2 concrete poles should be installed on both sides on the new road, the height – conforming with requirements.</p>
	
	Crossing #213 (Overpass KP -6+760)
	<p>The new road crosses existing 110 kV OTL installed on concrete poles. The height do not conform with requirements of the Rules for Electrical Installations. Relocation is required. 2 towers should be installed on both sides on the new road with height - adjusted to the requirements Rules for Electrical Installations.</p>

	
Electricity high, medium and low voltage overhead power transmission line	<p>Crossing #214 (KP -8+100-9+500)</p> <p>The new road crosses existing 110 kV OTL installed on concrete posts. 4 poles and 2 tower are located within the road construction area. 10 tower should be installed in total and two on both sides on new road (KP 8+100 and Overpass IC-3) with height compliant with requirements of the Rules for Electric Installations.</p>
	
	<p>Crossing #215 (Overpass IC-3 KP -9+120 KP 9+400)</p> <p>The new road crosses existing 10 kV OTL installed on concrete posts. 13 concrete poles in the overpass area are located within the road construction area. Relocation is required. In KP 9+400, the new road crosses the existing 10 kV OTL installed on concrete posts. The height is less than required under the Rules for Electrical Installations. Relocation is required.</p> <p>Section of 10 kV OTL should be replaced with underground cable line installed in pipes laid under the new road (one pipe for current cable and one spare pipe for future use) and New copper cable line (cross section 3x70mm²) between concrete posts should be installed in trenches and pipes placed under the road. 2 new towers on both sides of the new road (KP 8+100 and Overpass IC-3) with height compliant with requirements of the Rules for Electric Installations should be installed.</p>



3. KP 11+500 11+800. Section of five cables 10 kV underground line should be replaced with underground five cable line installed in pipes laid along under the new road (one pipe for current cable and one spare pipe for future use) and new copper cable line between two manholes in trenches and pipes placed under the road including connection (manholes) of cables with existing conductors.

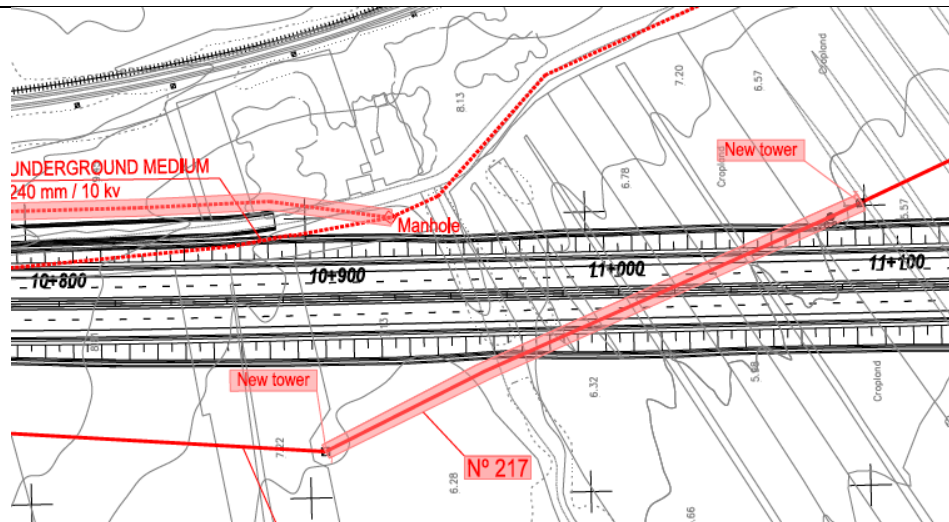
4. KP 12+100. Section of 10 kV underground line should be relocated or protected by means of at least 1.5m wide, 15cm thick r/c slab along the new road.



Electricity high, medium and

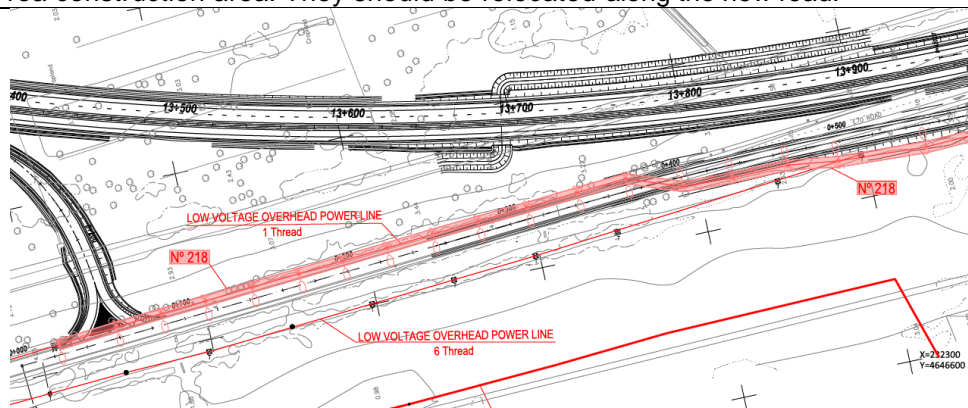
Crossing #217 (KP -11+000)

The new road crosses existing 110 kV OTL installed on concrete posts. The height is less than requested under the Rules for Electrical Installations. Relocation is required.2 adequate height tower should be installed on both sides on new road.



Crossing #218 (KP -13+500-14+400)

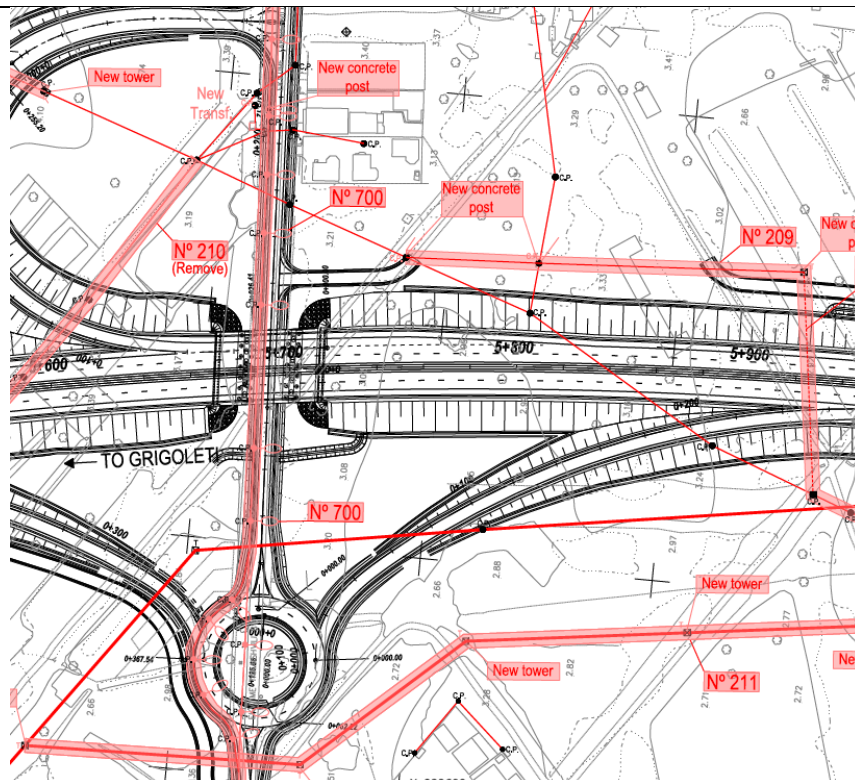
The new road crosses existing 0,4 kV OTL street light poles. 38 poles are located within the road construction area. They should be relocated along the new road.



Crossing #700 (Underpass KP 5+600)

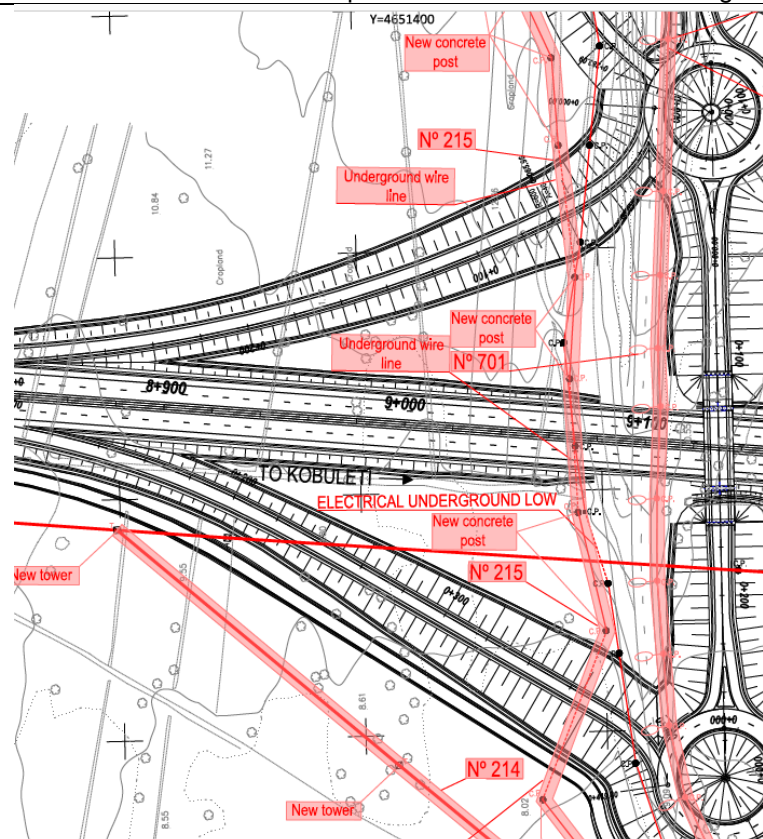
The new road crosses existing 0.4 kV OTL on street light poles. 14 poles are located within the road construction area. These poles (street light) should be relocated along the new road.

Electricity high, medium and low voltage overhead power transmission line



Crossing #701 (Underpass KP 9+10000)

The new road crosses existing 0,4 kV OTL installed in Street light. 14 poles are located in the new road construction area. These poles should be relocated along the new road.



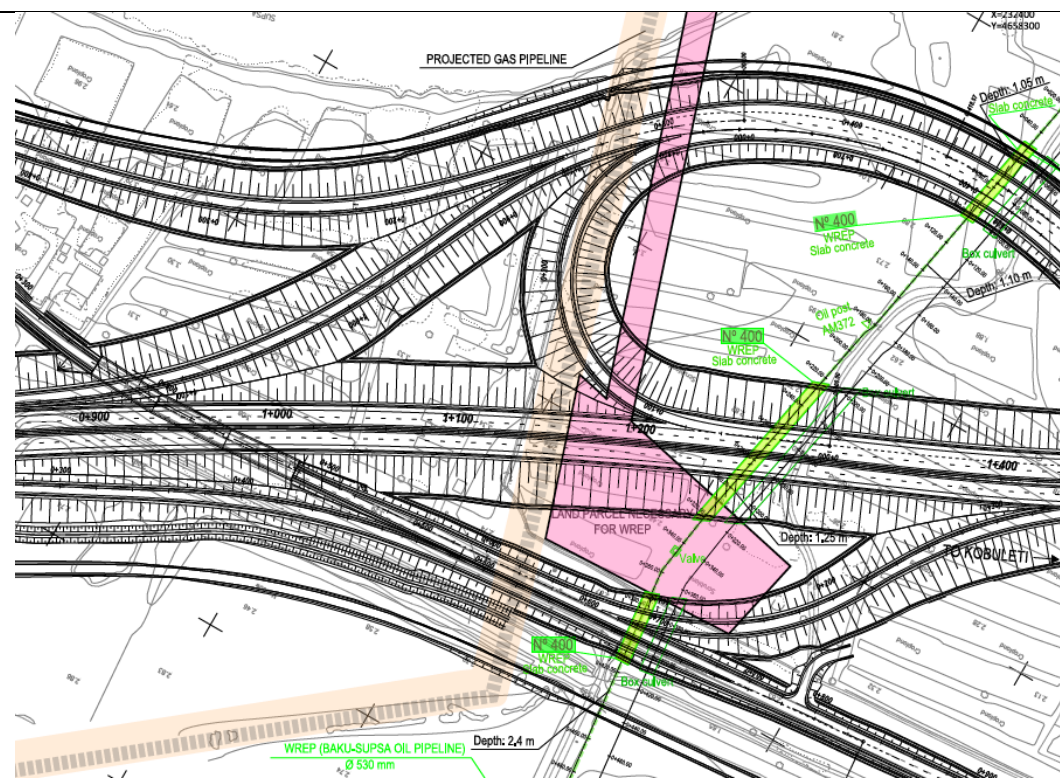
Crossing #400 (Interchange 1+300 and PK 2+036)

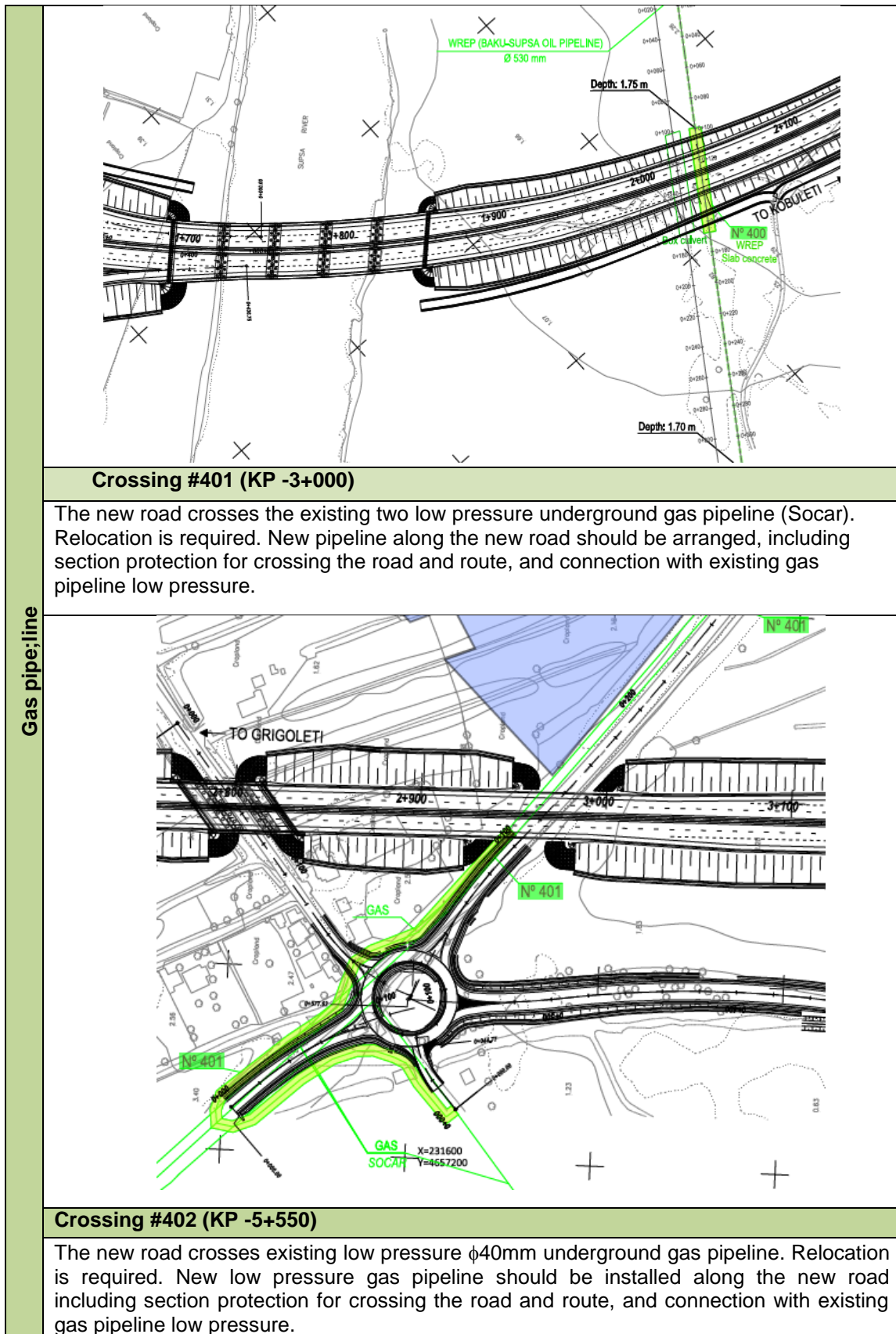
In interchange PK 1+300, a highway crosses (three times) existing high pressure oil pipeline Western Route Export Pipeline (WREP). The coordinates of road axis to oil pipeline are WGS 84 UTM HUSO 38 232385.284E 4658567.887N, and crossing angle is 54°, pipeline diameter 530mm, its deepening from ground surface ≈1.0 - 2.4 m, and its deepening from design road surface shall be 6.0-12.0 m.

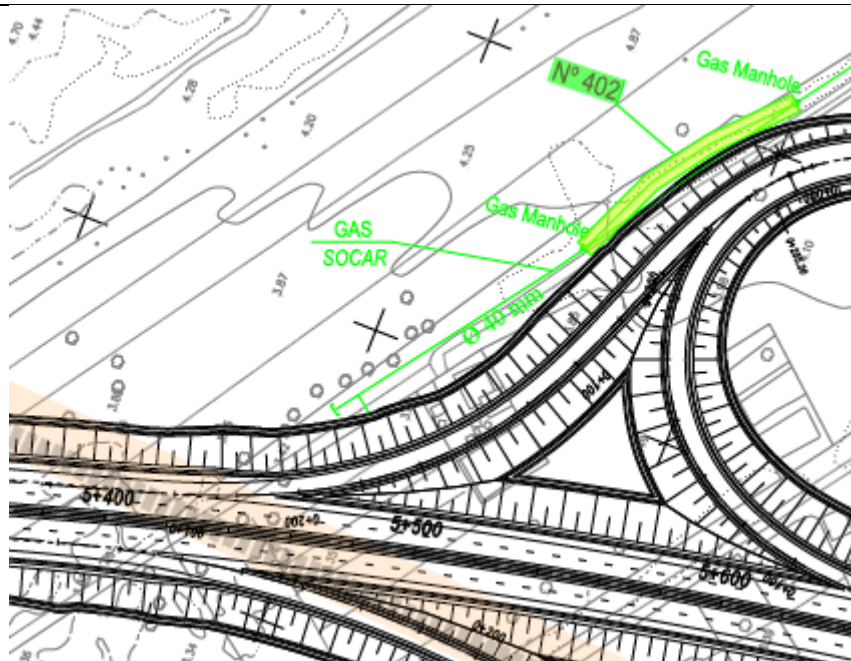
On PK 2+036, a highway road crosses existing high pressure oil pipeline Western Route Export Pipeline (WREP). The coordinates of road axis to oil pipeline are WGS 84 UTM HUSO 38 231837.506E 4658058.970N, and crossing angle is 78°, pipeline diameter – 530mm, its deepening from ground surface ≈1.70 - 1.75 m, and its deepening from design road surface shall be 5.0 - 7.0 m.

In order to protect the pipeline, reinforced-concrete slabs are to be installed. Reinforced-concrete slabs shall be laid on sand layer of 30cm thickness. Besides, in parallel to existing pipeline 15m away of it, 1.0x1.0(h) m reinforced-concrete case (box culvert) is to be installed to allow maintenance activities on the pipeline in a way not to damage motorway earth bed and thus, traffic delay. For this purpose substitute pipe shall be laid in case. The case is designed in a way that, soil thickness on its top shall be no less 0.5 m.

Gas Pipeline

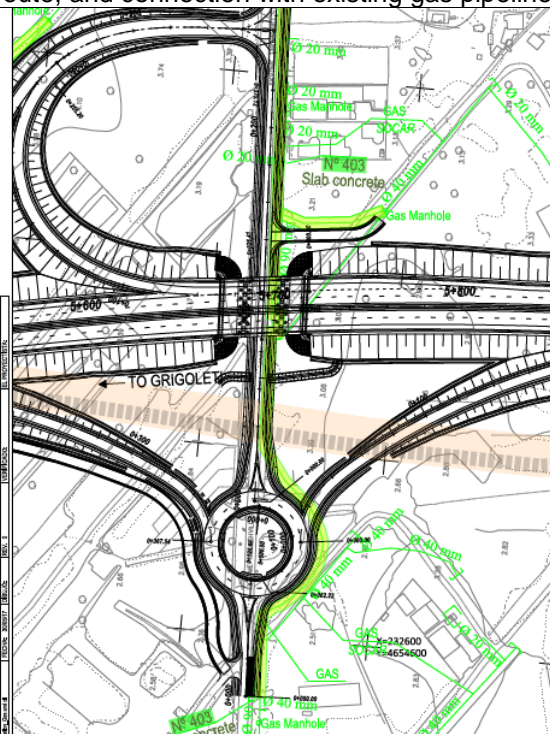




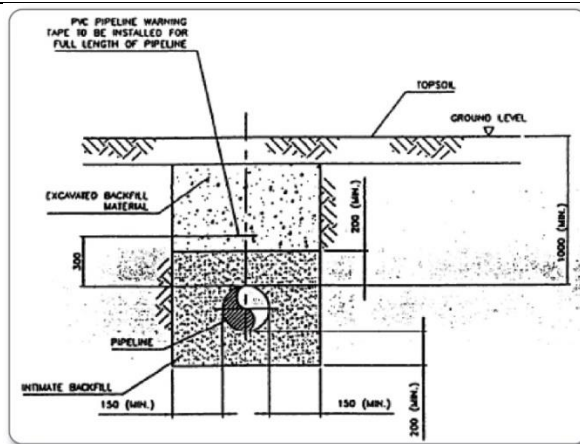


Crossing #403 (KP -5+700)

The new road crosses existing different diameter $\phi 90$, $\phi 40$ and $\phi 20$ mm low pressure underground gas pipeline. Relocation is required. New low pressure gas pipeline should be arranged along the new road including section protection for crossing the road and route, and connection with existing gas pipeline low pressure.



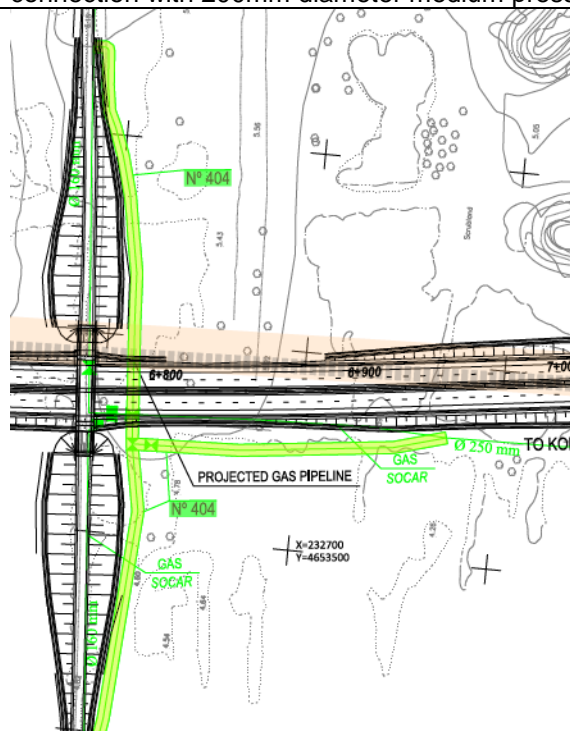
Gas pipe;line

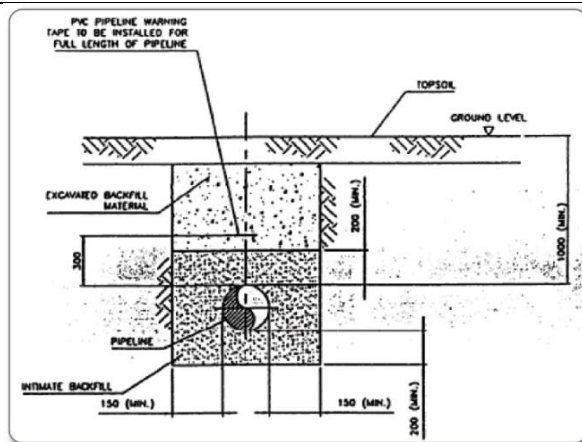


Crossing #404 (KP -6+780)

The new road crosses different diameter ($\phi 160$ and $\phi 200$ mm) medium pressure underground gas pipeline. Relocation is required. New low pressure gas pipeline along the new road is planned including section protection for crossing the road and route, and connection with 200mm diameter medium pressure gas pipeline.

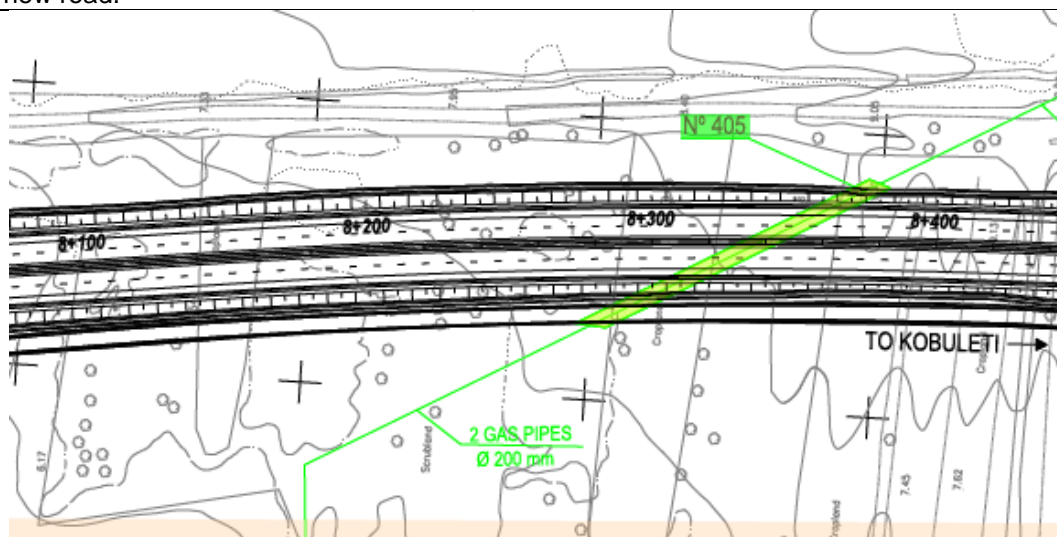
Gas pipe;line





Crossing #405 (KP -8+300)

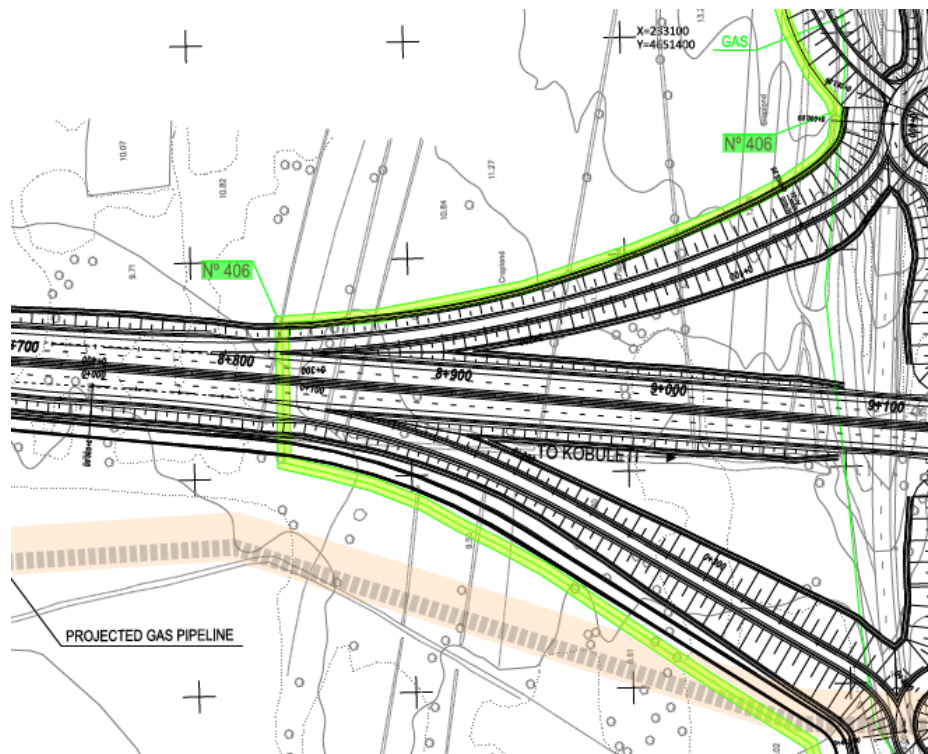
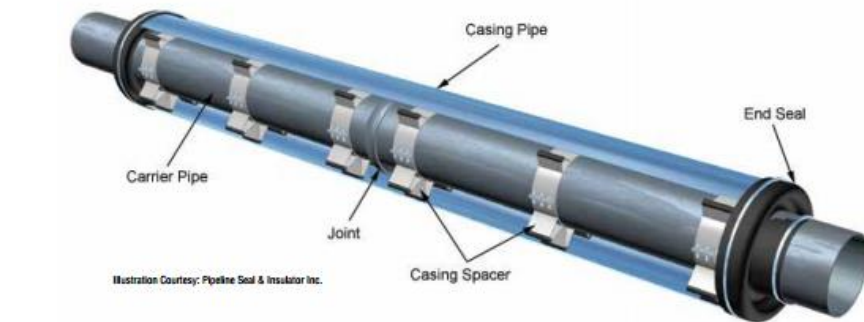
The new road crosses 200mm diameter two existing underground low pressure gas pipelines. Relocation or protection by means of 1.5m wide, 15cm thick r/c slab along the new road.



Crossing #406 (Overpass IC-3 KP -9+120)

The new road crosses existing underground low pressure gas pipeline. New low pressure gas pipeline will be located along the new road. Iron protection cased pipeline with cathodic protection for crossing the road and route, and connection with existing low pressure gas pipeline will be used.

Gas pipe;line



Crossing #407 (KP -12+200)

The road crosses 2 existing underground low pressure gas pipelines. Relocation or protection by means of 1.5 m wide, 15 cm thick r/c slab along the new road.

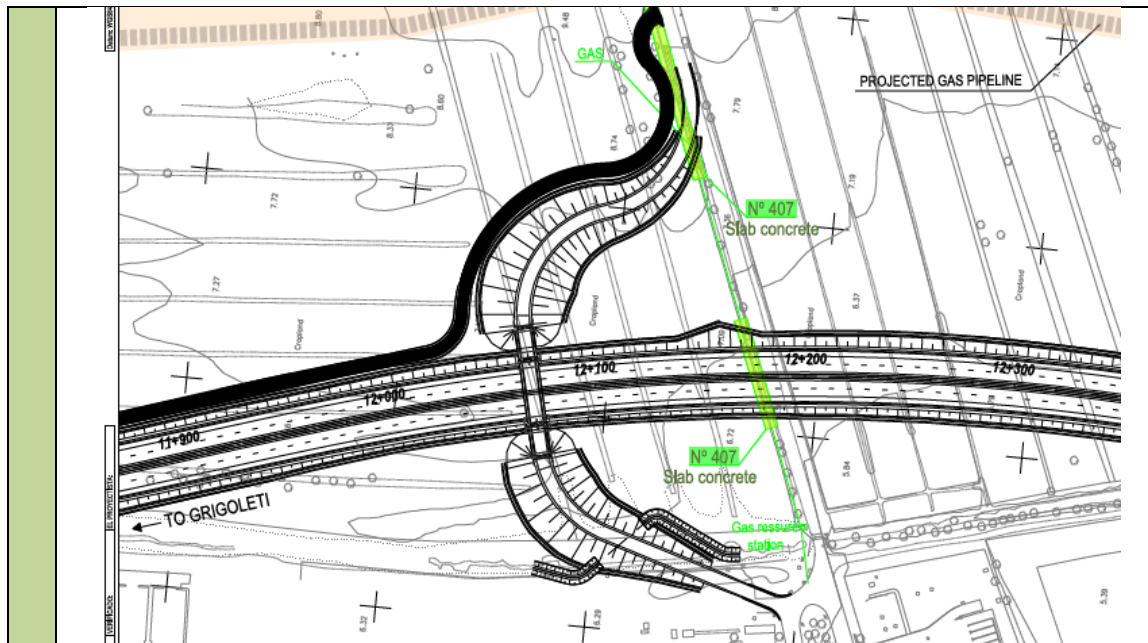


Figure 43. Infrastructure in the project area

5.3.12. ENERGY

Supply of the natural gas for Ozurgeti and Lanchkhuti residents is undertaken by private companies Sokar and Itera. By 2013 almost 98% of the city along with villages Likhauri, Shemoqmedi, Chanieti, Ozurgeti, Gurianta, Naruja and Laituri were connected to service network.

Every family has electrical energy. Extensive work program is carried out by private company Energo-pro Georgia for installing the individual electricity meters.

Only 6 households in the area directly affected by the project are using gas for heating, the use wood.

5.3.13. WATER AND SEWAGE

Centralized water supply and sewerage systems are available in towns. 57% of interviewed households in the project impact zone do not have a centralized water supply. Majority (80% of interviewed households) is using use latrines.

5.3.14. WASTE

There are landfills available in Ozurgeti, Lanchkhuti and Chokatauri: Ureki with total area of 13,305m², Ozurgeti (vil.Meria) – 39,699m², Chokhatauri 11,970m² and Lanchkhuti 45,001m². Volume of annual waste generation is 36,000m³. Management of landfills is responsibility of Solid Waste Management Company of Georgia.

Waste collection companies operate in municipalities. The services fully cover administrative centres, Ureki and Shekvetili, and partially other 12 territorial units of the district. In 2016, with financial aid from EBRD car park (dump trucks) and other equipment (containers) have been upgraded.

5.3.15. MEDIA

Along with the national coverage media, there are local TV broadcasting company Guria TV, two companies in Poti area (9th channel and cable television), cable TV Madi; one local radio station (Harmony) and a range of newspapers - Guria News, Guria Moambe and Alioni. Guria News and Guria Moambe are weekly editions with regional coverage.

5.3.16. NON-GOVERNMENTAL ORGANISATIONS

There are several NGOs in Guria region mainly involved in human rights protection, information availability, youth issues. The list includes:

- Union of Young Teachers (Ozurgeti),
- Youth centre Progress (Chokhatauri),
- Mediators association of Guria (Ozurgeti),
- Women for Development (Ozurgeti),
- Consumers Society of Ozurgeti,
- Farmers Union of the Guria Region (Ozurgeti),
- Foundation for Protection of Mothers and Children (Chokhatauri),
- Union of Hunters and Fisherman (Ozurgeti),
- Lanchkhuti Information Centre,
- Georgian Young Lawyers' Association – Ozurgeti branch;
- Youth Resource Centre of Guria;
- Student-youth consultative organisation.

6. EXPECTED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

6.1. INTRODUCTION

Environmental impacts of the Grigoleti-Kobuleti bypass section of the design highway have been identified and evaluated for pre-construction, construction and operation stages of the project. On each stage both negative and positive impact on environment along the new alignment and next to it will occur. The list of expected impact by the stage of the project is given in **Table 47**.

Table 47. Planned operations and related impacts

Planned Operations	Environmental Impact
Pre-construction: <ul style="list-style-type: none"> Obtaining all clearance and permits related to the project; Development and approval of plans (such as waste management, traffic management, erosion management); Identification of sources /suppliers of materials identified; Selection of sites for temporary camps, material, topsoil, spoil and waste with consideration of environmental and safety requirements. 	
<ul style="list-style-type: none"> Preparation of worksites, sites for vehicles and construction machinery, arrangement of temporary facilities and camp site (in case arrangement of construction camp is considered by contractor advisable) – this includes removal of vegetation (whether absolutely necessary), stripping and removal of topsoil to temporary storage, grading of the work areas; Clearing the RoW strip - removal of vegetation, stripping and removal of topsoil to temporary storage area; Onsite and offsite works. 	<ul style="list-style-type: none"> Air emission of inorganic dust and combustion products; Propagation of noise and vibration; Generation of waste, littering; Accidental oil spills - risk of soil and water pollution; Soil erosion, ramming; Impact on flora and fauna; Visual impact; Increase of traffic; Impact on infrastructure – potential temporary disruption of services provided to population; Resettlement/land acquisition of permanent use agreement needs; Safety – community, workforce; Temporary employment (Note: positive impact).
Construction works: <ul style="list-style-type: none"> Importation of inert material for arrangement of embankment; Storage of material in specially allocated area (if deemed advisable); Arrangement of embankment – forming embankment, ramming; 	<ul style="list-style-type: none"> Air emission – dust, exhaust emissions and welding aerosols; Propagation of noise and vibration; Deterioration of water quality – pollution with oil products and increased turbidity during works close/in the riverbed;

<ul style="list-style-type: none"> • Arranging drainage system; • Installation of sheet piles in water crossing bridge construction area (Supsa river crossing); • Bridge construction - arrangement of foundation; pile cap; bridge column, bearing, bridge deck – works include excavation, concrete works, assembling pre-cast elements on the site; • Paving of the deck and the carriageway, including shoulders; • Road marking and installation of road signs; • Onsite and offsite traffic. 	<ul style="list-style-type: none"> • Risk of flow blockage; • Accidental oil spills – soil pollution; • Soil erosion, ramming; • Waste generation, littering; • Impact on terrestrial fauna; • Impact on aquatic fauna (in river crossings); • Risk of impact on vegetation; • Increase of traffic; • Impact on road infrastructure; • Risk of accidental undeliberate impact on private properties; • Temporary employment in construction (Note: positive impact); • Safety – community, workforce; • Promotion of satellite businesses (positive impact).
Demobilisation <ul style="list-style-type: none"> • Dismounting of temporary structures; • Removal of machinery and waste from the area; • Recultivation of site disturbed during construction (based on recultivation plan, tailored to the site). 	<ul style="list-style-type: none"> • Air emission – dust, exhaust emissions; • Propagation of noise and vibration; • Waste generation, littering; • Risk of soil and water pollution; • Impact on baseline traffic; • Safety – community, workforce.
Operation: <ul style="list-style-type: none"> • Traffic along the new alignment; • Maintenance of roads and bridges. 	<ul style="list-style-type: none"> • Air emissions (dust, combustion emissions); • Noise and vibration; • Safety risks; • Impacts during maintenance - similar to those expected during construction, but with lower magnitude, local.
Decommissioning; Must be considered separately (whether required).	Will depend on planned works.

Impacts during construction and operation of the highway are described in the sections given below.

Note: On feasibility stage Zero alternative was excluded for consideration as non appropriate. Existing horizontal alignment is not suitable for the required design speed (120km/h). The road is two lane and will not be able to serve increasing traffic flows in the future. Bringing existing road into compliance with requirements set for 120km/h highways will require upgrading of 5 sections. Upgrading of these as well as widening of the other sections of alignment will affect existing properties and create problems with utilities which will have to be relocated. Besides, presence of multiple accesses from existing road to the properties is fully against the modern safety standards for more than 80km/h highways. In addition, complete rehabilitation of pavement and drainage conditions will be required. Alternative was considered as not appropriate and has been excluded from evaluation.

6.2. IMPACT ON AIR QUALITY

6.2.1. ASSESSMENT OF IMPACT - PRE-CONSTRUCTION AND CONSTRUCTION STAGES

Deterioration of air quality pre-construction and construction works can be due to the following:

- Dust emissions during earthwork and stockpiles;
- Dust from loading, transportation and unloading of soil and friable materials;
- Emissions from operation of construction machinery, asphalt/concrete plant;
- Dust and emissions from onsite and offsite traffic, vehicles moving across unpaved or dusty surfaces;

It is very difficult to accurately quantify dust emissions arising from construction activities. It is thus not possible to easily predict changes to dust soiling rates or PM₁₀ concentrations. Amounts of vehicle-emitted pollutants will mainly depend on technical condition of the vehicles, fuel quality and speed. Older vehicles usually have lower fuel consumption efficiency and cause higher emissions of combustion by-products. Increasing speed of the vehicle demands higher fuel supply and therefore results in larger amounts of emitted pollutants. Keeping that in mind attention should be paid to the age and status of technical maintenance of vehicles/machinery used during construction.

Alignment alternatives in some sections run close to the residential area. The sites suggested for stationing of machinery and storage of materials (including topsoil) are at some distance from the settlements, in the design interchange areas (**Figure 44**),

Dust and emissions during operation of machinery along alignments is inevitable. With consideration of prevailing wind direction higher risk of impact will be in areas located east and west to construction site (depending on the season). The impact can be managed to some extent though implementation of mitigation measures and good organisation of works.

The lengths of alternative alignment is 1 and 2 are almost similar. Alternatives 3 is the shortest. This enables to assume that because of the shorter duration of works the sources of dust and emissions in case of Alternative 3 will be of lower duration.

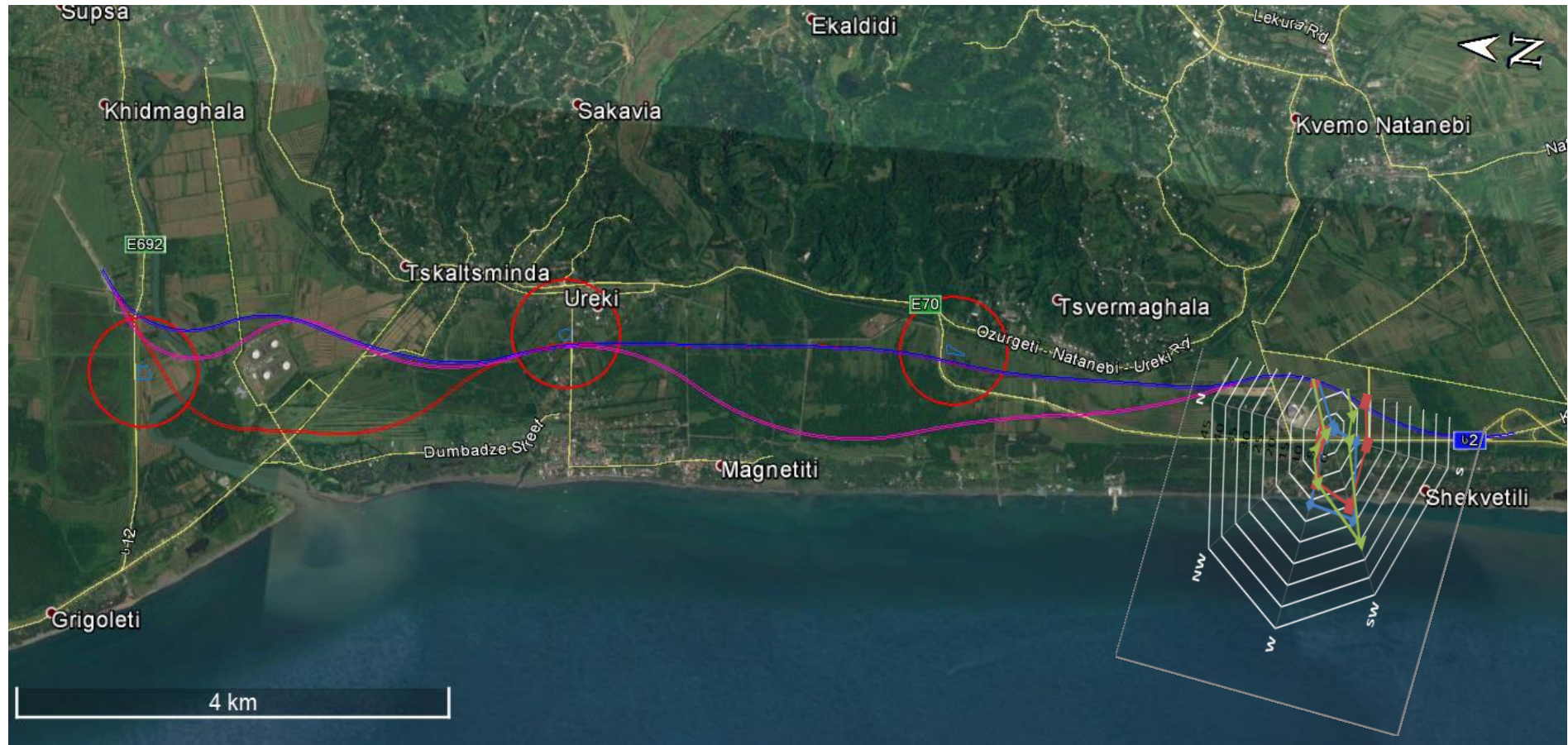


Figure 44. Worksites with indication of 500m impact zone and windrose for the project area
(wind rose key: blue line –Supsa, Red line – Ureki, green line – Kobuleti)

On the other hand, the difference is not expected to be significant. Dust and exhaust emissions for all alternatives will be of the same range.

The ranking of project impact on air quality for considered alternatives is as follows:

- Likelihood of impact – medium to high,
- Magnitude of impact – medium to high.

6.2.2. ASSESSMENT OF IMPACT - ROAD OPERATION STAGE

Impact during operation will be related to dust and exhaust emissions from the vehicles using the highway. Amounts of vehicle-emitted pollutants mainly depend on technical condition of the vehicles, fuel quality and speed. As already mentioned above, older vehicles usually have lower fuel consumption efficiency and cause higher emissions of combustion by-products. Increasing speed of the vehicle demands higher fuel supply and therefore results in larger amounts of emitted pollutants.

After construction of the new highway the speed limit will be set to 120 km/h (speed limits correspond to the Georgian Design Standard for roads of international importance with daily traffic of more than 8,000 vehicles). The improved road capacity will result in an increased number of vehicles passing the route and in higher emission levels. Traffic emissions will mostly depend on speed, technical condition of the vehicles and percentage of Heavy Goods Vehicles (HGV) in the traffic flow.

Assessment of impact on air quality during operation of the highway was carried out using software referred to in the text below. Traffic data provided by design team were used as a basis for calculation.

Results of calculation are given in tables presented below (**Table 48- Table 50**).

Modelling of air emissions was done with consideration of 11,186 cars per day, including 9,508 light (85%) and 1,679 (15%) heavy good vehicles. These values correspond to traffic flows predicted for the opening year (2020). Hourly flows recalculated using transition coefficient 6.13% total 583 and 103 light and heavy good vehicles respectively. For input into the software the flow per 20 minutes was identified (195 LV, 35 HGV). Qualitative and quantitative characteristics of emissions were calculated using the software 'Магистраль-город', версия 3.0, Copyright ©1997-2013 ФИРМА «ИНТЕГРАЛ»'.

Results of calculation are given below.

Table 48. Emissions from highway

Substance	Code	Emission, g/sec	Emission, t/year
Nitrogen dioxide	0301	0.139000	1.876500
Nitrogen oxide	0304	0.022587	0.304931
Soot	0328	0.003201	0.043214
Sulphur dioxide (SO ₂)	0330	0.000981	0.013247
Carbon oxide (CO)	0337	0.191771	2.588906
Benzo(a)pyrene	0703	2.750000e-8	3.712500e-7
Formaldehyde	1325	0.000290	0.003921
Hydrocarbons, petrol	2704	0.032500	0.438750
Hydrocarbons, kerosene fraction	2732	0.037917	0.511875

Dispersion of harmful emissions

Dispersion was calculated using software 'Ecolog-3'. for the section where alignment runs closest to the residential area (Ureki settlement). Conventional centre of coordinate system was set in the start point of the modelled section.

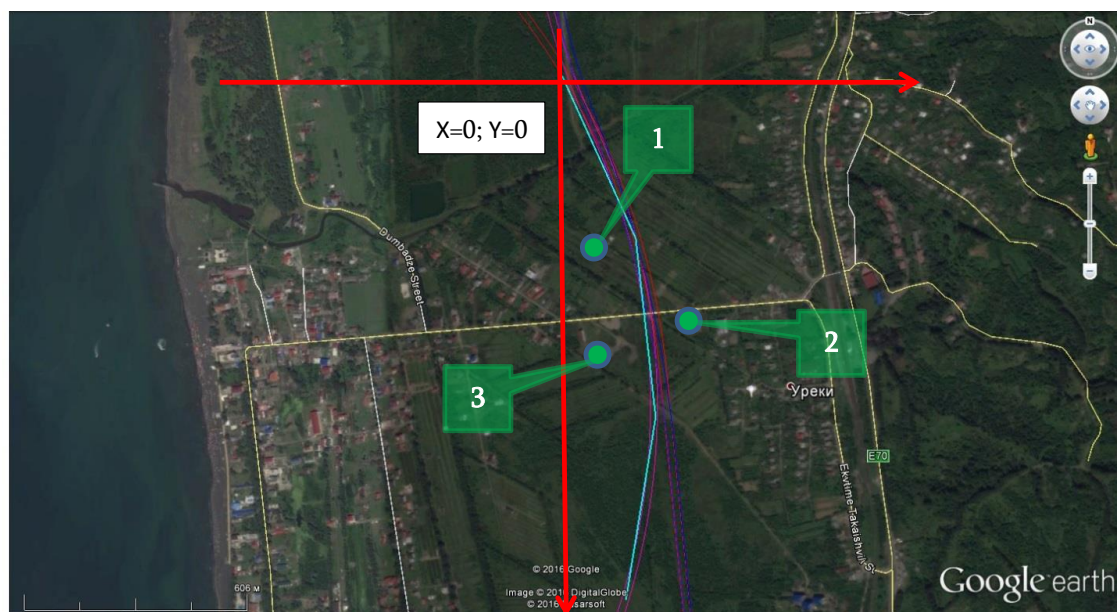


Figure 45. Location of recipients selected for calculation

Three locations at 110, 120 and 140m distance from alignment have been set as recipients. Additional 4 control points (within 1200m x 3000m rectangle, step 50m) were included in calculation.

Results in graphical representation of results (Figures 45-54) are given below.

Table 49. Calculation points

#	Coordinates of the points (m)		Height (m)	Description of the point	Comment
	X	Y			
4	-69,00	488,00	2	500 m zone boundary	North
5	756,00	-560,00	2	500 m zone boundary	East
6	193,00	-1938,00	2	500 m zone boundary	South
7	-276,00	-708,00	2	500 m zone boundary	West
1	86,00	-475,00	2	Point at the boundary of residential zone	
2	363,00	-676,00	2	Point at the boundary of residential zone	
3	139,00	-736,00	2	Point at the boundary of residential zone	

Calculation and graphical analysis shows that maximum concentration of all substances are below allowable limit. (Emissions and dispersion calculation printouts are given in Annex 3)

Table 50. Values of parameters as MPC shares

Parameter	Share of MPC
Nitrogen dioxide	0.45
Nitrogen oxide	0.04
Soot	0.02
Sulphur dioxide	0.0012
Carbon oxide	0.03
Benzo(a)pyrene	0.0019
Formaldehyde	0.0055
Hydrocarbons, petrol fraction	0.0042
Hydrocarbons kerosene fraction	0.02
Summary impact group 6009 (301+ 330)	0.28

Transport is considered as the major GHG emitter in Georgia. The main emissions from the sector include carbon monoxide (CO), hydrocarbons (volatile organic compounds and methane), nitrogen oxides (NO), sulphur dioxide (SO₂), soot, benzapirene and carbon dioxide (CO₂). Growth of emissions from the sector is determined by the following several factors:

- Annual growth of the car fleet,
- Large share of the used vehicles in the fleet,
- Poor vehicle monitoring and restrictions on local or global pollutants (standards),
- High traffic of transit vehicles, in particular HGV,
- Fuel quality.



Figure 46. Nitrogen dioxide (Code 301) – maximum concentrations in control points (#1-3 residential sites, #4-7 boundary of 500m zone)



Figure 47. Nitrogen oxide (Code 304) - maximum concentrations in control points (#1-3 residential sites, #4-7 boundary of 500m zone)

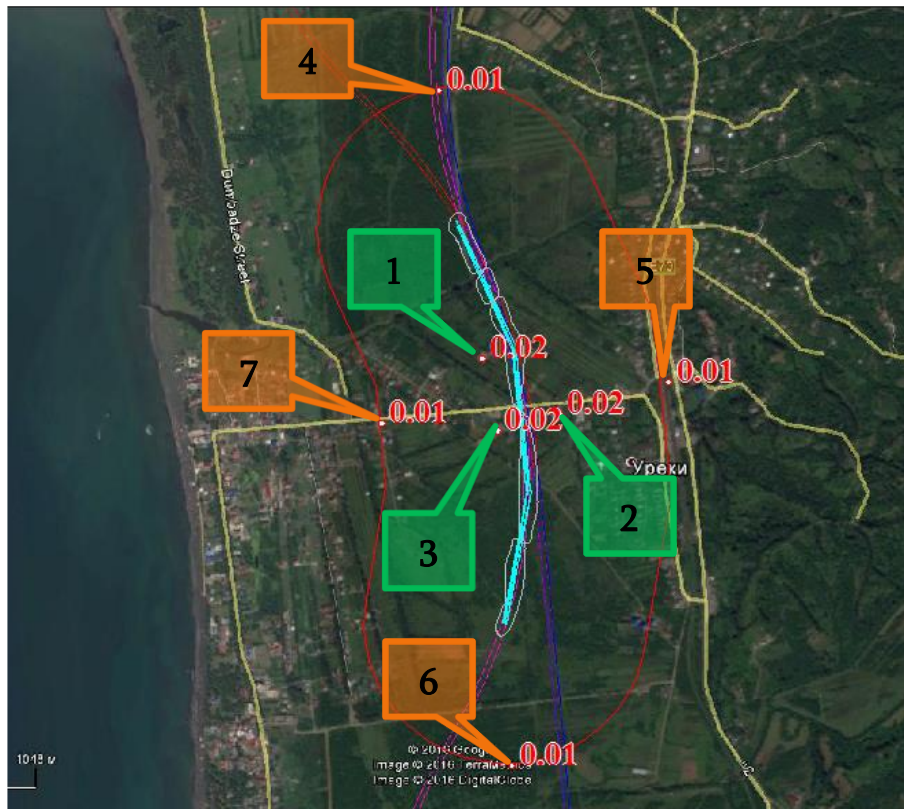


Figure 48. Soot (Code 328) - maximum concentrations in control points (#1-3 residential sites, #4-7 boundary of 500m zone)



Figure 49. Sulphur dioxide (Code 330) - maximum concentrations in control points (#1-3 residential sites, #4-7 boundary of 500m zone)

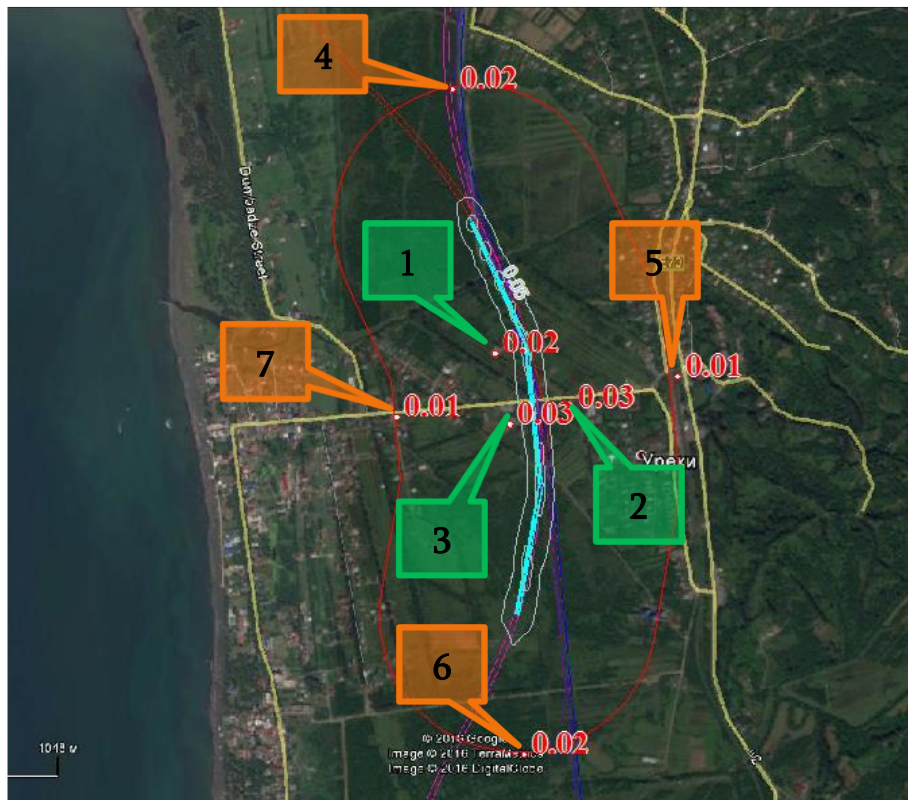


Figure 50. Carbon oxide (Code 337) - maximum concentrations in control points (#1-3 residential sites, #4-7 boundary of 500m zone)

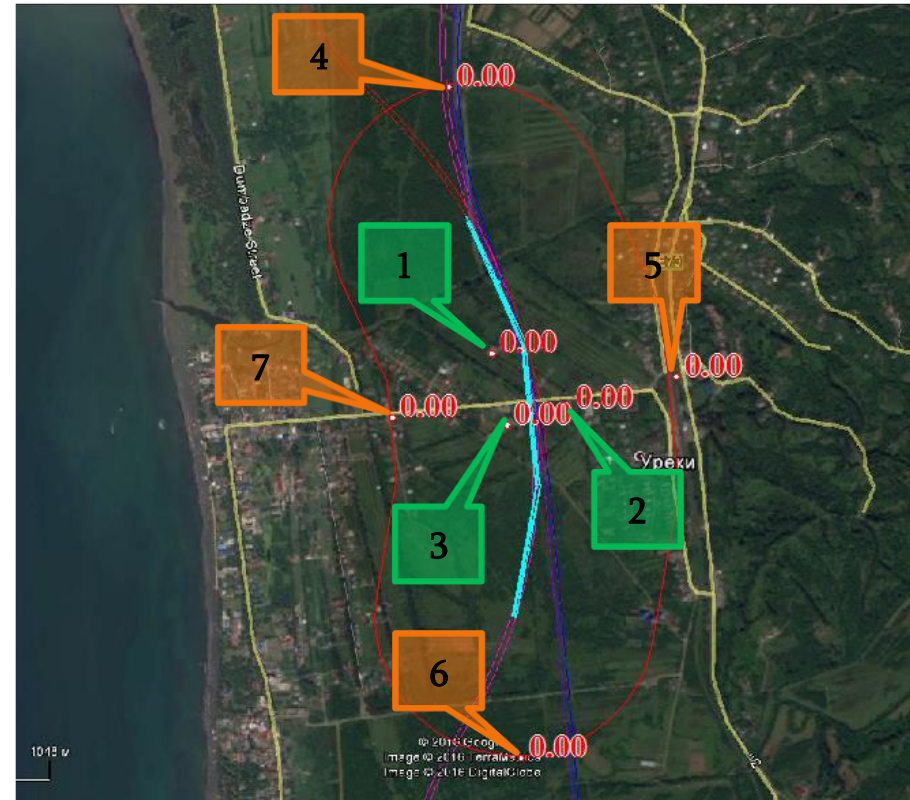


Figure 51. Benzo(a)pyrene (Code 703) - maximum concentrations in control points (#1-3 residential sites, #4-7 boundary of 500m zone)

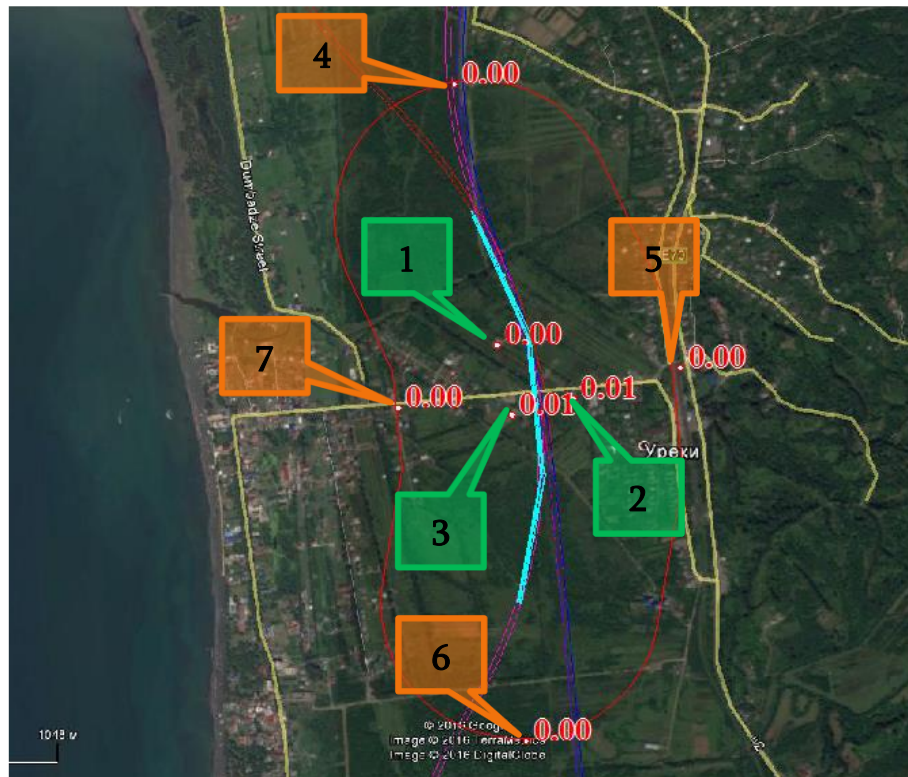


Figure 52. Formaldehyde (Code 1325) - maximum concentrations in control points (#1-3 residential sites, #4-7 boundary of 500m zone)



Figure 53. Hydrocarbons, petrol fraction (Code 2704) - maximum concentrations in control points (#1-3 residential sites, #4-7 boundary of 500m zone)



Figure 54. Hydrocarbons, kerosene fraction (Code 2732) – max. concentrations in control points (#1-3 residential sites, #4-7 boundary of 500m zone)

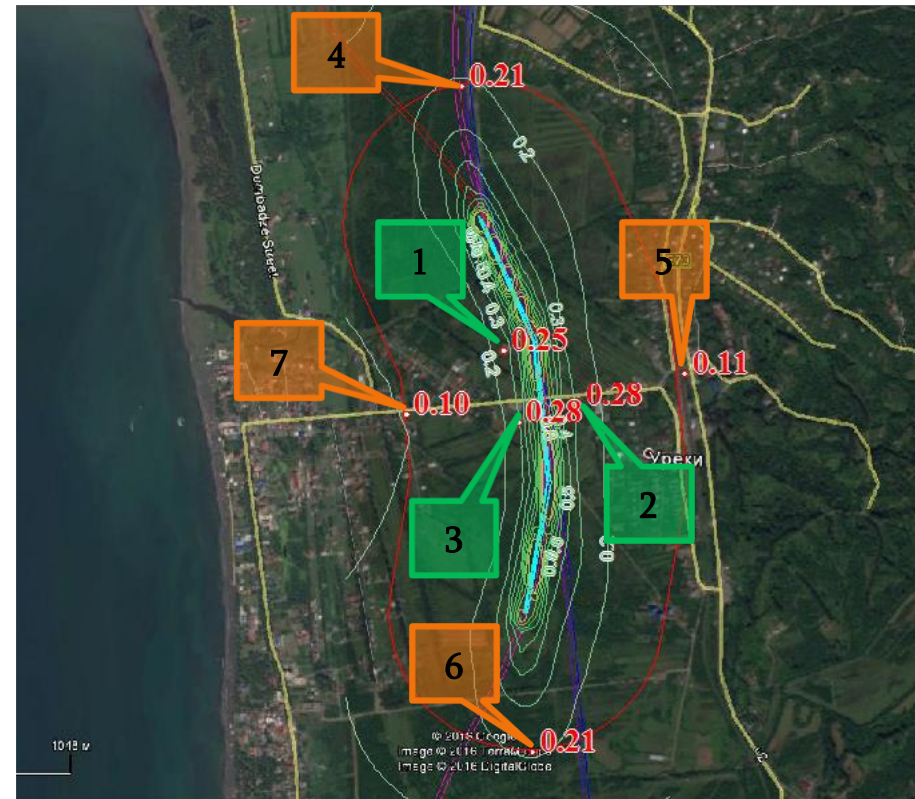


Figure 55. Incomplete total impact group 6009 (Codes 301 + 330) – max. concentrations in control points (#1-3 residential sites, #4-7 boundary of 500m zone)

Traffic accounts for over 60 % of CO₂ emissions in Georgia. Passenger transport contributes to 60.8% of total energy consumption in road transport, while trucks contribute to 26.5%, the rest belongs to other types of road transport (agriculture machine, firefighting cars etc.). Among the transport related greenhouse emissions carbon dioxide dominates with 99.3%.

Georgia has one of the fastest growing economies in the region, and favourable geographical position. It is expected to have continual increase in goods transit and upgraded roads should serve for this purpose. Increased traffic flows will inevitably result in bigger CO₂ emissions.

Very low average speeds generally represent stop-and-go driving, and vehicles do not travel far. Therefore, the emission rates per kilometre are quite high (when a car's engine is running but it is not moving, its emission rate per distance unit reaches the maximum). Conversely, when vehicles travel at much higher speeds, they demand very high engine loads, which require more fuel, and therefore lead to high CO₂ emission rates. Low emission rates are obtained at moderate speeds of about 65 - 95 km/h.

For design speed of the project is 120 km/h. Increased speed along the route would result in larger amounts of emitted CO₂ gases, but on the other hand would help to avoid emissions due to vehicles travelling at very low speed or queuing. One of the measures for CO₂ emissions reduction is proper management of vehicle speed. To reduce CO₂ emissions from the transportation sector, attention should be given to more efficient vehicles, alternative fuels. In terms of the perspective of the new road section upgrading, all factors influencing CO₂ emissions are hard to foresee. For example, it is possible that in 2040 the consumption of low-carbon fuel (such as biofuel and synthetic fuel) will considerably increase resulting in lower emissions than predicted. However, consistent policy on the topic should be obtained considering all the influencing factors and development of the state.

Despite of a certain growth in the traffic flow in 2020-2050 period, in a longer term perspective, as the country progresses in the implementation of recommendation for EU approximation, regulations of the age and technical condition of vehicles will considerably stiffen and control over the quality of fuel will enhance, leading to the decrease of impact from the movement of vehicles.

Project impact on air quality for all considered alternatives will be in the similar range. The ranking of project impact on air quality for considered alternatives is as follows:

- Likelihood of impact – high,
- Magnitude of impact - medium to low.

6.2.3. MITIGATION MEASURES

Pre-construction and construction stages.

In order to avoid or mitigate impact works will be performed with due consideration of environmental safety measures:

- Spraying all unpaved roads and significant areas of uncovered soil with water every four hours (or more frequently, depending on the needs) on working days, during dry and/or windy weather;
- Providing a wheel-washing facility and ensuring that it is used by all vehicles before leaving all sites;
- Covering all loose material with tarpaulins when transported off-site on trucks;
- Good selection of layout of the stockpiles to avoid aeolean erosion;
- Ensuring proper maintenance of vehicles and machinery;
- Setting optimum speed while moving through the residential area to reduce dust emissions;
- Prohibition of idling with switched gear;
- Prohibition of dumping of material from high to avoid dust related nuisance;
- Keeping at least 300 m distance from residences windward to reinforced concrete production plants (if planned to run);
- Obtaining environmental impact permit for asphalt plant (if planned to run own facility);
- Training staff in construction best practice.

*Note: Aeolean dust generally depends on location of the linear dust source. With wind perpendicular to the source dust is deposited in a broad strip, the thickness of deposited dust decreasing gradually with the distance from the source. When winds blow at oblique angle – the belt of dust deposition is narrower, the thickness decreases more rapidly in direction perpendicular to the source. In case of variable winds, the result is a broad strip with a zone of high thickness adjacent to the source. (see **Figure 56**).*

Under condition that mitigation measures are implemented the magnitude of residual impact will be medium to low, depending on location.

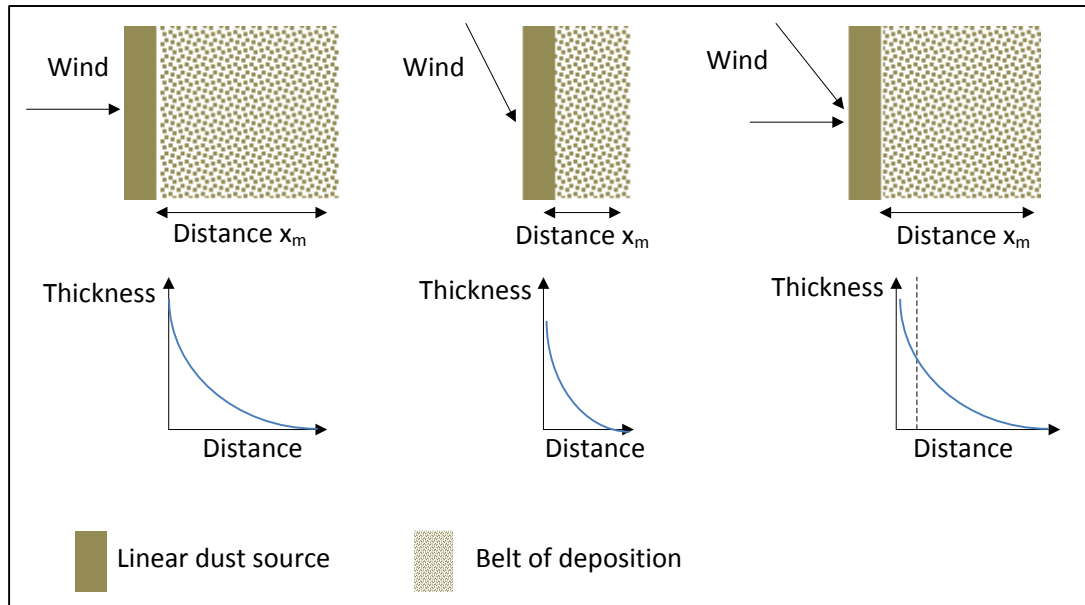


Figure 56. Schematic diagram showing dust dispersion from liner sources under different wind conditions

Operation stage

The only measure for reduction of emissions related nuisance during operation is arrangement and maintenance of vegetation barrier along the road (in particular in the sensitive areas such as settlements).

Mitigation measures suggested for construction stage should apply to road maintenance works (the measures should be relevant to the type of activity and the scale of impact).

Under condition that mitigation measures are implemented the magnitude of residual impact will be medium to low, depending on location.

6.3. IMPACT ON BACKGROUND NOISE LEVEL

6.3.1. ASSESSMENT IMPACT ON BACKGROUND NOISE AND VIBRATION: PRE-CONSTRUCTION AND CONSTRUCTION STAGES

Road construction will introduce additional noise sources to the local area. Road construction noise is caused by construction equipment and operations, i.e., there are two main sources of noise during the construction: noise resulting from road

upgrading works, and noise from additional activities, such as transport of materials by HGV along the route. Noise and vibrations will be inevitable from such activities as digging trenches, soil compaction, and other.

The dominant source of noise from most construction equipment is the engine, usually a diesel, without sufficient muffling. Only in a few cases noise generated by the process dominates (for example, impact pile driving, pavement breaking – if required). Noise levels during the construction will vary depending on the construction activity and schedule.

Noise limits for various working environments are estimated in General EHS Guidelines "Occupational health and safety" (issued by International Finance Corporation, 2007), which is the main document to rely on for noise and vibration issues in this phase. For heavy industry (with no demand for oral communication) limit equivalent noise level is set to 85 dBA; maximum – 110 dBA.

Noise levels induced by the main road construction equipment are presented in *Table 51*. (Note: the values indicated in the table may differ depending on the brand of machinery provided/used by construction company).

Table 51. Construction equipment noise emission levels

Equipment	Typical noise level (dBA), in appr. 15 m from source
Backhoe	80
Compactor	80
Roller	85
Concrete mixer truck	85
Concrete pump truck	82
Bulldozers	85
Front loader	80
Grader	85
Paver	85
Dump Truck	84
Clamshell	93
Angle dozers	85
Front loader	85
Shovel loaders	85
Excavators	85
Drilling Machines	85
Ditcher/Trencher	85

Equipment	Typical noise level (dBA), in appr. 15 m from source
Scrapers	85
Tractor	84

Noise impact assessment was performed identifying sensitive receptors (settlements, dwellings) within minimum distances from alignment boundaries.

Noise level for the worst possible scenario – all machinery operating simultaneously – was assessed. Octave levels of the sound pressure in the reference point are calculated using the following equation:

$$L = L_p - 15 \lg r + 10 \lg \Phi - \frac{\beta_a r}{1000} - 10 \lg \Omega$$

Where,

L_p – Octave level of the noise source capacity;

Φ – noise source direction factor, non-dimensional, is determined through trial and changes from 1 to 8 and depends on spatial angle of sound radiation;

r – Distance from the source of the noise to the reference point;

Ω – Spatial angle of sound radiation, which will be: $\Omega = 4\pi$ - when located in the space; $\Omega = 2\pi$ - when located on the surface of the area; $\Omega = \pi$ - double ribbed angle; $\Omega = \pi/2$ – triple ribbed angle;

β_a – Sound damping in the air (dBA/km) tabular description.

Table 52. Average geometric frequencies of octave band

Average geometric frequencies of the octave band, Hz	63	125	250	500	1000	2000	4000	8000
β_a dBA/km	0	0.3	1.1	2.8	5.2	9.6	25	83

Summary noise level on the site is calculated according as:

$$L_p = 10 \lg \sum_{i=1}^n 10^{0.1 L_{pi}}$$

Where,

L_{pi} – is i-type source noise capacity.

For simplicity, calculations are performed for the sound equivalent levels (dBA) and average value of its octave indicator is taken as sound reduction coefficient $\beta_{ave}=10.5$ dBA/km;

The summary noise level generated during simultaneous operation of all machinery from the source of noise propagation:

$$10\lg \sum_{i=1}^n 10^{0,1L_{pi}} = 10\lg (3 \cdot 10^{0,1 \times 80} + 12 \cdot 10^{0,1 \times 85} + 2 \cdot 10^{0,1 \times 84} + 2 \cdot 10^{0,1 \times 93} + 10^{0,1 \times 82}) = 99.4 \text{ dBA}$$

The maximum noise level at recipient located in 80m from the source will be as follows:

$$L = L_p - 15\lg r + 10\lg \Phi - \frac{\beta_a r}{1000} - 10\lg \Omega = 99.4 - 15\lg 80 + 10\lg 2 - 10.5 \cdot 80/1000 - 10\lg 2 = 59.3 \text{ dBA}$$

Calculation results are given in **Table 53**.

Table 53. Noise propagation calculation results with indication of allowable limits

Noise equiv. level at source,	Distance to nearest receptor	Noise equivalent level at the closest receptor	Norm ⁵			
			Georgian		Good international practice and standards (European)	
			Day hours	Night hours	Day hours	Night hours
99.4 dBA	80 m	59.3 dBA	55 dBA	45 dBA	65 dBA	55 dBA

Results of calculation show that the noise level in case of simultaneously operation all types of machinery is slightly above the day-time limit (Georgian regulations). Keeping in mind that this is the worst case scenario which is not likely to happen we can assume that acceptable noise level will not be exceeded. Construction during night hours is not planned.

Increased HGV movement along the route during the construction will be low as compared to the existing traffic flows and will not cause noise-related disturbance.

Settlement patterns along the road section imply that only few people would be exposed to elevated noise levels during the road construction. Besides, construction noise impact will be temporary and of medium significance, if environmental and safety requirements are followed.

⁵ Sanitary norms "the noise on the workplaces, residential, in public building housing and on the residential development territory".

According to acceptable practice, minimum distances for various construction related activities from sensitive recipients, to protect human health from the impacts of emissions, noise and vibration should be kept:

- Borrow pits > 100 m;
- Asphalt plants > 500 m;
- Reinforced concrete production > 300 m;

The mentioned requirements will be observed.

Vibration impacts are expected to be felt only locally near construction sites and should not have any negative impacts on residents. However, prior to construction the status of the nearest buildings will be checked to avoid unjustified complains of community regarding damages caused by construction related vibration. Mitigation measured allowing control of vibration will be kept to.

Noise and vibration levels generated during pre-construction and construction will be similar for all alternatives. As for related impact on recipients (wildlife, community and workers), it will depend on the distance from the source. More details are given in Sections 6.5 and 6.11.

The ranking of project impact for considered alternatives is as follows:

- Likelihood of impact – medium to high,
- Magnitude of impact – medium to high.

Under condition that mitigation measures are implemented the magnitude of residual impact will be medium to low.

6.3.2. ASSESSMENT OF IMPACT ON BACKGROUND NOISE AND VIBRATION: ROAD OPERATION (MODELLING OF LONG-TERM NOISE LEVELS)

There are two types of road-related noise:

- noise generated by vehicle engines and
- noise generated by tyre-road friction.

Noise levels increases with the speed. It should be taken into account that use of asphalt pavement is planned, in similar conditions, this, compared to concrete paving may result in noise level lower by approximately 3 dBA.

It is worth pointing out that long-term prognosis for noise dispersion might be inaccurate in the way that all impact factors are difficult to foresee. For example, calculations are made using noise emission factors reflecting current traffic fleet. It is obvious that such a long-time period will bring positive changes to the economy of Georgia, resulting in higher percentage of new cars in the traffic fleet and respectively lower noise levels.

As a part of this ESIA, noise modelling software CadnaA (Computer Aided Noise Abatement) was used for outdoor noise level assessment. The model allows calculation and evaluation of different scenarios by choosing and managing different types of noise sources (mobile sources – roads, railways, aircraft; point sources – industrial enterprises etc.).

According to good international practice and standards commonly used in European Union countries, the maximum noise level for residential areas, mainly influenced by traffic noise, is 65 dBA during the day and 55 dBA at night. National regulations (Noise at workplaces, in rooms of residential and public buildings, and on a territory of residential area, Approved by Order 297/n of the Minister of Labour, Health and Social Affairs, dated 16.07.2001) set maximum indoor day-time and night-time noise limits as 55 dBA and 45 dBA respectively. On the other hand, for the areas adjacent to residential houses, outpatient buildings, dispensaries, rest houses, elderly and disabled living facilities, preschool, school and other education facilities, library buildings, sanatoria and hotels, the mentioned regulation allows +10 dBA amendment to noise levels generated by road and railway traffic for the areas in 2 metres from the first row of buildings (outer building envelope) facing the main road. For the needs of this ESIA the Georgian limits with this last remark, which comply with the standards accepted in EU states, have been used.

Modelling the terrain in 2D, followed by detailed modelling work in 3D, focussed in possible affected areas detected in the previous appraisal has been carried out.

The noise level calculation was done for road operation using the forecasted traffic flow data for 2020 year. Traffic was considered as a main source of noise.

Table 54. Initial modelling road traffic data

Traffic type	Type of vehicle	Traffic flow, vehicles/period	Speed, km/h
Motor vehicle (Road to Lanchkhuti-Magnetiti)	Heavy motor vehicle	1935 vehicles/24 h	80
	Light motor vehicle	9840 vehicles/24 h	120
Motor vehicle (Magnetiti – Ozurtegui Coast)	Heavy motor vehicle	1838 vehicles/24 h	80
	Light motor vehicle	9348 vehicles/24 h	120
Motor vehicle (Ozurtegui Coast – Kobuleti Bypass)	Heavy motor vehicle	1687 vehicles/24 h	80
	Light motor vehicle	9494 vehicles/24 h	120

Noise from railway traffic (the railway line is situated at the distance of more than 350 m eastern from planned road) has been taken into account.

Table 55. Initial modelling train traffic data

Type of train	Traffic flow, vehicles/period	Speed, km/h
Fast passenger train (direction Tbilisi-Batumi)	2 trains/day 2 trains/evening 2 trains/night	100
Commuter electric train (direction Batumi-Ozurgeti)	1 train/day 1 train/evening	80
Freight train (direction Tbilisi-Batumi)	11 trains daily	60

The speed limit for trains in particular railway sections is unknown, but evaluation of the slowdown (from limit speed to 0 km/h) near the stations would be appropriate. On the other hand, the slowdown and acceleration of train leads to noise. Compensating the braking and accelerating noise, the speed limit was used as the actual speed for all railway in the model.

Configuration of calculation settings for the first appraisal was done as follows:

1. order of reflection – 2;
2. grid height: 1.5 m (as average hearing height at the outdoor areas);
3. receiver point spacing – 10 m;
4. evaluation parameters: $L_{eq,D}$, $L_{eq,N}$;
5. usage of map of ground absorption;
6. in noise maps one colour covers 5 dBA noise level and is divided by isolines at every 1 dBA.

Calculated $L_{eq,D}$, $L_{eq,N}$ values for built-up areas are provided in **Table 56**, noise maps - included in Annex 4.

Table 56. The $L_{eq,D}$, $L_{eq,E}$, $L_{eq,N}$ near the facades and indoor of the residential buildings during operation

Receiver	Equivalent noise level, dB(A)	
Site	Daytime $L_{eq,D}$, dB(A)	Night time $L_{eq,N}$, dB(A)
	55dB(A)*	45 dB(A) *
0	55	46
A	62	51
B	51	40
C	47	46
D	58	50
E	57	52
F	54	48

Receiver	Equivalent noise level, dB(A)	
G (territory of Black Sea Arena)	55	45
H	54	47

* Noise limit level (maximum noise level limits for Georgia)

Predicted equivalent noise level from operation of Grigoleti – Kobuleti bypass road will exceed the nominated guideline goals at some of the receivers. In these locations mitigation measures should apply.

The modelling was done without consideration of attenuation due to foliage and the fact that increase of noise level by 3dBA is barely perceptible to the human ear.

The results arisen from the first appraisal show the following areas as affected by noise at least during night period:

- Residential areas: A1, A2, B, D1, E, F
- Hotel: D1

The ranking of project impact for considered alternatives differs by location. Expected impacts can be described as follows:

- Likelihood of impact – medium to high,
- Magnitude of impact – medium-high to medium.

Under condition that mitigation measures are implemented the magnitude of residual impact will be low.

6.3.3. MITIGATION MEASURES

Pre-construction and construction stages

- Maintain the distance to the nearest residence building or inhabited area;
- Keep restrictions on working hours on week days, weekends or public holidays, no night-time working;
- Ensure proper state of maintenance of machinery and vehicles;
- Develop and keep to the traffic schedule;
- Set optimum travel speed during offsite travel;
- Install temporary noise barriers whether appropriate;
- Preserve vegetation that can act as a natural noise barrier;
- Prohibit idling with switched gear;

- Design and construction of noise barrier - a wall, an earthen berm, or a combination of wall and berm, use of green barrier (tree planting);
- Adherence to no horn policy;
- Train staff in construction best practice.

Operation stage

Installation of noise barriers and vegetation barriers can be used to reduce the noise impact. The artificial barrier can achieve a 10dBA noise level reduction, when it is tall enough to break the line-of-sight from the highway to the house or receiver, approximately 1.5 decibels of additional noise level reduction for each meter of barrier height. To effectively reduce the noise coming around its ends, a barrier should be at least eight times as long as the distance from the receiver to the barrier. This is just a simple orientative rule.

According to the preliminary modelling data (done assuming flat terrain and absence of structures/vegetation acting as barriers between the source and recipient), in some of the built up areas noise reduction measures are required. In those locations, where the night time noise is expected to slightly exceed allowable limit, (A1, A2, B, D1, E, F), noise barriers and speed reduction are recommended. In other areas (C, G) noise barriers are not needed. In Black Sea Arena section the modelled noise value were also found to be in allowable limit.

It needs to be stated that the whole area between Grigoleti and Kobuleti is in process of urbanistic development, addressed to touristic sector. This fact means that in the near future (short or medium term), seasonal housing, hotels and resorts may appear in the neighbourhood, more or less close to the new road. So that, it may be foreseen that the number of affected locations will increase and more barriers may be needed to mitigate the effects of noise caused by the road.

Following to additional modelling was carried out In the second stage of the study, dimensions of the walls were calculated with consideration of the distances and topography of the area. Lower, but longer barriers have been suggested to reduce visual effect of the structure. For all barriers height equal to 2.1m was chosen. Lengths of the barriers per site are as follows:

- Areas A1 + A2: length = 990 meters;
- Area B: length = 340 meters;
- Area D1: length = 630 meters;
- Area E: length = 420 meters;

- Area F: length = 2,910 meters.

Additional measures may be required later during operation in case monitoring reveals expedience of the limit or complaints from the resident received.

The proposed noise barriers are “metallic sandwich type”. It consists of a double metal sheet (aluminium or steel) and a rock wool sheet inside both. (see **Figure 57**).



Figure 57. Noise barrier: metallic sandwich type

Under condition that mitigation measures are implemented the magnitude of residual impact will be low/medium, although depending on location.

6.4. IMPACT ON WATER RESOURCES

6.4.1. ASSESSMENT OF IMPACT - PRE-CONSTRUCTION AND CONSTRUCTION STAGES

Preparation works and works during construction of the road, bridges and overpasses and underpasses may have impacts on water environment. These are:

- Potential contamination of surface and ground waters, which can be caused by:
 - Accidental leakages of fuel/oil/ lubricants from cars and machinery (including emergency situations);
 - Pollution caused by improper management of construction materials and waste;
 - Increase of turbidity caused by earthworks and construction activities near and/or in the riverbed;
 - Penetration of the contaminated sewage water into surface waters;

- Contamination of ground waters by infiltrated contaminated surface water.
- Blockage of the stream during construction near/in the waterbed;
- Littering.

According to the engineering geological survey, the ground water level in the project area varies from 0.3-2m. Thus, the risk of impact on shallow aquifers which are more vulnerable - exists. The impact probability in the bridge construction areas, where extensive excavation compared to that during the road construction works is needed, is higher.

Pollution of water may be observed during construction works near the Supsa, Sepa and Tskhaltminda streams. During construction, qualitative parameters of these surface water bodies may be affected by accidentally spilled fuel/oil or contaminated surface runoff. Increase of turbidity caused by the lack of erosion control, and pollution with poorly managed solid construction waste may also occur.

Direct discharge of potentially contaminated waste water into the river is not planned. Construction company selected through bidding will specify location of construction camp (if deemed advisable). With consideration of vicinity of worksites to the residential areas contractor may decide to use existing facilities (hire accommodation in the nearest village) rather than run his own camp. This will allow to resolve (avoid) the issue of domestic waste water and alleviate the impact on environment. On worksite portable toilets will be installed⁶.

Machinery stationing and material/topsoil storage sites are located away from the watercourses/canals. Impact on surface water from these areas will not happen.

Washing and fuelling of vehicles on the project site will be reduced to minimum. Use of commercial service facilities will be encouraged. Along with reduction of the risk of spills and pollution of water with spilled/washed off lubricants/fuel, impacts related to presence and management of fuel stock on site will be avoided.

⁶ According to the experience 1 toilet per 10 individuals is required. Capacity of a standard toilet tank is 225-227 litres. Capacity of water reservoir is 19 litres. The tank should be cleaned maximum once in 4 weeks. Odour problem can be avoided through use of deodorants.

All new alternatives have similar number of river crossings. Because the crossing over the most of the streams except for the Supsa River, does not require construction of piers in the riverbed, direct impact generally related to works in water for Sepa and small streams will be avoided.

During construction of the Supsa crossing sheet piles will be used to avoid operation in water. Use of machinery in the riverbed will be prohibited. Works will be implemented in 'dry' environment.

In the Supsa river crossing piers in the riverbed will be arranged in two sections of the stream – in case of alignment Alternatives 1 and 3, and three section – in case of alignment Alternative 2. Keeping the mentioned above in mind, impact on the surface water quality in river crossings for Alternatives 1 and 3 is assumed to be similar and lower compared to Alternative 2.

The risk of littering and blockage of the stream for all alternatives is similar.

With consideration of the main types of water pollution (mainly increase of water turbidity) deterioration of ground water because of the project is not expected.

The ranking of project impact on water flow and quality for considered alternatives is as follows:

- Sensitivity of receptor – high,
- Likelihood of impact – medium to high,
- Magnitude of impact - low to medium (Alternatives 1 and 3) to medium (Alternative 2).

6.4.2. ASSESSMENT OF IMPACT: ROAD OPERATION STAGE

Major possible impacts on water during operation of the highway will be:

- Sedimentation and pollution of waters with heavy metals and petroleum hydrocarbons (runoff, emergency);
- Pollution with waste;
- Cross contamination of ground water in case of surface water pollution;
- Increase of ground water level caused by the load of the road structure;
- Pollution during winter maintenance (application of salt, sand and other products posing water quality under threat);
- Pollution of water during maintenance works.

Surface and ground water pollution during operation of the highway may occur from regular operational and maintenance, as well as from traffic accidents involving cargo vehicles transporting hazardous substances. The risk of accidents will be brought to the possible minimum by application of road safety measures.

The World Bank-financed program of assistance to RD delivered through several on-going projects includes technical assistance with the implementation of Road Safety Action Plan 2016-2021, which will enhance safety of operation of the newly reconstructed highways as well.

Pollution from road maintenance works is possible in case of careless handling of construction materials and wastes and failure to adhere to good construction practice.

Finally, pollution of surface and ground water may occur from regular operation of the highway through direct release of drainage carrying heavy metals, oil products from the road surface. The list of typical pollutants washed off from the road surface/bridge deck is given in **Table 57**.

Table 57. Typical pollutants in the runoff

Pollutant	Source
Particulate matter	Pavement wear, vehicles, 'natural' dust, maintenance activities
Rubber	Tire wear
Asbestos	Clutch and brake lining wear
Nitrogen and phosphorus	Air, roadside fertilizer application and sediments
Lead	Leaded gasoline from auto exhaust, tire wear, lubricating oil and grease, bearing wear and atmospheric fallout
Zinc	Tire wear, motor oil and grease
Iron	Auto body rust, steel highway structures such as bridges and guardrails and moving engine parts
Copper	Metal plating, bearing wear, moving engine parts, brake lining wear
Cadmium	Tire wear
Chromium	Metal plating, moving engine parts and brake lining wear
Nickel	Diesel fuel and gasoline, lubricating oil, metal plating, brake lining wear and asphalt paving
Manganese	Moving engine parts
Sulphur	Roadway beds, fuel
Bromide	Exhaust
Petroleum	Spills, leaks, antifreeze and hydraulic fluids, asphalt surface leachate and blow-by motor lubricants

Pollutant	Source
PCB	PCB catalyst in synthetic tires
Pathogen bacteria	Soil litter, bird droppings and trucks hauling livestock/stockyard waste

Source: USEPA. Guidance Specifying Management Measurements for Sources of Non Point Pollution in Coastal Waters, Washington, D.C.: Office of Water 1997 and Federal Highway Administration. Sources and Mitigation of Highway Runoff Pollutants, Washington, D.C.: Federal Highway Administration, 1984

Concentration of the mentioned components in the runoff varies. Since specific quality data for runoff is not available, typical values for highways with more and less than 30,000 vehicles per day is used for illustrative purposes. (see **Table 58**).

Table 58. Concentration of pollutants in highway runoff

Pollutant	Mean concentration (mg/l) for highways with	
	<30000 vehicles/day	>30000 vehicles/day
Total suspended solids	41	142
Volatile suspended solids	12	39
Total organic carbon	8	25
Chemical oxygen demand	49	114
Nitrite and nitrate	0.46	0.76
Total Kjeldal nitrogen	0.87	1.83
Phosphate phosphorus	0.16	0.4
Copper	0.022	0.054
Lead	0.08	0.4
Zinc	0.08	0.329

Source: Driscoll, E., Shelley, P., and Strecker, E. Pollutant Loadings and Impacts from Highway Stormwater Runoff, Volume I. Washington, D.C.: Federal Highway Administration, 1990

The **Table 58** shows that the lower is the traffic flow the lower are concentrations of main pollutants in the runoff.

Concentration of contaminants in the runoff cannot be reduced on source and depend on the status of technical maintenance of cars, traffic speed, quality of petrol, etc. Curbs and gutters can trap particulate matter on the highway. Impact caused by the runoff on surface water can be somehow reduced by vegetation along the highway, availability of infiltration trenches, general roadway maintenance and clean-up activities. The baseline quality of water, size and characteristics of receiving stream, potential for dilution, ability of self-cleaning are the critical factors in determining the magnitude of highway runoff on surface water

For bridges, according to general practice, spill and/or runoff direct discharge prevention measures are taken for recipient water bodies of zero tolerance (drinking

water reservoir, protected area, etc.). To avoid pollution of water a system that collects water from the centre of the bridge to one of its sides, where some holes are available in the deck. In case of this scheme, water gets into a pipe (attached to the down side of the slab. The pipe spills off when the bridge ends (abutment) into a ditch. This ditch drains in a pool where the polluting spill gets stuck, while the clean water is allowed to flow through. Road design was developed so to minimize rapid direct discharge of drained water into rivers and streams.

In a longer-term perspective, as the country progresses in the implementation of recommendation for EU approximation, regulations of the age and technical condition of vehicles will considerably stiffen and control over the quality of fuel will enhance, leading to the decrease of impact from the movement of vehicles.

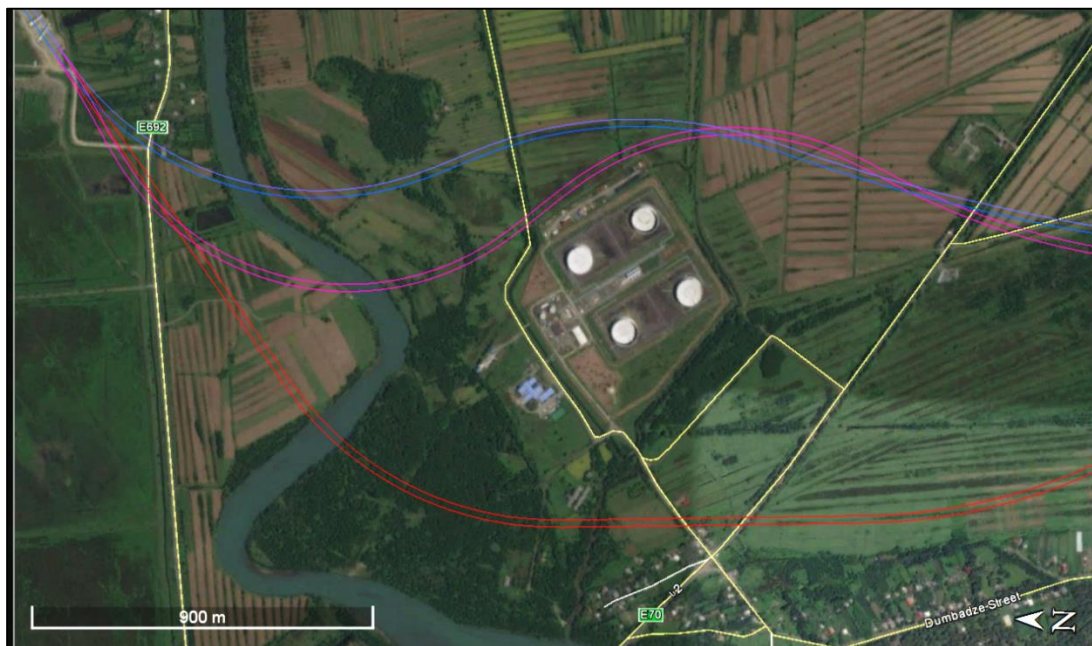


Figure 58. Supsa river crossing

(Alternative 1 – red line, Alternative 2 – purple line, Alternative 3 – blue line)

It should be mentioned that use of road salt or sand for improvement of traffic safety in winter might affect the quality of water. The road salt (sodium chloride), is composed of 40% of sodium ions (Na⁺) and 60% of chloride ions (Cl⁻). Other components and impurities account for 5% of the total weight. The salt components make their way into environment through the runoff (rain, melting snow and ice), as well as through splash and spray by vehicles and/or by wind causing impact on environment. Chloride ion is completely soluble and very mobile, toxic to aquatic life and capable to impacts vegetation and wildlife. There is no natural process by which chlorides are broken down, metabolized, taken up, or removed from the environment.

The transport of sodium (Na+) in environment is less prominent due to ion exchange. With consideration of the climate excessive use of ice breakers in the project area is not required.

The piers in Supsa river crossing may affect hydrology in the section of direct impact. The riverbed in the river crossing of Alternative 1, upstream and downstream of the new bridge is straight. Local change of the flow speed in the pier area will not result in significant bank scouring. Whereas Alternatives 2 and 3 are located in the sites where impact on riverbed is higher. The higher impact in this context means higher risk of turbidity increase in the Supsa river due to the washing away of the riverbanks downstream the 'obstacle'. As mentioned earlier, in other river crossings there are no piers in the active riverbed.

According to the design team the 'load' of the new infrastructure of the ground will not result in change of the ground water level. Drainage system along embankment and a range of culverts are planned.

By impact on surface water quality and risk of littering all alternatives are similar.

Cross contamination of ground water is not expected.

The ranking of project impact on water flow and quality for considered alternatives is as follows:

- Sensitivity of receptor – high,
- Likelihood of impact – medium to high,
- Magnitude of impact - low to medium.

6.4.3. MITIGATION MEASURES

Pre-construction and construction stages.

In order to avoid or mitigate impact works should be performed with due consideration of environmental safety measures:

- Should any temporary fuel tank be available, it must be located within at least 100m from the riverbed. The tank must be placed in covered areas with berms or dikes installed to intercept spills, if any. Any spill should be immediately localized and cleaned up with absorbent materials.
- Onsite repairs /maintenance and fuelling activities should be limited. Priority should be given to offsite commercial facilities. If impossible, a designated

area with secondary containment for possible spills for on-site repair or maintenance activities must be provided. These areas shall be located away from drainage channels and surface water bodies. (distance between the maintenance site and the river should be at least 100m).

- On-site vehicles and equipment shall be inspected regularly for leaks and all leaks shall be immediately repaired. Incoming vehicles and equipment shall be checked for leaks. Leaking vehicles/equipment shall not be allowed on-site.
 - Secondary containment devices (drop cloths, drain pans) shall be used to catch leaks or spills while removing or changing oils from vehicles or equipment. For small spills, absorbent materials must be used.
 - Tyre washing unit, if any, must be equipped with drainage and settling facilities. The area should be slanting to allow drainage towards the settling pit. The washout pit must be cleaned immediately upon 75 % filling.
 - Usage of off-site vehicle wash racks or commercial washing facilities is preferable. If on-site cleaning is required, bermed wash areas for cleaning activities must be established. The wash area may be sloped to facilitate collection of wash water and evaporative drying.
 - Discharge of any untreated water into the surface water body must be strictly prohibited.
 - Discharge of cement contaminated water must be avoided as cement pollution results in high alkalinity and raises the pH, which can be toxic to aquatic life.
 - Materials and waste must be stockpiled so as to avoid erosion and washing off into the river. Drainage trenches must be established to divert surface runoff from the site.
 - Runoff control measures can be installed at the time of road/highway and bridge construction to reduce runoff pollution.
 - To prevent runoff contamination, paving should be performed only in dry weather.
 - In disturbed soil areas silt fence, fibber rolls, gravel bags, or other approved sediment control must be ensured. At a minimum, bare soil (whether it is an abutment slope or a stockpile) must be protected before it rains. Soil stabilization BMPs such as mulch, soil binders, plastic sheeting or erosion control blankets must be used to protect bare soil;
 - Discharge of drained water into the surface water bodies should be minimized.
- პროექტის შესაბამისად, მინიმუმამდეა დაყვანილი დრენირებული წყლის ზედაპირულ წყლის ობიექტებში ჩაშვების შესაძლებლობა;
- Waste management will be done in compliance with waste management plan developed by construction company ნარჩენების მართვა მოხდება

მშენებელი კონტრაქტორის მიერ მომზადებული ნარჩენების მართვის გეგმის შესაბამისად;

- The work are will be cleaned regularly. მოხდება სამუშაო ტერიტორიის რეგულარული დასუფთავება.

Responsibility for mitigation measures rests with the contractor.

Under condition that mitigation measures listed above are implemented the magnitude of residual impact will be low to negligible.

Operation stage

Most mitigation measures suggested for construction phase shall be applied to maintenance works. The measures required for each specific site will be specified with consideration of the scope/scale and type of maintenance and location of the site.

Proper planning of rehabilitation works in the sections close/in the riverbed can be an effective measure for protection of the water environment during maintenance works. In addition to that, to reduce impact on the water environment while maintenance

- emergency risk should be minized through implementation of road safety measures [World Bank-financed program of assistance to RD delivered though several ongoing porjects includes technical assistance with the implementation of Road Safeaty Action Plan 2016-2021, which will enhance safety of operation of the newly road]
- ავარიული სიტუაციების რისკი მინიმუმამდე იქნება დაყვანილი გზაზე უსაფრთხოების ღონისძიებების გატარებით. [მსოფლიო ბანკის მიერ დაფინანსებული საავტომობილო გზებისთვის დახმარების პროგრამა ითვალისწინებს გზის უსაფრთხოების სამოქმედო გეგმის 2016-2021 შესრულებაში ტექნიკური დახმარების აღმოჩენას. ამ გეგმის განხორციელება გააუმჯობესებს საგზაო უსაფრთხოებას, მათ შორის განსახილველი საპროექტო მონაკვეთის ფარგლებში];
- paving should be performed only in dry weather to prevent runoff contamination;
- proper staging techniques should be used to reduce the spread of paving materials during the repair of potholes and worn pavement. These may include covering storm drain inlets and manholes during paving operations, using erosion and sediment controls to decrease runoff from repair sites, and using drip pans, absorbent materials and other pollution prevention materials to limit leaks of paving materials and fluids from paving machines;

- impacts (pollution) caused by poor management of waste and material should be avoided by implementation of mitigation measures set for construction stage.
- სამშენებლო მასალის და ნარჩენების დაუდევარი მართვის გამო დაბინძურების რისკი აცილებული იქნება სამშენებლო სამუშაოების ეტაპისთვის განსაზღვრული შემარბილებელი ღონისძიებების გატარებით.
- Cleanup of road and roadside strip
- მოხდება გზის და გზისპირა ზოლის დასუფთავება (ნაგვის გატანა).

As already mentioned, in a longer term perspective, as the country progresses in the implementation of recommendation for EU approximation, regulations of the age and technical condition of vehicles will considerably stiffen and control over the quality of fuel will enhance, the level of pollution of the runoff, i.e. the degree of impact on environment will decrease როგორც უკვე აღინიშნა, გრძელვადიან პერსპექტივაში, ევროკავშირთან ასოცირების რეკომენდაციების გათვალისწინებით სატრანსპორტო საშუალებების ასაკთან და ტექნიკური მდგომარეობის დაკავშირებული რეგულაციების გამკაცრების და საწვავის ხარისხის გაუმჯობესების შედეგად შემცირდება გზიდან/ხიდიდან ჩამონადენი წყლის დაბინძურების 'ხარისხი' და, შესაბამისად, გარემოზე ზემოქმედების დონეც.

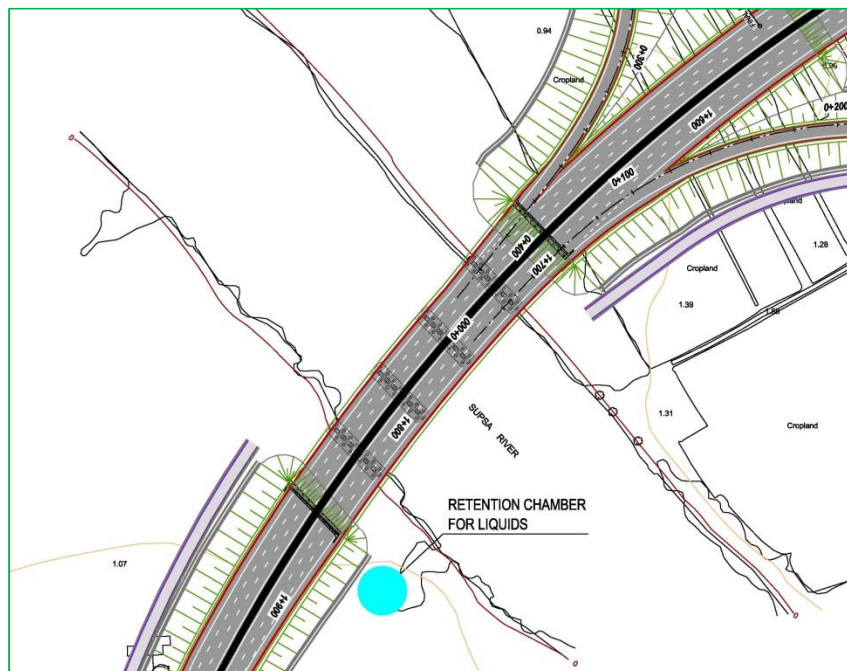


Figure 59. Location of the retention chamber at Supra river bridge



Prevention of pollution with spillage in case of a road accident. To protect water quality in case of accident and the subsequent possibility of spillage of hazardous substances, protection measures are considered.

Runoff waters and waters conducted by drainage will be collected and retained before discharge into the river/down the slope. Based on topography and relief, to assure the flow of waters from both sides of the structure, the area on the left side of the second abutment of the Supsa bridge (see **Figure 59**) was selected for arrangement of retention chamber. The drainage system will collect runoff from the bridge diverting it to the chamber. The chamber (**Figure 60**) is designed with consideration of capacity of a medium truck to cover average common situations.

The mentioned scheme will allow basic treatment of the runoff and enable retention and removal of spillage caused by a traffic accident.

Under condition that mitigation measures are implemented the magnitude of residual impact will be low.

6.5. IMPACT ON FLORA AND FAUNA

6.5.1. ASSESSMENT OF IMPACT - PRE-CONSTRUCTION AND ROAD CONSTRUCTION STAGES

Vegetation/Flora

General impacts of roads and other linear structures on flora include the following:

- Removal of roadside vegetation and vegetation within the RoW;
- Soil compaction, sealing of soil surface;
- Indirect impact from dust, particles; oil/fuel;
- Soil erosion triggered by removal of vegetation in road cuts that may lead to additional impact/loss of vegetation in adjacent to the cut areas;
- Sealing of soil surface reducing 'availability' of land for vegetation.

The project will affect farmlands and vegetation in the RoW.

Alignment alternatives cross forested areas, meadows and cultivated land. All alternative alignments are almost similar with the view of their impact on vegetation/flora. Botanical survey has not revealed any protected tree species in the

forested and other areas under the direct impact zone of considered alternative alignments. However, it should be mentioned that Alternative 1 in the section near the Supsa River (left bank of the river, near Supsa Terminal) runs close to the waterlogged area near the river delta. In existing river crossing, on the left bank of the Supsa river, and in the waterlogged areas in Shekvetili - Spring snowflake (*Leucojum vernum*) has been registered (see **Figure 62**). The plant is not protected, but has decorative value and used to be harvested and sold, providing minor, but still, a certain source of income for local residents. The plant is found in damp woodlands, scrub, hedges and meadows over a range of altitudes. It is often found in hilly areas on calcareous soils.

Another plant worth to mention in this section and other areas cut up with the drainage canals is rare (IUCN_Critically Endangered category) freshwater species with fragmented population - Colchis Water-Chestnut (*Trapa colchica*). This species is endemic to the Kolkheti lowland and is mainly found in the Abkhazeti, Guria, Adjara and Samegrelo floristic regions. These two species are considered as requiring particular attention on pre-construction and construction stages.

In the forest areas species registered in the direct impact are represented mainly by Alder (*Alnus barbata*), lianas such as Perfoliate honeysuckle (*Lonicera caprifolium*), and Common ivy (*Hedera helix*), Silkvine (*Periploca graeca*) and Blackberry (*Rubus fruticosus*) bushes.

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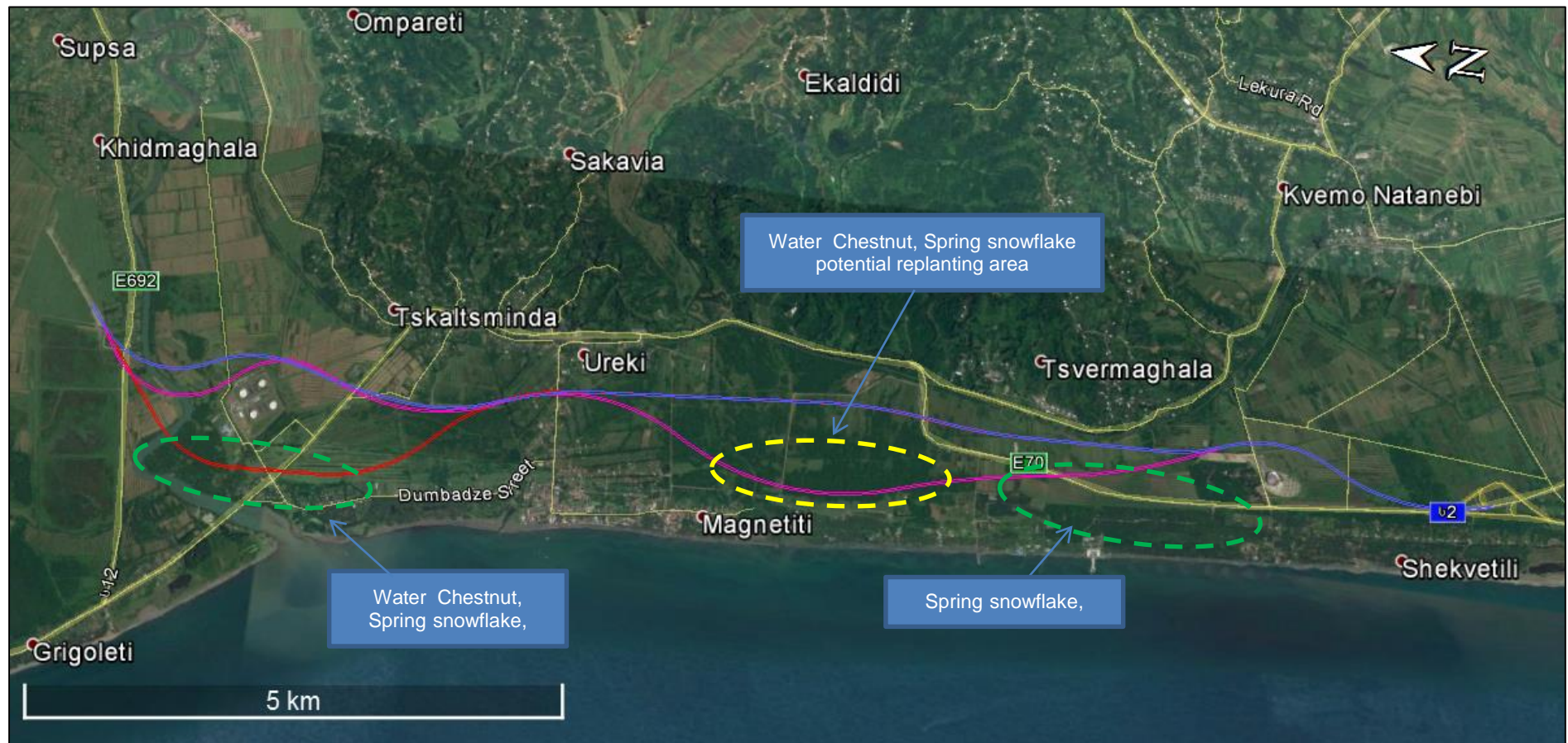


Figure 61. Sensitive areas within the project region

Water-Chestnut (*Trapa colchica*)Spring snowflake (*Leucojum vernal*)

(Source of the photos – web)

Rough comparison of alternatives shows that the length of the forested area under the impact varies by alignment. The main difference between alternatives is observed in the starting section of alignment.

In this area impact of Alternative 1 on forested zone is higher. After Ureki towards the end of the road Alternatives 1 and 3 coincide having similar, lower impact on trees/bushes compared to Alternatives 2 which has higher impact, even though affected vegetation is mostly secondary, represented by alder trees and bushes. All alternatives have similar scale impact on Colchis Water-Chestnut.

The project Alignment 1 will affect 14ha of the forested area. The species composition of affected strip will be as follows:

In the lowest sited humid section on the project corridor within the boundaries of alder dominating forest area (4 ha) mature and older than mature groves will be affected. Maximum height of the alder trees reaches 15m, diameter at the chest level is up to 0.5-1m. Density of the forest massive low (0.3-0.4), degree of sheltering 31-40%, timber category - firewood. During construction in this section 1000 Alder tree will be cut. Along with trees shrubs and hydrophilic grasses will be affected.

In 10 ha affected will be young alder boskets. Maximum height of the alder sprouts in this section is around 5m, stem width 3-5cm. In the mentioned section of alignment natural forestation is in process.

Most of these areas used to be used for agricultural purposes. The mentioned neglected sections are being overgrown by fast and easily growing plants, in

particular – alder, blackberry, rush, greenbrier. Density of the forest in these areas is low (0.1-0.2), degree of sheltering 10-20%, timber category – firewood.

The areas free of vegetation are pastures, seldom plough lands.

In forest areas individual Manchurian walnut (*Juglans mandshurica*) trees (young) have been registered. Along the drainage canals along with trees hydrophylic grasses are found.

In total, the new alignment will have impact on:

- 60000 young alder trees,
- blackberry, rush, greenbrier and other water loving plants/grasses (affected area 2.5ha).
- pastures and plough land (affected area 3 ha).

Tree felling in the project area is not expected to cause functional damage of ecosystem. Along with monetary compensation of loss, required under the national legislation, it is advisable to mitigate the impact by planting of the saplings of native species (see mitigation measures). However, first and foremost, unnecessary damage and removal of trees will be avoided to the extent possible. Access roads, the equipment/machinery stationing yard, and the camp (if any) must be established with maximum caution so as to preserve the vegetation/trees.

Compensatory tree planting will be performed within the highway corridor. When trees are planted along the highway, safety requirements must be taken into account while planting, so that the trees do not block the view, have acceptable diameter when mature while they are planted in certain locations and their canopies do not reach over the road.

The ranking of project impact on vegetation for considered alternatives is as follows:

- Sensitivity of receptor – high (in the area on the left bank of Supsa River marked as vulnerable (Alternative 1),
 - medium waterlogged areas where Water chestnut and Spring snowflake (Alternatives 1, 2 and 3) are found. Note: it is to mentioned that despite the overall sensitivity of the area on the left bank of the Supsa ranked as high (see above), within the RoW strip of Alignment 1 in the mentioned area no protected plant species have been registered),
- Likelihood of impact –high,
- Magnitude of impact – high (Alternatives 2) to medium (Alternative 1, 3).

Fauna

Construction and operation of highway in those sections which pass through transformed landscapes and cultivated lands will not cause significant impacts on animal life, as such areas do not support important animal species due to human presence and consequent significant permanent disturbance.

Hence, impacts on fauna are expected rather in the construction stage and will be considerably lesser in the operation stage. Expected impacts from the construction works are as follows:

- Loss of shelter due to removal of vegetation;
- Soil compaction, sealing of soil surface – potential impact on worms;
- Death of animals caused by road mortality;
- Higher levels of disturbance and stress, including that related to noise;
- Barrier effect - reduced connectivity;
- Indirect impact from exhaust emissions and dust,
- Light pollution,
- Impact of on aquatic life because increased water turbidity (river crossings)
- Impact due to soil and/or water pollution with spilled fuel/oil, poorly managed waste.

The roads and excavated sites are considered as a barrier for mammals, reptiles and amphibians that might occur in the project area, both during pre-construction, construction and operation.

Dust deposited on the plants in the road impact zone may affect food base of the vertebrate and invertebrate species.

Noise from construction machinery and heavy traffic on construction and operation stages will have immediate impact on animal world in the area. Animals respond to noise pollution by altering activity patterns, and with an increase in heartbeat and production of stress hormones. Birds and other wildlife that communicate by auditory signals may be confused near the road and construction sites. This is particularly important issue as the area is located within migration way of avian species.

On construction stage the magnitude of noise and vibration will be in the range from detection to avoidance level. Besides, because of the presence of people on the ground animals will try to avoid the project areas anyway.

Erosion during and after construction of roads, highways and bridges can cause siltation and increase water turbidity, which in its turn may lead to impact on macroinvertebrates and fish, result in siltation of the riverbed affecting quality of habitat and availability of food base for ichthyofauna. Heavy metals, oils, other toxic substances, spills and debris from project related traffic can be absorbed by soil at the project sites and carried by runoff to the river.

All considered alignment alternatives cross Supsa, Sepa and Tskhaltsminda streams. The widest is the Supsa river crossing, where, depending on alignment arrangement of three (Alternative 2) or two (Alternative 1 and 3) rows of piers in the riverbed is planned.

Prior to commencement of works in the riverbed, the sheet piles will be installed to allow dewatering of the pier construction grounds. In this process works will inevitably result in temporary increase of water turbidity. Respectively impact on fish will occur. Since construction works will be carried out in dry environment impact on fish will be minimal. The flow in the riverbed will not be blocked. Fish migration/movement will not be hindered.

The scale of impact during construction will depend of the level of observance and implementation of water impact related mitigation measures and schedule of works. The risk of impact is assumed higher for Alternative 2 where three rows of piers are required, i.e. duration of works and risk of related impact on water environment is more likely.

All alternative alignments are almost similar with the view of their impact on terrestrial fauna. Impact caused by poaching is ranked as low to negligible.

Pre construction and construction works are expected to have certain impact on birds. As mentioned above disturbance will be mainly due to noise, presence of people and machinery on the sites.

The survey has not revealed any protected species (aquatic, terrestrial) in the direct impact zone of the project alignment. During the walkover, no bat roosting places or bird nests have been registered within the direct impact zone of the project.

The ranking of project impact on fauna in the project area for considered alternatives is as follows:

1. For aquatic fauna

- Sensitivity of receptor – medium (Alternative 1, 3) to high (Alternative 2),
- Likelihood of impact –medium to high (depending on location),
- Magnitude of impact - medium.

2. For terrestrial fauna

- Sensitivity of receptor – medium,
- Likelihood of impact –medium to high, depending of the section
- Magnitude of impact – medium to low, depending of the section.

6.5.2. ASSESSMENT OF IMPACT - ROAD OPERATION STAGE

No direct impact on flora is expected during operation of the highway. Indirect impact can be related to dust and exhaust emissions from traffic and pollution with contaminated runoff from the road. Pollutants washed off from the road can impair growth of vegetation and affect soil organisms.

Main impacts on fauna during operation in general may include:

- Death of animals caused by road mortality;
- Higher levels of disturbance and stress, including that related to noise;
- Barrier effect (reduced connectivity) ;
- Modification of food availability and diet composition (e.g. reduced food availability for bats due to the air temperature change along the road embankments at night);
- Modification of humidity conditions (e.g. lower moisture content in the air due to higher solar radiation, stagnant moisture on road shoulders due to soil compaction);
- Modification of light conditions;
- Indirect impact from dust, particles (abrasion from tyres and brake linings); oil, fuel (e.g. in case of traffic accidents), including chronic contamination due to bioaccumulation.

As mentioned above, immediate impact related to the road operation is noise from heavy traffic. The birds and other wildlife that communicate by auditory signals may be particularly confused near roads.

Pollutants, such as heavy metals, carbon dioxide, and carbon monoxide, emitted by vehicles, may all have serious cumulative effects. Combustion of petrol containing tetraethyl lead, and wear of tyres containing lead oxide, result in lead contamination

of roadsides. Many studies documented increasing levels of lead in plants with proximity to roads, and with increases in traffic volume. Plant roots take up lead from the soil, and leaves take it up from contaminated air or from particulate matter on the leaf surface. The lead then moves up the food chain, with sometimes toxic effects on animals, including reproductive impairment, renal abnormalities, and increased mortality rates.

The impacts of other heavy metals, such as zinc, cadmium, and nickel are less known. Motor oil and tyres contain zinc and cadmium; motor oil and gasoline contain nickel. These metals, like lead, were found to increase with proximity to roads, with increasing traffic volume and decreasing soil depth. Earthworms were found to accumulate all these metals, in concentrations high enough to kill earthworm-eating animals.

Impact of ice-breaking salt and/or sand on vegetation and fauna, including aquatic, is not assumed to be high.

Impact of roadside litter is also to be mentioned. Poorly managed waste may attract and entrap small animals, while cigarette butts and filters are often mistaken for food by fish and birds.

Change of land use form will reduce acreage of pastures/arable lands.

The ranking of project impact on vegetation for considered alternatives is as follows:

- Sensitivity of receptor – high,
- Likelihood of impact – medium to low, depending of the section
- Magnitude of impact – low to medium, depending of the section

6.5.3. MITIGATION MEASURES

Pre-construction and construction stages

On pre-construction and construction stages the following measures for impact mitigation on the vegetation/flora are suggested:

- Strict keeping to the boundaries of RoW and operation area, prohibition of shortcuts to avoid impact on the adjacent vegetation;
- Preservation of vegetation as much as feasible;

- Replacing Colchis Water-Chestnut (*Trapa colchica*) and Spring snowflake (*Leucojum vernum*) to similar area out of the project impact zone (see **Figure 61**). Relevant plan and schedule must be developed and kept to;
- “Replacing’ lost vegetation by triple amount of the same species replanted in the area (whether deemed advisable), maintenance of vegetation for 2 years minimum;
- Clean up and recultivation of disturbed sites after completion of works;
- Fencing critical root zone of the trees at the boundary with the project area;
- Implementation of dust, noise, water, soil, waste-related impact mitigation measures;
- Training staff in construction best practice.

Note: while planting along the highway, safety requirements must be taken into account while planting, so that the trees do not block the view, have acceptable diameter when mature while they are planted in certain locations and their canopies do not reach over the road.

Measures for mitigation of impact on fauna include:

- Preservation of vegetation as far as feasible;
- Adherence to no horn policy to avoid disturbance of wildlife;
- Scheduling works to the season less sensitive for fauna. Special attention should be given to the avian fauna in the spring-summer (April to July). Tree cutting in the season most sensitive for birds (nesting/hatching) must be avoided;
- Avoidance of construction in/near the riverbed in the fish spawning season (June-September);
- Implementation of measures set for mitigation of impact related to noise, air, water, soil, vegetation/flora and waste generation;
- Trenches or pits, if made, should be fenced or protected to avoid entrapping and injuries of the fauna species. Bright coloured ribbons may be used for big animals (e.g. cattle), while metal plastic and other shields/fences may be used for small animals. If, despite of the mentioned precautions, small animals turn to be entrapped, upon completion of the shift, planks or medium size twigs must be made available for the animals to escape from the pits/trenches after the night. Pits and trenches must be checked prior to filling up.
- Prohibition of poaching;
- Training staff in construction best practice.

Under condition that mitigation measures listed above are implemented the magnitude of residual impact will be low to medium.

Operation stage

Impacts on flora and fauna during operation are reduced by

- Arrangement of barriers preventing cattle and animals from death caused by road mortality. Monitoring of road mortality in order to identify additional protection measures;
- Arrangement of passages to improve connectivity;
- Prohibition of direct discharge of untreated runoff into the river;
- Roadside waste collection and regular clean up (sweeping) of the road;
- Preservation of roadside vegetation.

During maintenance of the road cover, mitigation measures set for construction stage must apply.

Under condition that mitigation measures are implemented the magnitude of residual impact will be low.

Permeability and Connectivity

The structures that allow animals to cross the new road with no risk of being run over by vehicles considered in design include the following:

- Drainage. Box-culverts all sizes under 4m x 3m. Appropriate for small vertebrates (all structures) and some medium size species ($\geq 2\text{m} \times 2\text{m}$).
- Drainage. Box-culvert 4m x 3m. Useful for small and medium size vertebrates and cattle.
- Underpasses. Paths crossing under the road. Appropriate for small and medium wild fauna and also for cattle.
- Bridges over rivers and streams and local roads. May be used for all species, even large size.

As it can be observed in the table, all length of the road is reasonably permeable for small and medium size vertebrates, existing a structure at least each 1.000 meters. Two sections present deficient or lower permeability:

- Section between bridges 2+630 and 5+180, both over streams. Lower permeability than the average.

- Section between underpass for pedestrians 7+890 and drainage 13+690.
Connectivity is not completely assured.

Table below shows the general overview of the permeability of the new road. Some explanations about this table are as follows:

- Lenth. For box-culverts and underpasses, means the transverse lenth; for bridges means the lenth between abutments.
- Total Distance. One "x" points out a range of distance between 500 and 1.000 meters; two "xx" remarks a range from 1.000 to 2.000 meters.
- Partial Distance. One "x" points out a range of distance between 1.000 and 2.000 meters; two "xx" remarks a range over 2.000 meters.

Some recommendations are given in the table, regarding the possibilities to adequate the entrances of the structures to facilitate the permeability and to implement landscaping works under bridges.

ELEMENT									DISTANCE				RATES		REMARKS / RECOMMENDATIONS
LOCATION	Nº	TYPE	SIZE	LENG. (m)	Total	Signif.	Partial	Signif.	Section	Aperture ratio (AR)					
Start	0+000														
Drain	0+425	1	B-C	(3,0 x 2,0) m	50	425			6,00	0,120	Landscaping				
Drain	0+465	1	B-C	(3,0 x 2,0) m	50	40			6,00	0,120	Landscaping				
Drain	1+125	1	B-C	(2,0 x 2,0) m	50	660	x		4,00	0,080					
BR	1+680 1+845	Bridge			165	555	x	1.680	x		> 1	restoration under viaduct deck			
BR	2+540 2+630	Bridge			90	695	x	695			> 1	restoration under viaduct deck			
UP	2+800	Bridge			50	170		170			> 1	restoration under viaduct deck			
UP	2+960	Bridge			50	160		160			> 1	restoration under viaduct deck			
Drain	4+150	1	B-C	(2,0 x 2,0) m	50	1.190	xx		4,00	0,080					
UP	4+180	1	B-C	(4,0 x 2,5) m	40	30			10,00	0,250	landscaping at entrances				
BR	5+180 5+200	Bridge			20	1.000	xx	2.220	xx		> 1	restoration under viaduct deck			
UP	5+700	Bridge			40	500	x	500			> 1	restoration under viaduct deck			
Drain	5+732	1	B-C	(2,0 x 2,0) m	50	32			4,00	0,080					
Drain	5+934	1	B-C	(2,0 x 2,0) m	50	202			4,00	0,080					
Drain	6+545	1	B-C	(1,5 x 1,0) m	50	611	x		1,50	0,030					
Drain	7+000	1	B-C	(2,0 x 2,0) m	50	455			4,00	0,080					
BR	7+080 7+120	Bridge			40	80		1.380	x		> 1	restoration under viaduct deck			
BR	7+645 7+685	Bridge			40	525	x	525			> 1	restoration under viaduct deck			
UP	7+890	1	B-C	(4,0 x 2,5) m	40	205			10,00	0,250	landscaping at entrances				
Drain	7+935	1	B-C	(2,0 x 2,0) m	50	45			4,00	0,080					
Drain	8+850	1	B-C	(2,0 x 2,0) m	50	915	x		4,00	0,080					
Drain	9+055	1	B-C	(2,0 x 2,0) m	50	205			4,00	0,080					
Drain	9+290	1	B-C	(1,5 x 1,5) m	50	235			2,25	0,045					
Drain	10+125	1	B-C	(2,0 x 2,0) m	50	835	x		4,00	0,080					
Drain	10+410	1	B-C	(2,0 x 2,0) m	50	285			4,00	0,080					
Drain	10+945	1	B-C	(2,0 x 2,0) m	50	535	x		4,00	0,080					
Drain	11+795	1	B-C	(2,0 x 2,0) m	50	850	x		4,00	0,080					
Drain	12+450	1	B-C	(2,0 x 2,0) m	50	655	x		4,00	0,080					
Drain	12+850	1	B-C	(2,0 x 2,0) m	50	400			4,00	0,080					
Drain	13+155	1	B-C	(1,5 x 1,5) m	50	305			2,25	0,045					
Drain	13+690	1	B-C	(4,0 x 3,0) m	50	535	x		12,00	0,240	landscaping at entrances				
End	14+470					780	x	6.785	xx						
B-C: Box-Culvert															
BR: Bridge															
UP: Underpass															

6.6. ASSESSMENT OF IMPACT ON PROTECTED TERRITORIES AND CRITICAL HABITATS

There are no protected areas and/or critical habitats in the direct impact zone of the Grigoleti-Kobuleti alignment.

6.7. IMPACT ON GEOLOGY

6.7.1. ASSESSMENT OF IMPACT - PRE-CONSTRUCTION AND ROAD CONSTRUCTION STAGES

The construction will include a certain amount of earth moving, thus the probability of erosion from fresh road cuts and fills, and sedimentation of natural drainage channels should be taken into account. It should be also considered that siltation of canals and gorges in the RoW may cause their blockage and flooding of the area.

In the project corridor a range of the sensitive from the view of geological risk areas is registered. Presence of waterlogged and instable areas should be taken into account. The sensitive areas include river crossing sites where risk of erosion with consequent impacts on water and biodiversity exists. Erosion can be triggered by impact of atmospheric water and surface runoff in disposed areas. Altered topography is another cause of erosion and sedimentation.

The principle impact that highway development projects have on the natural geologic erosion process includes temporary exposure of disturbed soils to precipitation and to surface runoff. The soil exposure and the resulting reshaping of the topography may create situations when detrimental erosion and sedimentation temporarily occur.

The two factors that have the greatest impact on the slope stability are the slope gradient and the groundwater. Generally, the greater is the slope gradient and the presence of the groundwater, the lower is the stability of a certain slope regardless of the geologic material or the soil type.

The erosion of embankments near surface water body may have environmental impacts, including: pollution of surface water, damage to adjacent land. In general the process may be controlled by:

- selection of a reasonable embankment height and stabilization of the slopes (e.g. by hydroseeding, mechanical stabilisation if deemed advisable);

- establishment of temporary berms, slope drains, temporary pipes, contour ditches, ditch checks, diversions, sediment traps.

Road design (slope) and culverts used in the road to prevent flooding and washing out of roads. They also minimize erosion, build-up of standing water, and provide pathways for run-off.

Some of the problems and solutions are listed below.

Problem	Solution
When the runoff is allowed to flow down an excavated slope, the risk of erosion is high.	A combination of diversion ditches and slope blankets may be considered.
The outer surface of a fill is usually less compact than the rest of it. In wet weather, the moisture content of the outer layer will increase and the slope of adequate stability may fail in dry conditions.	Compaction, use of temporary shields
Bridge end fill slopes often suffer from the effects of concentrated flow, either running off the deck or from the deck drains.	Blocking the surface drains on the bridge temporarily, until vegetation becomes established, in the meantime collecting the water in a controlled manner at the end of the deck or placing water impact protection such as sufficiently large pads of rockfill under the drains.

The problem in the project area is soft ground. The design considers measures for avoidance of negative impact on surroundings, waterlogging, subsidence, etc.

Development of hazardous processes within the RoW is not expected.

Considered alternatives do not differ a lot in terms of possible impacts on geology. The ranking of project impact on geology for considered alternatives is as follows:

- Sensitivity of receptor – low to medium,
- Likelihood of impact – medium to low,
- Magnitude of impact – low to medium.

6.7.2. ASSESSMENT OF IMPACT - ROAD OPERATION

The operation impact is less likely to occur, as the design is developed based on the results of extensive geotechnical and engineering geological surveys implemented in the design stage of the project. However, visual observation of the slopes, in

particular after significant adverse weather must be carried out. Monitoring of the technical status of tunnels and maintenance is required.

Likelihood of triggering hazardous geological processes during operation will be low.

The ranking of project impact on geology for considered alternatives is as follows:

- Sensitivity of receptor – low to medium
- Likelihood of impact – low,
- Magnitude of impact – low.

6.7.3. MITIGATION MEASURES

Pre-construction and construction stages

- Choosing a proper elevation for the road;
- Stabilization of slopes - arranging slope drainage, contour drainage trenches;
- Stabilisation of the slopes with vegetation;
- Training staff in construction best practice.

Under condition that mitigation measures listed above are implemented the magnitude of residual impact will be low.

Operation stage

Avoidance of impact during operation will be ensured by proper design based on results of detailed geotechnical and geological survey.

Under condition that mitigation measures listed above are implemented the magnitude of residual impact will be low.

6.8. IMPACT ON SOILS/LAND

6.8.1. ASSESSMENT OF IMPACT - PRE-CONSTRUCTION AND CONSTRUCTION STAGES

Loss of the vegetative soil layer along the road section will inevitably occur, and soil properties will be changed to form sub-grades along the route, resulting in the loss of soil productivity. The road construction impact on the soil will mainly relate to organizing and operating the camps/machinery stationing and operation grounds; fuel/oil spills from vehicles and/or fuel storage (if available on the camp site/building ground) and erosion due to modification of the natural conditions.

The primary effect of roads is that on the topsoil. (According to the engineering survey in the area the topsoil depth is around 30cm). Total volume of topsoil removed from the project area for Alternative 1 will be around 262,677.6 m³. For Alternatives 2 and 3 the volume will be less.

The topsoil can be lost/degraded if not stripped prior to the construction, or if mixed with subsoil. Impact on soil productivity outside the RoW may result from excessive ramming.

Other sources of impact on soil quality are poorly managed waste (both solid and liquid), spilled fuel/oil.

With consideration of the floor space of the sites suggested for stationing of machinery and topsoil/material storage the areas are sufficient for accommodation of the topsoil stripped from the area. All three sites are easily accessible from existing road. This allows avoiding unnecessary additional impact related to construction of any temporary access.

The impact on soil is commensurate to the length of alignment. According to the design the lengths of alternative alignments are as follows:

Alternative 1	14,447.5 m
Alternative 2	14,300.7 m
Alternative 3	13,838.2 m

Respectively, impact of Alternative 1 on topsoil will be slightly higher compared to Alternative 2, while for Alternative 3 it will be the lowest. However, the impact is

conventional as the topsoil removed from the RoW will be reintroduced to remediate effect of temporary works after completion of construction activities.

Despite of the lowest length of Alternative 3 the risk of impact on soil for this alignment is expected to be higher. In the section after Ureki, from the E-70 crossing towards the end of alignment Alternative 3 runs through the area dissected by drainage canals. Therefore in case of accidental soil pollution the risk of spreading of the impact 'along' the canals and contamination of the clean areas exists.

The ranking of project impact on soil/land for considered alternatives, depending on the section of alignment is as follows:

- Sensitivity of receptor – medium (Alternatives 1 and 3) and high (Alternative2),
- Likelihood of impact – medium,
- Magnitude of impact – low to medium .

6.8.2. ASSESSMENT OF IMPACT - ROAD OPERATION STAGE

The road operation is usually related to soil pollution by heavy metals in a narrow band on either side of the road. Pollutants settling in soil within the RoW may impair vegetation growth and increase the risk of erosion. Impact on soil may result from blockage of the drainage system which may cause flooding and/or erosion of soil. Another impact is the pollution with litter. The impact on soil during operation is more difficult to manage as the sources of impact in this stage are the “users” of the highway.

Impacts may be partly mitigated by awareness rising and education of the community may contribute to the reduction of soil pollution with waste. To prevent impact on erosive sliding of the soil or flooding, blockage of the drainage system will be avoided. Phytoremediation may be considered as a measure for reduction of soil contamination.

For the area south to the Supsa River historically terrain uplift trend is observed. Minor impact of Supsa river level increase is sometimes registered in the river delta area. No flooding related impact on alignments under consideration is expected. Implementation of protection measures is not required. The drainage design implies the runoff of the future highway will improve compared to the current situation of the existing road. In addition, the material that will form the embankment will be properly selected according to international standards and consistently compacted to assure

that if any possibility of flooding processes in the basement occurs, the embankment will remain unchanged and steady.

As mentioned above impact of Alternative 2 on soil quality is ranked as high with consideration of peculiarities of the area. Impact of Alternatives 1 and 3 are almost similar.

The ranking of project impact on soil/land for considered alternatives, depending on the section of alignment is as follows:

- Sensitivity of receptor – medium (Alternative 1,3) to high (Alternative 2),
- Likelihood of impact – medium,
- Magnitude of impact – low to medium .

6.8.3. MITIGATION MEASURES

Pre-construction and construction stages

In order to avoid or mitigate impact on topsoil and other impacts caused by accidental fuel/oil spills, poor management of waste and/or polluted runoff, the operation ground must be established with consideration of environmental safety measures, as presented below:

- Ground clearance must be minimized;
- Topsoil must be removed from all areas required for permanent and temporary needs of the project;
- To avoid loss of the productive soil layer, all suitable topsoil and other material shall be saved and stockpiled separately for the future recultivation of the area;
- Stockpiles of removed topsoil must be properly designed/shaped and managed;⁷

⁷ Topsoil management must comply with requirements set in the Government regulations (#424, dated 31 December, 2013) on topsoil removal, storage, use and recultivation. Good management practice experience must be also taken into account. Subsoil pile must have a natural angle of slope of up to 40° depending on texture and moisture content but, if stable stockpiles are to be formed, slope angles will normally need to be smaller. For stockpiles that are to be grass seeded and maintained, a maximum side slope of 1 in 2 (25°) is appropriate. If the soil is to be stockpiled for more than six months, the surface of the stockpiles should be seeded with a grass/clover mix to minimise soil erosion and to help reduce

- Stockpiles of excavated soil must be properly designed and managed – stability of the stockpile through preservation of ‘safe’ slope inclination and diversion of runoff from the area must be ensured ;
 - Topsoil and subsoil must be stored separately until reuse;
 - To ensure stability, the soil piles shall not be higher than 2 metres. The piles must be placed and managed so as to avoid erosion and washing off. Drainage trenches around the piles must be provided.
 - Soil compaction may be reduced by strict keeping to temporary roads, camp/operation ground boundaries;
 - Disturbed vegetation must be replanted immediately after the construction/disturbance stops;
 - Any temporary fuel tank (if contractor decided to have small stock of fuel on the site) shall be placed in a covered area with berms or dikes to contain any spills. Any spill shall be immediately contained and cleaned up with absorbent material;
 - Onsite repairs /maintenance/fuelling activities shall be limited. Priority shall be given to offsite commercial facilities. If impossible, a designated area and/or secondary containment for the on-site repair or maintenance activities must be provided;
 - On-site vehicles and equipment shall be inspected regularly for leaks and all leaks shall be immediately repaired. Incoming vehicles and equipment shall be checked for leaks. Leaking vehicles/equipment shall not be allowed on-site;
 - Secondary containment devices (drop cloths, drain pans) shall be used to catch leaks or spills while removing or changing fluids from vehicles or equipment. Drip pans or absorbent materials shall be provided. On small spills absorbent materials shall be used;
 - Use of off-site vehicle wash racks (commercial washing facilities) is preferable. If on-site cleaning is necessary, bermed wash areas for cleaning activities shall be established. The wash area may be sloped to facilitate collection of wash water and evaporative drying;
 - Waste collection area must be sited so as to avoid receiving a substantial amount of runoff from upland areas and draining directly to a water body;
 - In case of the fuel/oil spills risk, an oil trap shall be additionally provided;
-

infestation by nuisance weeds that might spread seed onto adjacent land. Sites of temporary storage of excess material will be agreed with the local municipalities.

- Adequate training on environmental protection and safety shall be provided to the staff;
- No fly tipping policy shall be followed;
- Discharge of effluents into the water bodies is not planned. Only wastewater cleaned up to the established norms (TPH 0.3 mg/l and suspended particles 30 mg/l) may be discharged to the relief. Receiving area must not be prone to erosion or waterlogging.
- It is advisable not to drain water to the area where crops are cultivated.

Under condition that mitigation measures are implemented the magnitude of residual impact will be low .

Operation stage

- Awareness raising and education of community on waste management (no fly tipping);
- Establishment of the rest/service facilities with consideration of environmental requirements that may also contribute to reduction of soil pollution with waste – to be considered in design;
- Maintenance and clean up the drainage system to prevent impact on erosive sliding of the soil or flooding;
- Use of phytoremediation may be considered as a measure for reduction of soil contamination.

Under condition that mitigation measures are implemented the magnitude of residual impact will be low.

6.9. LANDSCAPE AND VISUAL IMPACT

6.9.1. ASSESSMENT OF IMPACT – PRE-CONSTRUCTION AND ROAD CONSTRUCTION STAGES

Visual impact during construction will be related to machinery and people operating on the ground, onsite and offsite traffic as well as the temporary facilities (car stationing, material and waste storage areas, camp (if available), borrow pits and quarry sites), built sections of the road and bridges. Most of activities will be implemented away from the residential areas.

As the road is a linear structure, construction works will not be always ‘concentrated’ in one location. So, the source of visual disturbance will be ‘moving’.

Landscape visual impact will also be due to topsoil/material storage areas. By the end of works it is assumed that surplus material (if any) and topsoil are fully removed from the area.

Special attention must be paid to the need for recultivation of all disturbed areas (including borrow pits/quarries in case contractor obtains a short-term licence) after completion of works. Adherence to the terms of licenses for resource extraction will be tracked by RD through technical supervisor or works and overseen by the Department of Environment Protection Oversight of MENRP.

In the section near Supsa Terminal, visual impact of construction works for Alternative 1 will slightly exceed that of Alternative 2 and 3. In Ureki-Magnetiti section Alternative 2 runs closer to residential area, so works will be more visible for the residents and travellers. In section from Supsa till Ureki impact of Alternatives 1 and 3 will be smaller.

The impact during pre-construction and construction will be unavoidable, though short term (restricted to duration of construction), local and reversible.

The ranking of visual/landscape impact of considered alternatives is as follows:

- Sensitivity of receptor – medium,
- Likelihood of impact – medium to high,
- Magnitude of impact – low to medium .

6.9.2. ASSESSMENT OF IMPACT - ROAD OPERATION STAGE

When in place, the new alignment will change the landscape substantially. In some sections of alignment the road will be completely new structure in flat landscape. So, visual impact related to it will be significant.

The main recipients of impact will be local residents, travellers, commuters using the road. Impact on them will be short term and limited to the travel time only. Besides, for some of the passengers the landscape may be not familiar, so for them the change will not be crucial.

With time, as community gets accustomed to the new infrastructure, visual discomfort related to the change will diminish. Therefore the magnitude of will become low to negligible.

In the sections where this is possible, the impact can be mitigated by tree plantations. Planting and landscaping of the roadsides where feasible, is generally considered as an efficient way of restoring, sometimes improving aesthetic views of the area and mitigating the impression of the landscape disturbance. At the same time plants along the roadside may act as windbreaks providing protection of farmland in the impact area. Planting with vegetation, preferably local, will also support wildlife by creating habitats.

Equally for all alternatives the impact will be unavoidable. Mitigation measures will reduce impact to some extent, however the impact will be significant. In the section near Supsa Terminal, visual impact of Alternative 1 will slightly exceed that of Alternative 2 and 3 in the same section. In Ureki-Magnetiti section Alternative 2 runs closer to residential area, so the new infrastructure will be more visible. In section from Supsa till Ureki impact of Alternatives 1 and 3 will be smaller.

The ranking of visual/landscape impact of considered alternatives depending on the section is as follows:

- Sensitivity of receptor – medium to low,
- Likelihood of impact –high,
- Magnitude of impact –medium (with time, as community gets accustomed to the new infrastructure, visual discomfort related to the change will diminish.)

6.9.3. MITIGATION MEASURES

Pre-construction and construction stages

- Visual impact of construction works will be mitigated by keeping to the boundaries of the worksites and traffic routes; preservation of vegetation; clean up and good management of construction sites and camps; timely removal of waste from the area;
- Using borrow areas are already in operation. Thus environmental impacts concerning potential disfigurement of landscape, vegetation losses and damage to access roads are kept to a minimum.
- Development and implementation of landscape planting.
- Preservation of vegetation from non-deliberate damage – achievable by keeping to the boundaries of the work areas and travel routes.
- Clean up and recultivation of all disturbed areas;

Under condition that mitigation measures are implemented the magnitude of residual impact will be low to medium.

Operation stage

- Clean up of the road and adjacent area;
- Preservation/maintenance of roadside vegetation to shield the visual change in the landscape related to the new infrastructure.

6.10. WASTE MANAGEMENT

6.10.1. WASTE: PRE-CONSTRUCTION AND ROAD CONSTRUCTION STAGES

Waste streams generated during the construction include inert and hazardous waste.

Inert waste (earth, soil) do not decompose or produce leachate or other products harmful to the environment. Recyclable materials include but are not limited to cardboard, gravel, excavated soil (uncontaminated), green waste, wood/lumber, limited amount of scrap metal.

To prevent the impact of the waste generated during construction on environment it must be collected and temporarily placed in the selected area with consideration of requirements applicable to each waste stream.

The inert waste must be placed so as not to interfere with free movement of machinery and staff, away from surface water (within at least 100m).

All waste must be source-separated in order to ensure proper management and enable reuse. Until removal from the site, domestic waste (food waste, plastic bottles, packaging) must be collected in containers with fitted lid to avoid attraction of scavengers, emanation of odour and scattering by wind. The lids also protect waste from rain and snow.

Assuming that the quantity of domestic waste generated per capita per year totals 0.7m^3 , the approximate total amount of the above-mentioned waste produced during the construction will equate $200 \times 0.7 = 140\text{ m}^3/\text{year}$.

In Georgia municipalities are responsible for the collection and transportation of household waste. However, regular waste collection service is only available in some of the central settlements. The household waste generated during construction will be collected and delivered to the nearest landfill under the contract with the Solid Waste Management Company of Georgia.

Hazardous waste generated during the construction will include:

- Used tires: 60-70 unit / year;
- Oil filters of construction equipment, vehicles and other machinery: 20-25 unit /year;
- Out-dated and damaged accumulators: 12-15 unit/year;
- Waste fuel, lubricants: 120-150 kg /year;
- Welding electrodes: 50-60 kg /year;
- Amount of soil contaminated with accidentally spilled oil will depend on the scale of the spill.

Since Georgia has no infrastructure for the final disposal of hazardous waste, such waste generated during construction works will be handed over to licensed companies for treatment (deactivation, incineration) or re-use in other technological processes.

The area allocated for temporary storage of hazardous waste shall have special preventive measures implemented, in particular, containers shall have secondary containment and no mixing of hazardous waste with any other waste shall be allowed. Hazardous waste containers shall be checked for tightness. The staff involved in hazardous waste management shall be trained in waste management and safety

issues. The waste shall be removed every 3 days. Treatment, utilisation, disposal of waste shall be carried out by an authorised contractor.

Soil polluted with petroleum hydrocarbons because of accidental small scale fuel/oil spills (leakages) can be remediated onsite (e.g. in situ bioremediation). Larger spills (less likely to be the case from experience with other similar projects) must be localized, contaminated soil removed by authorized contractor for remediation. New, clean soil must be introduced, followed by recultivation. It is recommended to involve an authorised company for this service.

Excavated soil can be used on site and/or for grading of disturbed areas after completion of construction works. Any inert waste materials that may be used for the project must be reused on the site, residues should be disposed at the nearest landfill. (The closest to the site municipal landfills are in Ureki, Ozurgeti and Lanchkhuti.). Material stock will be managed so to avoid accumulation of surplus on the site.

Contractor will be obliged to provide waste management plan tailored to the work schedule and waste streams.

Quantity and type of waste generated during construction will be the same for all considered alternatives. The ranking of project impact related to generation of waste is as follows:

- Likelihood of impact – low to medium,
- Magnitude of impact - low to medium.

6.10.2. WASTE: ROAD OPERATION STAGE

During operation of the highway, roadside litter may accumulate (unfortunate practice). It is predominantly food waste, plastic and paper that people fly tip. The roadside litter is extremely unsightly. Uncollected litter may attract vermin. It can impact animals that may get trapped or poisoned with litter in their habitats. Cigarette butts and filters threaten wildlife, as fish and birds often mistake this waste for food. Litter may end up in rivers and canals, and the last but not the least, the litter is also a road hazard that may occasionally contribute to accidents.

A fine for littering has been introduced in Georgia. However the littering along the highway is rather difficult to manage. One way of its reduction is education. It is necessary to:

- ensure that the community is aware of the range of ways to dispose of their waste correctly;
- educate the community that littering is illegal, fines apply and behaviours are monitored , inform the community of the level of fines that littering incurs.
- The signs may be suitable for placement in a series of two to four signs at 10 km intervals to repeat the message in different ways.

Management of waste during operation will be responsibility of the contractor identified by the Roads Department.

The ranking of project impact related to generation of waste is as follows:

- Likelihood of impact – low to medium,
- Magnitude of impact - low to medium.

6.10.3. MITIGATION MEASURES

Pre-construction and construction stages

Impact of waste generation on environment during construction can be mitigated by proper storage, maximum reuse and timely removal of unusable waste to agreed location.

Staff must be trained in good waste management practice.

Under condition that mitigation measures listed above are implemented the magnitude of residual impact will be low.

Operation stage

- Ensure that the community is aware of the range of ways to dispose of their waste correctly;
- Provide clean up.

Under condition that mitigation measures listed above are implemented the magnitude of residual impact will be low.

6.11. SOCIO-ECONOMIC IMPACTS

The project will have positive impact on Georgia's economy on the global scale. Modernization of the highway, as a part of the program to upgrade the major roads of the country launched by the Government of Georgia will contribute to improvement of transportation and transit of goods to surrounding countries, which is a significant and growing contributor to GDP.

6.11.1. ASSESSMENT OF IMPACT – PRE-CONSTRUCTION AND CONSTRUCTION STAGES

Pre-construction and construction will have both, negative and positive impact on community. Negative impacts on community during construction will be limited to duration of construction works, mainly reversible and local. Resettlement and land acquisition issues are to be mentioned separately (see RAP report).

Certain negative impact during construction will be related to dust, noise and temporary restriction of free movement due to the project activities.

Dust, emission, noise and vibration. With consideration of prevailing direction of wind (see **Figure 62** a -d), impact on community may occur in most of the sections. In some areas alignment alternatives coincides, so distance from the axles of alternatives to the residential area is the same. In the starting section of alignments differ. Alternative 1 bypasses Supsa Terminal from the west, running close to Supsa, whereas Alternatives 2 and 3 bypasses the terminal from the east at a distance from residential area. In this section risk of noise and vibration on community will be higher, while the risk of impact of Alternatives 2 and 3 will be similar and lower. Up to Ureki all alignments coincide – impact is similar. After Ureki, Alternative 2 deviates to the west and goes closer to Magnetiti. The length of the section of Alternative 2 running close to the settlement exceeds that for Alternatives 1 and 2.

DETAILED DESIGN FOR THE CONSTRUCTION OF POTI-GRIGOLETI-KOBULETI BYPASS.
SECTION OF INTERNATIONAL E-70 SENAKI-POTI (DETOUR)-SARPI (BORDER OF TURKISH
REPUBLIC) ROAD

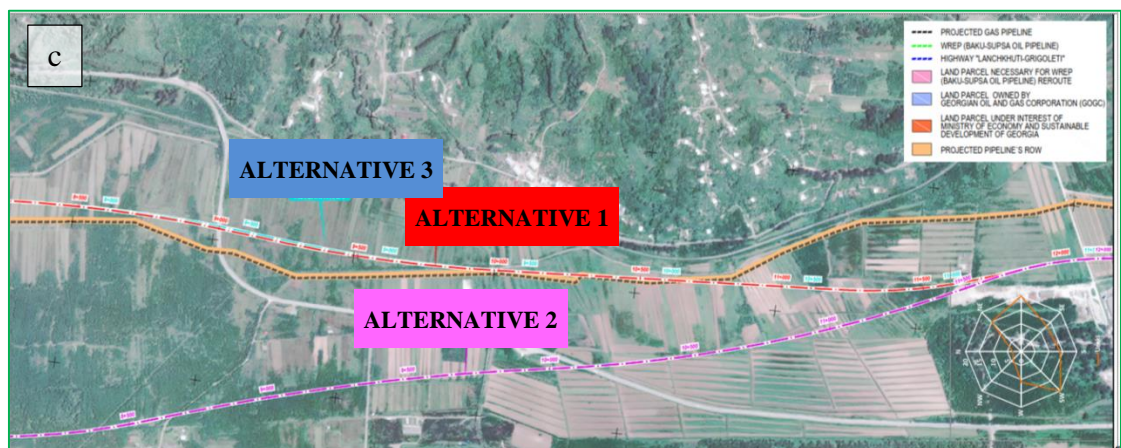
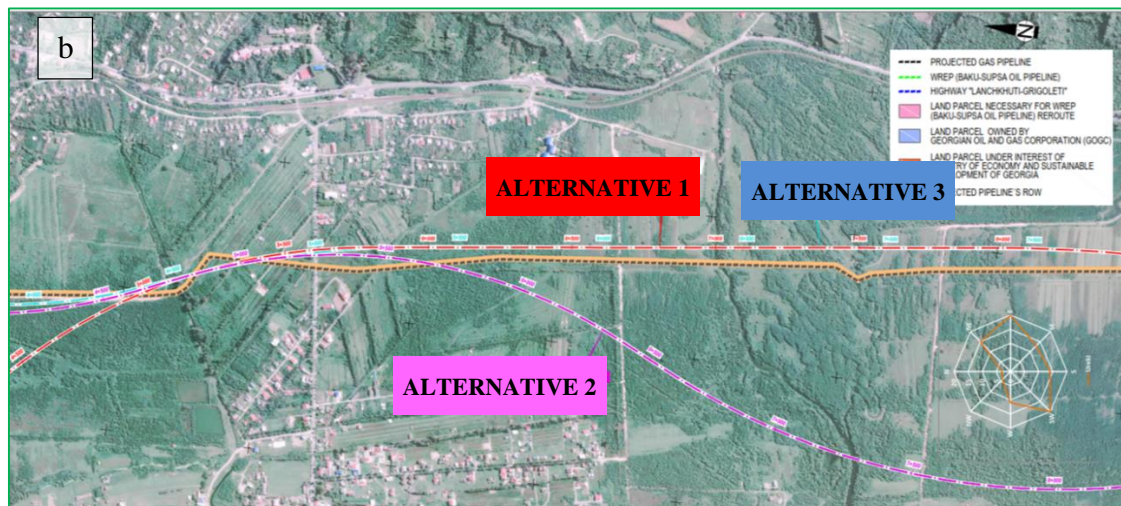
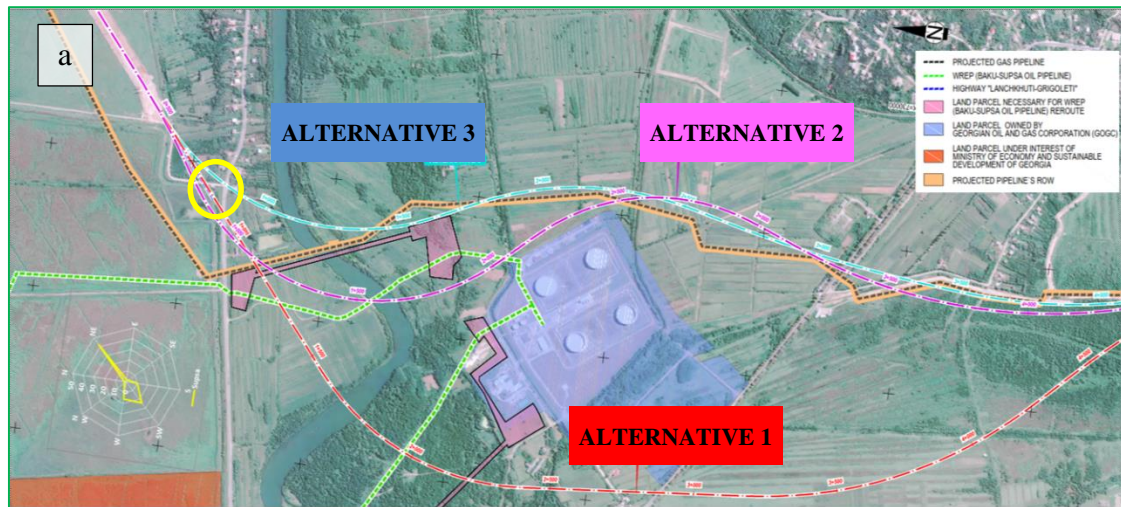




Figure 62. Layout of alternatives with indication prevailing wind directions

Respectively from the view of the scale of noise and vibration related impact alternatives slightly differ. Impact for all alternatives is ranked as medium. Vibration impacts are expected to be felt only locally near construction sites and are not expected to have negative impacts on residents. As mentioned in Section 6.3 status of the houses near construction site will be checked to avoid unjustified claims related to damage of properties caused by the project. All legitimate claims will be satisfied.

Disturbance of traffic.

Disturbance of background traffic is not expected and can be avoided by implementation of traffic management plan and works schedule.

Temporary employment

Negative impact during construction can be due to failed expectations of employment for local resident. Contractor will be encouraged to employ local residents as far as feasible. The more so as unskilled labour force is available on site.

Gender issues

The civil works contracts will include provisions to encourage employment of women. Additionally, women headed households will be considered vulnerable and special assistance is provided in the land acquisition and resettlement plan.

Local businesses

Local small businesses will benefit by provision of accompanying services (food, small maintenance works, etc.). In case contractor decides to rent accommodation in the village instead of running construction camp, this will provide additional temporary income for community.

Cultural heritage

There are no architectural or cultural heritage sites along alternative alignments. The highway will overpass small cemetery near Supsa River crossing.

With consideration of the fact that the region is rich in archaeological heritage, chance find procedure must be put in place. (outline of the Chance Find procedure is enclosed – see Annex 5). As a part of construction permit clearance from cultural heritage authorities must be obtained. Supervision of works by an archaeologist may be advisable.

Infrastructure

Affected infrastructure in the RoW of the new alignment includes:

Table 59. Infrastructure under the impact of the project

Description	Qty.	Unit
Water	813	m
Transmission lines	6 997	m
Streetlights	1 042	m
Fibre optic communication	3 028	m
Gas and oil	1 877	m

Relocation or reinforcement of this infrastructure is part of the project. The issue has been agreed with utility owners/operators and other stakeholders.

Local roads, if damaged by movement of construction machinery and vehicles, will be restored by contractor prior to quitting the site. Restoration should bring the local roads to at least the original condition or upgraded as feasible.

Community will be informed about the schedule of works, any inconvenience related to the work process and potential duration of the 'impact' in advance.

Resettlement and land acquisition

The survey revealed that from pk0+000 up to the end of alignment alternatives will affect:

Table 60. Affected land and houses(all alternatives)

	Affected land area, m ²	Number of houses, units
Alternative 1*	758,257.00	4.00
Alternative 2	700,130.00	20.00
Alternative 3	565,968.00	10.00

* value, verified based on site survey

In addition to mentioned above Alternative 2 will also affect the area where construction of hotel (impact on business) is in process. With consideration of the mentioned above, from the view of the need of physical resettlement, related costs and amount of compensation required for impact of Alternative 2 will be the highest.

Assessment of resettlement needs revealed that impact of Alternative 1 is the lowest. Implementation of the project will affect 4 buildings. With regard to Alternative 1 impact on hotel in Ureki, adjacent to the project interchange, should also be mentioned. Though the building is not in the direct impact zone, but the owners claim that proximity to the road will affect their business (Hotel Sanatorium). A flower house owned by one of AH will also get under impact.

Issues related to the involuntary resettlement, including land take, are covered under the RAP. Draft resettlement action plan is submitted as a separate document. Right to compensation is granted to all PAPs within the resettlement corridor, but the type of the compensation will be determined according to their legal status. Individuals, who have registered property, will receive the compensation for all types of impact. Compensation packages are shown in **Table 61**.

The ranking of impact on community for all alternatives depending on the section is as follows:

- Sensitivity of receptor – high,
- Likelihood of impact – high, medium to low,
- Magnitude of impact
 - Noise, dust, emissions – medium (for all alternatives in the sections running near the residential areas);
 - Visual - (with time, as community gets accustomed to the new infrastructure, visual discomfort related to the change will diminish.);
 - Resettlement – high (Alternative 2), medium (Alternative 3), low (Alternative 1);
 - Cultural heritage - no impact;
 - Infrastructure – medium to high.

Table 61. Compensation packages

Type of Loss	Application	Definition of AH/APs	Compensation Entitlements
Land			
Permanent loss of agricultural land	AP losing productive land regardless of impact severity	Registered Owner:	Cash compensation at full replacement cost. If the residual plot becomes unviable for cultivation, the project will acquire it if the owner so desire.
		Lawful Owner:	The ownership rights of these APs will be recognized, the land registered in NAPR and the APs provided with cash compensation at full replacement cost.
		Unlawful owners	One time minimum subsistence allowance in cash for 12 months
Non-Agricultural Land	AP losing their commercial/ non-agricultural land	Registered Owner:	Cash compensation at replacement cost or through replacement land equal in value to plot lost and at location acceptable to APs. The cash option has been selected for this project.
		Lawful Owner:	The ownership rights of these APs will be recognized, the land registered in NAPR and the APs provided with cash compensation at full replacement cost.
		Unlawful owners	One time minimum subsistence allowance in cash for 12 months

Buildings and Structures			
Residential and non-residential structures/assets		All AHs regardless of their legal ownership/ registration status (including unlawful owners)	Cash compensation for building/structures losses at full replacement costs free of depreciation and transaction costs
Loss Of Community Infrastructure/Common Property Resources			
Loss of common property resources	Community/Public Assets	Community/Government	Reconstruction of the lost structure in consultation with community and restoration of their functions
Loss of Income and Livelihood			
Crops	Standing crops affected or affected agricultural land, used permanently for crop cultivation.	All APs regardless of legal status (including unlawful)	Crop compensation in cash at market rate by default at to gross crop value of expected harvest.
Trees	Trees affected	All APs regardless of legal status (including unlawful)	Cash compensation at market rate on the basis of type, age and productive value of the trees.
Business/Employment	Business/employment loss	All APs regardless of legal status	<i>Owner:</i> 1) Permanent impact: cash indemnity of 1 year net income or in the absence of income proof, One time minimum subsistence allowance in cash for 12 months; 2) Temporary impact: cash indemnity of net income for months of business stoppage. Assessment to be based on tax declaration or, in its absence,

			minimum salary. <i>Permanent worker/employees:</i> indemnity for lost wages equal to One time minimum subsistence allowance in cash for 3 months.
Allowances			
Severe Impacts	>10% income loss	All severely affected AHs including informal settlers	One time minimum subsistence allowance in cash for 3 months
Relocation/Shifting	Transport/transition costs	All AHs to be relocated	An allowance covering transport and livelihood expenses for the transitional period.
Vulnerable People Allowances		AHs below poverty line, headed by Women	One time minimum subsistence allowance in cash for 3 months and employment priority in project-related jobs where feasible
Temporary impacts during construction		All APs	Due compensation to be assessed and paid when the impacts are identified based on the above provisions.

6.11.2. ASSESSMENT OF IMPACT - ROAD OPERATION STAGE

In some sections where the road will cross arable land plots, faster traffic on the highway and presence of the median barriers may 'disconnect' the right and the left side properties. In case the new highway dividing original plot makes part of it unusable this section will also be acquired. In some sections where the road will cross arable land plots, the highway will 'disconnect' the right and the left side properties. The concerns community may have with regard to this issue is being discussed with the stakeholders (local community) and reflected, if appropriate, in the design. As mentioned above, exact location and/or the need for installation of cattle passages and new culverts are being specified on design stage. So, complains related to this issues during operation stage are not expected.

Two key health risks in relation to roads and traffic are accidents, noise and air quality changes. Along with the exposure to emissions from the traffic, health risk is also related to potential contamination of crops cultivated adjacent to the road.

Diversion of the traffic will affect businesses along the existing alignment.

On the other hand modernisation of the road will result in higher traffic safety as the highway will bypass the residential areas reducing the risk of traffic accidents and fatal injuries.

There is no risk of impact on cultural heritage and infrastructure during operation.

Impact during operation on local community under condition of proper design of the road infrastructure and adequate compensation of the loss/damage of properties will be medium.

The ranking of impact on community for all alternatives depending on the section is as follows:

- Sensitivity of receptor – high,
- Likelihood of impact – high, medium to low,
- Magnitude of impact
 - Noise, dust, emissions – medium (for all alternatives in the sections running near the residential areas);
 - Visual - (with time, as community gets accustomed to the new infrastructure, visual discomfort related to the change will diminish.);
 - Cultural heritage - no impact;
 - Infrastructure – no impact.

6.11.3. MITIGATION MEASURES

Pre-construction and construction stages:

- Keeping to the measures suggested for noise, air quality, vegetation impact reduction.
- Development and implementation of Resettlement Action Plan;
- Development and keeping to the Chance Find Procedure;
- Development and communication of external grievance mechanism;
- Development and implementation of Stakeholder Engagement Plan;
- Development and implementation of Traffic Management, Waste Management plans;
- Addressing employment issues carefully, keeping information transparent;
- Encouraging employment of local residents as far as feasible;
- Encouraging employment of women;
- Informing community about the possible restriction of services (power supply) and duration of disruption;
- Provision of alternative access roads – if exiting ones are temporarily not available for pedestrian and traffic (including non-motorized);
- Installation of warning signs and barriers, wherever appropriate.

Operation stage

Measures to reduce/mitigate impact on socio-economic environment during operation of the road include:

- Development and implementation of traffic management plan
- signs, barriers to reduce access of pedestrians to the carriageway;
- allowing adequate passages and routes for non-motorized transport and pedestrians;
- implementation of dust, emissions, noise and vibration reduction/mitigation measures;
- development of alternative possibilities for employment. These can be support for family hotels, arrangement of small enterprises for fruit processing. The issue should be discussed with community and resolved with participation of the stakeholders involved in the process.

Part of the above listed mitigation measures are included into the design (passes, junctions), some are subject to the restoration of livelihood as part of Resettlement

Action Plan (alternative employment), and others are subject to the Road Safety Action Plan of RD (signage, barriers).

6.12. OCCUPATIONAL HEALTH AND SAFETY

Construction phase

Main impacts on workers during construction are related to operation of heavy machinery, traffic accidents, work on height, near and over water (bridges, overpasses), noise (most of the road construction activities will result in noise levels exceeding 85 dBA) and vibration. People working at the construction sites will be exposed to elevated noise and vibration levels. Most of the road construction activities will result in noise levels exceeding 85 dBA.:

Health and safety impacts for all considered alternatives are of the same scale and type.

The ranking of impact of considered alternatives is as follows:

- Sensitivity of receptor – high,
- Likelihood of impact – medium to low,
- Magnitude of impact – low to medium .

6.12.1. MITIGATION MEASURES

To mitigate impact on health and safety of the workforce it will be necessary to:

- Ensure proper maintenance of vehicles and machinery;
- Inspect machinery prior to use to ensure it is in safe condition;
- Check the machine perimeter before moving to exclude any possibility of collision with people/objects;
- Use seat-belts while operating machine;
- Prohibit leaving machinery unattended with engine running;
- Preserve safe speed;
- Assign designated spotter, if backing is required, to guide the move. (Note: The spotters must wear high-viz vests and stay in sight of the driver. The driver must stop if he loses sight of the spotter.);
- Ensure compliance with work on height safety measures;
- Provide adequate on site First Aid Boxes and treatment facilities;

- Provide and enforce use of PPE and safety gear during works on height and elsewhere as appropriate. This includes use of hearing protective devices capable of reducing sound levels at the ear to at least 85 dBA;
- Control exposure to hand-arm vibration from equipment such as hand and power tools, or whole-body vibrations from surfaces on which the worker stands or sits, through the choice of equipment, installation of vibration dampening pads or devices, and/or limiting the duration of exposure (EHS Guidelines, 2007);
- Prohibit alcohol use;
- Prohibit mobile phone while driving;
- Train drivers and other personnel;

6.13. CUMULATIVE IMPACT

The project area is rural. The only sources of nuisance/impact are railway, road itself and Supsa Terminal. No other existing or planned projects or sources capable to add to the impact of this project are known. No cumulative impact is therefore expected.

7. ANALYSIS OF ALTERNATIVES AND IDENTIFICATION OF THE PREFERRED OPTION

The project alternatives have been assessed using a methodology that transforms qualitative assessments in quantitative numbers, which are then summed up in a final score that expresses the overall impact of each alternative and allows their comparison. In order to encompass potential impacts 9 different components have been selected and analysed. Rank was assigned to each component:

	Ranking components	Ranking value
1	Landscape visual impact	5
2	Local air-quality	10
3	Noise	10
4	Impact on biodiversity & ecological integrity	20
5	Impact on surface water	15
6	Geotechnical risks	10
7	Impact on soil	5
8	Socio-economical	5
9	Resettlement	20
		100

These ranking criteria have been differentiated in order to reflect the peculiarity of the areas interested by the project. The criteria are key questions, to which closed answers and scores are associated. A score is ascribed to each answer:

No or negligible impact	0
Very low (VL)	0.3
Low impact (L)	0.5
Medium impact (M)	1
High impact (H)	1.5

For each criterion, a score is obtained by multiplying the component rank (based on potential impact) by the score of the criterion (criterion score). The final score value for alternative is obtained as a sum of the component scores. Alternative that shows the lowest score a value is assumed to have the best environmental and social performance.

Comparison/ranking of alternative alignments for Grigoleti-Kobuleti bypass is given in **Table 62**.

Table 62. Preliminary comparison of alternatives

Description	A -1						A2						A3					
	Construction			Operation			Construction			Operation			Construction			Operation		
	Ranking	Score	Score value	Ranking	Score	Score value	Ranking	Score	Score value	Ranking	Score	Score value	Ranking	Score	Score value	Ranking	Score	Score value
LOT 1																		
Local air-quality	10	0.5	5	10	0.5	5	10	0.5	5	10	0.5	5	10	0.5	5	10	0.5	5
Noise	10	0.5	5	10	0.5	5	10	0.5	5	10	0.5	5	10	0.5	5	10	0.5	5
Geotechnical risks	10	1	10	10	0.3	3	10	1	10	10	0.3	3	10	1	10	10	0.3	3
Impact on soil	5	0.5	2.5	5	0.5	2.5	5	0.5	2.5	5	0.5	2.5	5	0.5	2.5	5	0.5	2.5
Impact on surface water	15	1	15	15	0.5	7.5	15	1	15	15	0.5	7.5	15	1	15	15	0.5	7.5
Impact on biodiversity & ecological integrity	20	1	20	20	0.5	10	20	1.5	30	20	0.5	10	20	1.5	30	20	0.5	10
Landscape visual impact	5	0.5	2.5	5	0.5	2.5	5	0.5	2.5	5	1	5	5	0.5	2.5	5	0.5	2.5
Socio-economical	5	0.5	2.5	5	0.3	1.5	5	0.5	2.5	5	0.3	1.5	5	0.5	2.5	5	0.3	1.5
Resettlement	20	1	20	20	0	0	20	1.5	30	20	0	0	20	1	20	20	0	0
Total score			82.5			37			102.5			39.5			92.5			37

According to methodology described in above, each score was multiplied by ranking value of the component. The score of alternative was calculated as total of individual components ranked.

Comparison of alternatives shows that the lowest score belong to Alternative 1, which is considered as preferable option for the Grigoleti-Kobuleti road. (Note: the lowest score means less impact.).

Table 63. Ranking of alignments

	Score value (construction)	Score value (operation phase)	Total score
Alternative 1	82.5	37.0	119.5
Alternative 2	102.5	39.5	142.0
Alternative 3	92.5	37.0	129.5

(Note: the lowest score means less impact.).

8. SUMMARY OF IMPACT ASSESSMENT FOR THE PREFERRED ALTERNATIVE

8.1. RANKING OF IMPACTS

Table 64. Environmental and social impacts - construction

#	Potential Impacts	Severity	Sites
1	Impact on natural landscape in the right-of-way	Low to medium	Whole alignment
2	Impact on natural landscape	Medium	Borrow pit sites; Waste dumps, Construction camps; Equipment yards – to be defined at the pre-construction stage by the contractor.
3	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.	Low to medium	During works near the riverbed
4	Increased suspended sediment in stream/river (canal, ravines) affected by erosion at construction sites and fresh road cuts, fills and waste dumps. Declined water quality and increased sedimentation	Low to Medium	Bridge construction area, road section next to the surface water streams
5	Risk of flooding triggered by blockage of canals, ravines	Low/medium	Sections running close/crossing the river
6	Soil and water contamination during construction – spilled oil, grease, fuel, paint.	Low to Medium	Water –ravines, canal ; Soil – along the whole alignment; camps, equipment yards /concrete mixing sites
7	Poor sanitation/solid waste disposal in construction camps and work sites (sewerage, sanitation, waste management)	Low to medium	Note: Location to be defined by constructing contractor.
8	Construction wastes alongside the RoW, spoil; roadside litter.	Medium	Along alignment; at worksites; spoil disposal areas
9	Air pollution from vehicle operations, dust.	Low to medium	Near the settlement, along alignment, in quarry/borrow pit areas, along the traffic route
10	Air pollution from concrete plants.	Medium	Supplier site
11	Noise from machinery/vehicle traffic, local	Medium to high	Near the settlements
12	Poaching by construction workers	Negligible to low	Supsa, Sepa, tributaries, forest area
13	Impact on biodiversity (noise, emissions, barriers for movement water pollution)	Low to medium	Supsa, along the route; forest area
14	Creation of stagnant water bodies in borrow pits, quarries etc. suited to	Low	

	mosquito breeding and other disease vectors.		
15	Health hazards by noise, air emissions/dust (workers)	Low	Near the Operation ground
16	Impacts on archaeological sites	Low	Along the RoW
17	Hazardous driving conditions where construction interferes with existing roads.	Low to medium	Whole alignment ; Near the settlements
18	Impact on existing infrastructure	Medium	Communications, optical cable and transmission line crossing areas
19	Traffic related accident risks	Low	Whole alignment; Most sensitive sites are near the settlements
20	Physical and economical displacement of people living on the right of way	Medium to High	Affected households
21	OHS risks related to operating machinery, works on height and tunnelling	Medium to High	Worksites

Environmental and social impacts of the operation stage are presented in the table below.

Table 65. Environmental and social impacts - Operation

#	Potential impacts	Severity	Sites
1	Impact on landscape	Medium/High	Whole alignment
2	Impact on the access roads, borrow pit sites, waste dumps	Low	During repair
3	Roadside litter	Low	Along alignment, landfills
4	Erosion from road cuts and fills risk of landslides.	Low	Within the RoW.; Most of the alignment, in particular the section running close to the riverbed
5	Alteration of land/subsoil drainage patterns	Low	The existing culverts and drainage systems d
6	Soil and water contamination by oil, grease, fuel and paint alongside the highway	Low to medium	Most of the alignment
7	Air pollution from machinery during maintenance works.	Low	Most of the alignment
8	Air pollution from traffic	Low to Medium	Most of the alignment
9	Noise pollution from traffic	Medium to high	Most of the alignment
10	Roadside litter	Low to medium	Most of the alignment
11	Disturbance of fauna (noise, collision risks)	Low to medium	Most of the alignment
12	Creation of a transmission corridor for pests and weeds	Medium	Most of the alignment
13	Health hazards - dust and exhaust emissions	Low	Near the settlements:
14	Obstruction of routes from homes to farms, increasing travel time.	Low	Near the settlement

15	Impairment of non-motored transportation and pedestrians in the highway corridor due to reduced or impeded rights-of-way.	Low	Near the settlement
16	Impact on businesses	Medium to high	Businesses along the bypassed section of the road through Ureki
#	Emergency Related Impacts	Severity	
16	Accident risks associated with traffic that may result in spills, injuries or loss of life	Medium	Near the settlements; Most part of alignment

The impact matrix from the construction stage is presented in the table below.

Table 66. Impact matrix - Construction Stage

Activity	Impact	Direct/ Indirect (D/I)	Positive/ Negative (P/N)	Reversible/ Irreversible (R/I)	Temporary (term) (Short-S, Medium-M, Long-L)
Land clearance and grading in the RoW	Impact on landscape, flora/fauna, habitats	D	N	R/I	S
	Erosion	D	N	I	S
	Emissions	D	N	R	S
	Noise, vibration	D	N	R	S
	Soil pollution	I	N	R	S
	Waste generation	I	N	R	S
	Ground and surface water pollution	I	N	R	S
Construction, pavement	Emissions	D	N	R	S
	Noise, vibration	D	N	R	S
	Soil pollution	I	N	R	S
	Waste generation	I	N	R	S
	Ground and surface water pollution	D/I	N	R	S
Exploration of borrow pits	Impact on landscape, flora/fauna, habitats	D	N	R/I	M
	Erosion	D	N	R/I	M
	Emissions	D	N	R	S
	Noise, vibration	D	N	R	S
	Soil pollution	I	N	R	S
	Waste generation	I	N	R	S
	Ground and surface water pollution	D	N	R	S
Transportation of material from borrow pits	Emissions	D	N	R	S
	Noise, vibration	D	N	R	S
	Soil pollution	I	N	R	S
	Waste generation	I	N	R	S
	Impact on landscape, flora/fauna, habitats	D/I	N	R/I	S

Activity	Impact	Direct/ Indirect (D/I)	Positive/ Negative (P/N)	Reversible/ Irreversible (R/I)	Temporary (term) (Short-S, Medium-M, Long-L)
	Ground and surface water pollution	I	N	R	S
Disposal of spoil and wastes	Impact on landscape, habitats	D	N	R	S
	Emissions	D	N	R	S
	Noise, vibration	D	N	R	S
	Soil pollution	I	N	R	S
	Waste generation	I	N	R	S
	Ground and surface water pollution	I	N	R	S

The character of the main anticipated impacts of the operation stage is presented in the table below.

Table 67. Character of the Main Anticipated Impacts - Operation Stage

Activity/ Factor	Impact	Direct/ Indirect (D/I)	Positive/ Negative (P/N)	Reversible/ Irreversible (R/I)	Temporary (term) (Short-S, Long-L)
Physical existence	Impact on landscape	D	N	I	L
Traffic	Impact on landscape, flora/fauna, habitats	D/I	N	R	S
	Emissions	D	N	R	L
	Noise, vibration	D	N	R	L
	Soil pollution	I	N	+R/I	+M
	Waste generation	I	N	+R	+S
	Ground and surface water pollution	I	N	R/I	+S/M
Maintenance works	Impact on landscape, flora/fauna, habitats	D/I	+N	R	S
	Erosion	D	+N	R/I	+S
	Emissions	D	N	R	S
	Noise, vibration	D	N	R	S
	Soil pollution	I	N	+R/IR	+S
	Waste generation	I	N	+R	S
Accidents	Ground and surface water pollution	I	N	+	+
	Impact on landscape, flora/fauna, habitats	D/I	N	+R	+S
	Erosion	I	N	R	S
	Emissions	I	N	+R	+S

	Noise, vibration		N	R	R
	Soil pollution	I/D	N	+R/IR	+S
	Waste generation	I	N	+R	+S
	Water pollution	I	N	+R/IR	+

8.2. RESIDUAL IMPACT

Residual impact will be low if mitigation measures are in place, environmental management and best construction and operation practices are kept to. In *Table 68* „Negligible” means that residual impact is not anticipated or it is insignificant.

Table 68. Residual Impact- construction stage and operation stages

Impact	Ranking
Construction	
Deterioration of air quality	Low to medium, short term, reversible, local. According to calculation, impact is not high, no mitigation is required
Noise and vibration	Low to medium , short term, reversible, local.
Water quality	Low to negligible, short term, reversible, local.
Deterioration of soil quality	Low to negligible, short term, reversible, local.
Development of geohazards	Negligible.
Impact on flora/vegetation	Low to medium, local, in the areas not to be alienated permanently - medium to short term (temporary), reversible. Impacted will Alder trees, shrubs, grasses. In temporarily used areas impact will be reverted by reinstatement of the disturbed areas. None of affected tree species are rare, endemic, endangered, Red List or otherwise protected.
Impact on fauna	Medium to low depending on the section of alignment, temporary, reversible, local. These will be - residual noise propagation, exhaust emissions, certain risk of impact on aquatic life due to temporary impact on water quality (mainly increase of turbidity), collision. None of affected species are rare, endemic, endangered, Red List or otherwise protected.
Landscape and visual alteration	Low to negligible (depending on location), temporary, local, reversible
Land acquisition and resettlement	Physical resettlement of 4 residents will be required. More than 451 land plots will be affected
Operation	
Deterioration of air quality	Low to medium, according to the modelling data, impact is not high, no mitigation is required.
Noise and vibration	Low to medium.
Water quality	Negligible - pollution with surface runoff.

Impact	Ranking
Deterioration of soil quality	Low to negligible - pollution with surface runoff.
Development of geohazards	Negligible.
Impact on flora/vegetation cover	Negligible.
Impact on fauna	Low. Noise propagation, exhaust emissions, certain risk of impact on aquatic life due to water quality deterioration and risk of collision.
Landscape and visual alteration	Significant change due to road and bridges

9. ENVIRONMENTAL MANAGEMENT PLAN (EMP)

Information included in the EMP is based on the main findings outlined in every chapter of the ESIA report, i.e., all proposed mitigation and monitoring actions set to a timeline, specific responsibility assigned and follow up actions defined.

The EMP is presented in a table format and divided into three main parts, dealing with the physical environment, with the biological environment, and with the socio-economic and cultural environment. Each part is organized by development stages, i.e. pre-construction, construction and road operation.

The overall objective of the EMP is to bring the project into compliance with national environmental and social requirements and environmental and social policies of the World Bank.

EMP will be included into the bidding documents so that bidders can consider and incorporate their environmental responsibilities into their bid proposals. Later EMP becomes an integral part of a contract for the provision of works and is binding for implementation.

Once works provider is contracted, the provider should develop and submit to RD for subsequent approval the following thematic management plans:

- Waste Management Plan;
- Traffic Management Plan;
- Health and Safety plan; and
- Emergency Response plan.

These plans should be prepared and cleared prior to commencement of works.

Compensatory tree planting (and other greening/reinstatement as required) plan may be produced at a later stage, once progress of works allows initiation of reinstatement within the project area.

9.1. INSTITUTIONAL FRAMEWORK

The RD of the MRDI is responsible for general oversight of environmental compliance of works through ensuring quality performance of the technical supervisor and of the contractor. RD will perform these functions through its Resettlement and Environment Division comprising twelve staff members with relevant education and professional skills, as well as the safeguards consultants with international experience hired for the technical supervision of operations. This in-house capacity will be supported by external individual consultants upon demand.

The supervisor of works commissioned by the RD will be charged with the responsibility to establish strong field presence in the project area and supervise the works. Along with ensuring consistency with the design and quality of works, the supervisor is mandated to track the implementation of the EMP by the contractor, reveal any deviations from the prescribed actions, and identify any environmental / social issues should they emerge at any stage of the works.

Monitoring shall include visual observation and measurements as appropriate. Field testers and hand-held equipment shall be used to monitor short- term impact. Calibrated equipment and approved methods of monitoring must be used. Calibration must be done regularly, all calibration records and monitoring results, along with the copies of the site records, certificates, permits and documents shall be submitted and kept by the Roads Department.

The list of records must include:

- Work program and schedule;
- Environmental permits and licences;
- List of equipment;
- List of mitigation measures;
- Route/program of construction material transportation;
- Inspection records – noise, water quality monitoring data;
- Copies of correspondence related to environmental issues;
- Site drainage plan;
- Records of maintenance and cleaning schedules for sediment and oil/grease traps;
- Records of sewage disposal (if relevant);
- Records of quantity of discharged wastewater and concentration of pollutants;

- Waste disposal records
- Written designation of waste disposal sites and instructions for waste transportation from local authorities;
- Log of material inventories and consumption;
- Chance find records (if any);
- Complaints register;
- Incidence register (environmental limits expedience forms, injuries records, etc.);
- Records on remedial actions taken;
- Equipment control and maintenance log;
- Corrective and preventive action request records;
- Training records.

Works supervisor will be responsible for reporting to the RD on the environmental and social performance on monthly basis through including safeguard compliance section into the general reporting. Supporting photo material shall also be attached. RD will make monthly reports from the works supervisor available to the World Bank upon demand. Also, RD will include analytical sections on the EMP implementation and overall safeguard performance into the regular project progress reporting to the lender. This reporting will be based on the information received from the works supervisor, but should also reflect results of RD's own due diligence (quality control over the supervisor's work) and RD's assessment of supervisor's performance.

Environmental Management and Monitoring

The environmental management and monitoring required at each individual stage of the Project are presented in the tables below.

Table 69. Mitigation Plan for the Design Phase

Issue	Measures taken or to be taken	Implementing Organization	Responsible Organization - supervisor
Dust/air pollution	<ul style="list-style-type: none"> Location of soil borrowing sites, waste disposal sites and concrete mixing sites will be identified with consideration of environmental issues (to avoid negative impacts on humans and wildlife). 	Getinsa-Payma, Eurostudios/Contractor, contractor	RD
Noise	<ul style="list-style-type: none"> Planning of auxiliary and haulage routes will be done with maximum use of existing roads and/or away from densely populated areas to reduce nuisance related to noise. 	Getinsa-Payma, Eurostudios/Contractor	RD
Surface water pollution	<ul style="list-style-type: none"> Need for installation of drainage system will be identified. Surface water protection measures for facilities/works near or in the riverbed (Supsa, Sepa and its tributaries) will be identified 	Getinsa-Payma, Eurostudios	RD
Loss of land/harvest Loss of a source of income/business	<ul style="list-style-type: none"> Land acquisition/resettlement action plan (RAP) is developed Damages/loss will be compensated according to the RAP 	Getinsa-Payma, Eurostudios	RD
Landscape visual change	<ul style="list-style-type: none"> Design, colour and shape will be identified with consideration of peculiarities of the landscape 	Getinsa-Payma, Eurostudios	RD
Impact on surface water	<ul style="list-style-type: none"> River crossing are designed allowing minimum interference with active riverbed 	Getinsa-Payma, Eurostudios	RD

Table 70. Mitigation Plan for Construction Phase

AIR QUALITY				
Potential impact	Mitigation/Enhancement Measure	Monitoring requirements	Responsibility	
			Development/ Implementation	Control
Exhaust emissions from the engines of construction vehicles and machinery	<ul style="list-style-type: none"> • All vehicles, equipment and machinery used for construction will be regularly maintained and inspected/certificated to ensure that the pollution emission levels conform to the standards prescribed. • Idling of engines will be prohibited.. • Use of poorly maintained machinery or equipment that cause excessive pollution (e.g., visible smoke, fuel/oil leaks) will be banned. • Staff will be trained in best practice 	<i>Details are given in Table 72</i>	Contractor	RD Construction supervisor
Dust generated during loading/unloading and hauling of friable materials	<ul style="list-style-type: none"> • Construction materials (gravel, sand, etc.) will be transported in covered (for example, by tarpaulins) vehicles. • Unpaved roads and significant areas of uncovered soil will be sprayed with water every four hours on working days, during dry and windy weather; • Optimum speed will be kept to while moving through the residential area to reduce dust emissions; • Dumping of material from high will be prohibited to avoid dust related nuisance; • Staff will be trained in best practice. 	<i>Details are given in Table 72</i>		

Dust generated during the movement of vehicles	<ul style="list-style-type: none"> Water truck bowser with spray bar will be used to spray water on unsealed road surfaces, asphalt mixing sites and temporary service areas, for dust suppression. Optimum speed will be kept to while moving through the residential area to reduce dust emissions. 	<i>Details are given in Table 72</i>		
NOISE AND VIBRATION				
Potential impact	Mitigation/Enhancement Measure	Monitoring requirements	Responsibility	
			Development/Implementation	Control
Construction-related noise from vehicles, asphalt plants, crushing and batch plants (If any), equipment	<ul style="list-style-type: none"> All vehicles, equipment and machinery used for construction will be regularly maintained and inspected/certificated to ensure that the noise levels conform to the standards prescribed. 	<i>Details are given in Table 72</i>	Contractor	RD Construction supervisor
Noise Impact – Disturbance to residents	<ul style="list-style-type: none"> Work hours will be restricted between 06:00 to 21:00 hours within 500 m of the settlements. Noise on construction site will be limited. Idling with switched gear will be prohibited, shields used, if required. Other measures include design and construction of noise barrier - a wall, an earthen berm, or a combination of wall and berm, use of green barrier (tree planting); Dialogue will be maintained, grievance mechanism used to allow residents to contact Project staff and ask for additional measures; Traffic schedule will be developed and kept to; Optimum travel speed during offsite travel will be set; 	<i>Details are given in Table 72</i>	Contractor	RD Construction supervisor

	<ul style="list-style-type: none"> Distance to the nearest residence building or inhabited area will be kept to; Proper state of maintenance of machinery and vehicles will be maintained; Vegetation will be preserved as far as feasible to act as a natural noise barrier; Train staff will be trained in construction best practice. 			
Noise impact on workers	<ul style="list-style-type: none"> Noise standards will be strictly enforced to protect construction workers from noise impacts, in accordance with international Health, Safety and Environment (HSE) standards and procedures. Personal Protection Equipment (PPE) (e. g., ear defenders) will be provided and used. Noise exposure will be limited to 85 dB(A). 	<i>Details are given in Table 72</i>	Contractor	RD Construction supervisor
SOIL AND WATER				
Potential impact	Mitigation/Enhancement Measure	Monitoring requirements	Responsibility	
			Development/Implementation	Control
Pollution of soil and water (Supsa, Sepa and tributary)	<ul style="list-style-type: none"> Contractor will be requested to provide <ul style="list-style-type: none"> information about location and floor space of the area required and layout of the work camp; description and layout of equipment maintenance areas and lubricant /fuel storage facilities including distance from water 	<i>Details are given in Table 72</i>	Contractor	RD Construction supervisor, MENRP

	<p>sources and irrigation facilities;</p> <ul style="list-style-type: none"> • Storage facilities for fuels and chemicals will be located away from watercourses. The storage will be bounded and provided with impermeable lining to contain spillage and prevent soil and water contamination. Prior to the commencement of works the site installations will be inspected for approval; • Each parking, service, or cleaning and washing site will be equipped with waste water treatment facilities (temporary); • Sewage management plan and proper sewage collection and disposal system will be available to prevent pollution of watercourses (if discharge in surface water is planned); • Use of offsite fuelling and maintenance facilities will be encouraged. However, in planned to have onsite – storage and handling of fuels, oils and other hydrocarbons will be a controlled process, involving measures to prevent soil and water contamination. Designs will include storage on sealed surfaces and within secondary containment and refuelling of all plant, vehicles and machinery will not be allowed within 50 m of any watercourse, drain or channel leading to a water course. • Waste management plan will be prepared; • Storing and disposal of waste/used oil will comply with environmental regulations and standards; • Contaminated or hazardous waste such as bitumen waste will be disposed only in areas approved by the MENRP. All waste disposal will comply with a Waste Management Plan, to be developed at the 			
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	<p>start of construction;</p> <ul style="list-style-type: none"> • After completion of construction works the contractor will execute all works necessary to restore the sites to their original state (removal and proper disposal of all materials, wastes, installations, surface modelling if necessary, spreading and levelling of stored top soil); • Location of temporary disposal of soil material will be selected in the area with consideration of general environmental safeguards and potential risks. 			
Siltation of surface waters during construction near Supsa, Sepa and tributary and/or impact on soils due to improper disposal of excess materials	<ul style="list-style-type: none"> • Sheet piles will be used to avoid pollution of the water; • Bank protection measures will be used to avoid erosion; • Monitoring of bank stability will be implemented. 	<i>Details are given in Table 72</i>	Contractor	RD Construction supervisor
Soil compaction due to operation of heavy equipment	<ul style="list-style-type: none"> • Operation of heavy equipment will be confined within the corridor to avoid soil compaction and damage to land. 	<i>Details are given in Table 72</i>	Contractor	RD Construction supervisor
Loss of top soil	<ul style="list-style-type: none"> • All of the removed top soil within the corridor will be stored for reuse. Long-term stockpiles of topsoil will immediately be protected to prevent erosion or loss of fertility. • Topsoil will be stripped and reused during recultivation of disturbed sites; • Soil management plan will be provided. The plan will describe measures to be undertaken to minimize effects of wind and water 	<i>Details are given in Table 72</i>	Contractor	RD Construction supervisor

	<p>erosion on stockpiles, measures to minimize loss of fertility of top soil, timeframes, haul routes and disposal sites;</p> <ul style="list-style-type: none"> • Prior to operation of borrow pits, the contractor will develop and submit reinstatement plan – indicating location of the borrow pits, rehabilitation measures, implementation schedule (Rehabilitation measures may not be necessary for borrow areas still in operation after road works have finished). 			
Wastewater collection and disposal/treatment	<ul style="list-style-type: none"> • Camps (if any) will be furnished with sanitary and wastewater collection and disposal/treatment facilities and should operate fully compliant waste systems, involving storage of waste by waste category. 	<i>Details are given in Table 72</i>	Contractor	RD Construction supervisor
Sand and gravel borrow pit-disturbance of river bed, water quality, ecosystem disturbance	<ul style="list-style-type: none"> • Preference will be given to use of existing borrow pits or buying material at licensed facilities; • Borrowing from the stream will be prohibited. 	<i>Details are given in Table 72</i>	Contractor	RD Construction supervisor
ECOLOGY AND NATURAL ENVIRONMENT				
Potential impact	Mitigation/Enhancement Measure	Monitoring requirements	Responsibility	
			Development/Implementation	Control
Potential damage of vegetation/flora during excavation/ construction and transportation	<ul style="list-style-type: none"> • Boundaries of RoW and operation area will be strictly kept to -to avoid impact on the adjacent vegetation; • Any damage to the existing trees during construction activities will be avoided; temporary vegetation protection fence – established; 	<i>Details are given in Table 72</i>	Contractor	RD Construction supervisor

activities	<ul style="list-style-type: none"> • Dust, water, soil impact mitigation measures will be implemented; • Clearing up and removal of vegetation will be minimized to the extent necessary for the execution of works. • Vegetation will be preserved as much as feasible; • In case taxation reveals any protected plant species in the area, the latter will be removed from the environment in accordance with sub-paragraph (v), Article 24, first paragraph of the law of Georgia on 'Red List and Red Book' only; • Re-vegetation will be performed. "Replacing" lost vegetation by triple amount of the same species replanted in the area (whether deemed advisable), maintenance of vegetation for 2 years minimum; • Replacing Colchis Water-Chestnut (<i>Trapa colchica</i>) and Spring snowflake (<i>Leucojum vernum</i>) to similar area out of the project impact zone will be organised. 			
Maintaining animal mobility through culverts and bridges	<ul style="list-style-type: none"> • Designed culverts and underpasses will be used as animal crossing points. 	<i>Details are given in Table 72</i>	Contractor	RD Construction supervisor
Domestic and wild animals straying onto the road and being killed	<ul style="list-style-type: none"> • Protective fence along the road, and fencing of excavated sites as a measure to prevent domestic and wild animals straying onto the road and being killed or falling into the excavations will be Installed. Protective fences will be of various density. For small animals boards or corrugated metal shields will be used. For larger animals colour ribbons will be used as a generally accepted practice. 	<i>Details are given in Table 72</i>	Contractor	RD Construction supervisor
Disturbance of wildlife	<ul style="list-style-type: none"> • Adherence to no horn policy will be enforced; 			

	<ul style="list-style-type: none"> • Dust, noise, water, soil impact mitigation measures will be Implemented; • Strict keeping to traffic routes during the construction will be ensured to avoid impact on vegetation; • Vegetation will be preserved as much as feasible; • Works will be scheduled to the season less sensitive for fauna. Special attention will be given to the avian fauna in the spring-summer (April to July). Tree cutting in the season most sensitive for birds (nesting/hatching) will be avoided; • Poaching will be prohibited. 			
Damage to aquatic ecosystems, habitats and fish	<ul style="list-style-type: none"> • Movement of machines inside rivers, streams, or on their banks will be prevented except when it is unavoidable due to the construction of a structure or construction; • Vegetation on the slopes will be preserved to reduce the risk of siltation. • Construction in sensitive for biodiversity periods will be avoided. Construction in/near the riverbed in the fish spawning season (June-September) will be avoided. Contractors will prepare management plans for such works as a part of their Construction Method Statements • All the works to be performed in water or near watercourses will follow statement or plan for the execution of particular works. • Erosion protection measures set in Soil and erosion management plan will be implemented, including measures that will be undertaken to address adverse environmental impacts such as erosion of river 	<i>Details are given in Table 72</i>	Contractor	RD Construction supervisor

	<p>embankment and siltation of watercourses that may result from such activities.</p> <ul style="list-style-type: none"> • Poaching will be prohibited; • “Dropping structures” into rivers/streams will be avoided. This will be done by “sawing” appropriate sections of the structure and using cranes to lift these sections or alternatively construct a platform onto which the structure could be dropped. • Discharge of sediment-laden construction water (e.g., from areas containing dredged soil) directly into surface watercourses will be forbidden. Sediment laden construction water will be discharged into settling lagoons or tanks prior to final discharge. • Staff will be trained in construction best practice. 			
Damage to river morphology	<ul style="list-style-type: none"> • Digging and making the foundations for bridge piers, retaining walls, and structures located at, or near, surface water bodies, will take place in low water period to minimize negative impacts on rivers and their banks. 	<i>Details are given in Table 72</i>	Contractor	RD Construction supervisor
LANDSCAPE, VISUAL AND AGRICULTURE				
Potential impact	Mitigation/Enhancement Measure	Monitoring requirements	Responsibility	
			Development/Implementation	Control
Potential deterioration of aesthetic value of the landscape and vegetation	<ul style="list-style-type: none"> • Landscape planting will be developed and implemented; • Vegetation will be protected from non-deliberate damage – achievable by keeping to the boundaries of the work areas and travel routes. 	<i>Details are given in Table 72</i>	Contractor	RD Construction supervisor

losses	<ul style="list-style-type: none"> Erosion prevention measures (straw bales, fibre rolls, other) in sensitive locations will be provided; Stability of the slope of deep excavations for bridge piers will be ensured. For this purpose boarding can be used. 			
Damage to agricultural lands, including impacts of drainage and irrigation infrastructure	<ul style="list-style-type: none"> Grievance procedure will be developed before start of construction; Machinery and vehicle access will be strictly limited; All the affected areas will be restored. 	<i>Details are given in Table 72</i>	Contractor	RD Construction supervisor
Livestock resources damaged by machinery and vehicles	<ul style="list-style-type: none"> Grievance procedure will be developed before start of construction; Machinery and vehicle access will be strictly limited; All the affected areas will be restored. 	<i>Details are given in Table 72</i>	Contractor	RD Construction supervisor
Arrangement of new borrow pits or stone quarries, possibly damaging agricultural or archaeological	<ul style="list-style-type: none"> Contractor will be encouraged to use the Borrow pits on specific locations which are predefined within the detailed design. Advantage will be given to already licenced sourcing areas, Existing quarries will be used or licence to run own quarry will be obtain (if deemed advisable). 	<i>Details are given in Table 72</i>	Contractor	RD Construction supervisor
CULTURAL HERITAGE AND ARCHAEOLOGY				
Potential impact	Mitigation/Enhancement Measure	Monitoring requirements	Responsibility	
			Development/ Implementation	Control
Possible loss or damage to cultural resources	<ul style="list-style-type: none"> In case of chance finds, the Contractor will immediately, without delay, halt works and inform the authorized Institution for Protection 	<i>Details are given in Table</i>	Contractor	RD Construction

	of Cultural Monuments and undertake measures to ensure the findings are not destroyed or damaged and to protect the area and position in which they are discovered.	72		supervisor
HEALTH AND SAFETY				
Potential impact	Mitigation/Enhancement Measure	Monitoring requirements	Responsibility	
			Development/Implementation	Control
Health and safety risks to workers	<ul style="list-style-type: none"> • The following will be provided: Adequate health care facilities (including first aid facilities) within construction sites; • All construction workers will be trained in basic sanitation, general health and safety matters, and on the specific hazards of their work; • Personal protection equipment (PPE) for workers, such as safety boots, helmets, gloves, protective clothing, goggles, and ear protection required in accordance with HSE legislation will be provided and used; • Clean drinking water will be made available to all workers; • Drainage throughout the camps (in case available) will be arranged to avoid puddling; • Periodic cleaning of latrines (if available) and waste container will be implemented to prevent outbreak of diseases; • Where feasible contractor will arrange temporary integration of waste collection from work sites into existing waste collection systems and 	Details are given in Table 72	Contractor	RD Construction supervisor MENRP

	<p>disposal facilities of nearby communities.</p> <ul style="list-style-type: none"> • Training/briefing about safety – prior to commencement of works in rules for the handling and storage of hazardous substances (fuel, oil, lubricants, bitumen, paint) and cleaning of machinery/equipment will be provided; • International HSE standards will be implemented in all contracts. • Working on height and other safety requirements relevant to the task will be enforced. • Proper maintenance of vehicles and machinery will be ensured - machinery examined prior to use to ensure it is in safe condition; • Machine perimeter will be checked before moving to exclude any possibility of collision with people/objects; • Seat-belts while operating machine will be used; • Leaving machinery unattended with engine running will be prohibited; • Safe speed will be preserved; • Designated spotter will be assigned, if backing is required, to guide the move. (Note: The spotters must wear high-viz vests and stay in sight of the driver. The driver must stop if he loses sight of the spotter.); • Compliance with work on height safety measures will be ensured; • PPE and safety gear during works on height and elsewhere as appropriate will be provided, use - enforced. This includes use of hearing protective devices capable of reducing sound levels at the ear to at least 85 dBA; • Adequate on site First Aid Boxes and treatment facilities will be 			
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	<p>provided;</p> <ul style="list-style-type: none"> • Exposure to hand-arm vibration from equipment such as hand and power tools, or whole-body vibrations from surfaces on which the worker stands or sits will be controlled through the choice of equipment, installation of vibration dampening pads or devices, and/or limiting the duration of exposure (EHS Guidelines, 2007); • Alcohol use will be prohibited; • Use of mobile phone while driving will be prohibited; • Drivers and other personnel will be trained; • Measures suggested for noise, air quality reduction will be kept to; • Traffic Management, Waste Management plans will be developed and implemented; • Warning signs and barriers will be installed wherever appropriate. 			
Health and safety risks to adjacent communities	<ul style="list-style-type: none"> • Barriers and warning signs at all hazardous areas will be installed to protect general public; • Measures suggested for noise, air quality reduction will be kept to; • Community will be informed about the possible restriction of services (power supply) and duration of disruption; • Alternative access roads will be provided – if exiting ones are temporarily not available for pedestrian and traffic (including non-motorized); • Traffic Management, Waste Management plans will be developed and implemented; • Safety awareness campaigns, focusing on schools and children will be implemented. 	<i>Details are given in Table 72</i>	Contractor	RD Construction supervisor

Community tension and disruption	<ul style="list-style-type: none"> • Locations for camps (if any) will be designed by contractor. Project. Contractor will prepare Camp Management Plan. • Grievance mechanism will be in place; • Priority will be given to employment of local population (under condition that required qualification/skills are available) 	Details are given in Table 72	Contractor	RD Construction supervisor
TRAFFIC, MACHINERY				
Potential impact	Mitigation/Enhancement Measure	Monitoring requirements	Responsibility	
			Development/Implementation	Control
Asphalt plants	<ul style="list-style-type: none"> • Existing asphalt plants will be used, in case decision is made to use own asphalt plant - permit from MENRP will be obtained. 	Details are given in Table 72	Contractor	RD Construction supervisor
Traffic disruption	<ul style="list-style-type: none"> • Traffic Management Plan will be developed in conjunction with road authorities to manage all temporary accesses, delivery of material and machinery; • Traffic management plan will be submitted to local traffic authorities prior to mobilization; • Information about the scope and schedule of construction activities and expected disruptions and access restrictions will be provided to the public; • Adequate traffic flow around construc. areas will be allowed for; • Adequate lighting, well-designed traffic safety signs, barriers and flag persons for traffic control will be provided. 	Details are given in Table 72	Contractor	RD Construction supervisor

Table 71. Mitigation Plan for Operation phase

Activity	Location	Issue	Mitigation measure	Responsible authority (implementation)	Responsible agency (monitoring)
Accidental fuel/oil spill and/or roadside litter washed off/blown off into the river	Surface water	Water pollution	<ul style="list-style-type: none"> • Maintenance works will be planned so to prevent runoff contamination; • Surface sweeping and development of better cleaning methods – are considered as mitigation; • Culverts will be cleaned routinely, and repaired as far as required; • Water from bridge will be collected and retained prior to discharge. 	Road Maintenance Contractor	RD, Traffic Police
Road resurfacing	Road/bridge	Water bodies pollution by heavy metals, hydrocarbons and debris	<ul style="list-style-type: none"> • Maintenance paving will be performed only in dry weather to prevent runoff contamination; • Proper staging techniques will be used to reduce the spread of paving materials during the repair of potholes and worn pavement. These can include covering storm drain inlets and manholes during paving operations, using erosion and sediment controls to decrease runoff from repair sites, and using drip pans, absorbent materials and other pollution prevention materials to limit leaks of paving materials and fluids from paving machines. 	Road Maintenance Contractor	RD

Activity	Location	Issue	Mitigation measure	Responsible authority (implementation)	Responsible agency (monitoring)
Noise	Residential area	Disturbance of local residents by traffic related noise	<ul style="list-style-type: none"> In those locations where the nighttime noise is expected to slightly exceed allowable limit green barriers and speed reduction are recommended. In other areas (A1+Aw, B, D1, E,F) noise barriers are assumed to be an option. Dimensions of the walls are calculated with consideration of the distance and topography of the area. In Black Sea Arena section the modelled noise value is in allowable limit, however, keeping in mind that this is a concert hall, arrangement of green barriers is deemed to be necessary. Additional measures may be required later during operation in case monitoring reveals expedience of the limit or complaints from the resident received. 	n/a	n/a
Littering	Along the new road	Possible negative impact on wildlife, Water pollution, Aesthetic impact	<ul style="list-style-type: none"> Community will be informed of the level of fines that littering incurs; Awareness raising in proper waste disposal (no littering, no fly tipping); Installation of signage as a part of a roadside litter prevention program, educating the community that littering is illegal, fines apply and behaviours are monitored. The signs may be suitable for placement in a series of two to four signs at 10 km intervals to repeat the message in different ways; Cleaning up will be provided. 	Road Maintenance Contractor	RD

Activity	Location	Issue	Mitigation measure	Responsible authority (implementation)	Responsible agency (monitoring)
Status of biodiversity	Along the new road	Impact on vegetation, Road kills of animals	<ul style="list-style-type: none"> Faded plants will be removed, replaced with new saplings; Records of accidents will be kept; If accident hot spots with large mammals are identified, appropriate protective measures will be elaborated (e.g. reflectors /local fencing, warning signs, speed reduction). 	Road Maintenance Contractor	RD
Traffic	Along all road sections	Accidents due to winter typical hazards (snow, ice, fog)	<ul style="list-style-type: none"> Warning signs will be installed. 	Road Maintenance Contractor	RD
Presence of the road structure, traffic redirection	Along all road section	Restricted access because of the highway acting as a barrier, Safety issues, impact on non-motorized transport	<ul style="list-style-type: none"> Smooth operation of underpasses, overpasses, road junctions, and secondary roads within the highway area will be ensured. 	Contractor, supervision by RD	RD

Table 72. Monitoring Plan

Issue	What parameter is to be monitored?	Where is the parameter to be monitored?	How Is the parameter to be monitored?	When is the parameter to be monitored? (Frequency)	Institutional responsibility
CONSTRUCTION PHASE					
Waste water (if applicable)	Quality parameters of waste water from construction camps and portable sites, according to relevant standards	At construction camps (if available) and portable facilities at work sites	Inspection of wastewater units, latrines and septic tanks	Frequency defined by Georgian Environmental standards	RD, Construction Supervision
Community tension and disruption	Satisfaction/disturbance level of the residents	Camp (if available), Construction sites	Observation, surveys	Regular frequency or when changing operations	RD, Construction Supervision
Impact on topsoil	Striping of the topsoil Stockpiling, Protection from erosion and washing away Reintroduction	Worksite	Inspections; observation	During removal of the topsoil layer and preparation of the sites, After stockpiling, After completion of works – during reintroduction	RD, Construction Supervision
Oil/fuel spills	Oil/fuel spills	Worksite, car maintenance, servicing area (if available)	Inspections; observations	Unannounced inspections during construction	RD, Construction Supervision

Issue	What parameter is to be monitored?	Where is the parameter to be monitored?	How Is the parameter to be monitored?	When is the parameter to be monitored? (Frequency)	Institutional responsibility
Impacts created by material transport (stone, sand and gravel)	Are the truck loads covered or wetted; Compliance with the Contractor's Method Statement (restricted working hours; haul routes) dust suppression methods where required	Worksite/haul routes	Supervision	Unannounced inspections during work	RD, Construction Supervision
Impacts on trees near the working area	Are the trees located close to the project area protected by fence.	At sites where trees and forests are located along the construction site.	Supervision	After begin of construction works at the respective site	RD Construction Supervision
Impact on fauna	Injury cases	Along alignment	Visual inspection	After begin of construction works	RD Construction Supervision
Air pollution from improper maintenance of equipment/ machinery (general)	Exhaust emissions, dust	At site	Visual inspection, measurements of exhaust emissions	Unannounced inspections during construction works	RD Construction Supervision, MENRP
Dustiness	Visual presence of dust	At construction sites	Visual monitoring	Regularly during construction	RD, Construction

Issue	What parameter is to be monitored?	Where is the parameter to be monitored?	How Is the parameter to be monitored?	When is the parameter to be monitored? (Frequency)	Institutional responsibility
					Supervision
Contamination of surface water during construction – Supsa, Sepa, tributaries	Suspended solids, organic compounds, lubricants, fuel, solvents, heavy metals, pH value, mineral oils	Sampling downstream the worksite	Water quality analysis	During construction works near in the water Unannounced inspections during works near watercourses	RD, Construction Supervision
Contamination of soil during construction	Heavy metals and greases and oils	Agricultural land	Soil quality analysis	One month before the commencement of works. During construction - quarterly.	RD, Construction Supervision
Material supply Concrete production	Obtaining valid operation license or purchasing from licenced provider	Asphalt /concrete plant (if available)	Inspection	Before work begins	RD, Construction Supervision
Material supply Borrow areas	Obtain a licence for material extraction	Sand and gravel borrow pit	Inspection	Before work begins	RD, Construction Supervision
Damage to irrigation and other	Visual damages	Agricultural lands	Visual observations	Weekly	RD, Construction Supervision

Issue	What parameter is to be monitored?	Where is the parameter to be monitored?	How Is the parameter to be monitored?	When is the parameter to be monitored? (Frequency)	Institutional responsibility
infrastructure					
Material production/ extraction	Asphalt/concrete plant - possession of official approval or valid operating license	Asphalt /concrete plants (if available)	Supervision inspection	before work begins	RD, MENRP
Material production/ extraction	Stone quarry – availability of licence	Quarry	Supervision inspection	before work begins	RD, MENRP
Material production/ extraction	Sand and gravel borrow pit - possession of a license	Sand and gravel borrow pit	Supervision inspection	before work begins	RD, MENRP
Transportation	Traffic management - hours and alignments selected	Job site	Supervision inspection	Regular inspections during work	RD, Construction Supervision
Possible loss or damage to cultural resources in case of Chance Finds	Presence of chance finds	Construction site, during excavation works	Permanent archaeological supervision during earth works	During earth works	Construction Contractor Archaeologist-Supervisor
Vibration (whether	Vibration levels	Job site	Supervision,	Regular inspections during	RD,

Issue	What parameter is to be monitored?	Where is the parameter to be monitored?	How Is the parameter to be monitored?	When is the parameter to be monitored? (Frequency)	Institutional responsibility
appropriate)			observations	work and on complain	Construction Supervision
Noise disturbance to population and wildlife	Noise levels	Worksite, nearest residential areas, natural habitats	Mobile noise meter	Once per week and on any complaint	RD, Construction Supervision
Traffic disruption	Existence of traffic management plan	At job site	inspection; observation	Before works start; once per week at peak periods	RD, Construction Supervision
Workers safety	Protective equipment; organization of bypassing traffic	Work site	inspection	Regular inspections during work	RD, Construction Supervision
Slope stability	Status of slopes	Sensitive areas	Stability , identification of visual traces of possible erosion	Seasonally after adverse weather events(storm, gale)	RD, Construction Supervision
Impact on planted areas	Status of vegetation	Planted vegetation areas	Visual control	Seasonally	RD, Construction Supervision
OHS	Use of personal protective equipment (PPE) relevant to	Worksite	Inspection; interviews; comparisons with the	Unannounced inspections during	RD, Construction

Issue	What parameter is to be monitored?	Where is the parameter to be monitored?	How Is the parameter to be monitored?	When is the parameter to be monitored? (Frequency)	Institutional responsibility
	the task; Training records; Organization of traffic on the construction site Keeping to the safety rules while working on height		Contractor's method statement	construction and upon complaint	Supervision
OPERATION PHASE					
Road safety	Proper signage and traffic control arrangements in place	Entire length of constructed section	Inspection	Recurrent	RD
Adequate operation and maintenance of drainage and retention systems	Drainage/retention infrastructure in good technical condition and cleaned regularly	Entire length of constructed	Inspection	Recurrent	RD
Environmental performance during maintenance works	Temporary on-site storage of construction materials and waste organized to prevent environment pollution; Final disposal of construction waste and excess material into	Maintenance sites	Inspection	During conduct of maintenance works	RD

Issue	What parameter is to be monitored?	Where is the parameter to be monitored?	How Is the parameter to be monitored?	When is the parameter to be monitored? (Frequency)	Institutional responsibility
	designated locations; Conduct of maintenance works in adequate seasonal and weather conditions; Appropriate installation of traffic regulation and warning signs.				
Regular maintenance and periodic replacement of greenery within the alignment corridor	Trees planed for compensation of removed plants and grass seeded for slope stabilization properly safeguarded, watered as needed, and replaced to substitute dead plants.	Greened areas within the RoW	Inspection	Recurrent	RD
Livelihood restoration of project-affected households and communities	Project-affected individuals, households and communities re-gained streams of income and quality of life no worse than prior to the project implementation	Settlements of the project-affected municipalities	Inspection, Interviews, Review of statistical data	Medium-term post-project	Administrations of project-affected municipalities

9.2. COST ESTIMATE OF ENVIRONMENTAL MITIGATION MEASURES

Approximate cost estimates for mitigation measures based on the unit cost for similar road project are given below. Comprehensive cost estimate will be provided as an part of the BoQ for the project.

Table 73. Rough cost estimate for mitigation measures and monitoring for selected alternative

Description	Cost (LARI)
- Dust suppression by spraying water	158.655,79
- Seeding and sodding works on slopes	158.655,79
- Planting and landscaping works within the RoW	158.655,79
- Noise barriers: Provisional Sum	2.100.000,00
- Retention chamber for liquids. Operation Phase	8.722,03
- Monitoring quality parameters (air quality, water) (each sampling*1 site)	1.380,60
- Noise monitoring (1 sampling)	276,12
- Monitoring during construction (biodiversity) (1 year)	27.612,00
- Monitoring during operation (biodiversity) (1 year)	69.030,00
Total cost	2.682.988,12

Monitoring will comprise visual monitoring and control. The costs of monitoring will be covered by salary of EHS officer of contractor. Expenses related to measurements (water and air quality control) will depend on conditions of the contract signed with service provider.

10. PUBLIC CONSULTATION AND DISCLOSURE

The ESIA process includes public participation, consultation and focus group discussions to help RD achieve public acceptance of the Project. The consultation process is to follow IFIs safeguard requirements and relevant national regulations.

The major approach and principles for public engagement and consultations during the ESIA includes:

- Development and implementation of grievance mechanism to receive and resolve concerns and grievances from stakeholders.
- Consultation with affected people and informed participation as early as possible and throughout the project implementation.
- Consideration of the consultations carried out during feasibility study stage of the Project
- Disclosure of draft ESIA and organisation of public meeting no earlier than 50 and no later than 60 days from disclosure.
- Consultations with expert consultation, meetings and consultations with RD and MENRP – as appropriate.

Meetings and consultations with local community representatives in the project impact corridor were carried out by social survey team in August 2016, December 2016.

General information about the project, layout of suggested alignments, objectives of environmental and social impact assessment and basics of resettlement procedure have been communicated.

Main issues raised during the meetings were related to possible restriction of free movement, noise and dust impact during construction as well as resettlement/impact compensation issues. Employment issues and possibility of being employed were mentioned by all participants. Everybody was unanimous that proper compensation for land and structures is to be paid.

First meeting with community was organised on February 9, 2017. Minutes of the meeting are enclosed (see Annex 7)

Other meetings with communities will be conducted in the project impact area at the *Draft Final Report disclosure stage*, to inform the public about the likely impacts of the

project and the way in which they will be mitigated, and to obtain their support to the measures as far as possible. Not scheduled yet.

The draft ESIA report will be posted on the website of the RD Hard copies of the document were made available at the offices of local self-governments located within the project implementation area.

The RD will organize a public consultation meeting to discuss the draft ESIA report as well as the draft Resettlement Action Plan (RAP). Information about the venue, date and time of the meeting will be published in the national coverage newspaper. Other methods – emails, direct contact will also be used. All stakeholders (including, local community, representatives of local administration, NGOs, Getinsa-Payma Eurostudios, RD and MENPR) will be invited.

Feedback from stakeholders will be considered and incorporated in the final version of the ESIA report.

Note: Two meetings in RD office with participation of EIB and RD representatives, design team and environmental and social specialists (Gamma Consulting) were held on 30.01.2017 and 13.02.2017. Technical/design issues as well as environmental and social aspects of the project were discussed. Comments received from the EIB experts have been considered in the report.

11. CONCLUSIONS

The present ESIA revealed that there will be both negative and positive impacts due to the construction activities and normal operations of the road in case of all suggested alignments. (Note: On feasibility stage of the project, Zero alternative was excluded from evaluation as non-advisable).

Construction related activities will have impact on the natural drainages, generation of excess materials, noise and air pollution, impact on surface water quality, biodiversity and protected areas, temporary restriction of movement and hindered accessibility, resettlement and land acquisition needs.

Impacts during operation will include noise, emissions and waste generation. Certain risk of impact on avian fauna and water quality is worth to mention.

Expected negative impacts can be managed by implementation of mitigation measures and monitoring of their efficiency.

The positive impact of the Project will be less congestion, improved traffic safety and accessibility, short term employment possibilities for local community.

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ANNEX 1. METHODOLOGY

BASELINE DATA GATHERING METHODOLOGY

Botanical and faunistic surveys

The assignment consisted of a review of primary and secondary data (government and consultant reports, etc.). Botanical and fauna surveys were made. Field works were performed by biodiversity team (botanists and fauna specialists) in August and October 2016.

The objective of the botanical study was to identify plant communities within the section of interest, reveal sensitive populations and, if found, provide quantitative characteristics thereof. With consideration of expected direct and indirect impact, the corridor of 100 m on each side of the centreline was surveyed. The method of survey was walkover.

The main types of plants, as well as composition, distribution, dominant species, biome sensitivity and commercial value of plants were assessed. The presence of endemic, rare and other protected species in the project impact zone was identified.

Fauna field survey was organised with the purpose of verifying the data obtained from the literature on the animal species composition and areas of occurrence. A simple methodology of surveying including registration of animal footprints, droppings and dwellings was applied to collect information on key species of mammals and birds in the project impact area.

Negative impacts of road construction and operation were evaluated according to the main principles indicated in the Law on the Wildlife, the Law on the Red List and the Red List of Georgia. Along with the national legislation/ regulations, international requirements (such as the EBRD policy, the World Bank operation procedures, etc.), and the EU Directives to which Georgia is a party were taken into account.

Soil pollution

Evaluation of adverse impacts on soil and soil pollution was performed according to the Georgian laws and regulations (the law applicable to the largest extent is the Law on the Soil Protection).

For identification of the background quality of the soil along the road, samples were collected (October 2016). Taking into account that the area is mostly rural and no significant sources of pollution, except for the road itself are available, four average samples were collected. The samples were collected from the sampling depth of 0-10cm. The total amount of soil collected from one site was 1 kg. Prior to sampling, the sampling spots were cleared of grass and stones. Samples were collected in plastic bags, labelled and delivered to the lab for testing. The samples are dried, averaged and sieved.

Methods of soil analysis

Cu, Zn, Pb, Ni, Co, Co, Cd	ISO 11047, ISO 11466 - Aqua Regia extract Determination of Cu, Mn, Fe, Mn, Co, Pb, Cd, Ni, Zn, Cr, Ni. Al
As	ISO 2590 - General method for the determination of arsenic – Silver diethildithiocarbamate photometric method

The sample analysis revealed that concentration of all metals is below relevant maximum allowable concentrations adopted in the EU.

Water sampling

Water from Supsa and Sepa rivers was sampled for identification of the background water quality. The samples were collected in 1.5-liter capacity plastic bottles. 1 liter glass bottles were used for Total Petroleum Hydrocarbon analysis of water. Samples were labelled and delivered to the lab the same day. Analyses were performed in compliance with the ISO and EPA standards.

Methods of surface water analysis

Parameter	Method
pH	ISO 10523-2008
Conductivity	ISO7888:1985
Cl	GOST 23268.17-1978
HCO ₃	GOST 23268.1-91
SO ₄	ISO 9280-1990
K	ISO 9964-3-1993
Ca	GOST 23268.5-1978

Parameter	Method
Mg	GOST 23268.5-1978
Na	ISO 9964-3-1990
DO	ISO 5814-72
Total N	ISO 7890-82
Total P	ISO 6878-04
TPH	EPA 418.1-1997

Samples were analysed by Gamma lab.

IMPACT ASSESSMENT METHODOLOGY (CRITERIA)

Impact Assessment Methodology

The impact of the project on the physical, biological and socio-economic environment has been assessed using methodology described below.

Identification of Impacts - The impact assessment process involves identification of activities and potential impacts (environmental and social environment) resulting from each activity at all phases (preparation, construction, operation and decommissioning) of the project as well as planned routine activities; planned non-routine activities; unplanned or accidental events. The types of possible impact are defined as follows:

- Negative – an impact that is considered to represent an adverse change from the baseline, or introduce a new undesirable factor;
- Positive or beneficial – an impact that is considered to represent an improvement to the baseline or introduces a new desirable factor;
- Direct/ primary – an impact that results from direct interaction between a planned activity and receiving environment;
- Secondary – impacts that follow on from the primary interactions between the project and environment as a result of subsequent interactions within the environment;
- Indirect – impacts that result from other activities that are encouraged to happen as a consequence of the project (e.g. new business set up to cater for increased traffic on roads);
- Cumulative – impacts that act together with other impacts, from the same or other projects, to affect the same environmental or social resource or receptor;
- Short-term – impacts that are predicted to last only for a limited period (e.g. during construction) but will cease on completion of the activity, or as a result of mitigation/reinstatement measures and natural recovery (e.g. temporary employment of unskilled workers during construction);
- Long-term – impacts that will continue over an extended period, but cease when the project stops operating. These will include impacts that may be intermittent or repeated rather than continuous if they occur over an extended time period;
- Permanent – impacts that occur during the development of the project and cause a permanent change in the affected receptor or resource (e.g. the destruction of a cultural artefact) that endures substantially beyond the project lifetime;

- Accidental – impacts that result from accidental (unplanned) events within the project or in the external environment affecting the project (e.g. landslide). In these cases the probability of the event occurring is considered.

Development of mitigation measures. The measures to avoid, eliminate, reduce or compensate identified impacts are developed. Part of mitigation measures is inherent in design; others, are identified in the ESIA process. The mitigation measures are tracked through to the Project Commitments Register. Mitigation measures cover high and medium impacts. A hierarchy of options for mitigation has typically been explored as follows.

- Avoidance at source – remove the source of the impact
- Abatement at source – reduce the source of the impact
- Attenuation – reduce the impact between the source and the receptor
- Abatement at the receptor – reduce the impact at the receptor
- Remediation – repair the damage after it has occurred
- Compensation/offsetting – replace in kind or with a different resource of equal value.

Note: according to the good practice compensation/offset does not automatically make an impact 'acceptable'.

Residual impacts and defining significance. Any impacts remaining after mitigation measures have been applied are considered residual impacts. The significance level of the residual impact is assessed as a combination of: importance/sensitivity of the receptor and magnitude of the impact. To allow assessment of impact significance, tables have been specifically developed for this project to define the importance/sensitivity of receptor and the magnitude of a potential impact. Significance is ranked in four categories: high, medium and low adverse, and beneficial. The same rankings principle is used for both environmental and social residual impacts..

Importance/sensitivity of the receptor. The importance/sensitivity of receptor is defined taking into account such matters as its local, regional, national or international designation, importance to the local or wider community, ecosystem function or economic value. Importance/sensitivity of the receptor is determined on A–E tiered scale, where A = very low; B = low; C = medium; D = high; and E = very high.

Magnitude of Impact. Magnitude encompasses all dimensions of predicted impact including:

- nature of the change (what is affected and how)
- size, scale or intensity
- geographical extent and distribution
- duration, frequency and reversibility.

Project-specific magnitude tables have been developed for each impact. The magnitude of the impact is determined on 1–5 tiered scale. Where 1 = very low; 2 = low; 3 = medium; 4 = high; 5 = very high.

Note: Where an impact meets criteria in more than one level of impact, it is categorised according to the highest level.

Impact significance assessment tables. Each topic has two associated tables, one indicating importance/sensitivity of receptors and the other indicating magnitude of impact.

Soil and ground conditions assessment criteria:

Receptor Importance/ Sensitivity	Ranking	Examples
Very low	A	Unused land Geological risks in the area are not registered
Low	B	Land used for grazing by roaming graziers
Medium	C	Agricultural land used for cereals; Land used for permanent grazing
High	D	Land used for fruit or other high value crops; Sites valued or designated for protection on the grounds of geology or ecology at national level; Soils with formation rates substantially lower than the moderate soil loss tolerance rate vulnerable to erosion, even when reinstated
Very high	E	Houses or communities close enough to be impacted by project related erosion or ground movement; Sites of international importance/designated for protection at international level on geological or ecological grounds

Ranking of magnitude of predicted impacts on soils and ground conditions

Magnitude	Ranking	Examples
Very Low	1	No detectable effect on soils or ground conditions; Spill or accidental event that causes immediate area damage only and can be restored to an equivalent capability in a period of days or up to a month, i.e. full restoration is achieved as a result of immediate clean-up operations
Low	2	Minor losses of productivity expected to last up to six months after reinstatement; Water remains in surface depressions for less than three months after construction; Soil creep; Spill or accidental event leading to immediate area or localised damage that may take up to six months to restore to pre-existing capability/function
Medium	3	Minor losses of productivity expected to last between 6 and 12 months after reinstatement; Water predicted to remain in surface depressions less than one year after construction but more than three months; Soil erosion evident but not leading to visible gully

		formation; Spill or accidental event leading to immediate area or localised damage that may take between six months to one year to restore to pre-existing capability/function.
High	4	Moderate losses of productivity expected to last between one and five years after reinstatement; Water predicted to remain in surface depressions for between one and five years after construction; Soil erosion predicted to lead to visible gully formation; Landslip or ground subsidence not extending outside the working area; Spill or accidental event leading to localised damage that cannot be restored to pre-existing capability/function within one year.
Very High	5	Moderate or major losses of productivity predicted to last more than five years after reinstatement; Water predicted to remain in surface depressions permanently Rill and gully formation predicted to be extensive with potential impacts on neighbouring land ; Landslip, ground subsidence or ground collapse ; Spill or accidental event leading to widespread damage that cannot be restored to pre-existing capability/function within one year

Landscape and visual impact

Importance/Sensitivity of Visual Receptors and Landscapes

Receptor Importance/ Sensitivity	Ranking	Examples
Very low	A	<u>Landscape receptors</u> Landscape that is dominated by derelict, disused or degraded man- made structures and/ or which is not valued by local communities or others; A natural landscape severely degraded or modified by cultural land uses, such as intensive arable or pastoral agriculture <u>Visual receptors</u> Receptors with no or very limited views
Low	B	<u>Landscape receptors</u> A landscape with few intact or distinctive natural or historic features but which is valued at

		<p>settlement/district/municipal level (e.g. attracts local visitors);</p> <p>Landscape with large, dominant, numerous and/or noisy modern man- made features;</p> <p>A natural landscape degraded or modified by cultural land uses such as arable or pastoral agriculture</p> <p><u>Visual receptors</u></p> <p>People at their place of work, industrial facilities</p>
Medium	C	<p><u>Landscape receptors</u></p> <p>Landscape with a number of distinctive natural landforms or historic/traditional features that add character and where modern man- made features may be present but do not significantly degrade the landscape character;</p> <p>Anthropogenic landscape which has a more traditional, less intensive character and which has a higher sensitivity to change due to the presence of features such as gardens, traditional or unimproved pastures;</p> <p>A settlement which is valued at provincial /regional level (e.g. attracts tourists from province/region)</p> <p><u>Visual receptors</u></p> <p>People travelling through or past the affected landscape in cars, on trains or other transport routes where higher speeds are involved and views sporadic and short-lived;</p> <p>People engaged in outdoor recreation where enjoyment of the landscape is incidental rather than the main interest</p>
High	D	<p><u>Landscape receptors</u></p> <p>Landscape valued or designated for its landscape importance at national level (e.g. attracts tourists within the country);</p> <p>Landscape with a high degree of naturalness or dominated by traditional/historic landscape features and an absence of modern man- made features</p> <p><u>Visual receptors</u></p> <p>Occupiers of homes;</p> <p>Users of outdoor recreational facilities where</p>

		landscape value is important or integral to that activity; Communities who have views of the landscape that they value highly
Very high	E	<u>Landscape receptors</u> Landscape valued or designated for its landscape importance at international level ; Wilderness landscape or other landscape with a very high degree of 'naturalness', remoteness/ isolation and without any man-made features <u>Visual receptors</u> Homes and hotels purposely positioned/placed to take advantage of a view

Ranking of Magnitude of Assessed Impacts on Visual Receptors and Landscape Character

Magnitude	Ranking	Examples
Very Low	1	Small or imperceptible change in components of the landscape or introduction of a new element that is in keeping with the surroundings or no appreciable change to existing views
Low	2	Development would result in minor changes in views without affecting overall quality of views Minor permanent change in the landscape – new element is only slightly out of character, existing landscape quality is maintained; Temporary change where baseline landscape character is predicted to be restored within 1–2 years
Medium	3	The development would result in a noticeable change in the existing view and or would cause a noticeable change in the quality and/or character of the view; Permanent changes in the landscape predicted in a localised area; new element may be prominent, but not significantly uncharacteristic; Temporary changes where baseline landscape character is predicted to be restored in 2–5 years
High	4	The development would result in a prominent change in the existing view and/or would cause a prominent change in the quality and/or character

		<p>of the view;</p> <p>Permanent changes over an extensive area and/or new development that will result in significant negative change to the existing landscape character (e.g. because of loss of key elements of the existing landscape, or introduction of elements that are uncharacteristic compared to existing features);</p> <p>Temporary changes where baseline landscape character is predicted to be restored in 5–10 years</p>
Very High	5	<p>Development will dominate the view or result in a dramatic change to the quality and/or character of the view;</p> <p>Permanent change over an extensive area and/or introduction of elements that will fundamentally change the landscape character;</p> <p>Temporary changes where restoration of baseline landscape character is predicted to take longer than 10 years</p>

Surface water

Importance/Sensitivity of Surface Water Resources and Users

Receptor Importance/Sensitivity	Ranking	Examples
Very low	A	<p>Highly polluted watercourses, e.g. those with severely restricted or impoverished ecosystems or biology restricted to pollution tolerant species</p> <p>Watercourses with no community use or only used for low grade industrial use;</p> <p>Fish are absent or only present on a sporadic basis</p>
Low	B	<p>Watercourses with some pre-existing pollution that limit their use or value for wildlife or communities;</p> <p>Low-level use of water for agriculture/ industry;</p> <p>Fish is present in low numbers</p>
Medium	C	<p>River used for recreational fishing or bathing;</p>

		Water used extensively for agriculture; Watercourse supports a good fish population
High	D	Watercourse of high quality, e.g. close to its natural state or close to that expected for an unpolluted river; Watercourse that is an important constituent of, or supports, an area or a species value or designated for its ecological importance at national level; Watercourse used for drinking or domestic use, e.g. washing and cooking, by a small number of users; Watercourse supporting fish; Watercourse supporting a commercial or subsistence fishery; Area at risk of flooding
Very high	E	Watercourse of very high quality, e.g. in its natural state or corresponding to that expected for an unpolluted river; Watercourse that is an important constituent of, or supports, an area or a species valued or designated for its ecological importance at national/international level; Watercourse used for drinking or domestic use, e.g. washing and cooking, by a large number of users; Watercourse that supports a very good fishery

Ranking of Magnitude of Predicted Impacts on Surface Water

Magnitude	Ranking	Examples
Very Low	1	Direct or indirect impacts largely not discernible; No effect on users;
Low	2	Project effluent/discharge within effluent quality standards and does not breach ambient environmental quality standard for the receiving watercourse; Physical disturbance of watercourse limited to immediate working area;

		<p>Visible sediment and obscuration of watercourse bed observed for less than one week <15% decrease of downstream river flow rate for no more than one week;</p> <p>Minor shift away from baseline conditions.</p> <p>Direct or indirect impacts will be discernible but use and value of resource not impacted. Rapid return to baseline conditions on completion of project activities</p>
Medium	3	<p>Visible sediment and obscuration of watercourse bed observed for 1–3 weeks after completion of construction <15% decrease of downstream river flow rate for more than one week or 15–40% decrease of downstream river flow rate for no more than 1 week;</p> <p>Direct or indirect impacts to users or the value of the resource such that character/composition/ attributes of the resource temporarily changed and/or use temporarily affected or restricted but the overall integrity of the resource is not threatened.</p> <p>Guide timescale for return to baseline conditions: 3–6 months depending on receptor</p>
High	4	<p>Project effluent/discharge breaches effluent quality standards or ambient environmental quality standard for the receiving water body but rapidly diluted;</p> <p>Visible sediment and obscuration of watercourse bed observed for more than three weeks but less than three months after construction</p> <p>15–40% decrease of downstream river flow rate for more than one week or >40% decrease of downstream river flow rate for no more than one week Project causes temporary flooding over a small area;</p> <p>Direct or indirect impacts to other users or the value of the resource such that character/ composition/ attributes of the resource post development are changed, threatening the overall integrity of the resource, or use by others significantly restricted on a temporary</p>

		basis.
Very High	5	<p>Project effluent/discharge breaches effluent quality standards or ambient environmental quality standard for the receiving water body and receiving water body has poor dilution capacity;</p> <p>Visible sediment and obscuration of watercourse bed observed for more than three months after construction >40% decrease of downstream river flow rate for more than one week;</p> <p>Project causes temporary flooding over a large area;</p> <p>Total loss or very major alteration to key elements/features of watercourse such that post development character/composition/ attributes will be fundamentally changed and may be lost altogether or use by others permanently impacted.</p>

Groundwater

Importance/Sensitivity of Groundwater Resources and Users

Receptor Importance/ Sensitivity	Ranking	Examples
Very low	A	Non-aquifer (soil/geology with no groundwater resource) very low quality, groundwater/ groundwater not used by community
Low	B	Groundwater with some pre-existing pollution that limits its use or value for wildlife or communities
Medium	C	Groundwater used for industrial purposes or agriculture; Groundwater that provides base flow to surface watercourses used for recreational fishing or bathing; Springs and wells
High	D	Groundwater of high quality; Groundwater resource that is an important constituent of, or supports, a wetland designated for its ecological importance at national level; Groundwater that provides base flow to a

		<p>watercourse defined as a high value receptor in Table 3-6;</p> <p>Area of Influence;</p> <p>Area at risk of flooding;</p> <p>Groundwater used for health/spa treatments;</p> <p>Aquifer used for drinking or domestic use (e.g. washing, cooking, bathing) by a small number of users</p>
Very high	E	<p>Watercourse or groundwater resource that is an important constituent of, or supports, a wetland designated for its ecological importance at international level;</p> <p>Groundwater that provides base flow to a watercourse defined as a very high value receptor;</p> <p>Aquifer used for drinking or domestic use (e.g. washing, cooking, bathing) by a large number of users</p>

Ranking of Magnitude of Predicted Impacts on Groundwater

Magnitude	Ranking	Examples
Very Low	1	<p>Direct or indirect impacts largely not discernible</p> <p>No effect on users.</p>
Low	2	<p>Groundwater abstraction does not exceed recharge rate</p>
Medium	3	<p>Groundwater abstraction exceeds the natural low flow groundwater recharge rate but users and groundwater levels within any receiving water body, river or wetland are not affected.</p>
High	4	<p>Groundwater abstraction exceeds the natural high flow groundwater recharge rate leading to minor changes of groundwater levels within any receiving water body, river or wetland but not to saline intrusion;</p> <p>Project causes temporary flooding over a small area;</p> <p>Direct or indirect impacts to other users or the value of the resource such that character/ composition/attributes of the resource such that post-development character/composition/attributes changed or use by others significantly restricted</p>

		on a temporary basis
Very High	5	<p>Groundwater abstraction exceeds the natural high flow groundwater recharge rate leading to significant depletion of groundwater levels within any receiving water body, river or wetland and/or to saline intrusion;</p> <p>Project causes temporary flooding over a large area;</p> <p>Total loss or very major alteration to key elements/features of watercourse or aquifer such that post development character/ composition/attributes will be fundamentally changed and may be lost altogether or use by others permanently impacted.</p>

Ecology

Importance/Sensitivity of Ecological Receptors

Receptor Importance/ Sensitivity	Ranking	Examples
Very Low	A	<p>Commonly occurring habitats and species, not subject to significant decline;</p> <p>Habitats that are already disturbed or which are periodically subject to natural disturbance (e.g. arable fields or areas affected by existing infrastructure/development)</p>
Low	B	<p>Sites of local biodiversity value but not intact, fragile or unique;</p> <p>Wildlife corridors;</p> <p>Habitats that recover quickly following disturbance (i.e. habitats comprising species that readily re-colonise disturbed areas);</p> <p>Widespread common species with low biodiversity value and not listed on the CITES, IUCN or Georgian Red List Species.</p>
Medium	C	<p>Sites of regional importance;</p> <p>Habitats that are suffering significant decline at a regional level;</p> <p>Habitats of high species or habitat diversity or 'naturalness' Habitats that are capable of unassisted recovery to natural conditions following</p>

		<p>disturbance, although this may require several years (e.g. reed swamps and other habitats where growing conditions are favourable);</p> <p>Regionally important (in the country context) population of a species, either because of population size or distributional context;</p> <p>Species in significant decline at regional level;</p> <p>Species listed as rare at country level (i.e. listed in the country Red Data Book) or species listed on the IUCN Red List that either occur along the new alignment but are unlikely to be affected by it (e.g. raptors foraging over, but not breeding on, the route), or are unlikely to be present.</p>
High	D	<p>Sites designated for protection at national level;</p> <p>Habitats recognised as intact or areas recognised as having high environmental value (e.g. key bird areas);</p> <p>Habitats that are unlikely to return to natural conditions without some intervention (such as re-seeding or planting), but which are capable of assisted recovery;</p> <p>Species listed as rare at country level (i.e. listed in the country Red Data Book) or species listed on the CITES, IUCN that have either been recorded along the new alignment or are likely to be present, based on known distribution and habitat availability, and are likely to be affected by it.;</p> <p>The presence of a nationally important population of a species along alignment or which could be affected indirectly</p>
Very high	E	<p>Sites of international importance/designated for protection at international level;</p> <p>Areas recognised as intact and fragile and unique or areas recognised as having high environmental value (e.g. key bird areas);</p> <p>Habitats that are very difficult to restore to natural conditions (even with biorestoreation);</p> <p>Species that are rare at an international level;</p> <p>Natural or critical habitat</p>

Ranking of Magnitude of Predicted Ecological Impacts

Magnitude	Ranking	Examples
Very Low	1	<p>Direct or indirect impacts on habitat and species largely not discernible;</p> <p>Less than 1% of a habitat is within the project area of influence</p>
Low	2	<p>Minor shift away from baseline conditions. Direct or indirect impacts will be discernible but underlying character/ composition/ attributes of baseline condition will be similar to pre-development circumstances/patterns;</p> <p>Minor disruption of behaviour or species interactions not impacting overall health/integrity of the population of the species;</p> <p>Affects a specific group of localised individuals within a population over a short time period (one generation or less), but does not affect other trophic levels or the population itself;</p> <p>Approximately 1–5% of habitat affected within the Project area of influence</p>
Medium	3	<p>Direct or indirect impacts to one or more key elements/ features of the baseline conditions (habitat and/or species) such that post-development character/composition/ attributes of baseline will be partially changed but the overall integrity of the habitat or species is not threatened;</p> <p>Affects a portion of a population and may bring about a change in abundance and/or distribution over one or more generation, but does not threaten the integrity of that population or any population dependent on it;</p> <p>Approximately 5–20% of a habitat is within the Project area of influence</p>
High	4	<p>Major direct or indirect impacts to key elements/features of the baseline conditions such that post-development character/composition/attributes will be fundamentally changed and the overall integrity of the habitat or species is threatened;</p> <p>Affects an entire population or species in sufficient magnitude to cause a decline in abundance and/or change in distribution beyond which natural recruitment (reproduction, immigration from unaffected areas) would not return that population or species, or any population or species dependent upon it, to its former level within</p>

		several generations; Approximately 20–80% of a habitat is within the Project area of influence; Introduction of alien invasive species
Very High	5	Total loss or very major alteration to key elements/features of the baseline habitat or a species such that post-development character/composition/ attributes will be fundamentally changed and may be lost altogether; Affects an entire population or species in sufficient magnitude to cause a permanent decline in abundance and/or change in distribution >80% of a habitat is within the project area of influence

Air quality

Importance/Sensitivity of Receptors for Air Emissions

Receptor Importance/ Sensitivity	Ranking	Examples
Very low	A	Areas where people would not normally be found; Grazing or unused land; Fauna not susceptible to dust emissions
Low	B	Areas where people might be expected to pass through, but exposure for any extended period is unlikely (e.g. nomadic graziers, workers in agricultural fields); Crops and vegetation with high tolerance of dust emissions, e.g. cereal, animal feed crops; Fauna of low susceptibility to dust emissions, e.g. highly mobile mammals.
Medium	C	Areas or buildings where occasional longer periods of exposure may occur; Crops and vegetation with moderate susceptibility to dust, e.g. crops with rough leaves; Fauna of moderate susceptibility/moderate tolerance of dust emissions.
High	D	Areas or buildings such as schools, offices, shops, markets where exposure will be substantial, but not constant; Crops, vegetation and fauna of high susceptibility/low tolerance of dust emissions, e.g. greenhouses, nurseries, horticulture and fruit crops; Ecological sites designated at national level.

Very high	E	Residential buildings (including hospitals) where near-constant presence of people is possible and long-term exposure to dust is likely; Crops, vegetation and fauna of very high susceptibility/very low tolerance of dust emissions; Ecological sites designated at international level
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Table 3-13: Ranking of Magnitude of Impacts of Emissions to Air

Magnitude	Ranking	Examples
Very Low	1	Project contributions plus existing background concentrations are <5% of the standards noted in the table above; No visible increase in dust levels; Temporary combustion emissions during construction
Low	2	Project contributions plus existing background concentration is 5–20% of the standards noted in the table above; Visible increase in dust levels not predicted to cause a nuisance, lead to complaints or adverse health impacts
Medium	3	Project contributions plus existing background concentration is 20–50% of the standards noted in the table above; Dust is a nuisance to people or may cause minor property, crop or ecological damage
High	4	Project/process contributions plus existing background concentration is >50% of the standards noted in the table above; Dust is a significant nuisance to people or will cause measurable but not significant health effects, or moderate property, crop or ecological damage
Very High	5	Project/process contributions plus existing background concentration is >70% of the standards noted in the table above; Dust is a very significant nuisance to people or will cause significant health effects or significant damage to property or crops

Noise

Importance/Sensitivity of Noise Receptors

Receptor Importance/ Sensitivity	Ranking	Examples
Very low	A	Project workforce; No other human receptors
Low	B	Other workers outside of the Project site and/or not engaged in Project work
Medium	C	Residents
High	D	Schools
Very high	E	Hospitals, homes for the elderly

Table 3-15: Ranking of Magnitude of Noise Emissions

Magnitude	Ranking	Examples
Very Low	1	During construction, total noise level (ambient and construction) raised by <5 dB(A) and less than 50 dB(A) outside dwellings between agreed daytime working hours and a limit of Leq, 1 hour 45 dB(A) at night;
Low	2	During construction, total noise level (ambient and construction) raised by <5 dB(A) or less than 55 dB(A) outside dwellings between agreed daytime working hours and a limit of Leq, 1 hour 45 dB(A) at night;.
Medium	3	During construction, total noise level (ambient and construction) raised by 5–10 dB(A) and more than 55 dB(A) outside dwellings between agreed daytime working hours and a limit of Leq, 1 hour 45 dB(A) at night;
High	4	During construction, total noise level (ambient and construction) raised by >10 dB(A) and more than 70 dB(A) outside dwellings between agreed daytime working hours and a limit of Leq, 1 hour 45 dB(A) at night;
Very High	5	During construction, total noise level (ambient and construction) raised by >10 dB(A) and more than 75 dB(A) outside dwellings between agreed daytime working hours and a limit of Leq, 1 hour 55 dB(A) at night;.

Vibration

Importance/Sensitivity of Receptors for Vibration

Receptor Importance/ Sensitivity	Ranking	Human Disturbance	Building Disturbance
Very low	A	Project workforce	Industrial structures and buildings; Heavy public buildings
Low	B	Other workers outside of the project site and/or not engaged in project work	
Medium	C	Residents	Multi-storey reinforced concrete building; Timber residential buildings
High	D	Schools	Block or brick work residential buildings
Very high	E	Hospitals	Light and prefabricated constructions; Historical buildings and archaeological sites; Buildings containing equipment sensitive to vibration, e.g. recording equipment

Ranking of Magnitude of Predicted Impacts from Vibration

Magnitude	Ranking	Human Disturbance	Building Disturbance
Very Low	1	Vibration unlikely to be perceptible	
Low	2	Vibration might be perceptible in the most sensitive for most vibration frequencies associated with construction	Cosmetic damage to building unlikely
Medium	3	Vibration might be perceptible	Damage to buildings possible at frequencies < 4hz
High	4	Likely that vibration	Damage to buildings

		will cause complaint, but can be tolerated if prior warning and explanation has been given	possible at frequencies <15hz
Very High	5	Vibration likely to be intolerable for more than a very brief exposure to this level	Damage to buildings possible at frequencies >15hz >0.6mm/s at an archaeological site

Cultural heritage

The cultural heritage assessment is based upon International Finance Corporation (IFC) Performance Standard 8.

Importance/Sensitivity of Cultural Heritage Assets

Receptor Importance/ Sensitivity	Ranking	Examples
Very low	A	Assets with very little or no surviving archaeological interest, e.g. sites that have been previously heavily damaged, or destroyed
Low	B	Designated and undesignated assets of local importance; Assets compromised by poor preservation and/or poor survival of contextual associations; Assets of limited value, but with potential to contribute to local research objectives, e.g. sites that have been ploughed and are under threat of continued destruction by ploughing
Medium	C	Designated or undesignated assets that are regionally important or contribute to regional research objectives
High	D	Assets protected under national legislation, sites that are on the protected monuments list Assets that can contribute significantly to acknowledged national research objectives
Very high	E	UNESCO World Heritage Sites designated for their cultural, historic or archaeological value (including nominated sites) Assets that can contribute significantly to acknowledged international research objectives

Unknown	-	The importance of the resource is not currently known, insufficient assessment has been carried out to determine this
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Table 3-19: Ranking of Magnitude of Predicted Impacts on Cultural Heritage Assets

Magnitude	Ranking	Examples
Beneficial/ no change		Sites that were previously unknown or known but not previously surveyed and where survey or research as a result of the Project is predicted to lead to an increase in information/knowledge of benefit to researchers. No material change to the site. Applies to sites located in the study corridor outside the direct footprint of the Project
Very Low	1	Very minor changes to archaeological materials, or setting (the visible environment around the site or feature) (guide: 1–10% of surviving deposits damaged or destroyed)
Low	2	Changes to key archaeological materials, such that the asset is slightly altered (guide: 10–25% of surviving deposits damaged or destroyed) Slight changes to setting
Medium	3	Changes to many key archaeological materials, such that the resource is clearly modified (guide: 25–50% of surviving deposits damaged or destroyed) Considerable changes to setting that affect the character of the asset
High	4	Change to most of the key archaeological materials, such that the resource is significantly altered (guide: 50–75% of surviving deposits damaged or destroyed) Comprehensive changes to setting
Very High	5	Change to majority or all of the key archaeological materials, such that the resource is totally altered (guide: 75–100% of surviving deposits damaged or destroyed) Widespread changes to setting
Uncertain	-	The extent of data on the site/feature, or the nature of construction activities does not enable a determination of likely effects to be made at this stage

Social impacts

Importance/Sensitivity of Social Receptors

Receptor Importance/ Sensitivity	Ranking	Examples
Very low	A	Individuals or households or communities that use affected resource(s) have access to nearby alternatives, the use of which does not cause adverse indirect impacts; Highly skilled and experienced labour 'pool'; Threats to health and well-being well understood by all adults who have experience of living and working in vicinity of pipeline construction and operations; No stakeholders expressed concern about the impact.
Low	B	Individuals or households or communities that use affected resource(s) have access to nearby alternatives, the use of which may cause limited adverse indirect impacts; Highly skilled labour 'pool', but lack relevant experience; Few stakeholders expressed concern about the impact in a small number of project affected communities
Medium	C	Some individuals/households depend on the affected resource(s) and there are no nearby alternatives; Limited skills in labour 'pool' with only limited experience; Some households and business owners/operators perceive that a change will affect their ability to maintain their livelihood, store of resources or quality for a significant time period (>1 year); A range of stakeholders expressed concern about the impact in some PACs
High	D	A community depends on the affected resource(s) and there are no nearby alternatives; Many households and business owners/operators perceive that the change will affect their ability to maintain their livelihood or quality of life to an unacceptable extent; A high level of concern was expressed about the impact by NGOs and many stakeholders in most

		of the PACs
Very high	E	<p>Many communities depend on the affected resource(s) and there are no nearby alternatives; Lack of skilled and experienced labour 'pool'; Many households and business owners/operators perceive that the change will affect their ability to maintain their livelihood or quality of life to an unacceptable extent and may have to leave the area/community; An extremely high level of concern was expressed about the impact by NGOs and a range of stakeholders in all PACs</p>

Ranking of Magnitude of Impacts of Land Acquisition

Magnitude	Ranking	Examples
Beneficial	-	N/A
Very Low	1	Short-term (<6 months) inconvenience/decrease in the ability of landowners and users to exploit their land not involving loss of income, reduction in economic opportunities or options for improvement of the standard of living of affected households or individuals in a PAC; Perception of possible missed opportunity to improve livelihoods or 'life chances'
Low	2	Temporary (<1 year) or intermittent negative changes to some aspects of the ability of landowners and users to exploit their land that do affect the livelihoods, economic opportunities or options for improvement of the standard of living of a limited number of affected individuals/households in a PAC, but to which most individuals/households are expected to be able to adapt relatively easily
Medium	3	Permanent reduction in the ability of landowners and users to exploit their land, such that economic displacement affects up to 20 individuals or households in a PAC; Households and individuals in a PAC may be able to adapt to the loss or change of use of land, but the transition period will be difficult for some households/individuals
High	4	Permanent reduction in the ability of landowners and users to exploit their land, such that economic

		<p>displacement affects more than 20 individuals or households in a PAC;</p> <p>Households/individuals in a PAC may be able to adapt, but the transition period will be difficult for most individuals/households;</p> <p>Physical displacement of up to 5 households in aPAC</p>
Very High	5	<p>Physical displacement of more than 5 households/businesses;</p> <p>Economic displacement affecting more than 50% of the households in a PAC The integrity of communities is threatened due to difficulties experienced by of a significant number of individuals/households in adapting to changes.</p>

Ranking of Magnitude of Impacts on Economy, Employment, Skills and Livelihoods

Magnitude	Ranking	Examples
Beneficial	-	<p>Increased ability of individuals, households, businesses or communities to maintain or improve livelihoods through enhanced job opportunities, job security and enhanced per capita incomes; Local business viability/opportunities;</p> <p>Harmonious and cooperative mutually beneficial working relationship with PACs</p>
Very Low	1	<p>Short-term (<6 months) inconvenience/decrease in business viability/opportunities and to households or individuals which pose an increased threat of loss of income, reduction in 'life chances' and options for improvement;</p> <p>Perception of missed opportunity to improve livelihoods or 'life chances'</p>
Low	2	<p>Temporary (<1 year) or intermittent negative changes to some aspects of the livelihoods and life chances/options for improvement of a limited number of individuals /households/businesses (including job opportunities, and income, access to markets for produce sales), but to which most individuals/households are expected to be able to adapt relatively easily;</p> <p>Some owners of businesses experience short-term (<1 year) financial loss, but recovery is likely in near future;</p> <p>Temporary decrease in household/individual incomes resulting from reduction of jobs or hours worked, but</p>

		recovery is likely in near future
Medium	3	Job losses and adverse effects on livelihoods in a community able to adapt and provide alternative job opportunities and reverse adverse livelihood changes in near - medium term (within 1 year of job losses)
High	4	Job losses and loss of livelihoods in small communities with limited alternative opportunities in near-medium term (within 1 year from job losses); Change that has a differential adverse effect on the livelihoods or job opportunities/'life chances' of vulnerable groups (disabled, elderly, internally displaced persons (IDPs)/refugees, female-headed households and those living below officially defined poverty levels); Community(ies) may be able to adapt to job losses and/or income reductions, but the transition period will be difficult for most individuals/households; Medium to long-term (>1 year) financial loss to owners of businesses where recovery may be difficult
Very High	5	Local businesses close due to loss of income or are transferred to other locations; Significant job losses and loss of livelihoods in communities (>30% of jobs or livelihoods) with no local alternative opportunities in near-medium term (within 1 year from job losses) other than out-migration; Widespread perception of adverse impacts and/or missed opportunities to improve quality of life, resulting in frustration and disappointment leading to increased out-migration and threats to community integrity and viability; Perceived permanent reduction in quality of life

Ranking of Magnitude of Impacts on Infrastructure and Services

Magnitude	Ranking	Examples
Beneficial	-	Increased ability of individuals, households or communities to maintain or improve livelihoods and 'life chances' through enhanced physical infrastructure
Very Low	1	Short-term changes in access to non-essential local social/physical infrastructure facilities/services, but acceptable alternatives are available
Low	2	Short-term changes in access to certain essential local social/physical infrastructure facilities/services, but acceptable alternatives are available

Medium	3	Restricted access to/receipt of non-essential local social/physical infrastructure facilities/services for a period of <6 months; Temporary damage to non-essential infrastructure
High	4	Restricted access to/receipt of essential local social/physical infrastructure facilities/services for a period of 6–12 months; Temporary damage to essential infrastructure
Very High	5	Permanent restricted access to/receipt of essential local social/physical infrastructure facilities/services; Permanent damage to infrastructure

Health impact assessment

Environmental Health Areas

Environmental Health Area (EHA)
Accidents/injuries: road traffic and community access to construction sites related injuries, spills and releases, community access to construction sites
Health services infrastructure and capacity
Exposure to potentially hazardous materials
Soil, water, sanitation and waste-related diseases
Non-communicable diseases. sexually transmitted infections
Social determinants of health (SDH)
Housing issues
Food and nutrition related issues
Zoonotic diseases
Vector-related disease

Each potential health impact has several different dimensions that were characterised to assist with determining impact significance and mitigation measures:

- Nature – direct, indirect, or cumulative
- Timing and duration – when (Project phase), i.e. construction, operations, decommissioning and how long (days, weeks, months, years, etc.)
- Frequency – the overall rate of occurrence within the defined time duration
- Extent – localities most likely to experience the projected impact (local, regional, national)
- Magnitude – intensity, particularly with regard to existing baseline conditions

- Significance – perception of risks by a potentially affected community
- Manageability or ability to influence risk responses ('proactive' or 'reactive').

Potential impacts on community health and safety were evaluated to determine severity using the criteria below

Health Impact Severity Classification

Potential Impact	Community Health Guidelines
Very high	Major explosion/release with direct impact to nearby communities
High	Major road traffic asset accident; Widespread social impact; Change in a morbidity outcome by 30% over baseline
Medium	Change in morbidity outcome by 10–30% over baseline; Adverse local social impact
Low	Some disruption to local operations for less than 24 hours; Health claims at local clinic, e.g. headaches, sneezing, cough, eye irritation
Very low	Isolated short term complaints from households, e.g. noise, odours, headaches, cough

The probability of each impact occurring is evaluated on a graduated scale with 1 = remote and 8 = relatively common. Combination of impact severity and probability of impact occurring combines to give the overall health risk, which is part of a separate evaluation.

Traffic and transport

Importance/Sensitivity of Receptors for Project Traffic and Transport

Receptor Importance/ Sensitivity	Ranking	Examples
Very low	A	Roads with no restrictions in relation to predicted traffic levels/traffic types; Disused footpath
Low	B	Roads with minor restrictions (width, surface condition, visibility etc.) in relation to predicted traffic levels/traffic types; Footpath or road used as a footpath used rarely by pedestrians
Medium	C	Roads with moderate restrictions (width, surface condition, visibility etc.) and where some difficulties

		are predicted accommodating the types of traffic predicted; Footpath or road used as a footpath used by pedestrians at least once a day
High	D	Roads with major restrictions (width, surface condition, visibility etc.) in some areas and where significant difficulties are predicted accommodating the types of traffic predicted (e.g. where pedestrians are forced to walk on the road due to restrictions); Footpath or road used as a footpath several times a day by pedestrians; Road side traders/markets with people in close proximity to moving traffic
Very high	E	Roads with major restrictions along all/part of the route and where significant difficulties are predicted accommodating the types of traffic predicted; Schools, hospitals or market stalls adjacent to the road; Footpath or road used as a footpath in constant use by pedestrians or by children to go to school or patients to go to hospital

Ranking of Magnitude of Predicted Impacts of Traffic and Transport

Magnitude	Ranking	Examples
Very Low	1	No measurable permanent or temporary increase in traffic, traffic congestion, delays or accidents; No night-time traffic No road or footpath closures or diversions
Low	2	An increase of less than 5% on existing traffic flows during construction or operation or project predicted no more than 15 two-way movements per hour or 50 two-way movements a day (i.e. per 24-hour period); No night-time traffic Minor increase in traffic congestion or delays; Minor increase in the risk of traffic accidents; Road or footpath closures or diversions impact individual houses rather than communities and /or involve minor roads or footpaths with low traffic volumes and/or are for no more than five days

Medium	3	<p>An increase of between 6 and 10% on existing traffic flows during construction or operation or Project predicted to generate no more than 29 two-way movements per hour or 99 two-way movements a day;</p> <p>Night-time traffic predicted but will pass individual houses rather than communities;</p> <p>Moderate temporary but no significant permanent increase in traffic congestion or delays;</p> <p>Moderate temporary but no significant permanent increase in the risk of traffic accidents;</p> <p>Road or footpath closures or diversions impact a single community and/or involve roads or footpaths with moderate traffic volumes and/or are for 5–10 days;</p> <p>Moderate temporary increase over existing levels in HGV movements on the road but no/minor permanent increase;</p> <p>Transport of hazardous substances that could cause health and safety or environmental damage if spilled following an incident;</p> <p>Project traffic may lead to deterioration in road condition or rails requiring minor repairs (e.g. filling in pot holes)</p>
High	4	<p>An increase of between 11 and 20% on existing traffic flows during construction or operation or 30 or more two-way movements per hour or 100 or more two-way movements a day;</p> <p>Night-time traffic predicted through villages or towns but where existing night-time traffic flows are high;</p> <p>High temporary but no significant permanent increase in traffic congestion or delays;</p> <p>High temporary but no significant permanent increase in the risk of traffic accidents;</p> <p>Road or footpath closures or diversions impact more than one community and /or involve roads or footpaths with high traffic volumes and/or are for more than 10 days;</p> <p>High temporary increase over existing levels in HGV movements on the road but no/minor permanent increase;</p>

		Project traffic may lead to deterioration in road condition requiring substantial repairs (e.g. resurfacing)
Very High	5	<p>An increase of more than 20% during construction or operation or Project predicted to generate 60 or more two-way movements per hour or 200 or more two-way movements a day;</p> <p>Night-time traffic predicted through villages or towns where existing night-time traffic flows are low;</p> <p>Significant permanent increase in traffic congestion or delays;</p> <p>Significant permanent increase in the risk of traffic accidents;</p> <p>Road or footpath closures or diversions impact a larger area;</p> <p>Significant permanent increase in HGV movements on the road;</p> <p>Project traffic may lead to deterioration in road condition requiring road rebuilding</p>

Evaluating Significance of Residual Impact

The residual environmental and social impacts is assigned a level of significance based on the importance/sensitivity of the receptor and the magnitude of that impact. For each residual impact, an importance/sensitivity ranking between A and E and an impact magnitude ranking of between 1 and 5 have been assigned to the impacts as indicated in the tables given above). Significance level of the residual impact is then determined using the matrix shown in matrix (Figure A1)

		B	1	2	3	4	5
Importance / Sensitivity of receptor	E	B	L	M	M	H	H
	D	B	L	M	M	H	H
	C	B	L	L	M	M	H
	B	B	L	L	L	M	M
	A	B	L	L	L	L	M

Figure A1. Significance Matrix

Environmental and Social Hazard and Risk Assessment

Risk is an expression of the likelihood that an event will occur and the magnitude of the potential consequences if it does occur. The residual risk has been evaluated based on the residual impact significance and event probability in accordance with the matrix presented below (Figure 2.)

		Probability							
Impact Significance/ Severity		1	2	3	4	5	6	7	8
	Very High	L	H	H	H	H	H	H	H
	High	L	L	M	M	M	H	H	H
	Medium	L	L	L	M	M	M	M	M
	Low	L	L	L	L	L	M	M	M
	Very Low	L	L	L	L	L	L	M	M

Overall significance: H = High, M = Medium, L = Low

Figure A1_2. Residual Risk Significance Matrix for Unplanned Events

Cumulative Impacts

Cumulative impact assessment identifies those environmental and/or socio-economic aspects that may not constitute a significant impact on their own, but when combined with impacts from past, present or reasonably foreseeable future activities associated with this and/or other projects may result in a higher and more significant impact(s).

Management and Monitoring

Critical to the successful implementation of the commitments and mitigation measures within this ESIA is the development of a commitments register. The construction phase commitments are then tracked through to environmental and social management plans (ESMMP), which will form the environmental and social management system (ESMS) in the construction phase.

Operations phase commitments will be incorporated into the existing Operating Management System (OMS), which will include an integrated ESMS.

Monitoring during construction and operational phases of the project, through the audit of impact predictions and mitigation measures, will assure:

- Mitigation measures are implemented effectively
- Mitigation measures are appropriate and, if not, that they are amended or

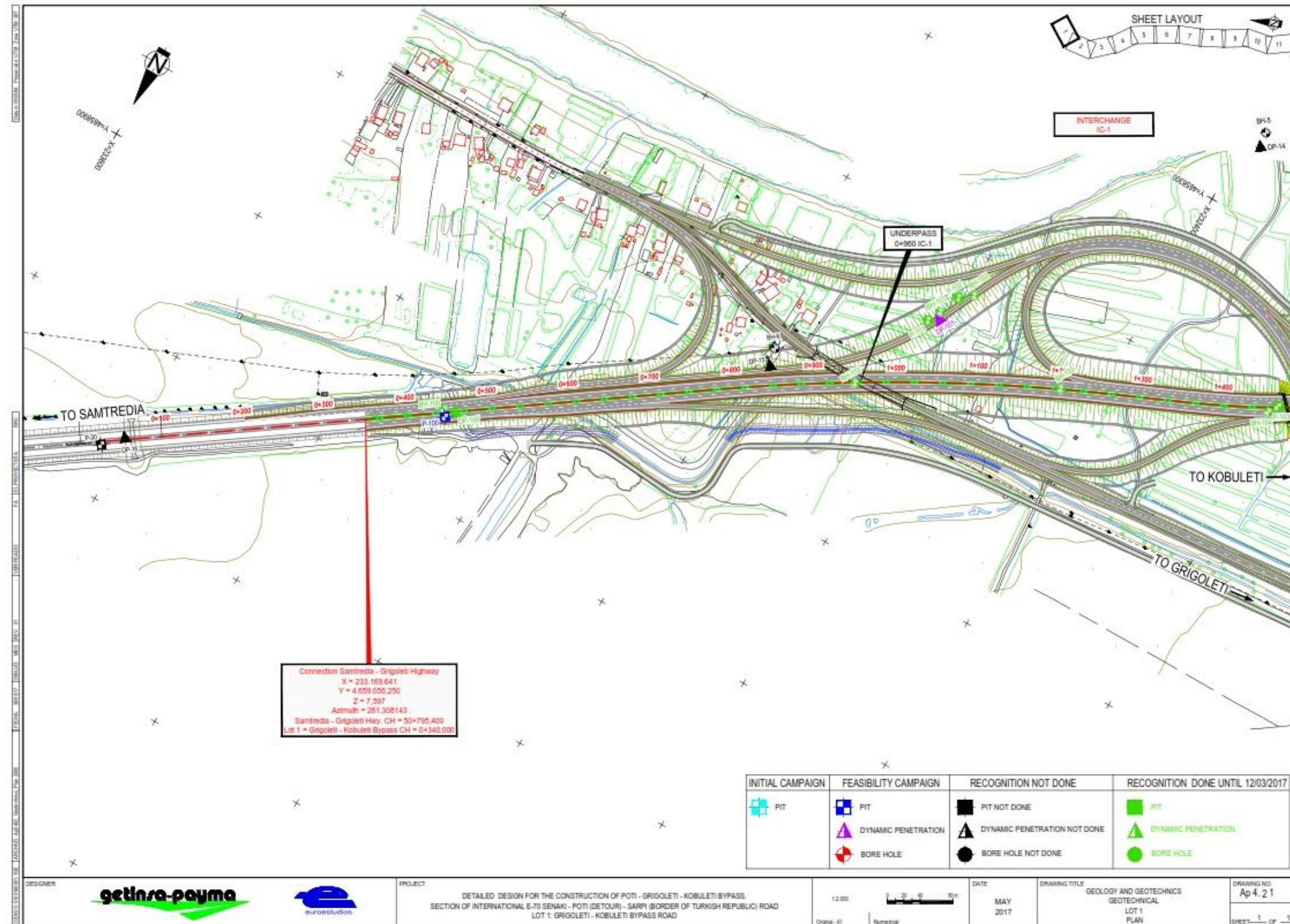
additional measures are designed and implemented

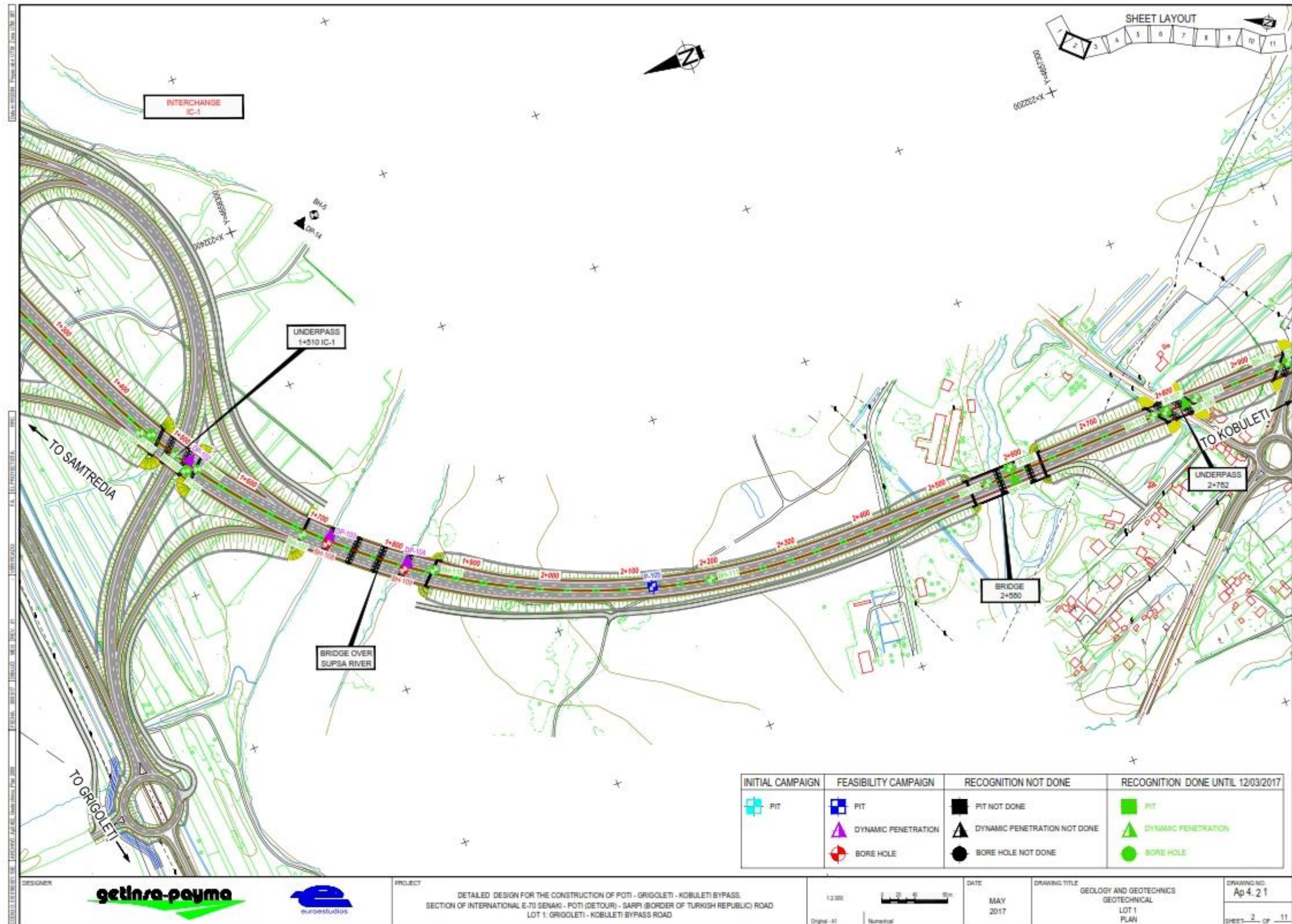
- Compliance with project standards, guidelines and best practice as applicable
- Assessment of cumulative and residual impacts, so that appropriate measures can be designed if necessary
- Continuation of the ESIA as an iterative process through to the construction and operational E&S management systems, which will be based on continual improvement.

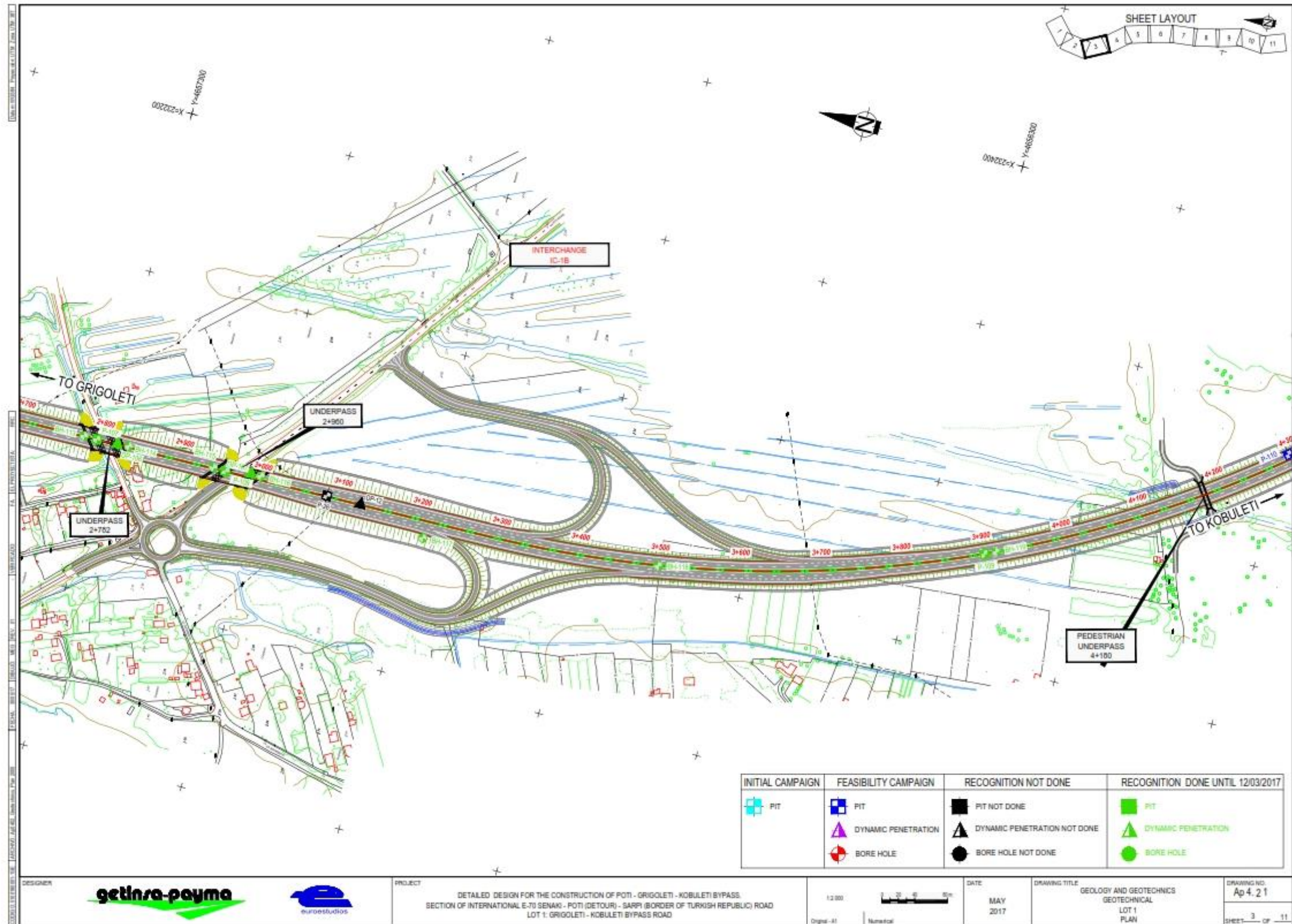


DETAILED DESIGN FOR THE CONSTRUCTION OF POTI-GRIGOLETI-KOBULETI BYPASS.
SECTION OF INTERNATIONAL E-70 SENAKI-POTI (DETOUR)-SARPI (BORDER OF TURKISH
REPUBLIC) ROAD

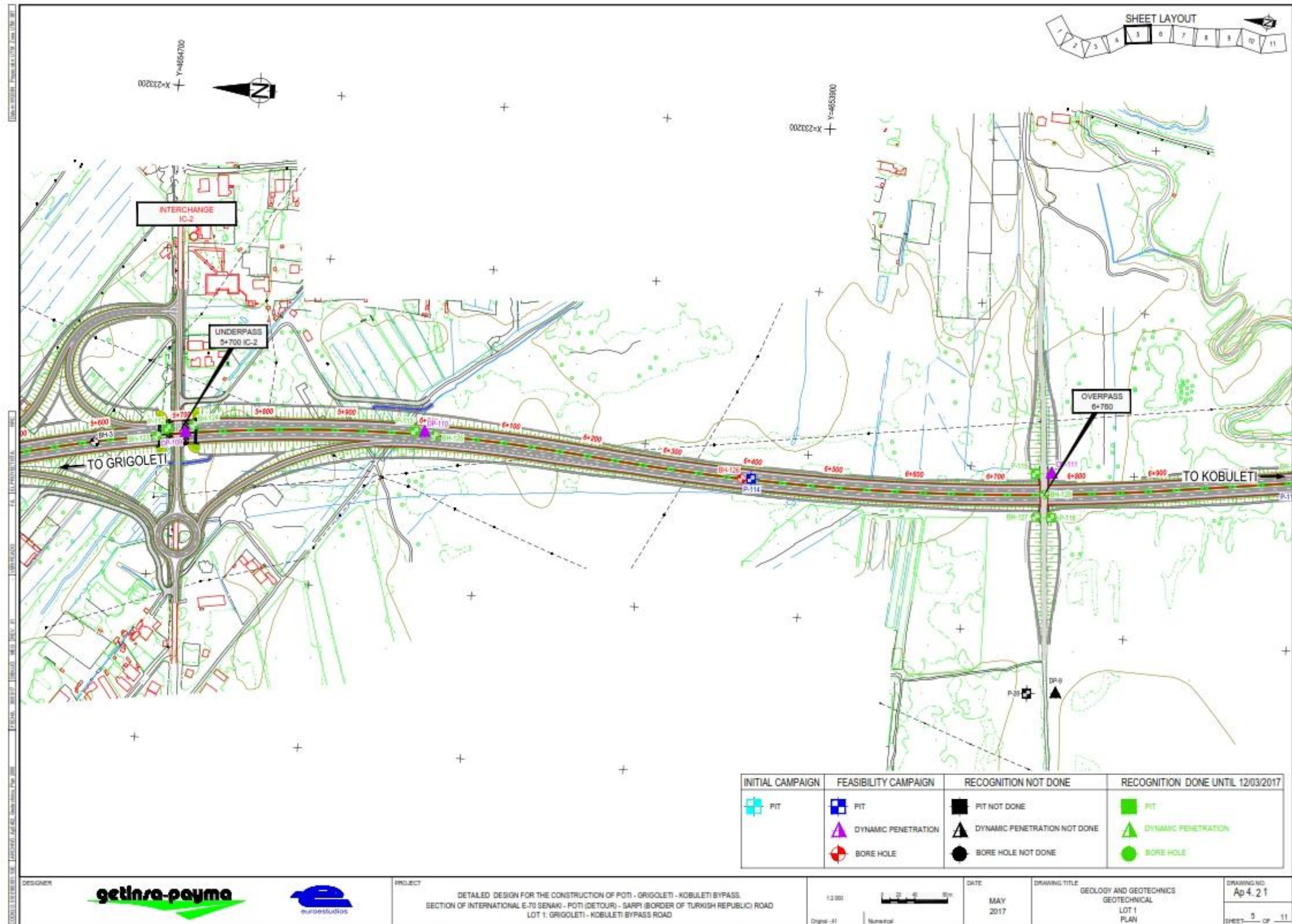
ANNEX 2. GEOLOGICAL SAMPLING MAP

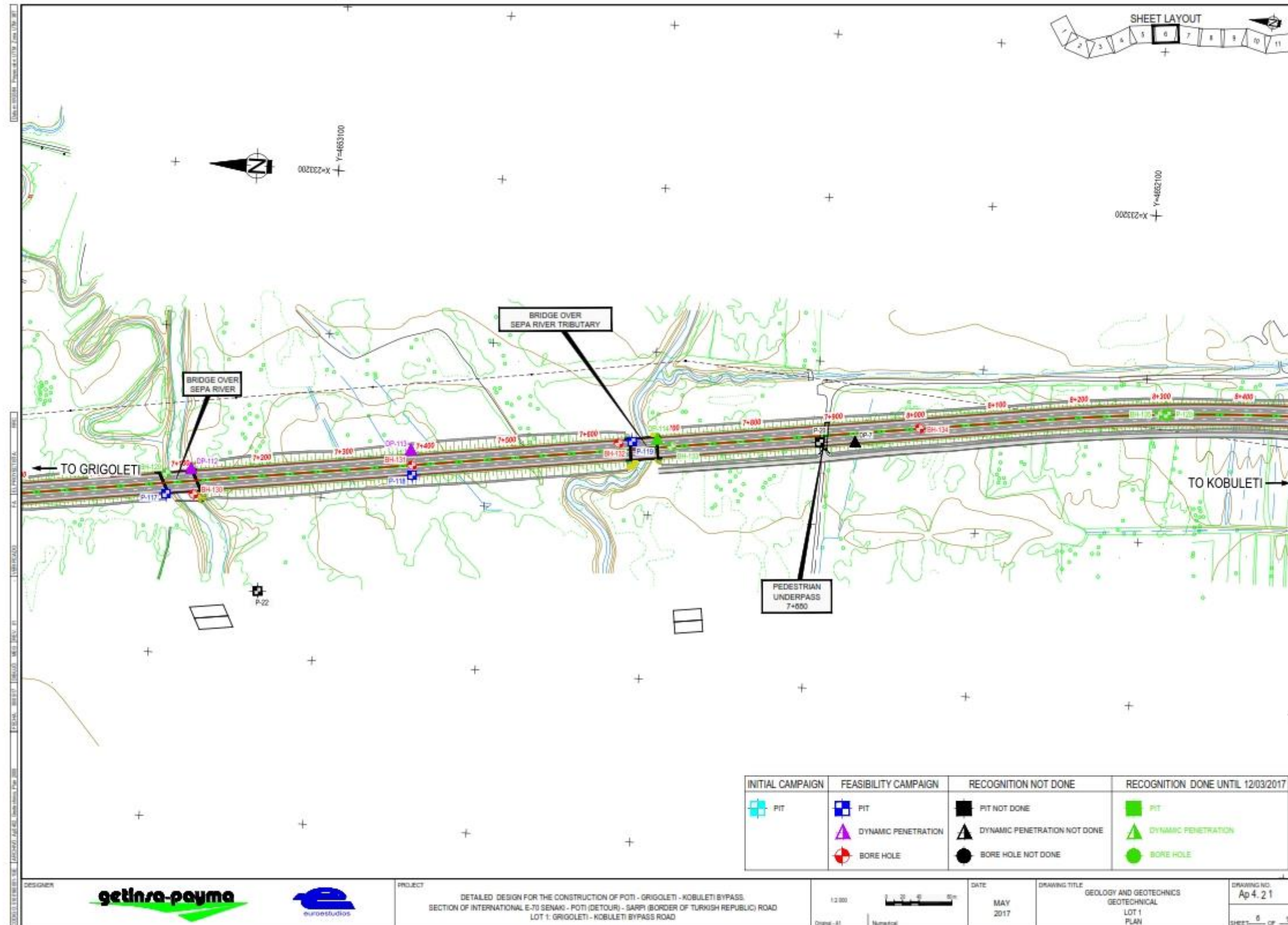




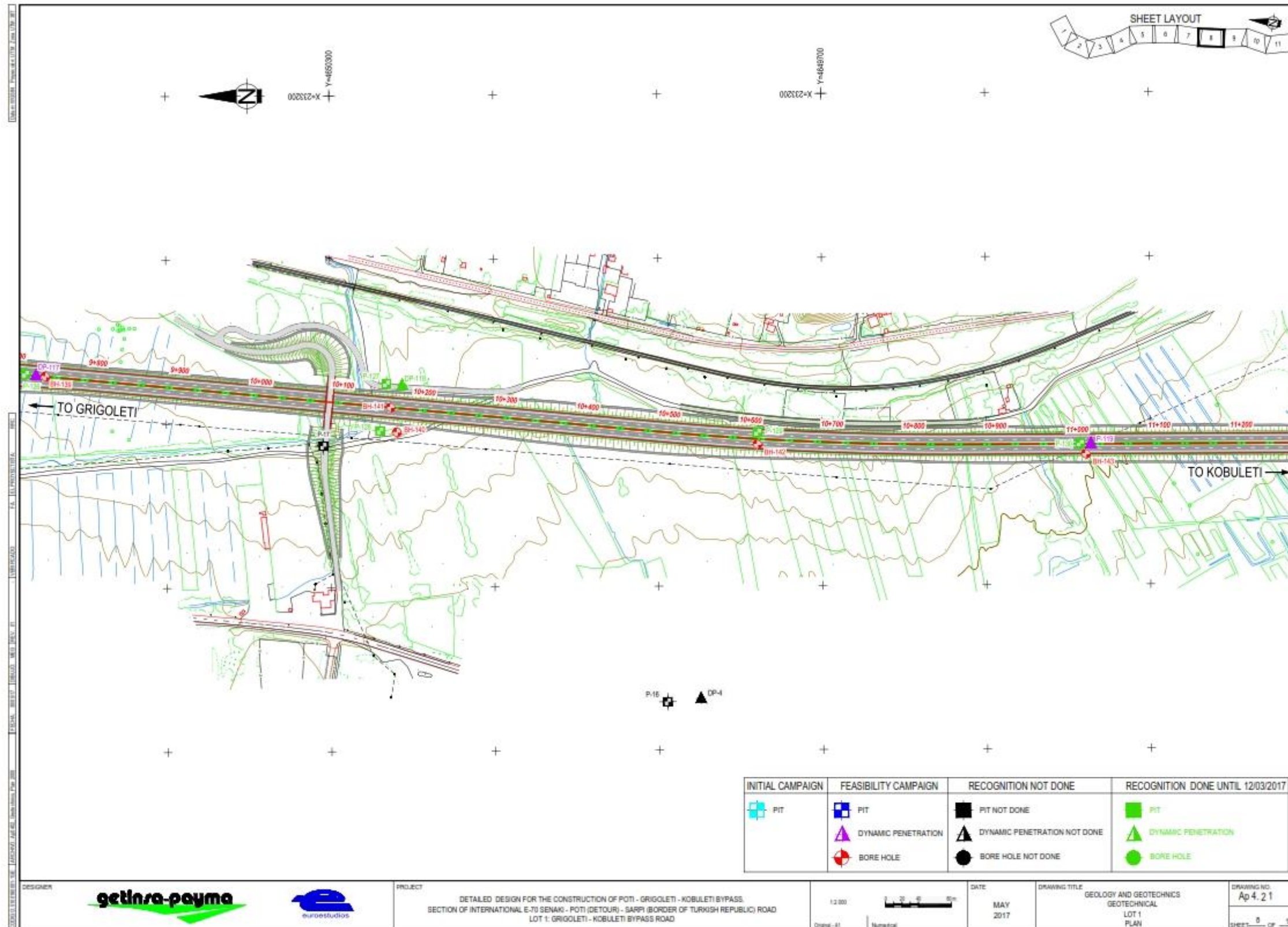


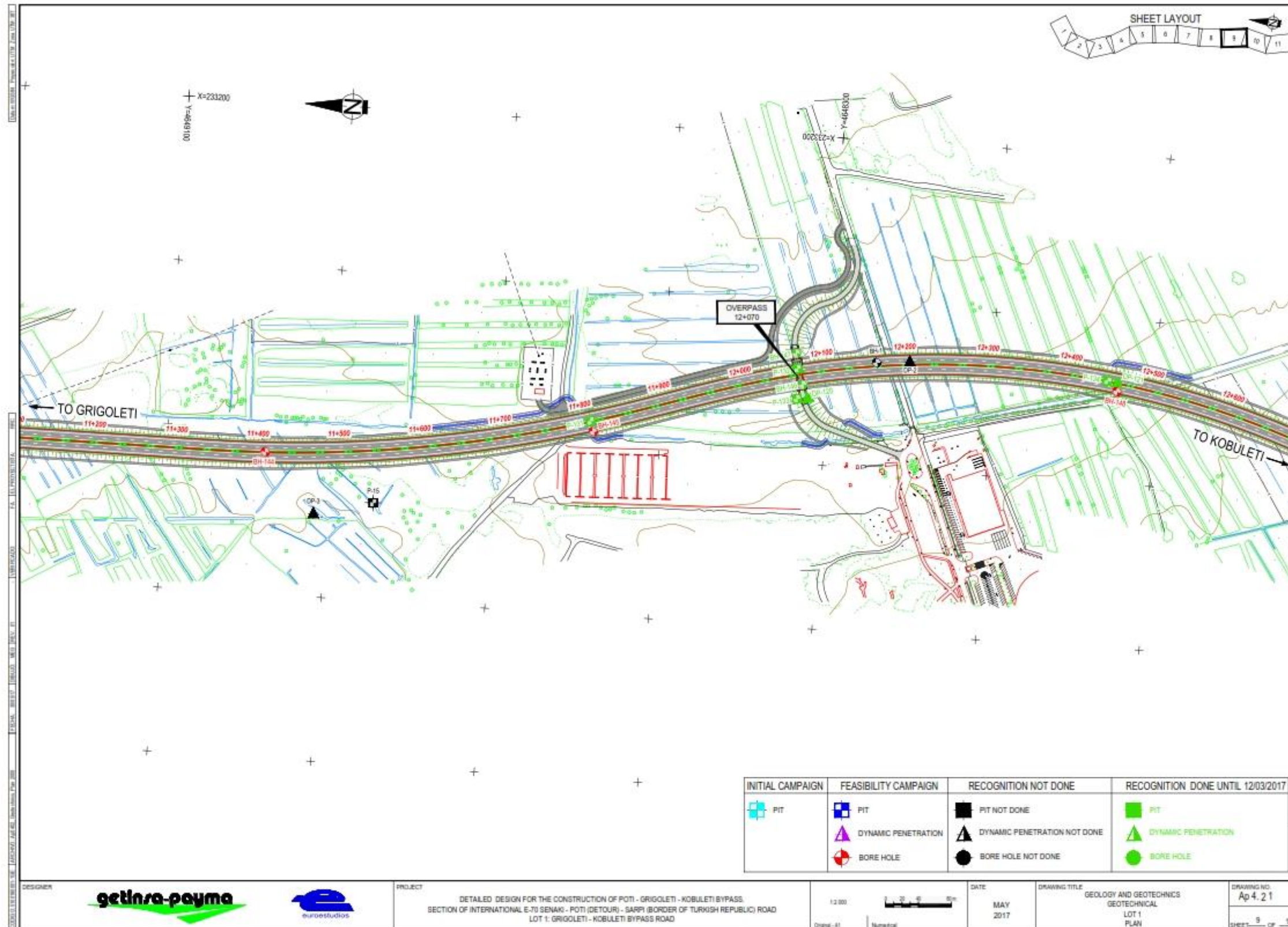


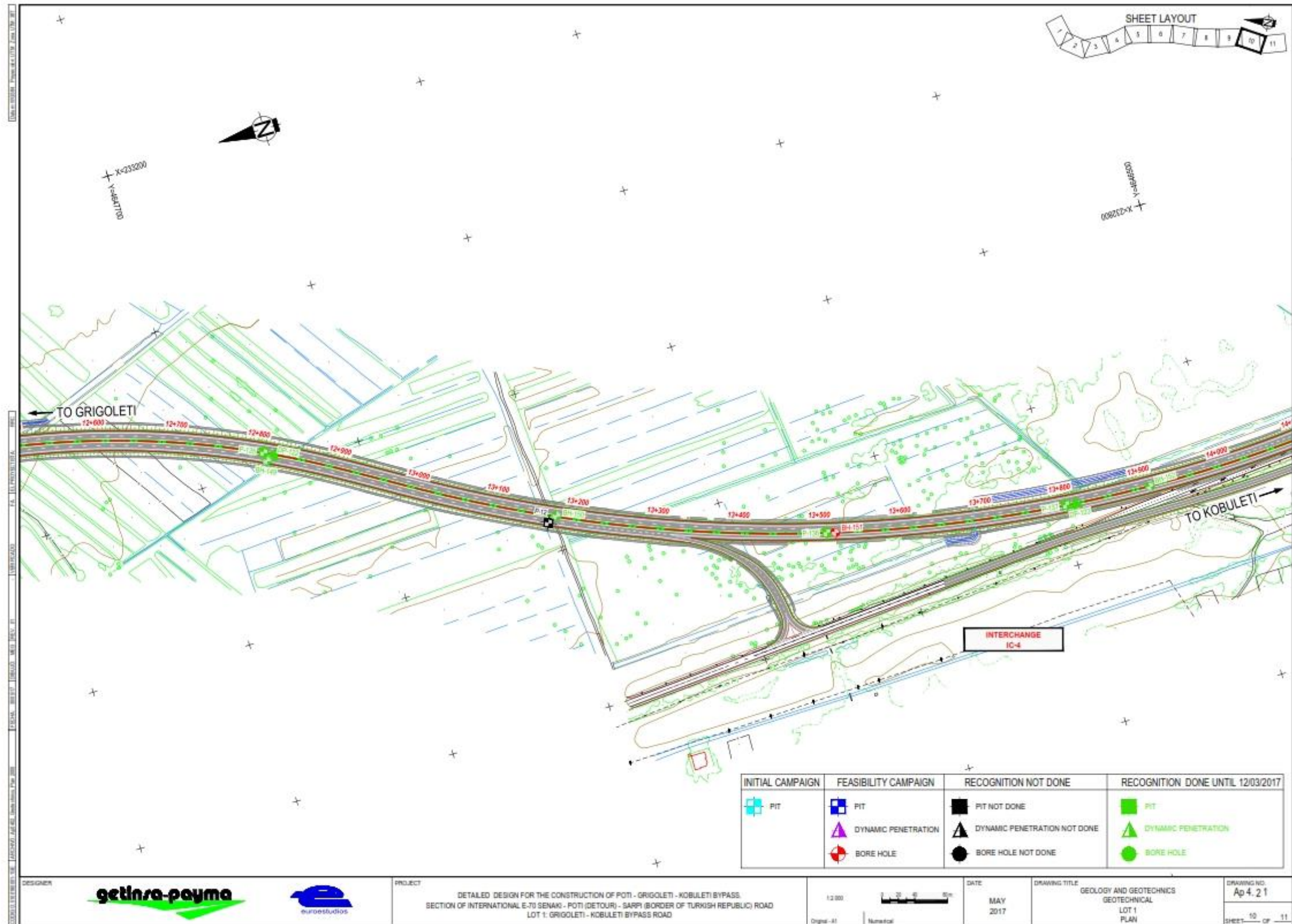












ANNEX 3. EMISSIONS AND DISPERSION CALCULATION PRINTOUTS

Printouts of calculation (Masgistrat Gorod v 3.0 (Copyright ©1997-2013 “Integral”)), in Russian language, are attached to the Georgian version of the document, as per requirements of MENRP.

ANNEX 4. NOISE MODELLING RESULTS

Annex 4.1 presents drawings of first simple modelling. This noise modelling was developed during the first stages of the Detailed Design phase.

Detailed noise modelling results are given in Annex 4.2.

ANNEX 4.1 RESULTS OF FIRST SIMPLE NOISE MODELLING. DRAWINGS

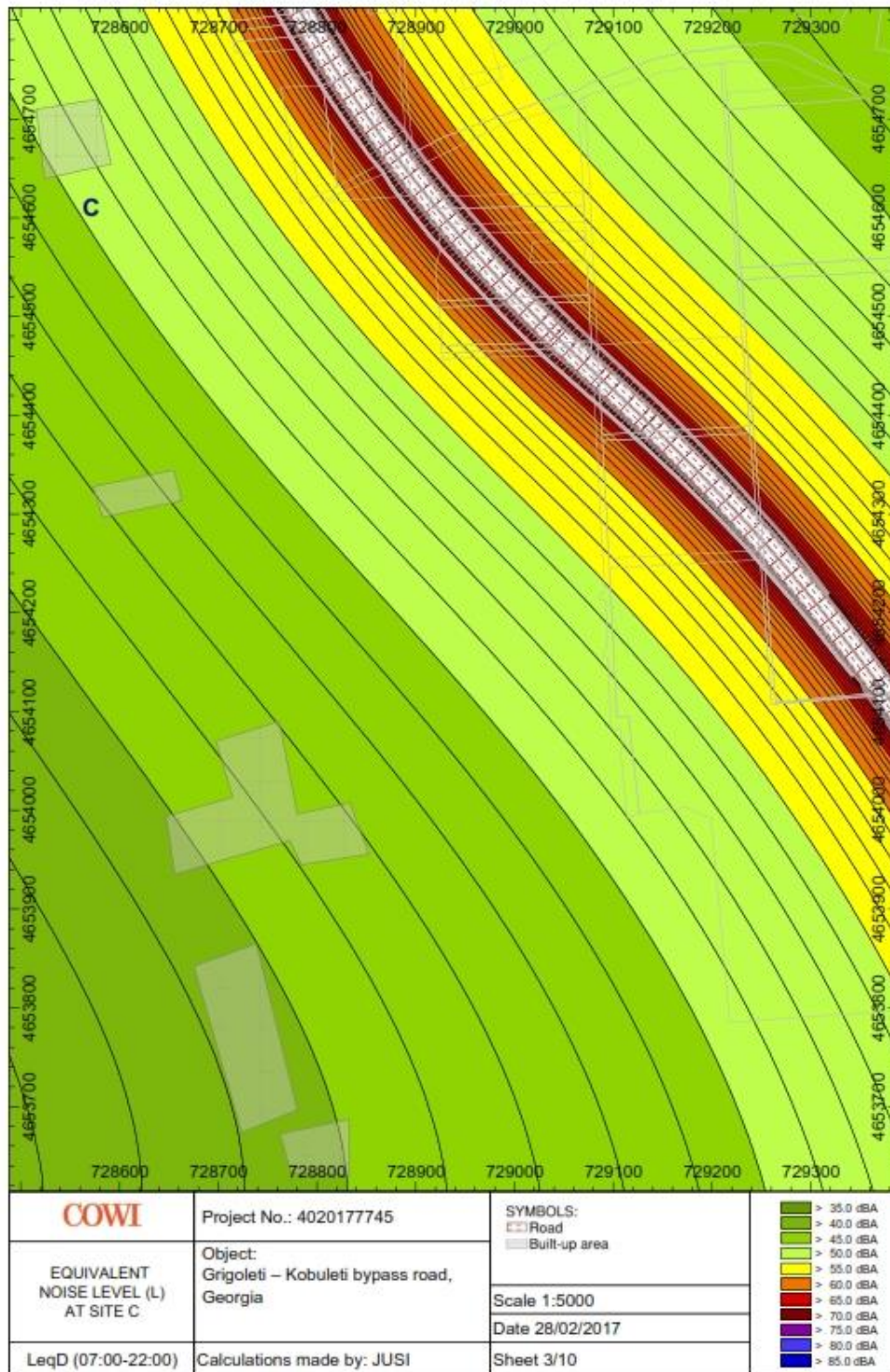




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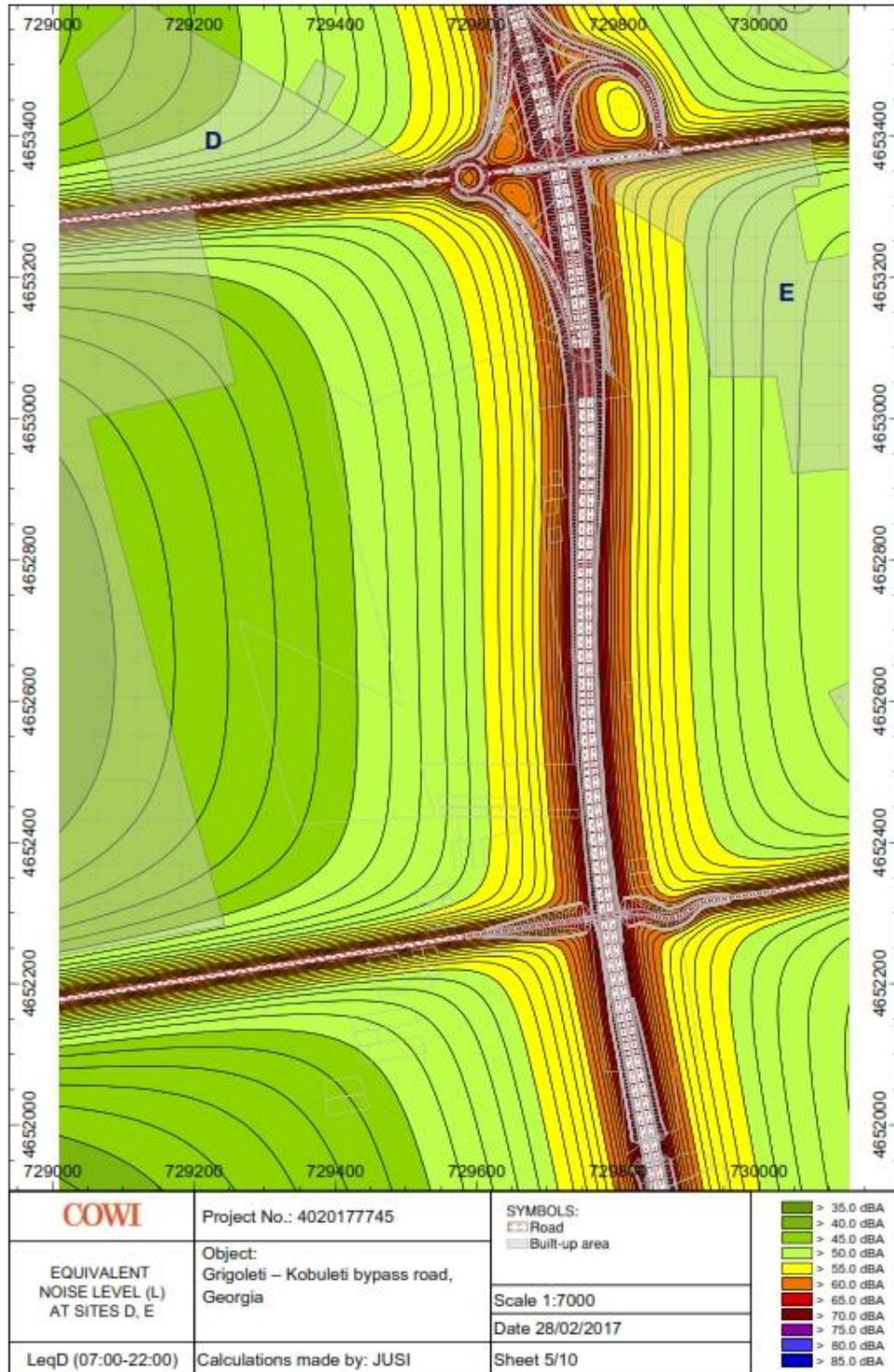








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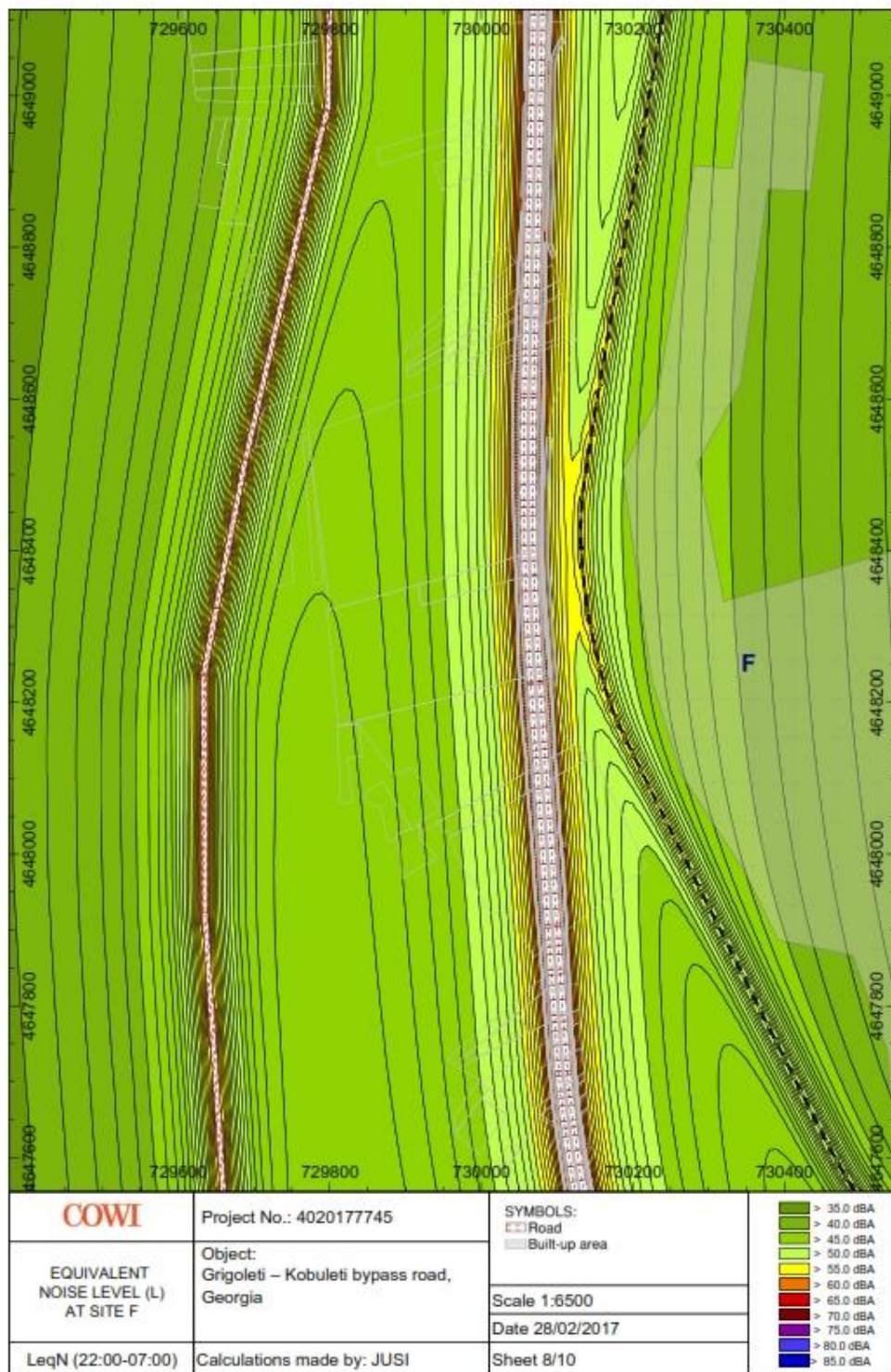


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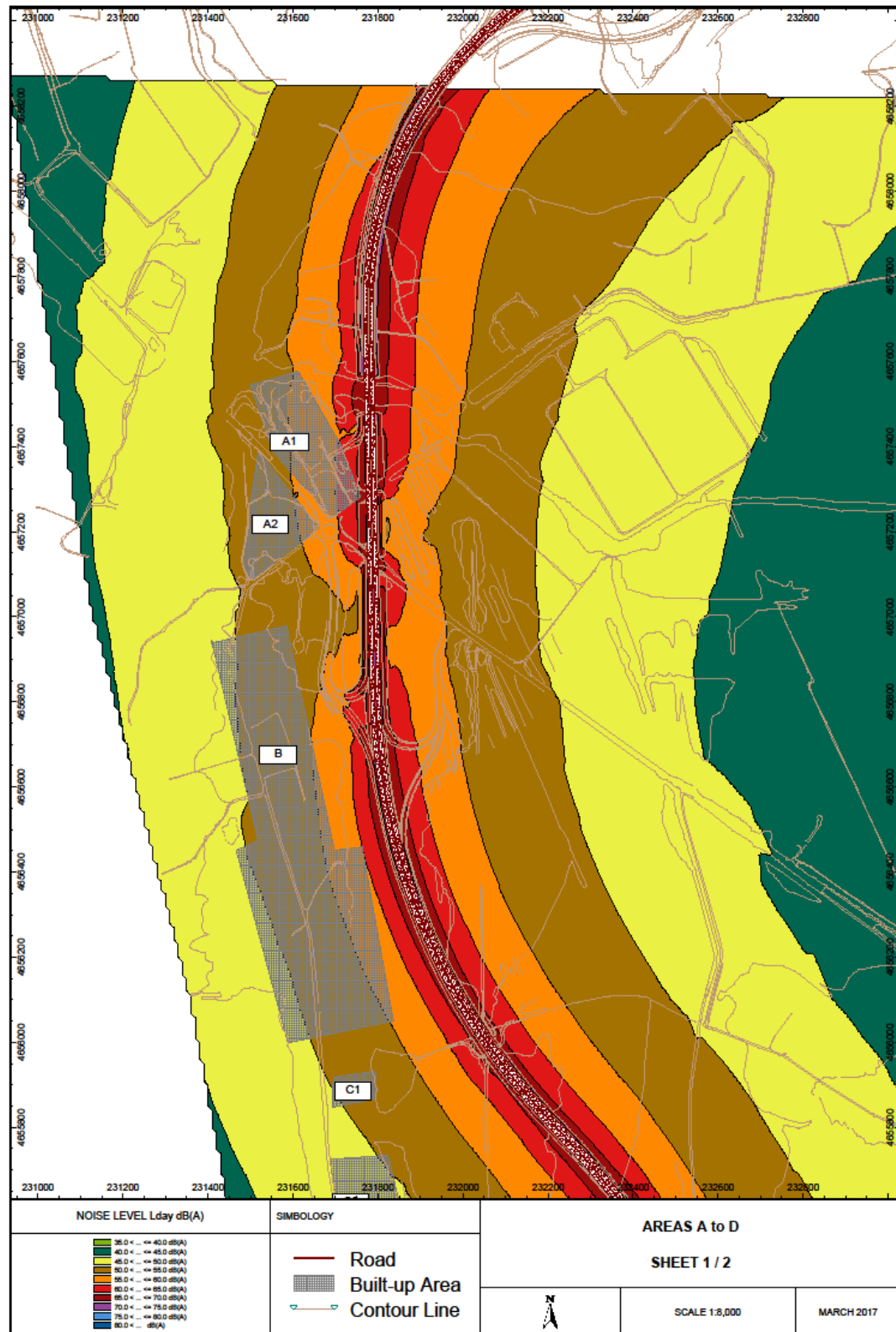
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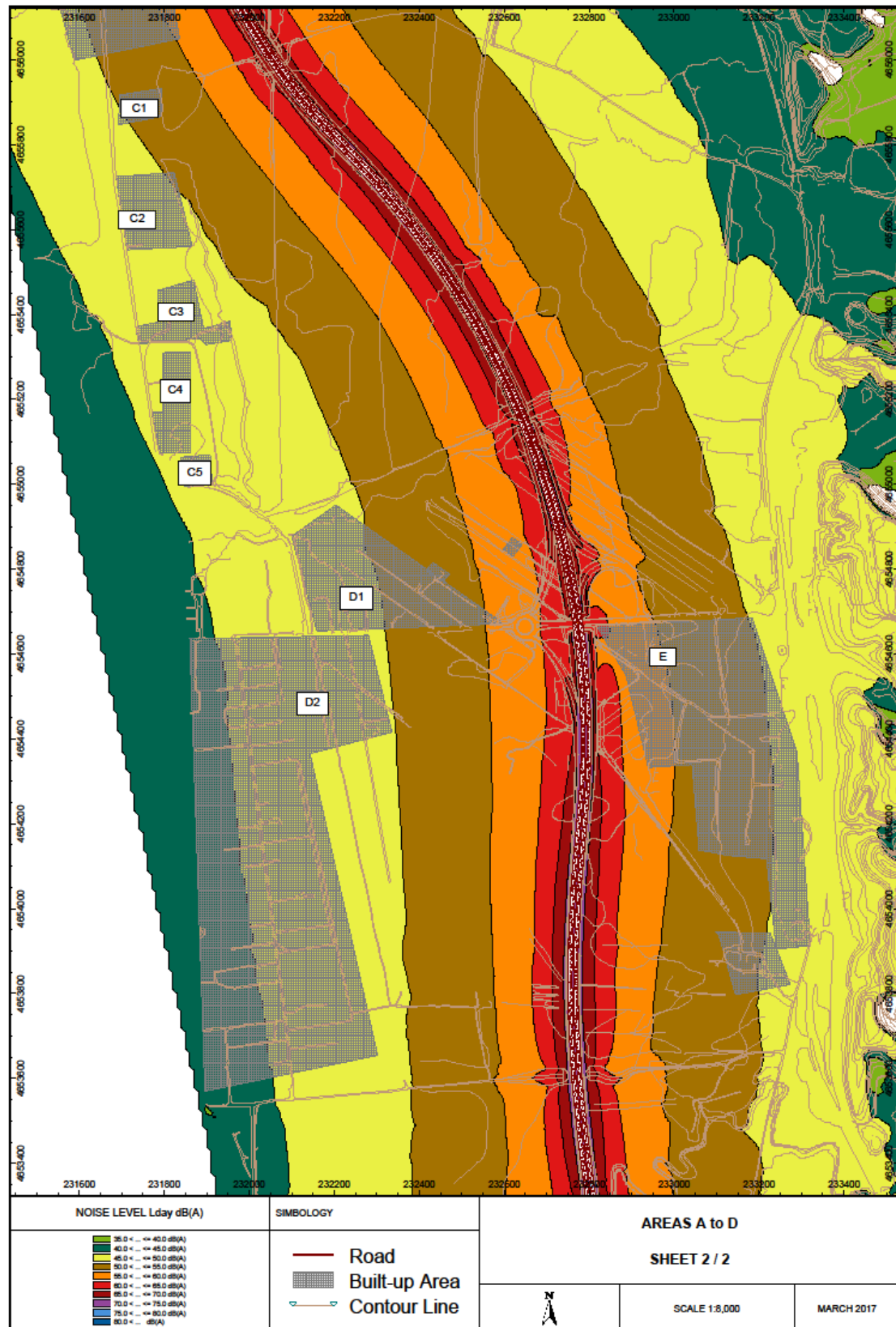


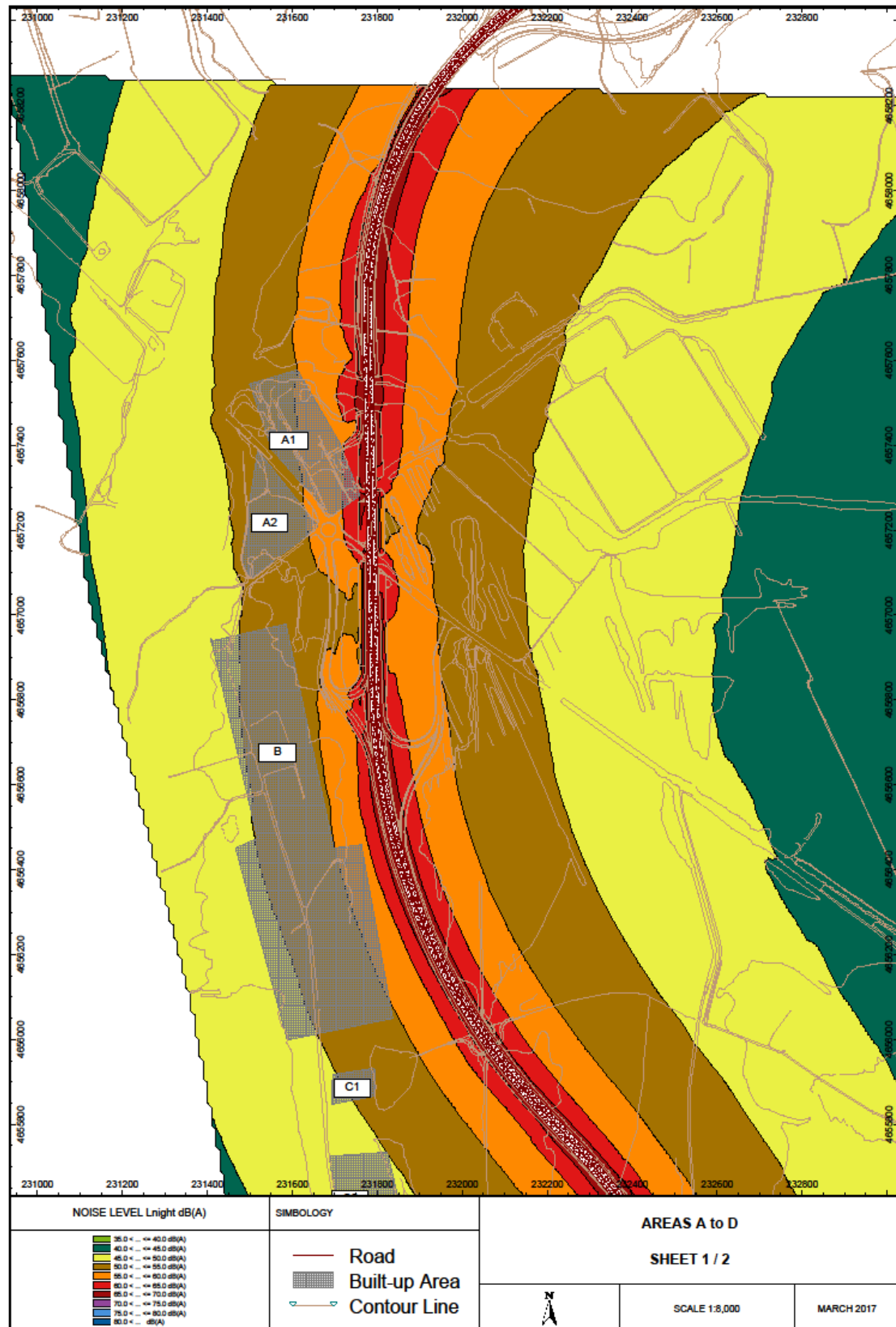
DETAILED DESIGN FOR THE CONSTRUCTION OF POTI-GRIGOLETI-KOBULETI BYPASS.
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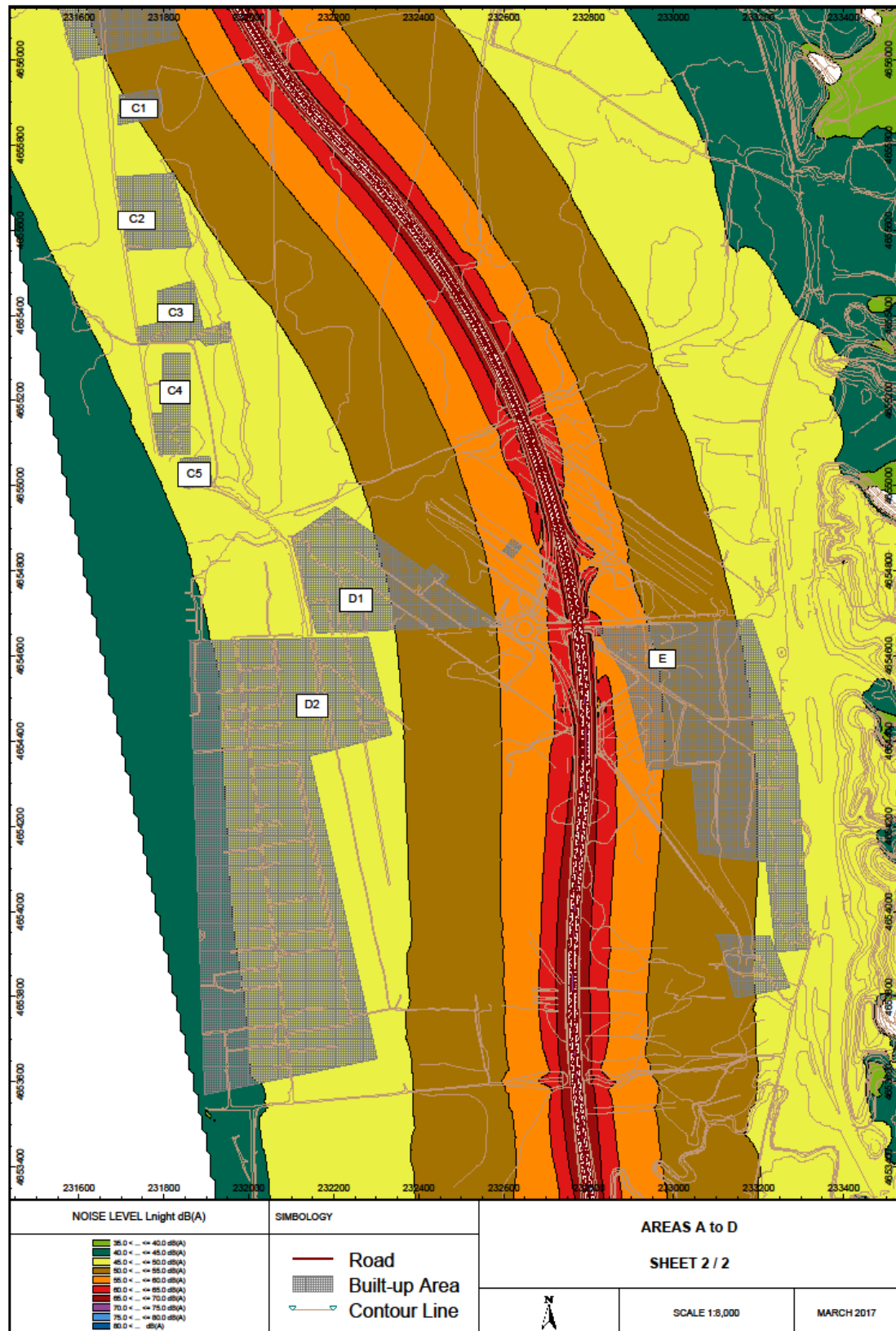


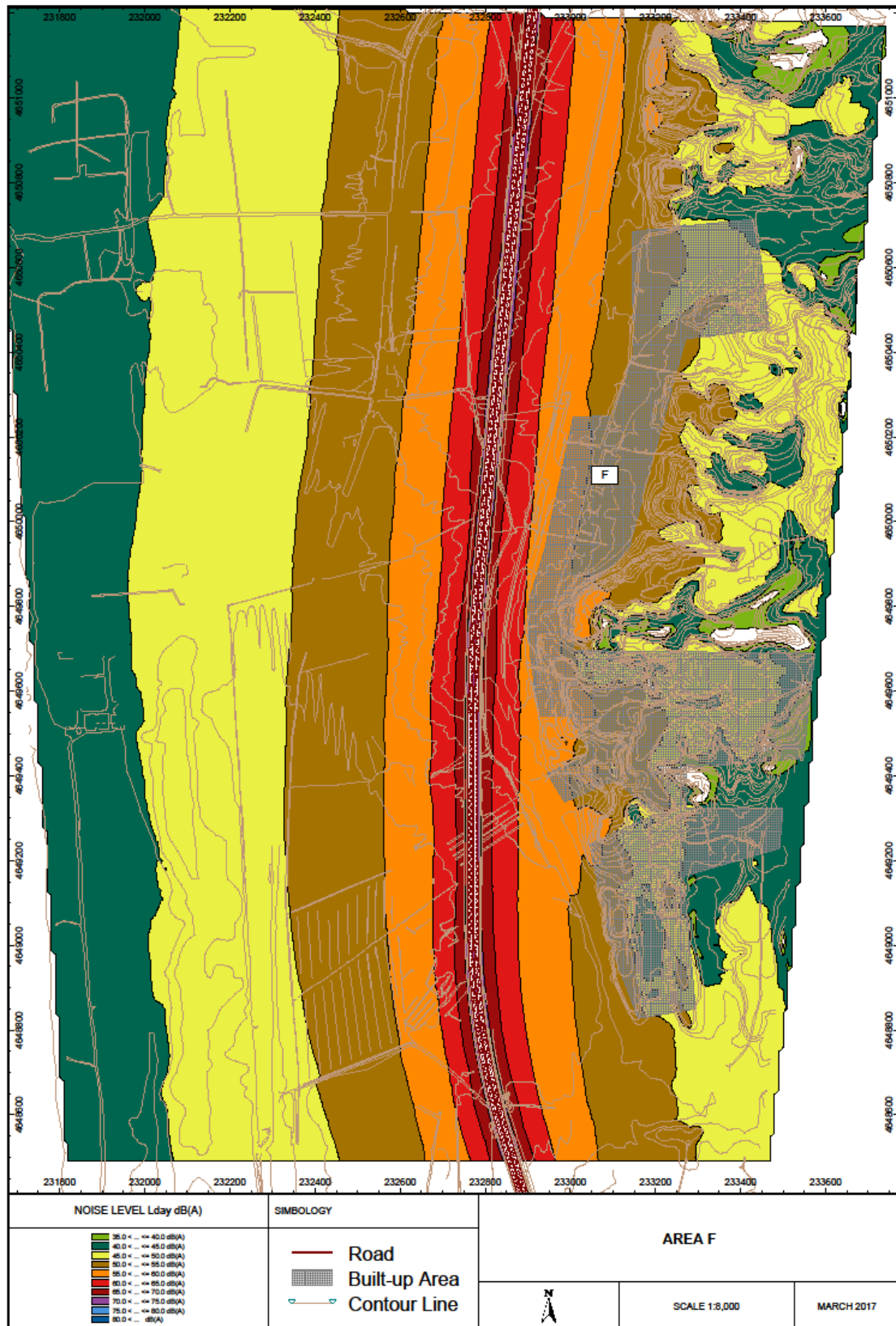
4.2 DETAILED NOISE MODELLING. DRAWINGS

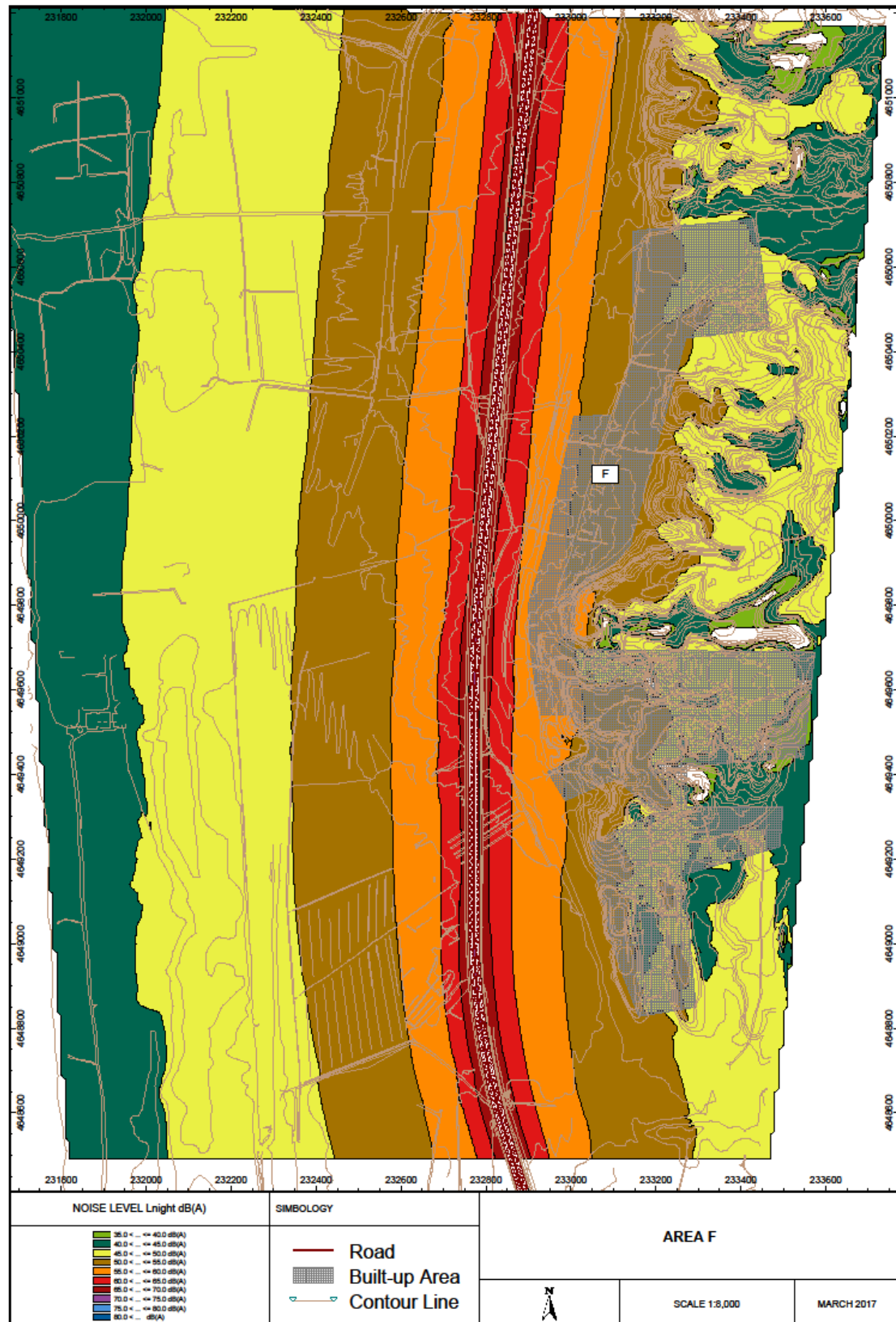


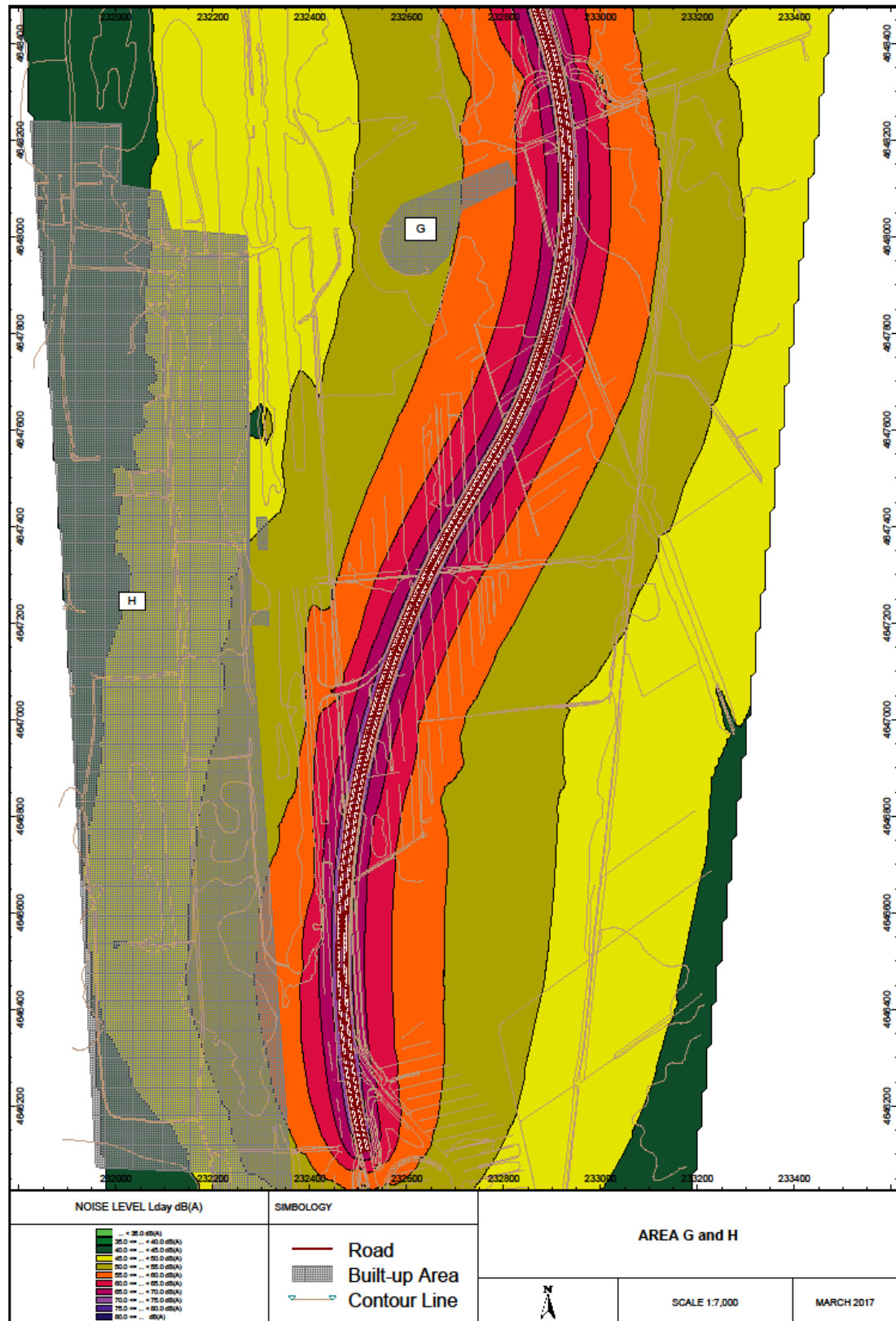


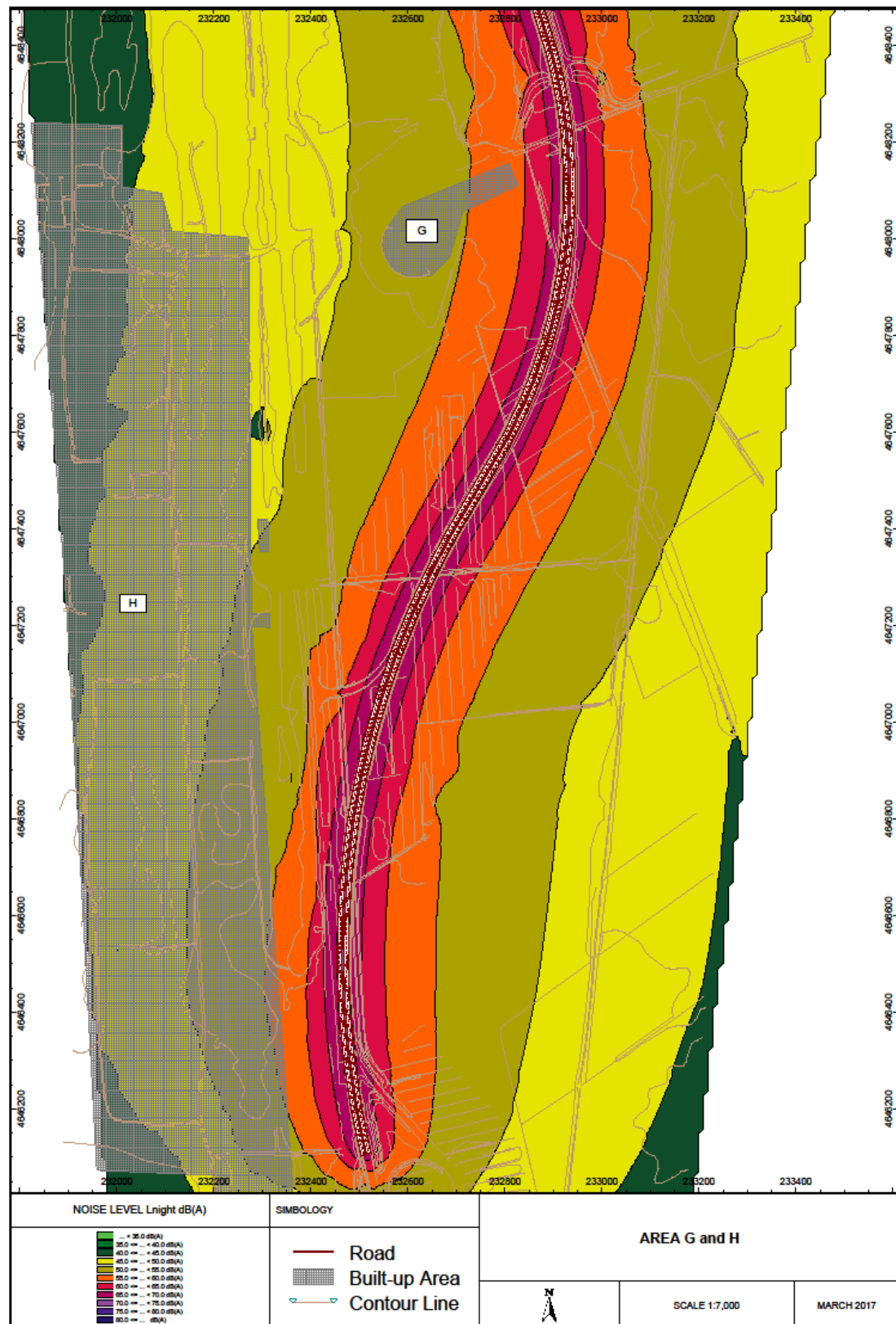












ANNEX 5. CHANCE FIND PROCEDURE

Purpose of the chance find procedure

The chance find procedure is a project-specific procedure that outlines actions required if previously unknown heritage resources, particularly archaeological resources, are encountered during project construction or operation. A Chance Find Procedure, as described in IFC Performance Standard 8 and EBRD Performance Requirement 8 and law on Cultural Heritage of Georgia, is a process that prevents chance finds from being disturbed until an assessment by a competent specialist is made and actions consistent with the requirements are implemented.

Scope of the chance find procedure

This procedure is applicable to all activities conducted by the personnel, including contractors, that have the potential to uncover a heritage item/site. The procedure details the actions to be taken when a previously unidentified and potential heritage item/site is found during construction activities. Procedure outlines the roles and responsibilities and the response times required from both project staff, and any relevant heritage authority.

Induction/Training

All personnel, especially those working on earth movements and excavations, are to be inducted on the identification of potential heritage items/sites and the relevant actions for them with regards to this procedure during the Project induction and regular toolbox talks.

Chance find procedure

If any person discovers a physical cultural resource, such as (but not limited to) archaeological sites, historical sites, remains and objects, or a cemetery and/or individual graves during excavation or construction, the following steps shall be taken:

1. Stop all works in the vicinity of the find, until a solution is found for the preservation of these artefacts, or advice from the relevant authorities is obtained;
2. Immediately notify a foreman. The foreman will then notify the Construction Manager and the Environment Officer (EO)/Environmental Manager (EM);
3. Record details in Incident Report and take photos of the find;
4. Delineate the discovered site or area; secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be arranged until the responsible local authorities take over;
5. Preliminary evaluation of the findings by archaeologists. The archaeologist must make a rapid assessment of the site or find to determine its importance. Based on this assessment the appropriate strategy can be implemented. The significance and importance of the

- findings should be assessed according to the various criteria relevant to cultural heritage such as aesthetic, historic, scientific or research, social and economic values of the find;
6. Sites of minor significance (such as isolated or unclear features, and isolated finds) should be recorded immediately by the archaeologist, thus causing a minimum disruption to the work schedule of the Contractor. The results of all archaeological work must be reported to the Ministry/Agency, once completed.
 7. In case of significant find the Agency/Ministry (Agency for Protection of National Heritage or Archaeological Research Centre, hereinafter referred to as Heritage team) should be informed immediately and in writing within 7 days from the find (ref.law on heritage protection).
 8. The onsite archaeologist provides the Heritage team with photos, other information as relevant for identification and assessment of the significance of heritage items.
 9. The Ministry must investigate the fact within 2 weeks from the date of notification and provide response in writing.
 10. Decisions on how to handle the finding shall be taken by the responsible authorities. This could include changes in the layout (such as when finding an irremovable remain of cultural or archaeological importance) conservation, preservation, restoration and salvage;
 11. Construction works could resume only after permission is granted from the responsible authorities.
 12. In case no response received within the 2 weeks period mentioned above, this is considered as authorisation to proceed with suspended construction works.

One of the main requirements of the procedure is record keeping. All finds must be registered. Photolog, copies of communication with decision making authorities, conclusions and recommendations/guidance, implementation reports – kept.

Additional information

Management options for archaeological site

- **Site avoidance.** If the boundaries of the site have been delineated attempt must be made to redesign the proposed development to avoid the site. (The fastest and most cost-effective management option)
- **Mitigation.** If it is not feasible to avoid the site through redesign, it will be necessary to sample it using data collection program prior to its loss. This could include surface collection and/or excavation. (The most expensive and time-consuming management option.)
- **Site Protection.** It may be possible to protect the site through the installation of barriers during the time of the development and/or possibly for a longer term. This could include the erection of high visibility fencing around the site or covering the site area with a geotextile and then capping it with fill. The exact prescription would be site- specific.

A1 Management of replicable and non-replicable heritage

Different approaches for the finds apply to replicable and non-replicable heritage.

A1_1.1 Replicable heritage

Where tangible cultural heritage that is replicable⁸ and not critical is encountered, mitigation measures will be applied.

The mitigation hierarchy is as follows:

- Avoidance;
- Minimization of adverse impacts and implementation of restoration measures, in situ;
- Restoration of the functionality of the cultural heritage, in a different location;
- Permanent removal of historical and archaeological artefacts and structures ;
- Compensation of loss - where minimization of adverse impacts and restoration not feasible.

A1_1.2. Non-replicable heritage

Most cultural heritage is best protected by in situ preservation, since removal is likely to result in irreparable damage or even destruction of the cultural heritage.

Nonreplicable cultural heritage⁹ must not be removed unless all of the following conditions are met:

- There are no technically or financially feasible alternatives to removal;
- The overall benefits of the project conclusively outweigh the anticipated cultural heritage loss from removal; and

Any removal of cultural heritage must be conducted using the best available technique advised by relevant authority and supervised by archaeologist.

⁸ Replicable cultural heritage is defined as tangible forms of cultural heritage that can themselves be moved to another location or that can be replaced by a similar structure or natural features to which the cultural values can be transferred by appropriate measures. Archaeological or historical sites may be considered replicable where the particular eras and cultural values they represent are well represented by other sites and/or structures.

⁹ Nonreplicable cultural heritage may relate to the social, economic, cultural, environmental, and climatic conditions of past peoples, their evolving ecologies, adaptive strategies, and early forms of environmental management, where the (i) cultural heritage is unique or relatively unique for the period it represents, or (ii) cultural heritage is unique or relatively unique in linking several periods in the same site. Examples of non-replicable cultural heritage may include an ancient city or temple, or a site unique in the period that it represents.

A1_2 Human Remains Management Options

The handling of human remains believed to be archaeological in nature requires communication according to the same procedure described above.

There are two possible courses of action:

- **Avoid.** The development project is redesigned to completely avoid the found remains. An assessment should be made as to whether the remains may be affected by residual or accumulative impacts associated with the development, and properly addressed by a comprehensive management plan.
- **Exhume.** Exhumation of the remains in a manner considered appropriate by decision makers. This will involve the predetermination of a site suitable for the reburial of the remains. Certain ceremonies or procedures may need to be followed before development activities can recommence in the area of the discovery.

EMERGENCY CONTACTS

Ministry of Culture and Monument Protection

Address: 4 Sanapiro Street, 0105, Tbilisi, Georgia; Fax: 995 32 2999966, 2932235;

E-Mail: culturegovge@gmail.com

National Agency for Cultural Heritage of Georgia

27 Atoneli street, 0105 Tbilisi, Georgia: tel/fax: +(99532) 2932411

E mail: info@heritagesites.ge

Archaeological Research Centre under the Georgian National Museum

3, Rustaveli Avenue 0105 Tbilisi, Georgia

Tel: +(995 32) 2998022; Fax: +(995 32) 2982133

E-Mail: info@museum.ge

ANNEX 6. STAKEHOLDER ENGAGEMENT PLAN, GRIEVANCE MECHANISM

Stakeholder engagement (including consultation and the disclosure of information) is a key element of project planning, development and implementation. Effective stakeholder engagement assists good design, builds strong relationships with local communities and reduces the potential for delays through the early identification of issues to be addressed as a project progresses.

RD is committed to a transparent and respectful dialogue with stakeholders throughout the lifecycle of the project. The activities of engagement are guided by Good International Industry Practice for ESIA.

This SEP is designed to ensure that the RD identifies all stakeholders with an interest in the Project, and can engage these stakeholders during the development and life of the Project. This SEP therefore outlines the current consultation activities and future plans to engage with stakeholders during pre-construction, construction and operational phases of the Project.

Stakeholder engagement includes:

1. The provision of relevant, timely and accessible information to stakeholders in a culturally appropriate and understandable format; and
2. Consultation with stakeholders on their opinions, concerns, preferences and perceived gains and risks with respect to the Project planning and implementation, including the design and proposed management and mitigation measures to reduce potential impacts and to enhance possible benefits.
3. A grievance mechanism to guide RD's response and resolution process for stakeholder concerns or grievances.

This SEP therefore describes the:

- National and good international practice requirements for public consultation and disclosure that the company will conform to;
- Project stakeholders that have been identified;
- Strategy, format and timetable for consultation and information disclosure;
- RD's resources and management structure for developing and implementing the SEP;
- Grievance mechanism(s) for stakeholders, and;
- Means of reporting on consultation and disclosure activities.

1. Regulatory framework

This section describes the regulatory framework that applies to the Project. The Project's approach to stakeholder engagement considers both regulatory requirements and principles of Good International Industry Practice (GIIP).

National regulations

Public consultation is a mandatory part of the ESIA process. The competent authority for the ESIA process is the Ministry of Environment and Natural Resources Protection (MENRP).

Georgian legislation provides a general legal framework governing the public disclosure of information on environmental issues but it lacks any specific requirements related to the design and organisation of the stakeholder consultation and engagement process.

The Constitution of Georgia guarantees public access to information and states the right of an individual to obtain full, unbiased and timely information regarding his/her working and living environment.

Public participation in project development is regulated under the **Law on Environmental Impact Permit**. This Law also provides a list of activities subject to the ESIA procedure. According to paragraphs 6 and 7 of the Law, project owner prepares ESIA report and is responsible for public engagement, which includes announcing public disclosure of the document in the central and local printed media. The law states that public participation and provision of access to information are obligatory procedures of the environmental permitting process. This is conducted in the form of a public discussion of the proposed activity with participation by the investor, the Ministry of Environment Protection and Natural Resources (MENRP) and local administrative authorities.

The permit application/issuance procedure, including ESIA coordination and establishment of the timeframes for information disclosure and discussion under Georgian Law, includes the following steps:

1. Publication of information about the planned development in national and regional newspapers: the advertisement must contain information related to the title of the project, venue, date and time of public disclosure meeting(s), addresses of the offices where information about the project is available. The deadline for the feedback.
2. Within 3 days from publishing the information in the newspaper, the developer must submit an ESIA report (both as a paper copy and in electronic format) to the administrative bodies. Within 45 days after publishing the information, the developer has to review comments obtained from the public. Not earlier than within 50 days and not later than 60 days after publishing the information, the developer must

organize the public consultation process. At least one meeting must be conducted in the administrative centre of the area where the activity is planned. The developer is required to provide minutes signed by the relevant authorities present at the meeting within five days.

3. All comments received are to be reviewed and where possible considered in the final version of the ESIA report. Where it is not possible to address comments within the Final ESIA, the developer must explain the reasons for that in writing to the author(s) of the comments. These information, together with the minutes of the meeting(s) and the final ESIA report, are then submitted to the MENRP for expertise. The documents must include a location map, the volume and types of any expected emissions, a technical summary with the description of the planned development and a statement on the confidentiality of the project (if appropriate).

No public participation procedure is required during the construction and operation phases. Public consultation occurs once a draft of the ESIA has been prepared. There are no additional requirements for disseminating information, e.g. by means of leaflets, posters and other visual displays, radio/television etc. Neither are there requirements/practices for identifying possible stakeholders (including vulnerable groups) and ensuring their participation.

The national regulatory framework does not contain any specific requirements for development of SEP and/or stakeholder engagement beyond completion of the ESIA process.

International requirements related to stakeholder engagement

The standards and guidelines RD is set to comply with include:

- Performance Standards (PS) of the International Finance Corporation (IFC), in particular PS 1, regarding the assessment and management of environmental and social risks and impacts, includes guidance for stakeholder engagement.
- The Common Approaches to Environmental and Social Due Diligence developed by the Organization for Economic Cooperation and Development (OECD);
- The Equator Principles (EP) - Principle 5 sets out guidance for stakeholder engagement;
- International Conventions for Public Participation, in particular the Aarhus Convention.

International standards and regulations underscore the importance of stakeholder engagement in building constructive relationships that are essential for environmental and social issues to be managed successfully.

The main points common to all IFI requirements include: identification of stakeholders, consulting stakeholders and get their view of impacts that may affect them, disclosure and dissemination of information about environmental and social issues in timely way and in understandable language; responding to questions and concerns; development and maintenance of SEP, including grievance redress mechanism.

International Conventions for Public Participation

Similar requirements for access to information and public involvement in decision making are also specified within the following international conventions:

- **Aarhus Convention.** The UN Economic Commission for Europe (UNECE) Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (the Aarhus Convention) guarantees the rights of access to information, public participation in decision-making, and access to justice in environmental matters, in order to protect people's rights to a healthy environment. Georgia has ratified the Aarhus Convention, and therefore it is also a legal requirement of the Government of Georgia.
- **Agenda 21.** (UN, 1992b) Article 27(9) states that the UN system should "provide access for non-governmental organizations to accurate and timely data and information to promote the effectiveness of their programs and activities and their roles in support of sustainable development".
- **Rio Declaration on Environment and Development** (1992). Annex 1 Principle 10 - "Each individual shall have appropriate access to information on hazardous materials and activities in their communities [...] States shall facilitate and encourage public awareness and participation by making information widely available".
- **UN General Assembly Resolution A/RES/S-19/2 (1997).** Paragraph 108 - "Access to information and broad public participation in decision-making are fundamental to sustainable development".
- **Dublin Declaration on Access to Environmental Information (2000)** - UNEP Infoterra
- **Directive 2003/4/EC (repeals Directive 90/313) on Public Access to Environmental Information.** It incorporates the provisions and requirements of the Aarhus Convention on public access to environmental information.

2. Project Stakeholders

The stakeholder identification has been done based on following criteria:

- **Dependence:** Stakeholders who can be directly or indirectly affected by the project implementation or company activities;

- **Influence:** Stakeholders who are able to influence the project progress and the ability of the proponent to develop the project successfully;
- **Partnership:** Stakeholders who have a potential for building mutually advantageous partnerships and long-term relationships;
- **Expressed interest:** Stakeholders who expressed an interest in the ESIA process

In addition, 'legitimate stakeholder representatives' may be identified for some of the stakeholder groups. Legitimate stakeholder representatives can include, for example '...elected officials, non-elected community leaders, leaders of informal or traditional community institutions, and elders within the affected community'.

Taking into consideration the location and scope of activities to be implemented under the planned development, a list of the stakeholders has been compiled. When identifying these potential stakeholders the Project's geographic sphere of influence was taken into account.

A broad list of the major stakeholders includes the following parties that are potentially affected, directly or indirectly:

- Local community within the Project's Area of influence – population of Ozurgeti and Lanchkhuti municipalities. Vulnerable groups within the affected communities will be specifically identified and consulted through dedicated means, as appropriate;
- NGOs and any other public initiative groups;
- Municipal government;
- Ministries and departments;
- Businesses and commercial sector;
- Contractor and sub-contractors (when identified);
- Other government institutions; and
- Employees of the HPP.

(A list with further details is given in Annex A5-1.)

Table A5-3 below details the processes for stakeholder engagement at different stages of the project.

Table A6-1. Proposed stakeholder engagement and format of information disclosure

Stakeholder	Engagement procedure/method	Format and information disclosed	Note
o Decision makers, regional governmental authorities, community	o Information	o Information on internet, emails	
o Stakeholders in the project area	o Meetings during site visit, dissemination of information o Participatory process	o Information about the planned development, location of the project sites, employment requirements, objectives of the ESIA o Leaflets	
o Governmental officials including local/regional officials, and environmental protection authorities	o Interviews o Meeting o Participatory process	o Non-technical documents o Project summary o Leaflets	Hard copies of the full ESIA available in governmental offices in the project affected municipalities, RD and Gamma Consulting offices, electronic copy – on the RD's website and webpage (if available) of Contractor
o Environmental and other NGOs and initiative groups	o e mail, phone o Public meetings o Participatory process	o Leaflets o Non-technical documents o Project summary	
o Businesses	o Interviews o Public meeting o e mail, phone	o Leaflets o Non-technical documents o Project summary	
o Affected community	o Interviews and focus group discussions o Surveys o Public meeting	o Leaflets o Non-technical documents o Project summary	
o All stakeholders invited	o Public meeting as requested under the Georgian legislation once the draft EIA/ESIA is disclosed		
o Governmental officials including environmental protection authorities and environmental NGOs	o Grievance mechanisms	o Feedback format depending on complaint	The full ESIA available electronically on the RD and Contractor's website (if available) throughout the construction phase
o NGOs, businesses, local community	o Open houses (in case deemed advisable) o Project updates o Grievance mechanisms		

3. Stakeholder Engagement Activities

Meetings with stakeholders were carried out during the surveys by Environmental and Social survey team. One to one meetings with project affected households took place in end of December 2016 and early January 2017.

Public meeting with participation of local residents, representatives of municipal authorities, RD, and businesses was held in Ureki on February 8, 2017. Information about the project, needs and scope of assessment was disclosed, information leaflets distributed (see Annex 6-3). Contract information for questions, comment and other communication - provided. The meeting was organized by RD. Environmental and Social Assessment team (Gamma Consulting Ltd) and representative RD were participating. Minutes of the meeting are given in Annex 6 of this report.

According to the national regulations, another series of meetings will be carried out after the Draft ESIA is disclosed. Information about the meeting (with indication of the date and venue) will be published in national and local coverage newspaper, stakeholders invited to provide comments. Public hearings will be carried out in administrative centres of municipalities after 50th, but not later than 60th day from information disclosure. Results of assessment presented to the stakeholders. Community will be given floor for discussion.

Engagement method and format of information disclosed tailored to the category of stakeholders have been developed (see Table A5-3).

After construction company is identified the latter will be encouraged to disclose information about the status of the project and notifications (if any) on its webpage. Information provided to stakeholders during construction will include:

- A description of the construction works with indication of scheduled start and finish dates for each type of the works;
- A drawing indicating the areas affected by the works and information on:
 - The type and duration of anticipated impacts;
 - Mitigation measures for each type of impact;
- Studies and documentation related to or affecting residents of adjacent area
- Progress photos of the worksite.

5. Disclosure of documentation

This Stakeholder Engagement Plan together with Non-Technical Summary and ESIA reports will be published on the RD's website and webpage of the lender (if deemed advisable by the latter).

Copies of Non-Technical Summary, the full ESIA report including Environmental and Social Management plan and Stakeholder Engagement Plan will also be made available for review by the general public at the following locations:

- as a hard copy in RD office – Kazbegi 12, Tbilisi, Georgia
- as a hard copy in administration offices in the project area
- as a hard copy in Gamma Consulting's office – 17a David Guramishvili avenue, Tbilisi, Georgia.

The public consultation process will be open for review and comment and revised as appropriate throughout the course of the project. This will include making publicly available the findings and analyses of the environmental and social studies as they emerge at critical milestones throughout the ESIA.

The electronic copies of the mentioned reports will remain in the public domain up to completion of the construction phase.

6. Public notification

In the course of the ESIA process the mechanisms for facilitating input from stakeholder include notifications to local and regional NGOs, distribution of the ESIA documentation (including MENRP and local municipality offices).

Community will be informed about feedback and grievance mechanisms (see below).

Throughout construction period local municipalities will act as focal point for the feedback from community. Contractor's representative charged with responsibility to deal with community liaison will be in permanent contact with local authorities and community representatives on the ground.

During operation information about any maintenance (location, type of maintenance required, etc.) will be communicated to the stakeholders by RD through established procedure,

7. Resources and Responsibilities

RD will take overall responsibility for consultation with all stakeholders in relation to the Project and will use available resources to ensure that all consultation activities are conducted to the appropriate standard.

Environmental and Social team will be responsible for 1) communication with stakeholders, within the scope of its field of competence, throughout the ESIA process and 2) consideration

of the comments received from the stakeholders in the final version of the ESIA report. Responsibility of environmental and social consultant will end on submission of the final ESIA and related final versions of the documents to the state ecological examination.

Construction company (Contractor) will be responsible for nomination of Community Liaison Officer (CLO) and implementation of grievance procedure. During the project implementation phase, the Contractor's staff responsible for community liaison will be charged with responsibilities to communicate with the local community and to handle grievances. RD will be informed (copy of the grievances, if any, will be sent to the RD), closely monitor and involved in the grievance resolution. The scale of RD's involvement will depend on the scale and subject of the grievance raised.

8. Grievance Mechanism

Grievances related to environmental and resettlement issued during ESIA/RAP stage will be logged by phone, e mail, during the public meetings and/or in writing, recorded and responded by environmental and social survey team.

Grievances during construction can be lodged using the grievance form (see Annex 5-2). The leaflets for community and grievance forms will be posted on Contractor's website (if available) and/or made available at the local government offices, and contractors onsite office. Copies of the grievance will be sent to RD.

When any public grievances are received, these will be managed through a series of steps. In summary, requests for information/complaints will be acknowledged within 5-10 days and, where possible, the information requested will be provided within 10-20 days depending on the complexity of information requested/complaints received.

All grievances will be reflected in a grievance log to ensure that each grievance is assigned an individual number and that consistent tracking and corrective actions are carried out. The log will be used to analyse the frequency, as well as for prevailing subjects and any recurrent trend of grievances. The log will contain:

- Date when the grievance was received;
- The reference number;
- Content of the grievance;
- Identification of parties responsible for the resolution;
- Dates when the investigation was initiated and completed;
- Findings of the investigation;

- Information on proposed corrective action sent to the person who lodged the grievance (unless it was anonymous) and the date of the response sent; the date when the grievance was closed out;
- Statement of satisfaction of the person who lodged the grievance, or a reason for non-resolution of the grievance.
- Any outstanding actions for non-closed grievances.

All complaint documentation will be kept on a file for a period defined by the RD. Levels and types of complaints will be monitored by RD. Where a resolution to the grievance cannot be provided within the timescales specified above, Contractor and/or RD will inform complainant about that and once investigations have been completed, contact the person making the grievance to discuss and agree on the resolution. Contractor and RD may undertake follow-up monitoring to check that the problem does not recur.

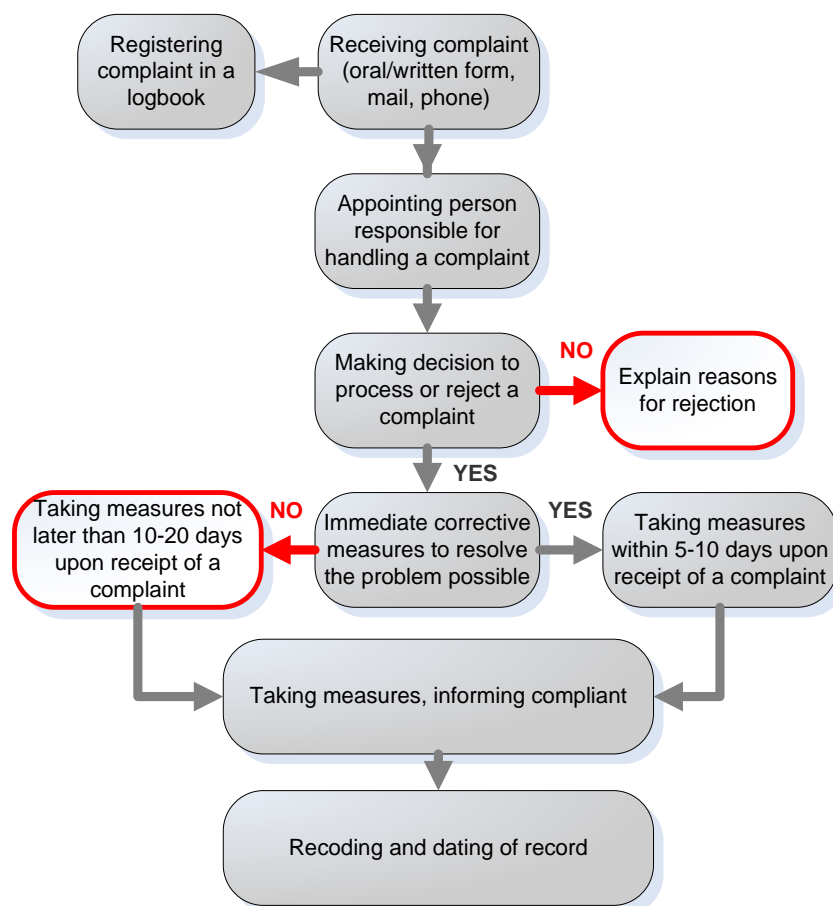


Figure A6-1. Grievance procedure

(The complainant will be informed if it has been decided to extend the complaint investigation period)

Management and resolution of any grievances will be subject to monitoring by the lender.

Persons lodging grievances will have an opportunity to maintain their confidentiality (see Annex 5-2 for details). Contractor/RD will ensure that the name and contact details of the person are not disclosed without their consent and only the team directly working on the investigation of the grievance will be aware of them.

In cases when an investigation necessitates passing some of the information on to third parties for the purposes of resolving the situation (e.g. when it is ascertained that the grievance resulted from certain actions by a contractor company), the complainant's agreement will be sought in a due manner. If it is not possible for the team to fully investigate the grievance without revealing the person's identity (for example if they are required to give evidence in court), the investigation team will discuss with the complainant how they wish to proceed.

The procedure also allows for anonymous complaints to be lodged. In this case the grievance will still be investigated, although Contractor/RD will not be able to provide feedback to a complainant. The procedure is shown graphically in the flow diagram below.

9. Monitoring and Reporting

It is important to monitor stakeholder engagement to ensure that consultation and disclosure efforts are effective, and in particular that stakeholders have been meaningfully consulted throughout the process. Monitoring will include:

- auditing implementation of the Stakeholder Engagement Plan;
- monitoring consultation activities conducted with government authorities and non-governmental stakeholders;
- monitoring the effectiveness of the engagement processes in managing impacts and expectations by tracking feedback received from engagement activities and recording and tracking commitments made to stakeholders;
- monitoring any grievances received and their resolution.

The Stakeholder Engagement Plan will be periodically revised and updated as appropriate during construction stage of the project.

Monthly summaries of incidents/grievances and the status of implementation of corrective/preventive actions will be referred to in Contractor's reports to RD.

Reporting to external parties such as regulatory authorities as required will be the responsibility of the RD. Reports will also be submitted to the lender in case agreed. Any record or document will remain available for examination by an authorised person.

10. Contact Details for the Public

Contact: Community Liaison Officer nominated by Contractor (construction company selected through tender)

Address: tbd

Email address: tbd

Tel/Fax: tbd

ANNEX 5-1. LIST OF STAKEHOLDERS

Governmental authorities:

- Ministry of Environment and Natural Resources Protection
- Administration of Lanchkhuti municipality
- Administration of Ozurgeti municipality

Utilities:

- Supsa Oil Terminal
- Water supply
- Power supply
- Amelioration service
- Georgian Oil and Gas Corporation

Communities:

- Tskhaltsminda
- Khidmaghala
- Supsa

Non-governmental organisations:

- Georgia Greens
- Green Alternative
- Union of Young Teachers (Ozurgeti),
- Youth centre Progress (Chokhatauri),
- Mediators association of Guria (Ozurgeti),
- Women for Development (Ozurgeti),
- Consumers Society of Ozurgeti,
- Farmers Union of the Guria Region (Ozurgeti),
- Foundation for Protection of Mothers and Children (Chokhatauri),
- Union of Hunters and Fisherman (Ozurgeti),
- Lanchkhuti Information Centre,
- Georgian Young Lawyers' Association – Ozurgeti branch,.
- Youth Resource Centre of Guria;
- Student-youth consultative organisation.

ANNEX 5-2. PUBLIC GRIEVANCE LEAFLET

The RD is striving to ensure that the construction of the Grigoleti-Kobuleti bypass highway will not cause any problems for those living near to the project site and for other potentially affected stakeholders. To achieve the mentioned goal and ensure preservation of environment we would like to hear about any concerns or grievances that you have in relation to the Project's activities. The grievance will be dealt with by Contractor (construction company identified through the tendering procedure). Copy of grievance form will be sent to RD. The latter will deal with grievances outside the scope of Contractors responsibilities.

What kind of grievance can I lodge?

Anyone can lodge a grievance if they feel that project activities are negatively affecting them, their community or their local environment. Example of grievances could include, for example:

- Negative impacts to local residents (such as excessive dust, noise, impact on private property, health and safety, etc.),
- Environmental damage resulting from the project activities,
- Practices that endanger the health and safety of employees or residents,
- Failure to meet the labour rights of employees working on the project.

How can I submit a grievance?

Anyone can submit a grievance in the following ways:

- By phone to tbd – will be specified after the tender,
- By e-mail on tbd - will be specified after the tender,
- In person or by ordinary mail to the: tbd - will be specified after the tender,

How will Contractor/RD deal with my grievance?

Contractor/RD will go through the following steps to deal with your grievance:

Step 1: Acknowledgement: Community liaison officer (CLO) nominated by Contractor will contact you to acknowledge and where possible resolve within the following timescales: Requests for information/complaints will be acknowledged within 5-10 days and, where possible, the information requested will be provided within 10-20 days depending on the complexity of information requested/complaints received.

This acknowledgment will include your grievance reference number, name of the person responsible for tracking your grievance and his/her contact details, expected date for completing the investigation into your grievance (where appropriate).

Step 2: Investigation: CLO will then set up an investigation into your grievance. We may need to contact you during this investigation. CLO will aim to complete the investigation within a further twenty working days.

Step 3 Resolution: When we have investigated the grievance we will contact you with our findings and our proposed response. If our investigations find that the grievance does not relate to the Project's activities we will explain this in writing to you. Otherwise we will propose a response to address the grievance. If you consider our response and its implementation to be satisfactory we will ask you to sign a statement of satisfaction if you are happy to do so. If you are not satisfied with our response we will have further discussions with you to see if there are other steps which can be taken to resolve the grievance.

Step 4 Follow up: CLO may contact you at a later stage to check that our activities pose no further problems.

Confidentiality: If you wish your grievance to remain confidential, CLO will ensure that your name and contact details are not disclosed without your consent and only the staff directly working on the investigation of your grievance will be aware of them. If it is not possible for the team to fully investigate the grievance without revealing your identity (for example if you are required to give evidence in court) the investigation team will discuss with you how you wish to proceed.

Anonymity: If you wish to lodge a grievance anonymously you can do so using the attached form without filling in the name and contact details. The grievance will still be investigated, but it may be more difficult for CLO to conduct the investigation and we will not be able to give you feedback on our investigations.

Public Grievance Form

Grievance Reference Number [(to be filled in by CLO)]:			
Your Contact Details	Name:		
	Address:		
	Tel:		
	e-mail:		
How would you prefer to be contacted? Please tick box	By post	By phone	By e-mail
Name and the identification information (from identity card).			
Details of your grievance. Please describe the problems, who it happened to, when, where and how many times, as relevant			
What is your suggested resolution for the grievance?			
How to submit this form to Contractor/RD	By Post to: tbd		
	By hand: tbd		
	By e-mail: tbd		
Signature		Date	

ANNEX A5-4. SCHEDULE OF STAKEHOLDER CONSULTATIONS

	Stakeholder	Date and time	Venue
1	Municipality representatives, all stakeholders	8 February 2017, time: 16:00	Municipality building: Ureki
2	Municipality representatives, all stakeholders	Tbd (after 50 th but not later than 60 th day from disclosure of the draft ESIA	Municipality building: municipalities within the project impact area

ANNEX 7. MINUTES OF MEETING**Environmental and Social Impact Assessment of Grigoleti-Kobuleti bypass construction and operation project****Minutes of meetings**

Ureki

09.02.2017

Venue: Ureki, administrative building

Chairman of the meeting: Gia Sopadze, Head of division for Resettlement and Environmental Protection, Roads Department of Georgia

Secretary of the meeting: Elene Mgaloblishvili, Social and resettlement specialist, Gamma Consulting Ltd

Attendees: Representatives of Roads Department of Georgia, representative of Ozurgeti municipality administration in Ureki, Ureki local government office staff, local residents, Representatives of Gamma Consulting Ltd, other stakeholders. (List of attendees in enclosed – see Annex A7-3)

Agenda:

1. General information about the project and companies/parties involved;
2. Presentation related to environmental impact assessment procedure and resettlement issues;
3. Questions and comments

Gia Sopadze, chairman of the meeting greeted the audience and described objective of the meeting and the project in general. He mentioned that construction of the new four lane, 14.4 km long section of the road bypassing residential areas as far as feasible is planned. Along with the road itself construction of bridges (over the rivers Supsa Sepa and Tskhaltsminda), three interchanges and overpasses is planned. The project is being developed by consortium of Spanish companies Getinsa Payma Eurostudios. The project is funded by European Investment Bank (EIB).

It was mentioned, that according to the national environmental legislation and international regulations the project requires assessment of impact on environment. Public participation in the process is essential component of that. Objective of the meeting is informing community/stakeholders about the project, related impacts on biophysical and socio-economic environment, assessment process/procedures, receiving feedback from the stakeholders and

their engagement in the process. Importance of comments and contribution of all interested parties was stressed.

Presentation of environmental impact assessment aspects was provided by M.Stamateli, Environmental Specialist of Gamma Consulting. Presented was visualization of alignment developed by design team. Objective of this presentation was to allow community better understand where the planned alignment will be. Impact of the project on local community and major nuisances/impacts related to the projects of similar type and scale were explained.

It was mentioned that on Feasibility Stage of the project three alignment alternatives and so called no action (Zero alternative) alternative were considered. For detailed evaluation alternative having least impact on environment and community was chosen. Positive and negative sides of alternatives were described. It was mentioned, that prior to commencement construction the project must undergo evaluation process and obtain approvals and permits from decision makers, including the lender. The project will be evaluated and checked for compliance with national regulations, EIB safeguards and other international regulations. In case of positive conclusion construction will be implemented by company identified via bidding procedure.

Particular interest of the attendees was related to resettlement and compensation issues. It was mentioned that construction of the road will result in depreciation of the cost of the land and that this will negatively affect development of Ureki resort. Health risks related to impacts caused by deterioration of air quality and noise related nuisances were discussed.

Attitude of local residents towards the project is dual – both positive and negative opinions have been voiced.

Attendees actively participated in discussion. Questions and answers are given in Annex 7-1.

Closing remarks were made by Mr.Sopadze. He promised to communicate the concerns and comments voiced by the stakeholders to RD and designers. He mentioned that all these issues will be discussed and that the project will be compliant with all relevant standards.

Chairman of the meeting: G.Sopadze

Secretary of the meeting: E.Mgaloblishvili

Annex 7-1

№	Question, comment, proposal	Answer
1	Why decision to build a highway through the resort area was made?	Construction of the four lane new road is required to ‘accommodate’ increasing traffic flows. Existing road is not sufficient to ensure safe and smooth traffic. The situation will worsen in the future when the traffic increases. For selection of alignment less damaging to environment and having minimum impact on the local residents (physical and economic resettlement is meant) and infrastructure several options have been considered. The space available for construction and abovementioned constrains (proximity of residents, railway line, etc.) restricted the choice significantly. Alternative presented for consideration is the least ‘damaging’ compared to other possible options.
2	Which company won the tender?	Tender for the design of the highway was won by Spanish company consortia – Getinsa-Payma-Eurostudios. Construction company will be identified through bidding procedure. The call for proposals will be announced after approval of the design, obtaining all required permits and authorisations from the national decision makers and the lender.
3	Have built a hotel with the aid of the credit from the bank. The road will run in less than 80m from my premises. Was told that the case is not eligible for compensation. The project will negatively affect my business. Construction and operation of the road will lead to pollution of environment. Consequently the number of visitors will diminish. Strongly oppose the	Compensation issues together with eligibility criteria are described in Resettlement Action Plan. In case the property/business is not eligible for compensation (is located out of the land acquisition boundaries) to alleviate negative impact on the latter mitigation measures will be put in place. This may include preservation of vegetation, installation of noise barriers, planting vegetation barrier between the source and recipient, implement measures to reduce visual impact, etc. Consultant is not empowered to resolve this complaint. It may be advisable to address the Roads Department directly to discuss the issue.

	project and plan to appeal to the court (including Strasbourg).	
4	What is the cost of 1m ² of land?	At this stage this information cannot be provided.
5	The property cottages have been valuated, Have no information about the cost. Send a letter with information request but no answer received. Why is this information kept confidential?	Land acquisition and resettlement procedure as well as proposal and negotiations related to the scale of compensation per each affected household will be offered and negotiated according to resettlement-compensation regulations currently in force in Georgia.
6	What is allowable setback distance from the road? Are there any limits available?	There are not universal limits for setback distances. According to information provided by design team (based on international experience) for already existing houses the distance from the edge of embankment to the house must be at least 8 meters; for new houses built after highway constructions at least 50 meters from the edge of the shoulder must be kept. In addition, authorities may establish extraordinary exceptions in specific locations or sections, due to special circumstances.
7	Are there any other alternatives? Is it possible to widen exiting Ureki road instead?	<p>Three alternative alignments and zero alternative have been considered on feasibility stage of the project.</p> <p>Widening existing road is not feasible. The space is restricted by railway on one side and buildings on the other side of the road. The only possibility in this case will be to relocated population and businesses along existing road. The scale of resettlement will be significant. Therefore this alternative was considered as unadvisable.</p> <p>Of all considered alternatives selected option has the least impact.</p>
8	Our properties are not in direct	Compensation issues together with eligibility criteria are described in Resettlement Action

	impact zone of the project (there are four of us). The project will have negative impact on us, but we are not supposed to be eligible for compensation. What can we do?	Plan. For properties not in direct impact zone of the project mitigation measures will be provided (such as noise barrier, green barriers, traffic speed reduction, etc).
9	My land plot is located near the new alignment. The price of my plot will reduce. Can somebody help me in resolving this issue?	Any indeliberate impact on property during construction works will be remediated.
10	What are the distances from Ureki and Shekvetili to the new alignment?	Distance from the new alignment to residential areas varies from 80m to 222m. Approximate distances are: 82m to Supsa, 135m to Tsvermaghala, 80m to Ureki, 182 m to Shekvetili, 220m to Black Sea Arena.
11	Why investor and Bank representatives do not meet us. Why information about the project is not transparent?	<p>According to the national regulations and requirements of International Financial Institutions informing and involvement of community/stakeholders in impact assessment process is obligatory. This meeting has been scheduled and is held in compliance with these requirements. Objective of the meeting is to inform community about the planned development, exchange of views and concerns as well as consideration of obtained information in the project and assessment of the impact.</p> <p>The 'owner' of the project is the state. Roads Department (RD) acts as representative of the state. The project is being developed under the request of the RD. All comments and opinion voiced or provided in writing will be discussed by relevant units/specialists of department, communicated to the design team and as far as feasible considered in the design.</p>

		Information will be provided to the Bank for consideration. The project, environmental impact assessment and resettlement action plan will undergo expertise both at national and international level. The reports will be posted to internet (webpage of the RD). Grievance mechanism has been developed to receive and respond to complain and comment from stakeholders. Contact information for any questions and feedback is indicated in the leaflet handed over to the attendees.
12	During construction and operation of the road pollution with lead and increase noise is expected. Are there any mitigation measures considered?	<p>During assessment of impact on environment impact on air quality and noise related impacts will be evaluated. Mitigation measures will be developed. Based on the modelling/calculations need for noise barriers or other measures will be identified and considered in the project.</p> <p>As for content of the lead and other substances in petrol, according to the Governmental Decree №229-(dated 27 May 2015) on amendment of 'Qualitative norms for petrol' from January 1, 2017 the following quality limits are set:</p> <p>Lead content – below 0.005 g/l; Benzene (volume fraction) – below 1 %; Aromatic hydrocarbons (volume fraction) – below 35%; Sulphur content – below 10 mg/kg.</p> <p>Measurements carried out at petrol stations by Environmental supervision division under the Ministry of Environment and Natural Resources Protection of Georgia and L.Samkharauli forensic expertise bureau in 2016 revealed compliance of the factual values with abovementioned figures.</p>
13	Have hotel, construction of the road will make it inaccessible. Is it	The issues will be discussed with design team to identify solution of the problem.

	possible to revise the design to resolve the problem.	
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Annex A7-2. Photolog



Annex A7-3 – List of attendees

N	გვარი, სახელი/Name	დასახლებული პუნქტი, ორგანიზაცია/ Settlement, organisation	საკონტაქტო ინფორმაცია (ტელეფონი, ელ ფოსტა)/ Contact details (phone, e mail)
1	საოქროსძე კოჭიჭიკაძე	ყარაი	598923898
2	ჭელი ნიკოლაშვილი	ჯეი	893 522-201
3	აბულაშვილი	ჯეი	555-58-56-48
4	საბაშვილი	ჯეი	599-11-86-62
5	შაველაძე ანდრია	ჭიჭიჭი	555-49-59-42
6	ხაბიბი ვახტანგ	ჯეი	599-39-29-76
7	პინა ვახტანგ	ჯეი	599-55-58-26
8	საბაშვილი ვიქტორია	ჯეი	597-10-44-65
9	შაველაძე ანდრია	ჯეი	591-71-71-24

N	გვარი, სახელი/Name	დასახლებული პუნქტი, ორგანიზაცია/ Settlement, organisation	საკონტაქტო ინფორმაცია (ტელეფონი, მერილი)/Contact details (Phone, e mail)
10	გვარამაძე პრინ	ჯეი	551-55-56-90
11	განაშვილი ზაქარია	ჯეი	598-66-81-39
12	ცაი ლომიძე	ჯეი	577-50-22-05
13	ხიჯიძე ზინაიდა	ჯეი	558-58-37-30
14	სამაგრაძე ზინაიდა	ჯეი	557-15-38-08
15	მამაძე მაქსიმე	ჯეი	551-27-39-34
16	ხიჯიძე ვახტანგ	ჯეი	599-75-13-07
17	განაშვილი ზინაიდა	ინვესტიციები	599-57-72-47
18	განაშვილი მანანა	ინვესტიციები	593-60-68-91
19	ლაშვილი მაქსიმე	ჯეი	598-70-38-72

N	გვარი, სახელი/Name	დასახლებული პუნქტი, ორგანიზაცია/ Settlement, organisation	საკონტაქტო ინფორმაცია (ტელეფონი, მელი)/Contact details (Phone, e mail)
20	საბაგო ეპინ	საბაგო	569-10-42-58
21	დუბიშვილი ვასილ (მუშაი)	მუშაი	599 58 21 45
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Note: Georgian version of the report includes a copy of leaflet (in Georgian) distributed to attendees