Draft Initial Environmental Examination

June 2019

Bakurtsikhe-Tsnori Road Section Project

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List of Acronyms

AM	Accountability Mechanism
ASR	Air Sensitive Receptor
AASHTO	American Association of State Highway and Transportation Officials
ASTM	American Society for Testing and Materials
AADT	Annual Average Daily Traffic
AC	Asbestos-Containing
ACM	Asbestos-Containing Material
CBR	California Bearing Ration
CIDH	Cast in Place Columns
CLO	Community Liaison Officer
OMC	Compaction Test
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CLS	Core Labour standards
CPS	Country Partnership Strategy
ESIA	Environmental and Social Impact Assessment
ESO	Environmental and Social Officer
EAC	Environmental Assessment Code
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EHS	Environmental, Health, and Safety
ESA	Equivalent Standard Axle
EU	European Union
EA	Executing Agency
GEL	Georgian Lari
GoG	Government of Georgia
GHG	Greenhouse Gas
GRC	Grievance Redress Commission
GRM	Grievance Redress Mechanism
GDP	Gross Domestic Product
H&S	Health and Safety
HSE	Health, Safety, and Environment
HGV	Heavy Good Vehicles
IEE	Initial Environmental Examination
IFC	International Finance Corporation
IFI	International Financial Institution
ILO	International Labor Organization
IMF	International Monetary Fund

IAS	Invasive Alien Species
pk	Kilometric point, milepost parker
LARP	Land Acquisition and Resettlement Plan
LGRM	Local Grievance Redress Mechanism
MCC	Manual Classification Count
MPC	Maximum Permissible Concentration
MoED	Ministry of Economic Development
MoESD	Ministry of Economy and Sustainable Development
MoEPA	Ministry of Environment Protection and Agriculture
MRDI	Ministry of Regional Development and Infrastructure
MDR	Moisture Density Relation
NAPR	National Agency of Public Registry
NSR	Noise Sensitive Receptor
NGO	Non-Governmental Organization
OHS	Occupation Health and Safety
OSHA	Occupational Safety and Health Administration
OECD	Organisation for Economic Co-operation and Development
O/D	Original Destination
PAP	Project Affected Person
PPE	Personal Protective Equipment
PC	Project Contribution
PIU	Project Implementation Unit
RAP	Resettlement Action Plan
ROW	Right-Of-Way
RD	Roads Department of Georgia
SPS	Safeguard Policy Statement
SEMP	Specific Environmental Management Plan
TOR	Terms of Reference
TMC	Turning Movement Count
UNFCCC	UN Framework Convention on Climate Change
USD	United States Dollar
WHO	World Health Organization

Currency Equivalents

1 US$ = 2.75 (GEL) - as of 4th June 2019
($ refers in this report to US-Dollars)

Weights and Measures

NH_4	Ammonium
NH^3	Ammonia
As	Arsenic
dBA	A-Weighted Decibels
BOD_5	Biochemical Oxygen Demand

Cd	Cadmium
Ca^{2+}	Calcium
CO^2	Carbon Dioxide
CO	Carbon Monoxide
cm	Centimeter
COD	Chemical Oxygen Demand
Cl^-	Chlorine
Cr^{6+}	Chrome
m^3	Cubic Meter
dB	Decibel
ha	Hectare
Hz	Hertz
HCO_3^-	Hydrocarbonate
Fe	Iron
km	Kilometer
km/h	Kilometers Per Hour
Pb	Lead
Mg^{2+}	Magnesium
MAC	Maximum Allowable Concentrations
MPC	Maximum Permissible Concentrations
m	Meter
µg	Microgram
$\mu g/m^3$	Micrograms per cubic meter
mg	Milligram
mg/kg	Milligram Per Kilogram
mg/l	Milligram Per Liter
mm	Millimeter
NO_3	Nitrate
NO_2	Nitrite
N	Nitrogen
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PM	Particulate Matter
PM_{10} and $PM_{2.5}$	Particulate Matter of 2.5 micron or 10 micron size
POPs	Persistent Organic Pollutants
K^+	Potassium
pH	Potential of Hydrogen
RFP	Resettlement Policy Framework
Na^+	Sodium
Km^2	Square Kilometer
m^2	Square Meter
SO_2	Sulfur dioxide
SO_4^{2-}	Sulphate
TSP	Total Suspended Particulates
TSS	Total Suspended Solids
Zn^{2+}	Zinc

Note

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1. Executive Summary

1.1 - Introduction

1. Georgia is located to the south of the Caucasus mountain range, with Russia located to its north, Armenia and Turkey to its south, and Azerbaijan to its east. With a population of 3.7 million, it is moderately urbanized, with 42% living in rural areas.[1]

2. Over the last five years, Georgia has achieved significant economic progress. In the past decade, Georgia's economy has grown robustly at an average annual rate of 4.5%. This was despite numerous shocks, including the global financial crisis of 2007–08, the conflict with the Russian Federation in 2008, and the drop in commodity prices since 2014, which impacted key trading partners. Poverty declined from 32.5% in 2006 to 16.3% in 2017. The poor have benefited considerably from the Government's social policies, as well as from new economic opportunities. Although inequality remains high by regional standards, it has been declining in recent years, thanks to strong improvements in the welfare of households in the bottom 40% of the income distribution. Georgia's recovery and growth can also be attributed to an increase in exports and tourism and continued high levels of public investment.

3. In 2011, the Government developed a ten-point economic program with the goal of facilitating job creation and improving welfare of the population. Among the top ten priorities is the improvement of the infrastructure, especially roads. The Government of Georgia (GoG) is currently implementing 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 Gross Domestic Product (GDP).

4. The Government's ambitious plans to maintain high economic growth by promoting the transportation of goods within the country, increasing tourism, and revitalizing agriculture, pose the following challenges to the road sector: i) significant capital investment is needed to bring the road network to a level that can support the economy; ii) scarce resources need to be prioritized to ensure long-term maintenance of the road assets; iii) local connections must be improved to provide the rural population with easy access to markets; and iv) investments in the road sector need to generate employment.

1.2 - Project Background

5. The RD of Georgia developed a Five-Year Rolling Program for Preservation and Improvement of Secondary Road Assets for 2016-2020. Improvement and upgrading of the Zhinvali-Bakurtsikhe-Tsnori secondary transport corridor is part of this Five-Year Rolling Program and is important in connecting several regions of the country and two international transport corridors linking Georgia with Azerbaijan (via S-5 Tbilisi-Bakurtsikhe-Lagodekhi) and Russia (E-117).

6. The Tbilisi-Bakurtsikhe-Lagodekhi international road (S-5) connects Tbilisi with Lagodekhi city and the State border with Azerbaijan, as well as with the cities of Kakheti. The Bakurtsikhe-Tsnori section is located along the Tsivgombori ridge and passes through densely populated villages in Gurjaani and Sighnaghi districts and several ravines. The deteriorating condition of the existing road and high levels of congestion, including from a

[1] The World Bank. 2019. World Development Open Data.

large number of heavy goods vehicles (HGVs), has reduced road safety and limited the ability to accommodate future projected traffic. This is particularly problematic on the Bakurtsikhe-Vakiri section of the road where the existing alignment runs through the villages of Bakurtsikhe, Kardanakhi, Anaga, and Vakiri. The road does not currently meet the necessary international standards and there is no feasible option to improve the existing road without requiring demolition of infrastructure (houses, land plots, etc.) and resettlement.

7. Financial support from the ADB is being sought for construction of the Bakurtsikhe-Tsnori road section herein referred to as the "Project". The Project is consistent with the ADB's Country Partnership Strategy (CPS), 2019-2023 for Georgia which identifies the development of an efficient, sustainable transport network as a strategic objective and operational priority in line with making the country an international gateway and to promote inclusive growth.

8. A design-build contract modality is being used for the detailed design and construction of the road section. Kocks Consult GmbH ("Kocks") was engaged by the RD to provide consultancy services for preparation of a feasibility study, preliminary design, and bidding documents. An Environmental and Social Impact Assessment (ESIA)[2], Resettlement Policy Framework (RPF), and Resettlement Action Plan (RAP) were also developed in 2018 by the RD in accordance with World Bank safeguards policies.

9. Since funding is being sought from the ADB for construction of the Project, an environmental assessment has been carried out in accordance with the requirements of the ADB's Safeguard Policy Statement (SPS) (2009). In this case, the Project was initially Categorized as a B and so an Initial Environmental Examination (IEE) has been prepared. It should be noted that the impact assessment provided in this IEE is based on preliminary designs for the Project road and not the detailed designs.

1.3 - Description of the Project

10. The Bakurtsikhe-Tsnori road section is expected to be designed and built in the Alazani lowland along a new alignment bypassing the settled areas along the existing road. The new road section will branch from the Bakurtsikhe - Gurjaani bypass road, which is presently under construction, at approximately km 1.8. The road continues north-east crossing an irrigation canal and then turns right to run parallel to the canal in a south-easterly direction before connection with the S-5 Tbilisi - Lagodedekhi. The length of the new road is approximately 16 km, starting at km 0+600 and ending at km 16+809. The road is located within Gurjaani Municipality (Bakurtsikhe) and Sighnaghi Municipality (Tsnori). The geometrical road design is based on the Georgian Geometrical Road Design Standard introduced in 2009.[3] The road design also conforms with the Trans-European North-South Motorway (TEM) Standards, but road itself is not part of the Trans-European road network.

11. To provide adequate access to the villages being bypassed, a diamond interchange at km 11+386 is planned. The secondary road where the new interchange will connect will be rehabilitated/paved. The length of the secondary road is approximately 1,100 m and the paved carriageway width will be 6 m with 0.50 m gravel shoulder on both sides. While final designs of the secondary road still need to be developed by the design-build Contractor, the upgraded road will stay within the exiting right-of-way (ROW).[4] The secondary road currently connects the village of Vakiri to a service road running parallel to the agriculture channel and

[2] The draft World Bank ESIA has been disclosed and is available on the Roads Department of Georgia website here: http://www.georoad.ge/?lang=eng&act=project&func=menu&uid=1543574999
[3] Geometrical and Structural Requirements for Georgian Automobile Roads, Ministry of Regional Development and Infrastructure, Roads Department, Tbilisi 2009
[4] Davit Getsadze, Roads Department, pers. comm. 2019

the proposed road. The secondary road is now being utilized by local residents and farmers and the numbers of vehicles is very low. Since the secondary road will be the only connection along the new road between Bakurtsikhe and Tsnori, the number of users is expected to increase however.

12. The Project area is sparsely populated and highly agricultural. The area is characterized by a large number of small-scale farms and land acquisition and resettlement was identified immediately as key issue of concern in defining alignment alternatives. There were particular concerns around land parcels not officially registered and with the anticipated impact on agriculture land being for production of fruit and grapes in the planned ROW.

13. Figure 1 indicates the location of the Project within the context of Georgia.

Figure 1. Road Location Map

1.4 - Alignment Alternatives

14. During project preparation, various alternatives for project components were proposed, screened, and studied against technical, economic, social, energy efficiency, and environmental criteria. The primary objective with respect to the environmental criteria was to identify and adopt options with the least adverse environmental impacts and maximum environmental benefits. The following key environmental factors were used in comparing alternatives: i) impact on air quality; ii) noise; iii) impact on soil; iv) impact on surface water; v) impact on biodiversity and ecological integrity; vi) landscape and visual impact; and vii) socio-economic impact. The alternative analysis also included the no-project alternative.

15. No-Project scenario. Without the Project the existing road would continue to be a logistic obstacle to road transport and limit the economic benefits to Georgia and surrounding economies. The condition and capacity of the existing roadway increases travel time and contributes to increased traffic safety risks (particularly from large vehicles). The

surrounding villages would continue to experience through traffic, which is negatively impacting community health and safety, especially to pedestrians, cyclists, animals, and other non-motorized road users.

16. During periods of inclement weather, such as in the winter season, traffic obstructions are common on the existing road since the current road size makes it difficult to remove snow. Traffic also intensifies during the summer and autumn seasons when the numbers of the tourists traveling along the Kakheti region increases. In the future, with growing traffic flows expected from Tbilisi and other cities to Kakheti region, the condition of the existing road is expected to deteriorate further.

17. Therefore, it can be determined that the 'No-Project' alternative is not a reasonable option if the overall socio-economic situation in the eastern region is to be improved.

18. Existing road upgrading alternative. Upgrading the existing road between Bakurtsikhe and Tsnori is not the preferred alternative for many of the same reasons identified in the 'No-Project' option described above. While upgrading the road would have a comparatively lower cost and impact on landowners compared to constructing a new road, it does not address the fundamental transport issues identified by stakeholders and the GoG. Due to the road alignment, there would be significant adverse impacts to settlements from road construction and widening if undertaken. In addition to considerable transit disruptions from road upgrading actives, the completed upgrades would fail to address existing safety issues for road users, including cyclists and pedestrians. Moreover, with traffic flow expected to increase over time, including use from heavy vehicles, the upgraded road would soon prove inadequate compared to the services of a new road.

19. Alternatives of the road corridor. Three alignment alternatives were developed to bypass the villages along the existing road. The alignment alternatives aimed to minimize impacts on arable land, especially vineyards and peach plantations. Alternatives were assessed during the feasibility phases through a multi-criteria analysis in which the various alternative alignments for Project were proposed, screened, and studied against functional, economic, and environmental and social criteria. While the alignment alternatives analyzed have similarities, the option providing the greatest economic and social benefits and fewest negative environmental and social impacts has been selected as the preferred option.

1.5 - Description of the Environment

20. The IEE report presents information about the physical, biological, and socio-economic characteristics of the environment alongside the preferred Project alignment. The purpose of this description is to establish an environmental baseline to identify potential direct, indirect, cumulative, and induced environmental impacts on and risks to these resources, and to suggest adequate response through measures that are appropriate to avoid, minimize, or mitigate potential adverse impacts. The environmental baseline conditions in the Project area include:

21. Meteorology and climate. The territory of the Gurjaani and the Sighnaghi Municipalities, where the proposed road section is located, covers the central part of Alazani Valley and the low and medium mountain zone of Tsivi - Gombori Ridge. In general, the climate is temperate humid, with hot summers and moderately cold winters. The average annual temperature in the area is +12.4 ^{0}C; the average coldest month (January) is 0.9 ^{0}C; the average hottest month (August) is +23.6 ^{0}C; the average annual relative humidity of the air is 72%; and the absolute minimum and maximum temperatures were recorded as -22 ^{0}C; and +38 ^{0}C respectively. Annual total precipitation is 741mm, with a monthly total maximum

of 117 mm in May, and minimum 28 mm in January. Average annual wind speed is 1.7 m/sec with western and south – western winds prevailing in the surrounding area.

22. Geology and geomorphology. The Project area belongs to Alazani Depression in western part of the intermountain plain zone of Georgia. The Alazani Depression is a continental geosynline located between the Major Caucasus range on the east and the Gombori range on the west. The direction of the Alazani Depression is NW - SE and it is filled with Quaternary alluvial-prolluvial deposits from the rivers which flowing from the Caucasus and Gombori slopes in the same direction, most notably the Alazani River.

23. Hydrology and hydrogeology. The central part of Georgia is covered by the Georgian and Azerbaijan hydrogeological district. The major aquifers are Tertiary rocks, which built up the artesian basins of Alazani and Lori. The proposed Project alignment is crossed by 24 gullies and nine smaller channels dispensing water from the irrigation canal. The gullies crossing the Project road are on the north-eastern slopes of the south-eastern end of Tsiv-Gombori ridge and flow into the river Alazani. A relatively permanent water flow in the gullies is fixed on the slopes of Tsiv-Gombori ridge, while the beds of the gullies near the settled areas at lower altitudes and on Alazani Plain (where the Project road is planned) are typically dry. Along these sections, water in the gullies flows only during the periods of snow-melt or intense rains. Sometimes during intense rains, water can discharge out of the gully banks inflicting significant material damage to the settled areas and agricultural fields. One of the gullies, flowing across the village Kardanakhi (which the Project road is bypassing), experiences occasional mudflows during periods of heavy rain. According to the engineering-geological studies conducted within the study area, the groundwater level is 9.5-10.5 m.

24. Soils, landscape, and land use. Forest brown soils can be found on alluvial fans and Gombori ridge slopes. In areas with higher elevation other forest brown soils of medium and small thickness can be found. Upland of Kakheti, black soils of medium and small thickness can be found and within the Alazani valley calcareous alluvial soils are present. This is an area of alluvial carbonaceous soils, which are formed on the alluvium taken from Gombori ridge by Alazani tributaries. The Project area is predominately rural, agricultural, and undeveloped.

25. Air quality. Only farm equipment and vehicles belonging to a low number of residents frequent the area. No other potential sources of atmospheric pollution (e.g., quarries, factories, power plants) exist along the alignment. Therefore, establishing ambient air quality was not considered necessary at the preliminary design stage. Air quality data is also not available from other sources (e.g., monitoring stations) for analysis. In general, existing air quality appears to be good and is not expected to be above allowable limits set by international standards.

26. Noise. Three 24-hour long noise measurements were conducted along the eastern part of the Project where there are noise sensitive receptors, in order to determine the existing background noise levels. As the new highway is traveling through the farmlands on a new alignment, there is no existing traffic noise along the proposed alignment. Two of the measurement sites were along the new highway and one along the existing secondary road that will be rehabilitated as part of the proposed Project. According to the measured results, daytime and nighttime peak noise levels are either below or at the IFC limit of 55 dBA and 45 dBA respectively.

27. Natural hazards. Georgia is located within the Mediterranean seismic belt, in the active seismic zone of the Caucasus. 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. Kolkheti depression is bounded by major folds and active faults. For the area of interest, flooding and mudflow are the main hazard.

28. Habitats, flora, and fauna. There are no protected areas in the vicinity of the Project area. In general, the area has been heavily anthropogenically modified. The majority of land has been deforested for wood and agricultural purposes. However, what remains in terms of habitat provides important shelter for animals. The proximity to the river, flat terrain, understory layer of vegetation, and overall isolation from noise and largescale development has allowed different species of animals to persist in the area. Most likely, the territory is used as a wildlife corridor by larger mammals on their way to Alazani River groves and surrounding forest areas which would provide much better habitat. Fish species are not known to be present in the Project area. Along the agricultural lands which are located near populated areas, approximately 150 walnut trees (*Juglans regia*) were registered by the survey team that fall within the ROW. This species is included in Red List book of Georgia and identified as vulnerable.

29. Historical and cultural heritage. There are many architectural monuments in Gurjaani-Sighnaghi municipalities, including the VIII-IX c. Gurjaani Kvelatsminda. The Kvelatsminda Monastery is located a few kilometers away from the village of Vachnadziani which is revered for its Georgian architecture. Near the village of Vejini is a fortress built with cobble-stone. There are several churches inside the fort, including the Easter Ascension and St. Mary's churches. In the village of Kardenakhi, the Church of Sabatsminda of XIII c. is preserved. Near to Cheremi is the Georgian architectural monument Tsverdabali, and the site of former city is also located here. In the Sighnaghi municipality, the Bodbe Monastery, St. Nino's Monastery Complex, and Episcopacy are historically and architecturally important. Despite the numerous historic and cultural monuments located in the Gurjaani and Sighnaghi municipalities, there are no historical or cultural sites present in the Project area. The closest historic monument is located in the village Akura, which is approximately 25 km away from Bakurtsikhe.

30. Social environment. Bakurtsikhe Village (Gurjaani Municipality), where the Project road begins, is located on the right side of the Alazani River, on the banks of the Chalaubniskhevi River, 440 meters above the sea level, and 8 km from the town of Gurjaani. According to the official census, 2,574 people lived in the village in 2014.The residential areas closest to the Project sites are Bakurtsikhe, Vakiri Village, and Tsnori. The town of Tsnori (Sighnaghi Municipality) close where the proposed alignment ends, has a population of 4,815 according to the 2014 census data. The main source of income for the population in the Project area is viticulture, although most of the agricultural plots belong to private companies or companies that have long-term leasing agreements for producing wine. Part of the local population is employed in the enterprises, but the income from this alone is often not sufficient. The LARP should be referred to for full details on Project affected people (PAP).

1.6 - Anticipated Environmental Impacts and Mitigation Measures

31. The Project is expected to generate both positive and negative impacts throughout the project cycle. Potential impacts were screened, identified, and assigned significance based on the assessment method provided in Section **7.1 - Impact Assessment Methodology**. Assessment of impact tables for the most significant potential impacts were developed to provide more in-depth analysis and are included in Section **7.2 - Impacts and Mitigation Measures**. Residual impacts after implementing mitigation measures were then identified.

32. Potential direct impacts typical for this kind of project include the use of geological and water resources; soil disturbance and erosion; degradation of water resources; localized generation of fugitive dust and air emissions from construction and operational equipment; noise generation; disturbance or loss of paleontological and cultural resources; degradation or loss of wildlife habitat; disturbance of resident and migratory wildlife species; degradation or loss of plant communities; increased opportunity for invasive vegetation establishment; alteration of visual resources; land use changes; road access restrictions and increased traffic; accidental release of hazardous substances; and increased human health and safety hazards.

33. A general description of primary environmental impacts and mitigation measures is provided below:

i. Primary Impacts During Site Preparation, Construction, and Worksite Closure Phase

- Water quality. Without mitigation, one of the principal impacts during construction will be on water bodies, particularly during construction along the irrigation canal. The activities posing the highest risk to deterioration in the surface water environment would be the temporary works associated with bridge and road construction and release of contaminants, sediment loading, and other runoff into watercourses. Surface water quality analysis from the baseline surveys indicated that the surface water near the Project site had elevated levels of total coliform and total suspended solids. Therefore, water quality will be measured regularly throughout the construction phase and emphasis will be placed on local consultations with farmers along the proposed alignment. Control of water, materials, and construction equipment will be of utmost importance during construction. Canal, river, and riverbank protection measures will need to be elaborated in the detailed design stage.
- Noise and dust. The dust generated and mobilized by construction activities is likely to impact on residents and vegetation, including crops, close to the Project construction sites. However, dust suppression measures are clearly specified and will be implemented to manage dust to acceptable levels. Noise will be managed to the extent possible using best practice and mitigation measures aimed at reducing and or directing construction related sounds that may impact sensitive noise receptors.
- Health and safety. Project workers will be exposed to different hazards during construction including noise and vibration, dust, handling heavy materials and equipment, falling objects, work on slippery surfaces, fire hazards, drowning and chemical hazards such as toxic fumes and vapors etc. There are a number of potential health and safety related impacts which may result from construction activity on the Project, including traffic accidents, presence of new infrastructure, management of hazardous materials and waste, and spread communicable disease. Potential risks will be eliminated or reduced using good practice and known control and management solutions.
- Terrestrial habitat. It is unlikely that construction of the new road section will exert any significant additional impact on the existing flora and fauna in the Project area over and above the current situation due to the presence of largely modified habitat. However, approximately 77 ha of land will need to be cleared of trees, shrubs, and general waste to accommodate for the associated working areas.[5] This will result in loss of plants, contributing to a

[5] Kocks Feasibility Study, 2018.

decline in their numbers, as well as loss of habitat for species of mammals, birds, insects and herpetofauna that they provide. The Contractor shall be responsible for replanting of any trees cut which are not already included as part of the LARP on a 1:3 basis using species native to the area. To ensure that impacts can be correctly quantified, and any replanting requirements can be properly established, the extent of habitat by type will be surveyed as part of the detailed design work by the Contractor.

- As mentioned above, a number of walnut trees (*Juglans regia*) that are included in the Red List book of Georgia were registered by the Kocks survey team in the Project ROW. It is not known at this time how many of these trees will be lost and the Contractor will need to identify protected walnut trees, as well as any other protected species, through a site survey prior to construction. This survey will form part of the Contractor's Clearance, Revegetation, and Restoration Management Plan. Where walkover surveys pre-construction reveal that protected plant species in the area will be lost, the contractor will be responsible for replanting cut trees on a 1:10 basis. Revegetation and compensatory tree plantings will be implemented in coordination with the RD and Project affected communities according to a reinstatement plan to ensure proper survival of tree seedlings restoration of the vegetative cover.
- Socio-Economic. Several socio-economic beneficial impacts are expected including: (i) generation of skilled and unskilled employment opportunities; (ii) induced economic effects of spending on goods and services by construction workers; and (iii) long-term capacity enhancement for the local workforce.

ii. Primary Impacts during Operation Phase

- Community health and safety. One of the key potential positive impacts during operation will be reduced traffic safety risks (particularly from large vehicles) for communities where the existing road passes since much of the traffic is expected to use the new highway once constructed. While higher traffic speed on the proposed highway could result in increased risk to drivers, the risk will be reduced through installation of road signs, pavement marking, installation of guide posts and steel guardrails, cast in situ concrete parapets in the dividing strip, and enforcement of speed limits to ensure traffic regulations and safety. Overall, construction of the new road will improve community health and safety, especially to pedestrians, cyclists, animals, and other non-motorized road users.
- Noise. Results of the traffic noise impact analysis indicate that there would be no significant noise impact per IFC guideline limits. Therefore, no noise mitigations such as noise barriers are needed. However, a new noise source will be introduced to the rural area once the Project is operational. Monitoring of the nearby noise sensitive sites will be required in the future to determine actual noise levels in these areas.
- GHG emissions. The Project road section will help to increase the economic development of the region and result in increased traffic. This will lead to higher levels of GHG emissions. The overall contribution to GHG emissions will be low and no adverse air quality impacts are expected at the air sensitive receptors in the vicinity of the Project site above what already exists.
- Air quality. To quantify potential air quality impacts on local vineyards associated with projected traffic levels, an air quality impact assessment study was conducted as part of this IEE by an international engineering and

environmental consultancy[6] using appropriate air quality modelling methods. 21 parcels have been identified as potentially exceeding thresholds for airborne NOx concentration and dust deposition based on modeling results for years 2020, 2025, and 2035 (see Table 53). In view of the uncertainty in the study conclusions, a program of monitoring will be carried out before and after operation of the road commences to determine whether implementing appropriate mitigation measures is necessary. In order to ensure a protective approach, considering the economic importance of the wine sector in the region, mitigation measures will need to be implemented in the areas of the proposed road where land parcels have been identified by the assessment as exceeding guideline thresholds. Mitigation measures should include planting of vegetation barriers (i.e., trees and hedges) at the closest boundary of the vineyards to the road.

1.7 - Implementation, Management, and Monitoring

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

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

36. The EMP states that the SEMP will also need to include the following thematic management plans:

- Waste Management Plan
    - Wastewater Management Plan
    - Spoil Disposal Management Plan
- Soil Erosion Management Plan
- Traffic Management Plan
- Method Statement for Temporary Roads
- Aggregate and Borrow Pits Management Plan
- Employment and Procurement Procedure
- Occupational and Community Health and Safety Management Plan
- Emergency Response Plan
- Air Quality Plan
- Spill Management Plan
- Clearance, Revegetation, and Restoration Management Plan
- Noise Management Plan
- Biodiversity Management Plan
- Laydown Area and Construction Camp Management Plan
- Asphalt, Rock Crushing, and Concrete Batching Plant Management Plans
- Bridge Construction Plan

37. Direction and guidance on what the above-mentioned thematic management plans should cover is provided in **Annex 9. Thematic Management Plans**.

[6] Ricardo Energy & Environment

38. The EMP and all its requirements will then be added to the Contractor's contract, thereby making implementation of the EMP a legal requirement according to the Contract. The Contractor will then prepare a SEMP which will be approved and monitored by the Engineer. Should the Engineer note any non-conformance with the SEMP (and the EMP) the Contractor can be held liable for breach of the contractual obligations of the EMP. To ensure compliance with the SEMP the Contractor should employ an Environmental Officer (EO) to monitor and report Project activities throughout the construction phase. The Contractor shall also hire qualified Health and Safety Specialists (HSS) for the Project duration. In addition, the Contractor will be responsible for nomination of a Community Liaison Officer (CLO) who will ensure that the grievance mechanism is available to all stakeholders, involves an appropriate level of management and addresses concerns promptly.

39. The GRM prepared as part of the Project provides a structure for stakeholders to make complaints and a mechanism for the complaints to be resolved both locally and centrally (see Chapter **9. Grievance Redress Mechanism**).

40. Monitoring and verification will be reported and made available for inspection upon request. All incidents will be reported and corrective actions will be taken as necessary according to management plan recommendations and RD procedures. This will enable and facilitate a process of continuous improvement. All grievances received will be addressed and investigated.

41. 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; and
- continuation of the IEE as an iterative process through to the construction and operational environment and social management systems, which will be based on continual improvement.

1.8 - Conclusions and Recommendations

42. Based on the analysis of information and feedback received from various stakeholders, this IEE concludes that potential significant physical, biological, or socio-economic environment impacts from the Bakurtsikhe-Tsnori Road Section Project can be addressed and it is unlikely that there will be any significant environmental impacts remaining after planned mitigation and offset measures. The Project will have short term impacts during construction which can be mitigated to an acceptable level through measures which seek to reduce the potential for harm to the environment and human health.

43. Residual impacts for the most significant potential impacts (see assessment of impact tables in Section **7.2 - Impacts and Mitigation Measures**) are identified below. Residual impacts are qualified as **Negligible**, **Minor**, **Moderate**, and **Major** according to the assessment method described in Section **7.1 - Impact Assessment Methodology**.

Table 1. Summary of Residual Environmental Impacts

Environmental Factor	Project Phase	Potential Impacts	Pre-mitigation Impact Significance	Residual Impact Significance
Soil Fertility and Quality	Site Preparation, Construction, and Worksite Closure	Loss of topsoil resources and contamination of soil during construction.	**Moderate**	**Minor**
	Operation	Potential for soil erosion and contamination from vehicle circulation and maintenance activities during the operation of the road.	**Minor**	**Negligible**
Air Quality	Site Preparation, Construction, and Worksite Closure	(i) Fugitive dust emissions associated with the materials handling, wind erosion of open areas, and truck movements on access roads within the construction worksites; (ii) operation of concrete batching plant; and (iii) Air emissions including NO_2, SO_2, PM_{10} and $PM_{2.5}$ from construction equipment and truck circulation within the work areas.	**Minor**	**Negligible / Minor**
	Operation	Release of air pollutants including NO_2, SO_2, PM_{10} and $PM_{2.5}$ from vehicle circulation on the new road.	**Moderate**	**Minor**
		Potential impacts on climatic condition due to GHG emissions.	**Minor**	**Minor**
		Effects of road traffic pollutants on vegetation or agricultural production, and vineyards specifically.	**Moderate**	**Negligible**
Noise and Vibration	Site Preparation, Construction, and Worksite Closure	Noise and vibration emissions resulting from the use of machinery and equipment and vehicle circulation.	**Minor**	**Negligible / Minor**
	Operation	Noise impact from circulating vehicles during operational phase.	**Moderate**	**Minor**

Surface and Groundwater	Site Preparation, Construction, and Worksite Closure	Potential for impacts to surface and ground water due to: (i) contamination from accidental releases of hazardous substances such as fuels, oils or lubricants; (ii) improper chemical/fuel storage; and (iii) wastewater discharges and sediment laden runoff. Potential secondary impacts to downstream users of irrigation canal.	**Major**	**Minor / Moderate**
	Operation	Potential for impacts to surface and groundwater from vehicle circulation and maintenance activities during the operation of the road.	**Moderate**	**Minor**
Ecology and Biodiversity (Habitat / Flora)	Site Preparation, Construction, and Worksite Closure	Impacts to flora on the Project area, not including agricultural flora, from site development and construction of Bakurtsikhe-Tsnori Road Section.	**Moderate**	**Minor**
	Operation	Impacts on vegetation in the Project area, not including agricultural flora, in the operation phase from vehicle circulation and maintenance of the road.	**Minor**	**Negligible**
Ecology and Biodiversity (Fauna)	Site Preparation, Construction, and Worksite Closure	Impacts on terrestrial and aquatic biodiversity resulting from construction of the Bakurtsikhe-Tsnori Road Section.	**Minor**	**Negligible**
	Operation	Impacts on terrestrial and aquatic biodiversity resulting from operation of the road.	**Minor**	**Negligible**
Landscape	Site Preparation, Construction, and Worksite Closure	Landscape and visual impacts during construction phase.	**Moderate**	**Minor**
	Operation	Landscape and visual impacts during operation phase.	**Moderate**	**Minor**

Socio-Economic	Site Preparation, Construction, and Worksite Closure	Impact to employment and economy.	***Positive****	**Minor**
		Impact on community health, safety, and security due to increased traffic; the transport, storage, and use and/or disposal of materials (e.g., fuel and chemicals); access to structural elements or components of the project; and introduction of infection disease (both vector borne and other communicable diseases).	**Major**	**Minor**
		Impact on community infrastructure and services.	**Minor**	**Negligible / Minor**
	Operation	Impacts to connectivity and accessibility resulting from the operation of the Project road.	***Positive****	**Moderate**

Note: It is considered sufficient for the purpose of this IEE to indicate that the Project is expected to result in a potential positive impact prior to mitigation without characterizing the exact degree of positive change likely to occur.

44. Based on the analysis provided in this IEE, the classification of the Project as Category B per ADB SPS is confirmed.

45. Interviews and analysis from a preliminary social survey with affected communities and roadside businesses undertaken by Kocks (see **Annex 3. Interviews and Analysis from Preliminary Social Survey with Affected Communities and Roadside Businesses**) indicates that small outdoor vendors operating on the existing road expect to lose business as a result of reduced traffic flows. It is recommended that a component be integrated into the Project that supports outdoor vendors operating on the existing road who are likely most vulnerable to this change. One mitigation measure could entail creating a centralized marketplace for the vendors where the section of new road will connect to the S-5 highway in the town of Tsnori.

2. Introduction

2.1 - Overview

46. The Roads Department (RD) of the Ministry of Regional Development and Infrastructure (MRDI) of Georgia developed a Five-Year Rolling Program for Preservation and Improvement of Secondary Road Assets for 2016-2020. Improvement and upgrading of the Zhinvali-Bakurtsikhe-Tsnori secondary transport corridor is part of this Five-Year Rolling Program and is important in connecting several regions of the country and two international transport corridors linking Georgia with Azerbaijan (via S-5 Tbilisi-Bakurtsikhe-Lagodekhi) and Russia (E-117).

47. The Tbilisi-Bakurtsikhe-Lagodekhi international road (S-5) connects Tbilisi with Lagodekhi city and the State border with Azerbaijan, as well as with the cities of Shida Kakheti. The Bakurtsikhe-Tsnori section is located along the Tsivgombori ridge and passes through densely populated villages in Gurjaani and Sighnaghi districts and several ravines. The deteriorating condition of the existing road and high levels of congestion, including from a large number of heavy goods vehicles (HGVs), has reduced road safety and limited the ability to accommodate future projected traffic. This is particularly problematic on the Bakurtsikhe-Vakiri section of the road where the existing alignment runs through the villages of Bakurtsikhe, Kardenakhi, Anaga, and Vakiri. The road does not currently meet the necessary international standards and there is no feasible option to improve the existing road without requiring demolition of infrastructure (houses, land plots, etc.) and resettlement.

48. Financial support from the ADB is being sought for construction of the Bakurtsikhe-Tsnori road section herein referred to as the “Project”. The Project is consistent with the ADB’s Country Partnership Strategy (CPS), 2019-2023 for Georgia which identifies the development of an efficient, sustainable transport network as a strategic objective and operational priority in line with making the country an international gateway and to promote inclusive growth.

2.2 - Purpose and Scope of the IEE Report

49. An Environmental and Social Impact Assessment (ESIA)[7], Resettlement Policy Framework (RPF), and Resettlement Action Plan (RAP) were developed in 2018 by the RD in accordance with World Bank safeguards standards. Since funding is being sought from the ADB for construction of the Project, this Initial Environmental Examination (IEE) has been carried out in accordance with the requirements of the ADB’s Safeguard Policy Statement (SPS) (2009) (refer to Section **2.3 - Category of the Project** below on Categorization of projects).

50. The IEE provides a road map to the environmental measures needed to prevent and/or mitigate negative environmental effects associated with the development Project. The IEE also provides a detailed description of the direct and indirect environmental effects associated with the proposed Project during key periods of work. More specifically, the IEE:

(i) Describes the extent, duration, and severity of the impacts;
(ii) Analyzes all significant impacts;
(iii) Formulates the mitigation actions and presents it all in the form of an environmental management plan (EMP).

[7] The draft World Bank ESIA has been disclosed and is available on the Roads Department of Georgia website here: http://www.georoad.ge/?lang=eng&act=project&func=menu&uid=1543574999

51. The IEE covers the proposed construction of 16 km of the Bakurtsikhe-Tsnori road section, rehabilitation of approximately 1,100 m of secondary road, 19 bridges of various sizes, three interchanges, and other associated components such as construction yards, a worker's camp, and drainage systems.

2.3 - Category of the Project

52. According to the ADB's SPS, projects are classified by significance of potential environmental impacts. A project's category is determined by the category of its most environmentally sensitive component, including direct, indirect, cumulative, and induced impacts in the project's area of influence. Each proposed project is scrutinized as to its type, location, scale, and sensitivity and the magnitude of its potential environmental impacts. Projects are assigned to one of the four categories (Category A, B, C, or FI):

- **Category A** – A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment is required.
- **Category B** – A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An initial environmental examination is required.
- **Category C –** A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. No environmental assessment is required although environmental implications need to be reviewed.
- **Category FI** – A proposed project is classified as category FI if it involves investment of ADB funds to or through a FI.

53. According to the ADB's and Operations Manual Section F1/OP (2013)[8], the Project is classified as Category "B" and therefore requires that an IEE be completed.

2.4 - Methodology and Defined Spatial Unit of Analysis Adopted for the IEE

2.4.1 - Feasibility Studies, Preliminary Design, and National EIA

54. Kocks Consult GmbH ("Kocks") was engaged by the RD to provide consultancy services for preparation of a feasibility study, preliminary design, ESIA, and bidding documents for a design-and-build contract for construction of the Bakurtsikhe-Tsnori (16km) and Gurjaani (Chumlaki) – Telavi Bypass (30km) road sections and evaluation of strategic importance of Zhinvali-Bakurtsikhe-Tsnori Secondary Transport Corridor.

55. The scope of Kocks' work included the following:

(i) Evaluation of the strategic importance of the entire Zhinvali-Bakurtsikhe-Tsnori (Zhinvali-Tianeti-Ahmeta-Telavi-Gurjaani-Bakurtsikhe-Tsnori) Secondary Transport Corridor and to analysis of alternatives in terms of engineering and economics, in order to recommend a preferred alternative and timing for rehabilitation and/or upgrading of each section;
(ii) Review, study and analyze main social, technical and economic as well as general transportation-operational characteristics and data of the current road sections;

[8] https://www.adb.org/sites/default/files/institutional-document/31483/om-f1.pdf

(iii) Preparation of the Feasibility Study for the construction of Bakurtsikhe-Tsnori and Gurjaani (Chumlaki) – Telavi Bypass Road Sections;
(iv) Preparation of Preliminary Designs for these two sections, including cost estimated and all necessary materials for preparation of the Bidding Documents;
(v) Carrying out ESIA, preparing EMP, and develop RAP, as required as a result of the screening outcome, in accordance with the requirements of the World Bank's Social and Environmental Safeguard Policies;
(vi) Preparation and delivering Bidding Documents for improvement and/or construction works of the subject road sections using a Design-and-Build approach.

56. Activities implemented by the Kocks environmental team for the Bakurtsikhe-Tsnori section included desktop studies and field works for verification of available reference/literary data and additional data gathering, followed with analysis of information. Field surveys involved traffic studies, sampling and analysis of soil, faunistic and flora surveys, and socio-economic data gathering. Modeling was also completed to predict future traffic levels.

57. Final detailed designs have not been completed by Kocks and will be the responsibility of the design-and-build Contractor, herein referred as the "Contractor".

58. The ADB is not supporting the Gurjaani (Chumlaki) – Telavi Bypass road section and the analysis provided in this document is limited to the Bakurtsikhe-Tsnori road section only.

2.4.2 - IEE Methodology

59. This IEE was developed by an international environment specialist[9] through a review of existing Project documentation, including the feasibility studies and ESIA developed for the RD by Kocks, other existing grey and published literature, and consultations with The Government of Georgia (GoG). Additional field visits were undertaken by the environment specialist in November 2018, by noise monitoring consultants in March 2019, and water quality consultants in April and May 2019.

60. The IEE follows the methodology outlined in the ADB Guidelines[10]; ADB SPS and environmental Laws of the GoG. The IEE process consisted of the following six main activities:

(i) Collection of baseline data describing biophysical and social environment within the study area; desk studies and field surveys to address identified gaps in the existing data; and update of information on topics and areas where significant negative impacts are expected.
(ii) Identification of the expected positive and negative impacts of the proposed works on the road section and of its operation thereafter; assessment of the likelihood and significance of the potential negative impacts; and development of mitigation measures.
(iii) Analysis of alternatives in terms of location, technology, design, and operation, including the "no-project" alternative.
(iv) Development of the EMP.
(v) Drafting of the IEE report.
(vi) Information disclosure and stakeholder consultation.

[9] Mr. Raymond Von Culin, Environment Specialist
[10] The process for completing a full EIA and an IEE is essentially the same. While the level of data collected, and assessment conducted is proportionate to the nature of the Projects impacts, the process is the same and the elements that need to be included in an EIA or IEE are also the same.

61. The desk study reviews of existing sources and field reconnaissance / surveys were used to ensure the analysis and verification of data collected. Field works were conducted by the international environmental specialist in order to verify the information collected from the reference materials, describe the present conditions of physical and biological resources, and finalize the identification of potential receptors.

62. This IEE covers the description of existing environmental conditions, initial screening of environmental impacts of the Project, and recommended management and mitigation measures and monitoring of selected parameters. The environmental impact was considered for activities during site preparation, construction, worksite closure (i.e., project closure phase) and operation (including maintenance) phases of the Project. The study area has been defined widely enough to include all the territories likely to be significantly affected by the Project.

63. As mentioned, a RAP was developed along with the ESIA in accordance with World Bank safeguards standards (OP 4.12). To comply with the ADB's SPS, A Land Acquisition and Resettlement Plan (LARP) consistent with ADB standards has been prepared by RD under the assistance of the international social safeguards (resettlement) specialist.[11] The LARP entailed consultations with the stakeholders, especially the affected people and their community, to understand the extent of impact and validate the severity and compensation measures. As part of the LARP, a detailed assessment of loss of land, structures, and other assets under the Project was undertaken. The LARP should be referred to for full details on Project affected people.

64. In addition to the survey and studies conducted by Kocks during the feasibility study and preliminary design phase, several additional surveys were undertaken under this IEE to strengthen baseline data by local consulting firms specializing in environmental and social studies. They include:

- Instrumental noise monitoring according to the International Finance Corporation (IFC's)
- Instrumental Air Quality Monitoring
- Instrumental Water Quality Surveys

2.4.3 - IEE Boundaries

65. This IEE covers the entire length of the Project road. For purposes of this impact assessment, an envelope of 200 meters wide on each side of the project road over its entire length is identified as the primary impact area. This distance takes into account the common impacts associated with road works such as noise, dust, and emissions. However, a wider Project impact area has been considered to include specific construction sites outside of the Project area, including borrow pits, quarries, and work camps (where detailed information is still not available). The road sections where sensitive receptors are present, such as adjacent agriculture areas, hospitals, or nearby residences or businesses are given particular attention so that ample mitigation is formulated. For road sections that cross rivers, water bodies, or agriculture canals, the impact assessment is expanded to cover the identified continuous extent of any ecologically important habitats / features along the Project Corridor.

2.5 - Structure of the Report

[11] Mr. Medgar Tchelidze, Social Safeguards (Resettlement) Specialist

66. This IEE report has been presented as per requirements of the ADB's SPS. The report is organized into the following chapters:

- **Chapter 2. Introduction –** This section describes the background information about the project and IEE study.
- **Chapter 3. Policy, Legal, and Administrative Framework –** This section summarizes the national and local legal and institutional frameworks that guided the conduct of the assessment.
- **Chapter 4. Project Description –** This section presents the key features and components of the proposed project.
- **Chapter 5. Analysis of Alignment Alternatives –** This section examines alternatives to the proposed Project site.
- **Chapter 6. Description of the Environment –** This section discussing the relevant physical, biological, and socioeconomic features that may be affected by the proposed Project.
- **Chapter 7. Impact Assessment and Mitigation –** This section details the impact assessment methodology used for this IEE and presents the environmental assessment of likely positive and adverse impacts attributed to the proposed project and concomitant mitigation measures.
- **Chapter 8. Public Consultation and Information Disclosure –** This section describes the consultation process undertaken during the environmental examination and its results, their consideration in the project design, and manner of compliance to the ADB's Public Communications Policy and related national laws.
- **Chapter 9. Grievance Redress Mechanism –** This section describes the formal and informal redress procedures for registering, resolving, and reporting complaints.
- **Chapter 10. Environmental Management and Institutional Requirements –** This section describes the process through which impacts identified in previous sections are translated into mitigation and monitoring plans to avoid, reduce, mitigate, or compensate adverse impacts and reinforces beneficial impacts. This section also describes the institutional requirements for the Contractor, Engineer, and Project Management Unit.
- **Chapter 11. Cost Estimate of Environmental Mitigation Measures –** This section provides an approximate cost estimate for environmental mitigation measures.
- **Chapter 12. Conclusions and Recommendations –** This section highlights key findings and recommendations to be implemented by the borrower.

3. Policy, Legal, and Administrative Framework

3.1 - Overview

67. The IEE will be carried out in compliance with Georgian legislation and environmental standards, the environmental and social safeguard policies of International Financial Institutions (IFI's), as well as Core Labour standards (CLS) outlined in the International Labor Organization (ILO) Declaration on Fundamental Principles and Rights at Work, and the relevant national labor laws.

68. During planning and development of the IEE a range of documents were considered. The list, inter alia, includes:

- International Conventions and Directives (environment, social);
    - Environmental and social safeguards of International Financial Institutions, such as:
    - ADB Safeguard Policy Statement, 2009;
    - ADB Environmental Safeguards – A Good Practice Sourcebook (Draft Working Document), 2012;
    - World Bank Environmental and Social Safeguard Policies, 2013;
    - IFC Environmental and Social Performance Standards, 2012;
    - General EHS Guidelines document (IFC, WB group, April 30, 2007);
- Recommendations given in the WB technical paper No. 376 "Roads and the Environment. A Handbook" (1997);
- Georgia's Third National Communication to the UN Framework Convention on Climate Change.

69. According to Georgian law, the Project is subject to environmental regulation and requires an environmental impact permit in order to begin planned development activities.

70. According to the ADB's SPS, projects with limited impacts that are few in number, generally site-specific, largely reversible, and readily addressed through mitigation measures are considered a Category B which require development of an IEE.

3.2 - Environmental Legislation of Georgia

71. Environmental legislation of Georgia comprises the Constitution, environmental laws, international agreements, by-laws, presidential decrees, ministerial orders, instructions, and regulations. Along with the national regulations, Georgia is signatory to a number of international conventions, including those related to environmental protection.

72. Ministry of Environment Protection and Agriculture (MoEPA) is responsible for regulating the activities that affect the natural environment.

73. A table below presents a list of Georgia's environmental legislation as it pertains to the proposed project.

Table 2. List of Environmental Laws and Regulations Relevant to the Project

Year	Law / Regulation	Last Revision	Code
1994	Law on soil protection	07/12/2017	370.010.000.05.001.000.080
1995	Constitution of Georgia	13/10/2017	010.010.000.01.001.000.116
1996	Law on subsoil	07/12/2017	380.000.000.05.001.000.140
1996	Law on environmental protection	07/12/2017	360.000.000.05.001.000.184

1996	On the system of protected areas	07/12/2017	360.050.000.05.001.000.127
1997	Law on wildlife	07/12.2017	410.000.000.05.001.000.186
1997	Law on water	07/12/2017	400.000.000.05.001.000.253
1999	Law on protection of atmospheric air	07/12.2017	420.000.000.05.001.000.595
1999	Forestry code of Georgia	07/12/2017	390.000.000.05.001.000.599
1999	Law on compensation of damage from hazardous substances	07/12/2017	040.160.050.05.001.000.671
2000	Law on regulation and engineering protection of the sea and river banks	05/05/2011	400.010.010.05.001.000.830
2003	Law on Red List and Red Book of Georgia	07/12/2017	360.060.000.05.001.001.297
2005	Law on licenses and permits	23/12/2017	300.310.000.05.001.001.914
2003	Law of Georgia on conservation of soil and restoration-amelioration of soil fertility	07/12/2017	370.010.000.05.001.001.274
2014	Waste code	07/12/2017	360160000.05.001.017608
2017	Environmental Assessment Code	07/12/2017	360160000.05.001.018492

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

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

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

- screening;
- scoping procedure;
- preparation of the EIA Report by the developer or the consultant;
- ensuring public participation;
- examination of the information presented in the EIA Report and any supplementary information provided by the developer to the Ministry as well as assessment of the information received through the public participation and consultation processes;
- expertise procedure;
- implementation of transboundary environmental impact assessment procedure (weather appropriate); and
- issuance of Environmental Decision or the decision on refusal to implement the project by the Minister.

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

78. **Law on Environmental Protection** regulates the legal relationship between the bodies of the state authority and the physical persons or legal entities (without distinction-legal form) in the field of environmental protection and in the use of nature on all Georgia's territory including its territorial waters, airspace, continental shelf, and special economic zone. The law defines the principles and norms of legal relations, rights and obligations and responsibilities, awareness raising, education and scientific research in the field of environment, and the key players and principles of environmental management. It also describes economical mechanisms and levers; ecological insurance; basics of environmental audit; environmental requirements during privatization; justifies needs of environmental standards and limits (air, water, soil, noise, vibration, fields, radiation) and ecological requirements for production, transportation and storage of goods and food products; ecological requirements applicable to waste; states necessity of environmental impact assessment and related issues (strategic environmental protection and transboundary environment assessment) referring to Environmental Assessment Code; defines general principles of environmental protection; considers different aspects on protection of ecosystems, protected areas, issues of global and regional management, protection of ozone layer, biodiversity, protection of Black Sea and international cooperation aspects. As stated in the law, in order to protect the climate against the global changes, the subject of the business activity is obliged to observe the limits to green-house gas emissions as well as to take measures for mitigating this emission. The emission of the green-house gases is regulated on the basis of integrated control of pollution of environment (Article 51). Besides, the subject of the business activity is obliged to reduce or stop production and use of such chemicals, which are likely to have effects on the ozone, layer of the earth and cause depletion of it (Article 52).

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

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

Article 7 - General waste management requirements

- Waste, depending on its type, properties, and composition, shall be collected, transported, and treated in a manner not impeding its further recovery.
- Waste shall be collected, transported, and treated in a manner which excludes, to the maximum extent possible, pollution of the environment and risks for human health.
- In case of waste pollution caused by waste transport activities, the waste transporter shall be responsible for taking clean up measures.
- The producer and holder of waste is obliged to treat their waste
- on their own or hand it over for collection, transport and treatment to persons entitled to carry out such operations in accordance with this Law and legislation of Georgia.
- Where waste has been submitted for recovery or disposal, the original producer's and/or holder's responsibility shall remain until recovery or disposal is completed.
- Persons who collect and transport waste shall hand it over for treatment to appropriate facilities, holding the relevant permit or registration.
- The burning of waste outside permitted incinerators shall be prohibited.

Article 14 - Company waste management plan

- Legal and natural persons that produce more than 200 tons of non-hazardous waste or 1,000 tons of inert waste or any amount of hazardous waste annually, shall prepare a company waste management plan.

Article 15 – Environmental Manager

- The persons under Article 14 of this Law shall nominate a suitable person as a company environmental manager.

Article 17 - General obligations for hazardous waste management

- The production, collection, and transportation of hazardous waste, as well as its storage and treatment, shall be carried out in conditions providing protection for the environment and human health. It shall be prohibited to

    a) discard hazardous waste outside waste collection containers;
    b) discharge it into the sewerage systems or underground or surface waters, including the sea;
    c) burn it outside waste incinerators permitted for that purpose; and
    d) treat it outside waste treatment facilities permitted to treat such type of waste.

Article 18 - Special obligations for hazardous waste management

- Waste producers that produce more than two tons of hazardous waste per year shall:

    a) create and implement a suitable separation and collection system for such waste;
    b) designate an environmental manager, pursuant to Article 15 of this Law, responsible to make arrangements for the safe management of said waste; and
    c) make arrangements for briefing and training for staff handling hazardous waste.

- Until the exact content of waste is unknown, the waste shall be regarded as hazardous.
- Hazardous waste for which no appropriate treatment techniques and/or technologies are available in accordance with the requirements of this Law within the territory of Georgia shall be exported for treatment. Until the export is carried out, the waste shall be safely stored at temporary storage facilities.
- The Ministry may exceptionally once allow for an extended storage period of up to one year if this is justified and does not harm human health or the environment.

- Hazardous waste may only be collected and transported by a natural or legal person after its registration pursuant to this Law.

Article 29 - Obligations for keeping records and reporting on waste

- Records on waste shall be kept and waste reports shall be submitted to the Ministry by natural and legal persons:

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

81. **Law on Protection of Atmospheric Air**. The law regulates protection of atmospheric air from man-caused impact. Pollution of atmospheric air is emission of hazardous substances originating from activities which are able to have negative impact on human health and environment. Four types of pollution are considered (Part II, Chapter IV, Article II.2): (i) Pollution of environment with hazardous matter; (ii) Radiation pollution of atmospheric air; (iii) Pollution with microorganisms and biologically active matter of microbial origin; and (iv) Noise, vibration, electromagnetic fields, and other physical impact. Maximum permitted limits for concentration of hazardous substances into the atmospheric air are defined for each contaminant and represent maximum concentration of hazardous pollutants, in averaged time span, recurring action of which has not have negative impact on human health and environment. Maximum permitted levels of emission of hazardous matters into the atmospheric air are defined with allowance of prospective of development of the enterprise, physical. geographical and climatic conditions, dispersion of emitted substances, background concentration of pollutants emitted from other neighbouring enterprises, taking into account inter-location of existing or planned dwellings, sanatoria and recreation zones. In compliance with the law (Clause 28), in order to restrict pollution from the stationary sources12 of hazardous emissions the limits of emissions are to be set. The limit of pollution from the stationary source of emission is permitted quantity (mass) of emitted hazardous matters (Clause 29). Maximum annual emission level means the maximum permitted limit of discharge. This is annual permitted quantity of emission predetermined by technology in conditions of standard permitted capacity of discharge. Annual maximum capacity is defined for each hazardous substance and is calculated so that for each stationary source of emission cumulative emission from all registered sources of discharge does not exceed relevant maximum permitted value. Discharge of hazardous emissions from the stationary sources of emission without approved limits of discharge is forbidden. The standards of emissions (Clause 30) are to be worked out by the enterprise itself. According to the law (Clause 38) the enterprise is responsible for conducting self-monitoring which includes measurement of emission (evaluation), recording/registration and accounting. Emission which has not been recorded in self-monitoring record is considered illegal. As mentioned in the Clause 51 results of the monitoring and information on pollution of the air with hazardous substances is transparent and accessible for the public.

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

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

implementation of any other activity which may cause water pollution; and sets requirements for forest use within water protection zones. The state management of water protection and use is exercised through accounting, monitoring, licensing, control, and supervision.

1) State monitoring of water is implemented by the Legal Entity under Public Law - the National Environmental Agency under the MoEPA. By virtue of the law when locating/designing/constructing/commissioning of a new or reconstructed enterprise, or other facility, as well as in introducing of new technological process capable to affect the state of water, rational water use is to be secured. At the same time, attention is to be paid to the measures ensuring due accounting of water abstracted from and returned to water bodies; protection of water from contamination, pollution- and depletion; avoidance of the unfavorable water impact; restriction of land flooding up to minimum necessary level; protection of land from silting, swamping, or drying up; and environmental protection and landscape preservation.

2) Under the law, purification of the waste water discharged in a water body is required up to the fixed standard. In order to protect the quality of water resources, the law requests creation of sanitary protection zone that consists of three belts, each having a special regime. The procedure fixing the water quality standards, the maximum permissible rates of emission of harmful substances (including microorganisms) into ambience, the water abstraction quotas, and the temporary rates (limits) of emission of harmful substances (including microorganisms) into water is defined by the Law of Georgia on the Environmental Protection.

3) Georgian legislation may provide liability for other violations of law in the water protection and use sphere. Water users shall compensate for damages caused by violation of the law on Water in the amount and under procedure established by legislation of Georgia. Under Article 17 (Protection of natural resources of the Black Sea), anadromous fish species (fish species seasonally migrating upstream of a river against the current) within the rivers of Georgia shall be protected by creation of conditions necessary for their reproduction, through conservation of the habitat, determination of procedures for regulating the fishing industry, determination of a total permissible amount of catching these species within the territorial waters, and within and outside special economic zones of Georgia, also through implementation of other measures defined by the legislation of Georgia. Article 20 (River water protection zone) defines protection zone of a river shall be its adjacent territory, where a special regime is established to protect water resources from pollution, littering, fouling, and depletion. This zone may include its dry bed, adjacent terraces, natural elevated and steep riversides, as well as gullies directly adjacent to riversides. The width of a river water protection zone shall be measured in meters from the edge of a riverbed to both sides under the following procedure:

    - 10 meters - in the case of a river up to 25 kilometers long,
    - 20 meters - in the case of a river up to 50 kilometers long,
    - 30 meters - in the case of a river up to 75 kilometers long,
    - 50 meters - in the case of a river over 75 kilometers long.

83. Within this zone, it is prohibited to: (i) construct, expand or reconstruct functioning enterprises, except for cases directly determined by law; (ii) spray, by air atomization, perennial plants, sown crops, and forest lands with toxic chemicals; and (iv) keep, collect or place toxic chemicals and mineral fertilizers, as well as any other wastes as defined in the legislation of Georgia. It is requested that hydraulic structures located within a water protection zone shall be normally equipped with appropriate technical facilities to completely exclude the possibility of river pollution and littering.

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

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

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

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

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

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

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

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

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

92. Laws and regulations related to social aspects and land ownership applicable to the project are presented in Table 3)

Table 3. List of Social and Land Ownership Related Laws Relevant to the Project

Year	Law / Regulation	Last revision	Code
1996	Law on agricultural land ownership	16/06/2017	370.030.000.05.001.000.132
1997	Civil code of Georgia	23/12/2017	040.000.000.05.001.000.223
1997	Law on compensation of land substitute costs and damages due to allocating agricultural land for non-agricultural purposes	25/12/2014	370.020.000.05.001.000.244
1999	Law on rules for expropriation of property for public needs	06/09/2013	020.060.040.05.001.000.670
2007	Law on cultural heritage	07/12/2017	450.030.000.05.001.002.815
2007	Law on public health	07/12/2017	470.000.000.05.001.002.920
2010	Law on state property	07/12/2017	040.110.030.05.01.004.174
2010	Labour Code	04/05/2017	270000000.04.001.016012
2018	Law of Georgia on Labor Safety	22/12/2018	270000000.05.001.018780

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

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

95. **Civil Code** regulates contractual relations, describes the rights and responsibilities of natural and legal persons, defines the penalties in the case of violations of the requirements set out in the document. The Civil Code differentiates between movable and immovable

property and provides rules for acquiring title over property, as well as any proprietary or obligatory rights thereto. This piece of legislation must be taken into account when entering into contracts in Georgia.

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

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

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

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

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

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

102. **Law of Georgia on Labor Safety** define basic requirements and preventive measures in terms of workplace safety for the employers. The Law applies to jobs considered to be of increased danger, hard, harmful and hazardous. The employer's compliance with the labor safety regulations in Georgia are overseen by the Ministry of Health, Labor and Social Affairs of Georgia through its respective departments.

3.3 - Environmental Regulations and Standards of Georgia

3.3.1 - Air Quality Standards

103. Maximum permissible concentrations (MPC) for air born pollutants are set by the hygienic standards on Maximum Permissible Concentrations of Air Born Pollutants for Settlements (HN 2.1.6. 002-01), see Table 4. This project will also ensure compliance with IFC guideline values (not interim targets) as these values are, in some instances, more stringent than the national standards, the most stringent standards are highlighted in blue and will be applied.

Table 4. Ambient Air Quality Standards

Parameter	Averaging Period	Limit (µg/m^3)		
		Maximum Permissible Concentration (MPC) for Air Quality	IFC Guideline Value	EU Ambient Air Quality Guidelines
Nitrogen Dioxide (NO_2)	30 minutes	200	-	-
	1 Hour	-	200	200
	24 Hours	40	-	-
	1 Year	-	40	40
Sulphur Dioxide (SO_2)	10 minutes	-	500	-
	30 minutes	500	-	-
	1 Hour	-	-	350
	24 Hours	50	20	125
Carbon Monoxide (CO)	30 minutes	5,000	-	-
	24 Hours	3,000	-	-
Total Suspended Particulates (TSP) / Dust	24 Hours	150	-	-
	30 minutes	500	-	-
PM10	1 year		20	40
	24 hours		50	50
PM2.5	1 year		10	25
	24 hours		25	-
Ozone	8-hour daily maximum		100	120

3.3.2 - Surface Water Quality Standards

104. The values of Maximum Admissible Concentrations of the harmful substances in surface are provided in the Environmental Quality Norms approved by the Order #297N (16.08.2001) of the Ministry of Labor, Health and Social Protection (as amended by the Order No 38/n of the same Ministry of 24.02.2003). The admissible level of pollutants in surface water is given in Table 5. All effluents shall comply with the Georgian National Standards. However certain parameters are not specified in the national standards for these IFC Guidelines are being used as shown in the Table.

Table 5. Applicable Standards for Surface Water Quality

Parameter	Maximum Permissible concentration	Source
pH	6.5-8.5	National
Diluted Oxygen, mg/l	4-6	National
BOD5, mg/l	30	IFC
COD, mg/l	125	IFC
Total Nitrogen, N, mg/l	10	IFC
Total Phosphate, mg/l	2	IFC
Chlorides, mg/l	350	National
Oil Products, mg/l	0.3	National
Zinc (Zn^{2+})	1g/kg	National
Lead (Pb total)	23.0	National
Chrome (Cr^{6+})	32.0	National
Cadmium (Cd, total)	6.0	National
Total Suspended Solids, mg/l	50	IFC
Total Coliforms, MPN* in 100 ml	400**	IFC

*Note: * MPN, most probable number*

*** Refers to indicative value for treated sanitary sewage discharges according to the IFC EHS Guidelines for Wastewater and Ambient Water Quality.[13] This standard is not applicable to centralized, municipal, wastewater treatment systems which are included in EHS Guidelines for Water and Sanitation.*

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

Table 6. Water Quality Requirements by Water Use Category

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

[13] https://www.ifc.org/wps/wcm/connect/026dcb004886583db4e6f66a6515bb18/1-3%2BWastewater%2Band%2BAmbient%2BWater%2BQuality.pdf?MOD=AJPERES

3.3.3 - Groundwater Quality Standards

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

Table 7. Drinking Water Quality Criteria

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

3.3.4 - Noise and Vibration Standards

107. The IFC's EHS Guidelines on Noise Management provides noise level guidelines for daytime and night time which are applicable for the traffic noise but does not offer any guidelines for construction noise and vibration. Because no vibration impact is anticipated from the traffic, there are no specific vibration guidelines for traffic. Admissible noise standards of the IFC and Georgian national standards for residential areas are similar. The national standards for noise are set according to the Technical regulation – Acoustic noise limits for rooms/premises in residential houses and public establishments (Document #300160070.10.003.020107, Date 15/08/2017) see Table 8.

Table 8. Georgian Standards for Noise Levels

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

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

108. For IFC noise limits, impacts should not exceed the levels presented in Table 9, or if already exceeded result in a maximum increase in background levels of 3 decibels (dB) at the nearest receptor location off site. This Project will comply with both IFC Guidelines and Georgian Standards.

Table 9. IFC Noise Level Guidelines

Receptor	One-hour L_{eq} (dBA)	
	Daytime 07:00 - 22:00	Night-time 22:00 - 07:00
Residential; institutional; educational	55	45
Industrial; commercial	70	70

109. No standardized criteria have been developed by international organizations for assessing construction noise impact. Consequently, criteria must be developed on a project-specific basis unless local ordinances apply. Generally, local noise ordinances are not very useful in evaluating construction noise. They usually relate to nuisance and hours of allowed activity and sometimes specify limits in terms of maximum levels, but they are generally not practical for assessing the impact of a construction project. Project construction noise criteria should take into account the existing noise environment, the absolute noise levels during construction activities, the duration of the construction, and the adjacent land use.

110. Due to the lack of local construction noise limits, recommended noise limits for the construction activities in the Noise and Vibration Impact Assessment manual of the US Department of Transportation, Federal Railroad Administration (2012) will be used for this project. Table 10 presents recommended noise limits.

Table 10. General Assessment Criteria for Construction noise

Land Use	One-hour Leq (dBA)	
	Day	Night
Residential	90	80
Commercial	100	100
Industrial	100	100

111. For workplace noise the following IFC standards are applicable to the construction workers. It should also be noted that IFC EHS guidelines advise that where existing ambient noise levels already exceed thresholds, the Project should not result in an increase of more than 3dB over existing ambient noise at the nearest receptor location off-site.

Table 11. IFC Work Environment Noise limits

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

3.3.5 - Vibration Standards

112. The Georgian Standards for vibration are designed for human comfort. These are shown in Table 12. Note that no standards for building damage exist.

Table 12. Georgian General Admissible Vibration Values in Residential Houses, Hospitals and Rest Houses, Sanitary Norms 2001

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

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

113. Over the years, numerous vibration criteria and standards have been suggested by researchers, organizations, and governmental agencies. Because IFC does not have specific vibration impact guidance, the California Department of Transportation (Caltrans) Transportation and Construction-Induced Vibration Guidance Manual (Caltrans, 2013) was used as a guideline for this construction vibration study. The manual provides practical guidance for addressing vibration issues associated with construction, operation, and maintenance of roadway projects. Table 13 presents vibration limits that are used for this project to evaluate the potential for damage and annoyance from vibration-generating activities.

Table 13. Human and Building Response to Transient Vibration

PPV (mm/sec)	Human Response	Effect on Buildings
10 - 15	Unpleasant	Architectural damage and possible minor structural damage
5	Annoying	Threshold at which there is a risk of architectural damage to normal dwelling houses (houses with plastered walls and ceilings)
2.5	Begins to annoy	Virtually no risk of architectural damage to normal buildings
2	Readily perceptible	Recommended upper limit of vibration to which ruins and ancient monuments should be subjected
0.15 – 0.5	Threshold of perception	Vibration unlikely to cause damage of any type

3.3.6 - Soil Quality

114. Soil quality is currently assessed by Methodological Guides on Assessment of Level of Chemical Pollution of Soil (MG 2.1.7.004-02). However, these limits will soon be replaced as Georgia harmonizes its regulations with the European Union (EU) and moves away from the outdated standards prepared while part of the Soviet Union. The national standards for soil quality are given in Table 14 along with the limits proposed by MoEPA and the Ministry of Labour, Health and Social Affairs.

Table 14. Soil Screening Values

Compound	Units	Current Limit	Proposed Limit
Metals and Miscellaneous			
Arsenic, As	mg/kg	2	30
Cadmium, Cd	mg/kg	2*	0.5** – 1.0***
Copper, Cu	mg/kg	3-132*	60**-100***
Mercury, Hg	mg/kg	2.1	
Nickel, Ni	mg/kg	4-80*	60**- 80***
Lead, Pb	mg/kg	32-130*	100** - 140***
Zinc, Zn	mg/kg	23-220*	130** - 200***
Total Petroleum Hydrocarbons	mg/kg	1000	-
Cyanide	mg/kg	0,2	-
Volatile Organic Compounds			
Benzene	mg/kg	0.3	0.05
Toluene	mg/kg	0.3	-
Total xylenes	mg/kg	0.3	0.05
Semi Volatile Compounds			
Benzo(a)pyrene	mg/kg	0.02-0.2	0.1
Isopropylbenzene	mg/kg	0.5	-
Pesticides			
Atrazine	mg/kg	0.01-0.5	-
Lindane	mg/kg	0.1	-
DDT (and its metabolite)	mg/kg	0.1	0.075

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

3.3.7 - Asbestos Management

115. The hygienic requirements, sanitary rules and standards related to asbestos and asbestos-containing materials (ACM) on the territory of Georgia are regulated by Decree No. 2004 of the Minister of Labour, Health and Social Affairs of Georgia "The hygienic requirements for the sanitary rules and standards for asbestos and asbestos-containing materials".

116. The IFC's EHS Guidelines specify that the use of ACM should be avoided in new buildings and construction or as a new material in remodeling or renovation activities.[14] Existing facilities with ACM should develop an asbestos management plan that clearly identifies the locations where the ACM is present, its condition (e.g., whether it is in friable form or has the potential to release fibers), procedures for monitoring its condition, procedures to access the locations where ACM is present to avoid damage, and training of staff who can potentially come into contact with the material to avoid damage and prevent exposure. The plan should be made available to all persons involved in operations and maintenance activities. Repair or removal and disposal of existing ACM in buildings should be performed only by specially trained personnel following host country requirements or, if the country does not have its own requirements, internationally recognized procedures.[15] Decommissioning sites may also pose a risk of exposure to asbestos that should be prevented by using specially trained personnel to identify and carefully remove asbestos insulation and structural building elements before dismantling or demolition.

117. The International Labor Organization (ILO) established an Asbestos Convention (C162) in 1986 to promote national laws and regulations for the "prevention and control of, and protection of workers against, health hazards due to occupational exposure to asbestos".[16] The convention outlines aspects of best practice: Scope and Definitions, General Principles, Protective and Preventive Measures, Surveillance of the Working Environment, and Workers' Health. As of March 4, 2008, 35 countries had ratified the Convention.[17]

Some of the ILO asbestos convention requirements include:

- work clothing to be provided by employers;
- double changing rooms and wash facilities to prevent dust from going home on street clothes;
- training of workers about the health hazards to themselves and their families;
- periodic medical examinations of workers,
- periodic air monitoring of the work environment, with records retained for 30 years;
- development of a work plan prior to demolition work, to protect workers and provide for proper waste disposal; and
- protection from "retaliatory and disciplinary measures" of workers who remove themselves from work that they are justified in believing presents a serious danger to health.

3.4 - National Technical Regulations Applicable to the Project

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

[14] https://www.ifc.org/wps/wcm/connect/9aef2880488559a983acd36a6515bb18/2%2BOccupational%2BHealth%2Band%2BSafety.pdf?MOD=AJPERES

[15] Training of specialized personnel and the maintenance and removal methods applied should be equivalent to those required under applicable regulations in the United States and Europe (examples of North American standards are available at: https://www.osha.gov/SLTC/asbestos/)

[16] https://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO::P12100_ILO_CODE:C162

[17] https://www.ilo.org/dyn/normlex/en/f?p=1000:11300:0::NO:11300:P11300_INSTRUMENT_ID:312307

- 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.).

119. According to these documents:

- Roads of international and national importance should be built bypassing settlements. Access roads to the settlements should be provided. To allow modernization, the distance between the residential area (settlement) and the edge of the carriageway must be not less than 200m, distance to agricultural land - 50m. If because of technical or economical purposes the road is to cross the settlement, minimum distance to the residential area must be 50m, in case noise barriers are provided – 25m. For local roads minimum distance to residential area must be 50m, distance from agricultural land – 25m.
- Along with technical and economic aspects environmental impacts must be taken into account during design and construction;
- Prior to arrangement of temporary infrastructure and preparation of road embankment, topsoil must be removed and stockpiled until subsequent use for re-cultivation after completion of construction and removal of all temporary facilities;
- Roads along the rivers, lakes and reservoirs must be built with consideration of protection zone boundaries for the surface water bodies.

3.5 - Environmental Permitting Procedure – National Regulations

120. Application procedure for obtaining authorization from environmental authorities required for implementation of the planned development, including Environmental and Social Impact Assessment coordination, timeframes for information disclosure and public review for this project follows procedure described in the table below. It should be noted that the national EIA developed for this Project was disclosed before January 1, 2018. At the time this IEE was completed, the RD was still waiting for the MoEPA to complete its review of the national EIA and provide an Ecological Decision for approval.

Table 15. Procedure Applicable to the Project Disclosed Before January 1, 2018

Step	Action	Comment	Timeframe
1	Publication of information on the project in central and regional newspapers.	The advertisement has to be included the project title, location, place and the date, time and venue of public disclosure meeting(s). It will also identify locations where the EIA can be reviewed and where comments may be submitted.	Day 0
2	Submission of the draft ESIA report to the Ministry of Environment Protection and Agriculture (MoEPA, former Ministry of Environment and natural Resources Protection - MENRP)	Hard copy and electronic version of the report delivered to MoEPA	Within 3 days after announcement in the newspapers

Step	Action	Comment	Timeframe
	Feedback	Receiving public comments on the disclosed EIA	45 days from announcement in the newspapers
	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 MoEPA, (together with non-technical Summary, Technical Summary, reports on emissions and allowable limits) for the state ecological examination.	Comments received from the stakeholders considered in the report. Minutes of meeting(s) enclosed to the document as attachment. .	After arranging a public review of the EIA report and development of final version of the EIA, the developers is authorized to submit, within one year, an application to the permit issuing administrative body for a permit
4	Consideration of the documents by Ministry and issuance of conclusion		20 days after registration of an application for a permit and submission of the EIA package to the MoEPA.

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

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

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

Table 16. Environmental Decision (formerly environmental impact permit) issuance procedure (after January 1, 2018)

Step	Action	Comment	Timeframe
1	Written application to the Ministry submitted by developer.	The application submitted by the developer shall be accompanied with the following documents and/or data: a. EIA report; b. Projects on estimation of the limits for emission of harmful substances into the atmospheric air and for the injection of polluting substances into the surface waters together with the waste waters.	Day 0

Step	Action	Comment	Timeframe
		c. Notification about a confidential part of a submitted application, if applicable; d. Copy of the document evidencing payment of the fee (500 GEL) in accordance with the existing legislation. e. Electronic copy of above mentioned documents.	
2	Ministry ensures publication of submitted application and attached documents on its official website as well as on the notice board of the relevant local authorities and/or representative bodies and upon request, provides paper copies of abovementioned documentation.	The Developer is entitled to request the Environmental Decision on several activities through a single application, if the activities are significantly interconnected.	Within 3 days after submission of the application
3	Minister sets up the Expert Commission		Within 5 days after registration of the application
4	Expert commission prepares and submits the expertise conclusion on the EIA report to the Ministry		Within 40 days
5	Ministry takes decision on the finding of a deficiency in application		Within 15 days after registration of the application
6	Feedback from stakeholders		Within 40 days after the publication of the application
7	Publication of announcement on the public hearing	The announcement on public hearing shall include the information on: a. The content and brief description of the issue to be discussed, format of the discussion; b. The time, place and rules of the public hearing; c. The web address where the respective application, the EIA report and any other information relevant to decision-making will be available as well as indication about the opportunity of accessing the paper copies of these documents during the public hearing.	No less than 20 days prior to organizing the public hearing
8	Public hearing	The Ministry is responsible for organizing and conducting the public hearing. It is chaired and protocoled by a representative of the Ministry. The public hearing is organized in the closest appropriate administrative building to the site of the planned project or within its vicinity. If the project is planned to be	No earlier than 25th day and no later than 30th day after the publication of the application

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

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

3.6 - Licenses, Permits, and Approvals

123. The Project will also be required to obtain a number of permits and consents, of which the main permits and the implementing national legislation are described in Table 17. The Law on Licenses and Permits governs the issue of all permits and consents. Subject to satisfaction of application requirements, all the permits are issued within 30 days from application submission.

Table 17. Permits Register

Permit Required Activity	Permit Title	Issuing Authority	Implementing Law	Responsible Party for Obtaining License
Preparation Phase				
Construction activities	Construction Permit	Ministry of Economy and Sustainable Development	Law No.1775 on Licenses and Permits; Government Resolution N57 "On Terms and Conditions of issuance of Construction Permit"	RD
Construction activities	Environmental Decision	MoEPA	Law No.519 on Environmental Protection Law No 890-II Environmental Assessment Code	RD
Construction activities	Cultural Heritage Clearance	National Agency of Cultural Heritage	Law No 4708 "On Cultural Heritage" Law No.1775 on Licenses and Permits; Government Resolution N57 "On Terms and Conditions of issuance of Construction Permit"	RD
Construction activities	Visual geological-engineering conclusion	National Environmental Agency	Government Resolution N57 "On Terms and Conditions of issuance of Construction Permit"; Order N7 of the Minister of Environment Protection	RD
Construction Phase				
Underground water abstraction	Mineral extraction license	Ministry of Economy and Sustainable Development	Decree of the Government of Georgia N136 of August 11, 2005; Law N 946 "On Fees for Use of Natural Resources"	Contractor
Construction or upgrade of access roads	Approval of construction or upgrade activities	Ministry of Infrastructure and Regional Development; local municipalities	Government Resolution N57 "On Terms and Conditions of issuance of Construction Permit"	Contractor

Transportation of oversized and overweight cargo	Transportation permit	Ministry of Internal Affairs	Joint Order N956/1-1/746 of the Minister of Internal Affairs and Minister of Economic Development; Law N 700 "On Road Transport"; Law "On Road Traffic"	Contractor
Spoil disposal	Spoil disposal approval	MoEPA	Law "On Subsoils", May 8, 2012	Contractor
Wastewater discharge	Approval of discharge points and water quality limits	MoEPA	Law on Water 1997 (last amended in 2017	Contractor

3.7 - Construction Permits

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

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

126. The responsible authority (the RD) must obtain the following approvals before it gets approval from the Ministry of Economy and Sustainable Development (MoESD):

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

3.8 - State Forest Fund

127. According to The Resolution No.242 of Government of Georgia on Approval of Rules for Forest Use, Article 271 State forest land (or State Forest Fund (SFF)) may be used for the purposes of construction of motorways, as well as for other activities which are deemed as special use of forest lands. Article 27 states that if the activity that is deemed as special use of forest land and is subject to Ecological Expertise then the Client (in this case the RD) is obliged to apply to remove all trees identified in the affected SFF area from the SFF register or "de-list" them before they can be cut. The decision to de-list trees and plants from the State Forest Fund of Georgia is issued by the National Forest Agency excepting the vegetation species protected by the Red List of Georgia. A decision to de-list trees and plants from the Red List of Georgia is made by MoEPA. The client must apply to the MoEPA in writing regarding the presence of the Red-Listed species in the project area.

3.9 - International Conventions Relevant to the Project ratified by Georgia

128. List of key conventions on air quality and climate change, biodiversity and protection of ecology and habitats, cultural heritage, public consultation, labor issues and the dates of ratification by Georgia are listed below (see Table 18):

Table 18. Conventions (relevant to the project) Ratified by Georgia

Year	Title	Status in Georgia, date	
Natural environment			
1961	International Convention for The Protection of New Varieties of Plants	Entry into force	2008
1971	Ramsar Convention on Wetlands of International Importance Especially as Wildfowl Habitat	Entry into force	1997
1973	Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	Entry into force	1996
1991	Agreement on The Conservation of Populations of European Bats	Entry into force	2002
1995	Agreement on The Conservation of African-Eurasian Migratory Waterbirds	Entry into force	2001
1996	Agreement on The Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area	Entry into force	2001
1997	International Plant Protection Convention (1997 Revised Text)	Entry into force	2007
1983	Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) (CMS)	Entry into force	2000
1992	Rio Convention on Biological Diversity	Entry into force	1994
2000	Cartagena Protocol on Biosafety to the Convention on Biological Diversity	Entry into force	2009
2000	European Landscape Convention	Entry into force	2011
2002	Black Sea Biodiversity and Landscape Conservation Protocol to the Convention on the Protection of the Black Sea Against Pollution	Entry into force	2011
2008	Convention on the Conservation of European Wildlife and Natural Habitats (Bern)	Entry into force	2010
2010	European Landscape Convention	Entry into force	2011
Environmental pollution, waste			
1992	Convention on The Protection of The Black Sea Against Pollution	Entry into force	1994
1992	Protocol on Cooperation in Combating Pollution of The Black Sea Marine Environment by Oil and Other Harmful Substances in Emergency Situations	Entry into force	1994
1992	Protocol on The Protection of The Black Sea Marine Environment Against Pollution by Dumping	Entry into force	1994
1992	Protocol on The Protection of the Black Sea Marine Environment Against Pollution from Land-Based Sources	Entry into force	1994
1997	Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management	Entry into force	2009
1998	Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade	Entry into force	2007
1989	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal	Entry into force	1995
2001	Stockholm Convention on Persistent Organic Pollutants	Entry into force	2007
2009	Protocol on the Protection of the Marine Environment of the Black Sea from Land-Based Sources and Activities	Ratified	2009
Climate			
1994	UN Framework Convention on Climate Change (UNFCCC)	Entry into force	1994
1994	International Convention to Combat Desertification	Ratified	1999

1985	Vienna Convention for the Protection of the Ozone Layer	Entry into force	1996
1987	Montreal Protocol on Substances that Deplete the Ozone Layer, (and its London, Copenhagen, Montreal, and Beijing Amendments 2000 and 2011)	Entry into force	1996
1997	Kyoto Protocol to UNFCCC	Entry into force	2005
1999	Geneva Convention on Long-Range Transboundary Air Pollution	Entry into force	1999
Cultural heritage			
1954	European Cultural Convention	Entry into force	1997
1972	Paris Convention Concerning the Protection of the World Cultural and Natural Heritage	Entry into force	1992
1982	European Convention on the Protection of the Archaeological Heritage	Entry into force	2000
1985	Convention for the Protection of the Architectural Heritage of Europe	Entry into force	2000
2005	Council of Europe Framework Convention on the Value of Cultural Heritage for Society (Faro convention)	Entry into force	2011
Public participation and information accessibility			
1998	Aarhus Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters	Ratified	2000
Labour issues			
1930	Forced Labour Convention	Entry into force	1993
1936	Holidays with Pay Convention	Entry into force	1993
1949	Freedom of Association and Protection of the Right to Organise Convention	Entry into force	1999
1948	Right to Organise and Collective Bargaining Convention	Entry into force	1993
1950	European Convention for the Protection of Human Rights and Fundamental Freedoms	Entry into force	1999
1951	Equal Remuneration Convention	Entry into force	1993
1957	Abolition of Forced Labour Convention	Entry into force	1996
1958	Discrimination (Employment and Occupation) Convention	Entry into force	1993
1962	ILO Social Policy (Basic Aims and Standards) Convention	Entry into force	1997
1964	Employment Policy Convention (Geneva)	Entry into force	1993
1973	Geneva Convention concerning Minimum Age for Admission to Employment	Entry into force	1996
1975	Human Resources Development Convention	Entry into force	1993
1978	Labour Relations (Public Service) Convention	Entry into force	2003
1987	Seafarers Welfare Convention	Entry into force	2004
1997	Employment Service Convention	Entry into force	2002
1997	Private Employment Agencies Convention	Entry into force	2002
1999	Worst Forms of Child Labour Convention	Entry into force	2002
2003	Seafarers identity Documents Convention	Entry into force	2015

129. 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]; and
- EU Waste Framework Directive [Directive 2008/98/EC on waste].

130. Georgia is also committed to harmonize national legislation with EU and international legislation.

131. EU and Georgia signed an Association Agreement (27 June 2014). Along with other issues the Association Agreement requires implementation of a number of environmental commitments aimed at maintenance, protection, improvement and rehabilitation of the environment, protection of human health and the sustainable use of natural resources. It involves facilitation of international efforts to resolve regional/global issues relating to environmental protection.

3.10 - ADB Safeguards Policy

132. ADB's SPS adopted in 2009 describes common objectives of ADB's safeguards, lays out policy principles, objectives, scope and triggers, and principles for three key safeguard areas: (i) environmental safeguards, (ii) involuntary resettlement safeguards, and (iii) indigenous peoples safeguards. It applies to all ADB-financed, ADB administered projects, and their components including investment projects funded by a loan, grant, or other means. Objectives of ADB's safeguards are to:

- avoid adverse impacts of projects on the environment and affected people, where possible;
- minimize, mitigate, and/or compensate for adverse project impacts on the environment and affected people when avoidance is not possible; and
- help borrowers/clients to strengthen their safeguard systems and develop the capacity to manage environmental and social risks.

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

1. Use a screening process for each proposed project, as early as possible, to determine the appropriate extent and type of environmental assessment so that appropriate studies are undertaken commensurate with the significance of potential impacts and risks. (The Project is classified as a Category B project).
2. Conduct an environmental assessment for each proposed project to identify potential direct, indirect, cumulative, and induced impacts and risks to physical, biological, socioeconomic (including impacts on livelihood through environmental media, health and safety, vulnerable groups, and gender issues), and physical cultural resources in the context of the project's area of influence. Assess potential transboundary and global impacts, including climate change. Use strategic environmental assessment where appropriate. (The IEE herewith provides the environmental assessment for the Project, including an assessment of climate change. Transboundary impacts are not applicable).
3. Examine alternatives to the project's location, design, technology, and components and their potential environmental and social impacts and document the rationale for selecting the particular alternative proposed. Also consider the no project alternative. (Alternatives have been considered, including the 'no project' alternative in Chapter **5.4 - Alignment Alternatives Analysis**).
4. Avoid, and where avoidance is not possible, minimize, mitigate, and/or offset adverse impacts and enhance positive impacts by means of environmental planning and management. Prepare an environmental management plan (EMP) that includes the proposed mitigation measures, environmental monitoring and reporting requirements,

related institutional or organizational arrangements, capacity development and training measures, implementation schedule, cost estimates, and performance indicators. Key considerations for EMP preparation include mitigation of potential adverse impacts to the level of no significant harm to third parties, and the polluter pays principle. (An EMP has been prepared for the Project and is outlined in detail in **Annex 1. Environmental Management and Monitoring Plans**).

5. Carry out meaningful consultation with affected people and facilitate their informed participation. Ensure women's participation in consultation. Involve stakeholders, including affected people and concerned nongovernment organizations, early in the project preparation process and ensure that their views and concerns are made known to and understood by decision makers and taken into account. Continue consultations with stakeholders throughout project implementation as necessary to address issues related to environmental assessment. Establish a grievance redress mechanism to receive and facilitate resolution of the affected people's concerns and grievances regarding the project's environmental performance. (Initial consultations were held to discuss environmental issues and additional consultations are planned. The findings of the consultations and a description of the Project grievance redress mechanism are presented in Chapters **8. Public Consultation and Information Disclosure** and **9. Grievance Redress Mechanism**, and **Annex 2. Stakeholder Engagement Meeting Minutes**).
6. Disclose a draft environmental assessment (including the EMP) in a timely manner, before project appraisal, in an accessible place and in a form and language(s) understandable to affected people and other stakeholders. Disclose the final environmental assessment, and its updates if any, to affected people and other stakeholders. (This IEE and its EMP will be disclosed on the ADB and RD web-sites).
7. Implement the EMP and monitor its effectiveness. Document monitoring results, including the development and implementation of corrective actions, and disclose monitoring reports. (The IEE and its EMP outline a plan to monitor the implementation of the EMP and the institutional responsibilities for monitoring and reporting throughout the Project lifecycle: See **Annex 1. Environmental Management and Monitoring Plans**).
8. Do not implement project activities in areas of critical habitats, unless (i) there are no measurable adverse impacts on the critical habitat that could impair its ability to function, (ii) there is no reduction in the population of any recognized endangered or critically endangered species, and (iii) any lesser impacts are mitigated. If a project is located within a legally protected area, implement additional programs to promote and enhance the conservation aims of the protected area. In an area of natural habitats, there must be no significant conversion or degradation, unless (i) alternatives are not available, (ii) the overall benefits from the project substantially outweigh the environmental costs, and (iii) any conversion or degradation is appropriately mitigated. Use a precautionary approach to the use, development, and management of renewable natural resources. (No critical habitats have been identified that would be significantly impacted by the Project).
9. Apply pollution prevention and control technologies and practices consistent with international good practices as reflected in internationally recognized standards such as the World Bank Group's Environmental, Health and Safety Guidelines. Adopt cleaner production processes and good energy efficiency practices. Avoid pollution, or, when avoidance is not possible, minimize or control the intensity or load of pollutant emissions and discharges, including direct and indirect greenhouse gases emissions, waste generation, and release of hazardous materials from their production, transportation, handling, and storage. Avoid the use of hazardous materials subject to international bans or phase-outs. Purchase, use, and manage pesticides based on integrated pest management approaches and reduce reliance on synthetic chemical pesticides. When host country regulations differ from these levels and measures, the borrower/client will achieve whichever is more stringent. (The IEE and its EMP outline

specific mitigation and management measures to prevent and control pollution: **Annex 1. Environmental Management and Monitoring Plans**. Chapter **3. Policy, Legal, and Administrative Framework**, identifies the most stringent regulations).

10. Provide workers with safe and healthy working conditions and prevent accidents, injuries, and disease. Establish preventive and emergency preparedness and response measures to avoid, and where avoidance is not possible, to minimize, adverse impacts and risks to the health and safety of local communities. (The IEE and its EMP outline the requirement for specific health and safety plans and emergency response plans in Chapter **10. Environmental Management and Institutional Requirements**).
11. Conserve physical cultural resources and avoid destroying or damaging them by using field-based surveys that employ qualified and experienced experts during environmental assessment. Provide for the use of "chance find" procedures that include a pre-approved management and conservation approach for materials that may be discovered during project implementation. (No physical and cultural resources have been identified that would be significantly impacted by the Project. Chance finds are discussed in **Annex 8. Chance Find Procedure**.

134. **Safeguard Requirements 2: Involuntary Resettlement –** The objectives are to avoid involuntary resettlement wherever possible; to minimize involuntary resettlement by exploring project and design alternatives; to enhance, or at least restore, the livelihoods of all displaced persons in real terms relative to pre-project levels; and to improve the standards of living of the displaced poor and other vulnerable groups. The safeguard requirements underscore the requirements for undertaking the social impact assessment and resettlement planning process, preparing social impact assessment reports and resettlement planning documents, exploring negotiated land acquisition, disclosing information, and engaging in consultations, establishing a grievance mechanism, and resettlement monitoring and reporting.

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

136. **Safeguard Requirements 3: Indigenous Peoples –** The objective is to design and implement projects in a way that fosters full respect for Indigenous Peoples' identity, dignity, human rights, livelihood systems, and cultural uniqueness as defined by the Indigenous Peoples themselves so that they (i) receive culturally appropriate social and economic benefits; (ii) do not suffer adverse impacts as a result of projects; and (iii) can participate actively in projects that affect them.

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

3.11 - Institutional Framework

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

139. MoEPA is responsible for all environmental protection issues and natural resources. The responsibilities of the Ministry as the competent authority are to: i) intermit, limit, or stop any activity having or likely to have adverse impact on the environment; ii) issue a series of licenses and permits (including for environmental impact); iii) control the execution of mitigation measures by the developer; and iv) receive free and unrestricted information from the developer about the utilization of natural resources, monitoring systems, waste management and explanations from authorities concerning the project.

140. RD will apply for the environmental permit for works to be undertaken on the Bakurtsikhe-Tsnori road section to the MoEPA. MoEPA's Department of Ecological Examination will undertake expert review of the IEE sanctioned by the RD report and take decision on the issuance of an environmental permit as well as on the conditions under which the permit is to be granted.

141. The MoEPA consists of several functional departments, which are responsible for different aspects of environmental protection and administration. Department of Permits is responsible for carrying out State Ecological Expertise and issuing environmental permits. The Department of Environmental Supervision is responsible for execution of control over the environmental protection and use of natural resources and adherence to the terms of issued environmental permits and resource use licenses.

142. **Ministry of Economy and Sustainable Development (MoESD)** – MoESD is responsible for carrying out the review of technical documentation (including conclusion of independent experts) and issuing Permits on Construction for projects, as well as for supervision over constructing activities and for arranging Acceptance Commission after completion of construction. State supervision of construction and compliance monitoring is provided by the Main Architecture and Construction Inspection (MACI), which is operating under the Ministry of Economy and Sustainable Development of Georgia. Following to reorganization of MoEPA and the Ministry of Energy the MoESD took over the functions of the latter, as well as part of the main functions of MoEPA (viz. licensing activity).

143. **Ministry of Regional Development and Infrastructure (MRDI)** – The MRDI oversees regional and infrastructure development throughout the country which includes modification and modernization of the State road network of international and domestic importance. MRDI works out suggestions and recommendations pertaining important investments into the national infrastructure and submits them for review and decision-making to the Cabinet. The RD is an agency within the MRDI.

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

145. **The Ministry of Culture, Monument Protection and Sports** – The Ministry is responsible for supervision of the construction activities in order to protect archaeological

heritage. In case if construction is to be carried out in a historic sites or zones of cultural heritage, consent of the Ministry of Culture, Monument Protection and Sport is also required for issuing construction permit.

146. In case of chance finds of the potential archaeological value, Project proponent shall contact the Ministry of Culture and seek guidance on the course of action. All action has to be taken on hold till the guidance from the Ministry is received formally. Project proponent is obligated to allow sufficient time and provide favorable conditions for undertaking works necessary for excavation, removal of artefacts from the site and its conservation. Works may resume only upon formal consent of the Ministry of Culture. In rare cases, changes may be required in the project design to bypass the site of exceptional importance and historic value.

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

148. **The Ministry of Interior** – This Ministry is the responsible authority for road accident data management (during construction and operation) and all issues involving detours will be National Police (under the Ministry of Interior).

149. **Municipalities** – The Constitution of Georgia gives the principles to identify the rights of a self-governing unit and not the rights of a self-governing unit. A detailed list of the rights of a self-governing unit based on the principles given by the Constitution is given in Article 16 of the Code of the Local Self-Governing Body of the Organic Law. Municipalities participate in spatial and territorial planning of the municipality and approving urban planning documents, including the general plan of land use. They issue construction permits for small scale infrastructure. Municipalities are also authorized to exercise control of the construction works. Municipalities are mandated to manage public property and natural resources (e.g., land and forest) owned by them. They are in charge of the collection and disposal of household waste, management of local roads, controlling street trade, protecting and regulating cemeteries, and a few other functions that may have relevance for decision-making in regard to the construction of Bakurtsikhe-Tsnori road section. In addition, local municipalities will play an important role of designating and allocating sites for the arrangement of construction camps and will have crucial function in the grievance redress mechanism, functioning as interlocutors between local communities, Contractor, Engineer, and the RD.

4. Project Description

4.1 - Overview

150. Georgia is located to the south of the Caucasus mountain range, with Russia located to its north, Armenia and Turkey to its south, and Azerbaijan to its east. With a population of 3.7 million, it is moderately urbanized, with 42% living in rural areas.[18]

151. Over the last five years, Georgia has achieved significant economic progress. In the past decade, Georgia's economy has grown robustly at an average annual rate of 4.5%. This was despite numerous shocks, including the global financial crisis of 2007–08, the conflict with the Russian Federation in 2008, and the drop in commodity prices since 2014, which impacted key trading partners. Poverty declined from 32.5% in 2006 to 16.3% in 2017. The poor have benefited considerably from the Government's social policies, as well as from new economic opportunities. Although inequality remains high by regional standards, it has been declining in recent years, thanks to strong improvements in the welfare of households in the bottom 40% of the income distribution. Georgia's recovery and growth can also be attributed to an increase in exports and tourism and continued high levels of public investment.

152. In 2011, the Government developed a ten-point economic program with the goal of facilitating job creation and improving welfare of the population. Among the top ten priorities is the improvement of the infrastructure, especially roads. The GoG is currently implementing a program to upgrade the major roads of the country, managed by the RD of the MRDI. The program aims to improve transportation and transit of goods to surrounding countries, which is a significant and growing contributor to Gross Domestic Product (GDP).

153. The Government's ambitious plans to maintain high economic growth by promoting the transportation of goods within the country, increasing tourism, and revitalizing agriculture, pose the following challenges to the road sector: i) significant capital investment is needed to bring the road network to a level that can support the economy; ii) scarce resources need to be prioritized to ensure long-term maintenance of the road assets; iii) local connections must be improved to provide the rural population with easy access to markets; and iv) investments in the road sector need to generate employment.

4.2 - Project Introduction

154. The Bakurtsikhe-Tsnori road section is expected to be designed and built in the Alazani lowland along the new alignment bypassing the settled areas along the existing road. The new road section will branch from the Bakurtsikhe - Gurjaani bypass road, which is presently under construction, at approximately km 1.8. The road continues north-east crossing an irrigation canal and then turns right to run parallel to the canal in a south-easterly direction before connection with the S-5 Tbilisi - Lagodedekhi. The length of the new road is approximately 16 km, starting at km 0+600 and ending at km 16+809. The road is located within Gurjaani Municipality (Bakurtsikhe) and Sighnaghi Municipality (Tsnori). The geometrical road design is based on the Georgian Geometrical Road Design Standard introduced in 2009. The road design also conforms with the Trans-European North-South Motorway (TEM) Standards, but road itself is not part of the Trans-European road network.

155. To provide adequate access to the villages being bypassed, a diamond interchange at km 11+386 is planned. The secondary road where the new interchange will connect will be rehabilitated/paved (see Figure 3). The length of the secondary road is approximately

[18] The World Bank. 2019. World Development Open Data.

1,100 m and the paved carriageway width will be 6.00 m with 0.50 m gravel shoulder on both sides. While final designs of the secondary road still need to be developed by the design-build Contractor, the upgraded road will stay within the exiting right-of-way (ROW).[19] The secondary road currently connects the village of Vakiri to service road running parallel to the agriculture channel and the proposed road. The secondary road is currently being utilized by local residents and farmers and the numbers of vehicles is very low. Since the secondary road will be the only connection along the new road between Bakurtsikhe and Tsnori, the number of users is expected to increase however.

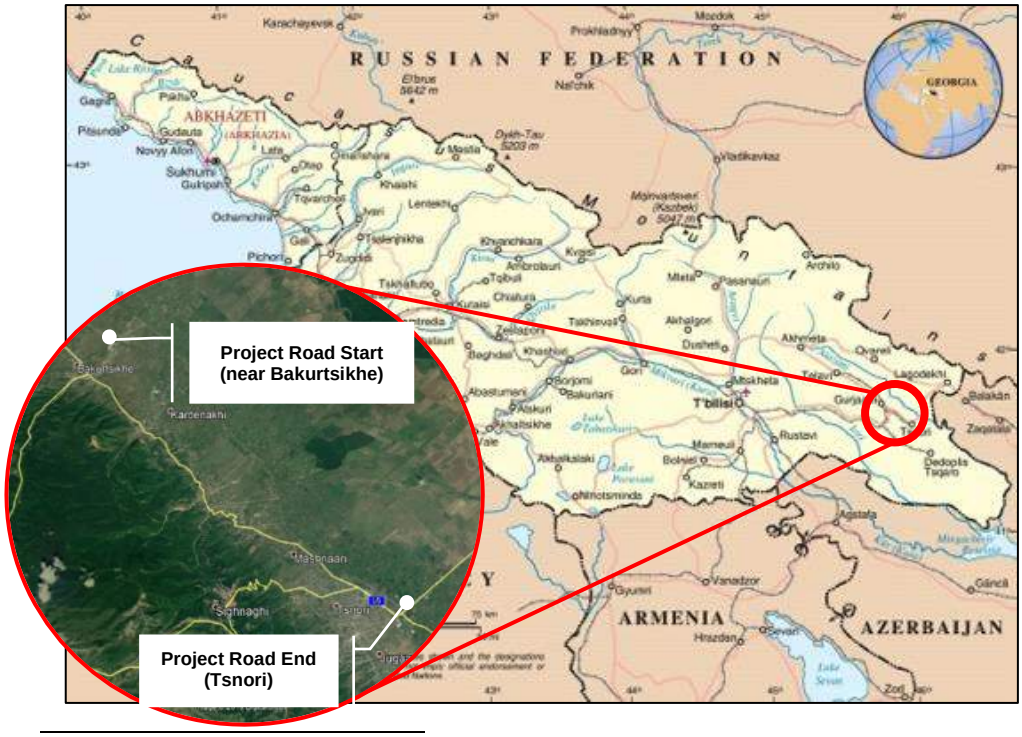
156. The Project area is sparsely populated and highly agricultural. The area is characterized by a large number of small-scale farms and land acquisition and resettlement was identified immediately as a key issue of concern in defining alignment alternatives. There were particular concerns around land parcels not officially registered and with the anticipated impact on agriculture land being for production of fruit and grapes in the planned ROW.

157. In addition to providing consultancy services for preparation of the feasibility study and original ESIA (according to World Bank standards), Kocks developed the preliminary designs and bidding documents for the design-build construction based on the recommended alignment alternatives. The alignment established as part of the preliminary design is not expected to be changed by the Contractor during the detailed design and construction phase.[20]

4.3 - Section Layout

158. Figure 2 indicates the location of the Project within the context of Georgia. Figure 3 provides a map of the entire Project road and identifies the location of the proposed diamond interchange at km 11+386. Figure 4 provides a view of the secondary road to be upgraded and connected to the proposed diamond interchange.

Figure 2. Road Location Map



[19] Davit Getsadze, Roads Department, pers. comm. 2019
[20] Ibid.

Figure 3. Project Road Overview

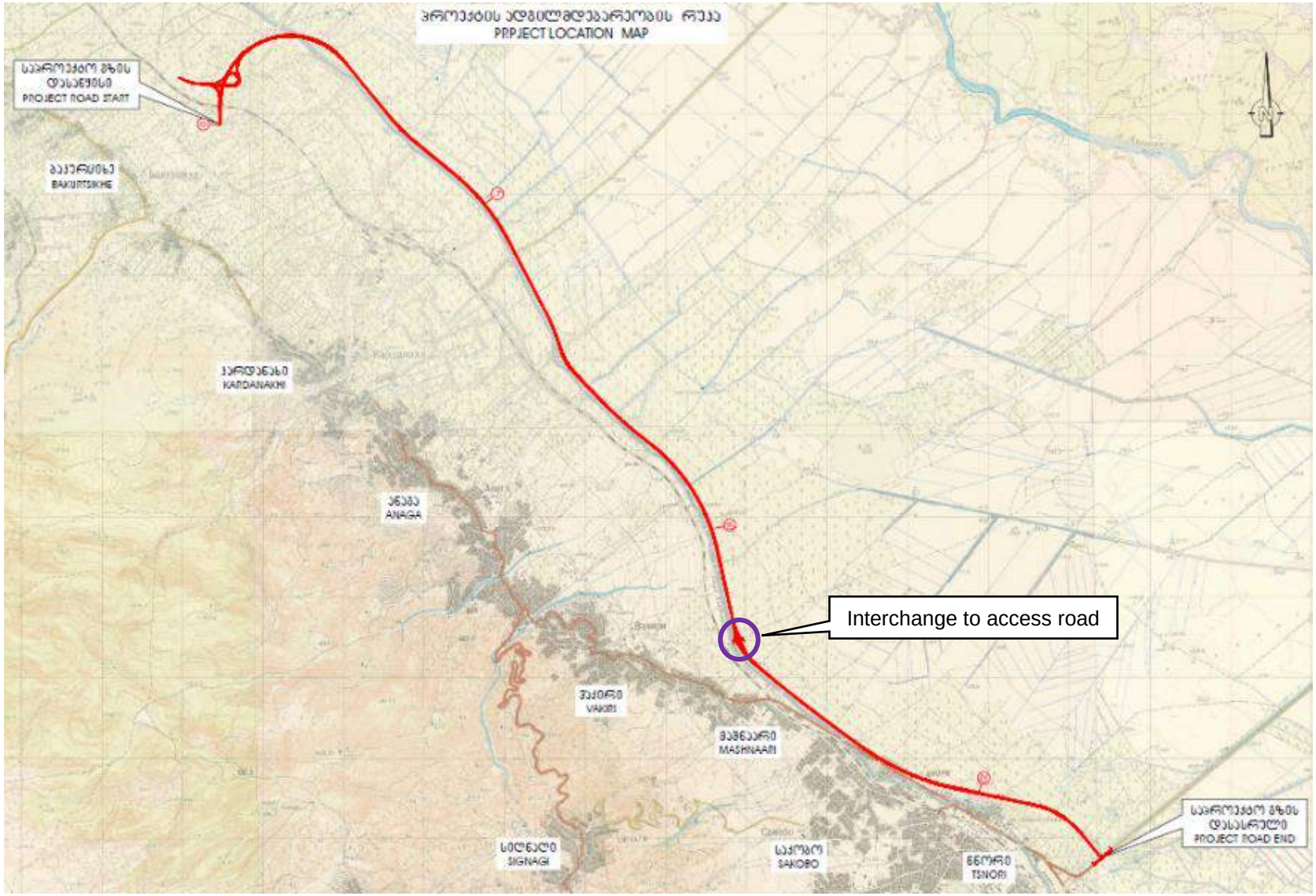
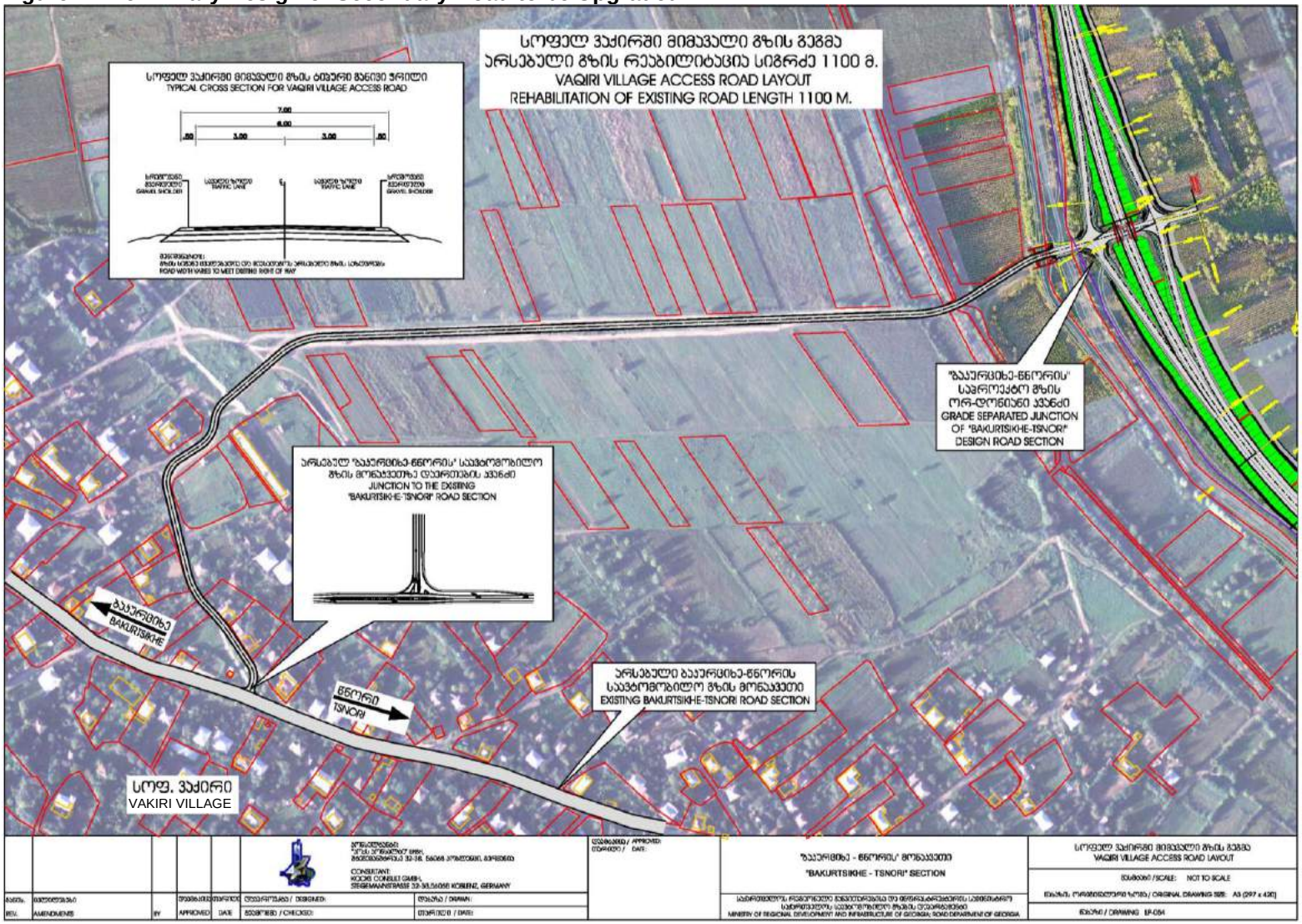


Figure 4. Preliminary Design of Secondary Road to be Upgraded



4.4 - Design Standards and Considerations

4.4.1 - Geometrical Road Design Standard and Parameter

159. In 2009 a new Georgian Geometrical Road Design Standard was introduced.[21] According to the design standard, roads are classified based on the functional classification, the annual average daily traffic (AADT) volume and terrain type. As mentioned, the road design also conforms with the Trans-European North-South Motorway (TEM) Standards, but road itself is not part of the Trans-European road network.

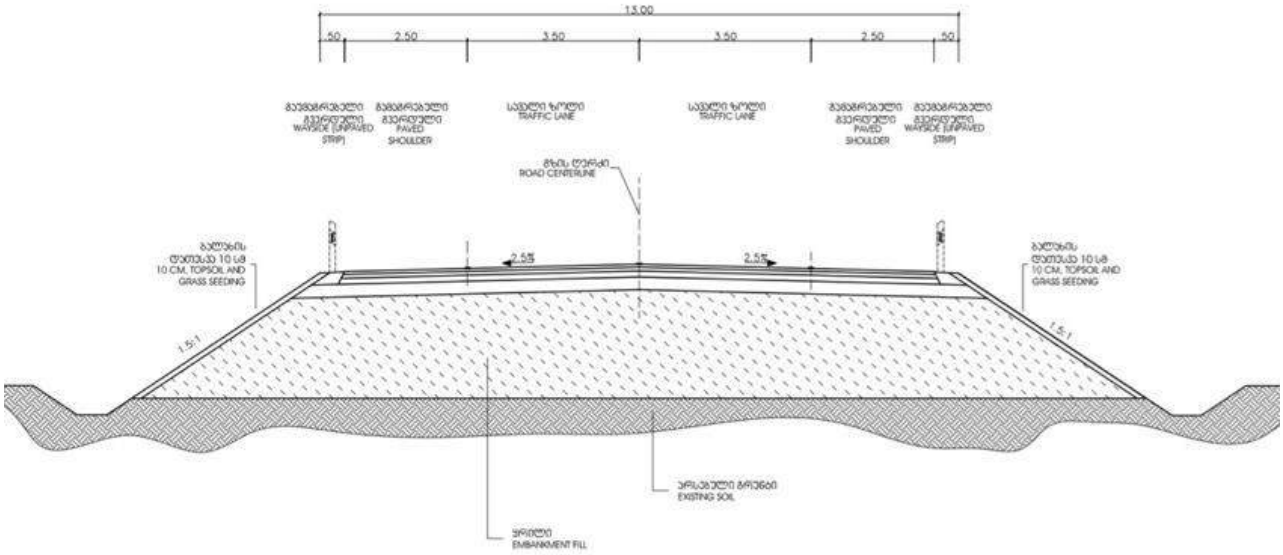
160. The terrain in the Project area is relatively flat and within the Georgian standard flat terrain is characterized by natural slope coefficient less than 1:10 and a natural difference in height per kilometer of less than 30 m. Considering the functional classification and terrain type, the design speed should be set as 100 km/h for sections with AADT less than 8,000 vehicles. The geometrical design parameter used in the design of the new road comply with the parameter design speed of 100 km/h. The minimum horizontal radius used in the design of the centerline is 550 m, the minimum vertical slope is 0.4%, and the maximum vertical slope is 4%.

161. Cross section. The selected design elements for the cross section of the Project shall be accordance to Attachment 4 of the Georgian Road Design Standard, considering construction of the road as two lane (one carriageway) road with a design speed of 100 km/h. The width of road is composed of the width of carriageway (sum of the width of lanes) and the width of the shoulders (see Figure 5 below for typical road cross section). In accordance with the Georgian Road Design Standard, the selected design elements for the cross section of the Project road are as follows:

Number of lanes:	2
Lane width:	3.50 m
Carriageway width:	7.00 m
Paved shoulder width:	2.50 m
Way side (unpaved shoulder):	0.05 m
Total road width:	**13.00 m**

[21] Geometrical and Structural Requirements for Georgian Automobile Roads, Ministry of Regional Development and Infrastructure, Roads Department, Tbilisi 2009

Figure 5. Typical Road Cross Section



162. On the embankments, where installation of crash barriers is required, an additional 0.50 m 'wayside' (shoulder) for a one-carriageway road should be considered.

163. Geometrical design parameter. The highway from Bakurtsikhe to Tsnori shall be composed of 2-Lane standard sections of Type 1 roadway (13.00 m wide). The desired geometrical design parameters for the selected design speed of 100 km/h are as follows:

Min. horizontal radius:	450 m
Max. vertical slope (gradient):	5%
Min. longitudinal slope:	0.4%
Min. crest curve:	10,000 m
Min. sag curve:	4,900 m
Min cross section slope:	2.5%
Max super elevation:	7%

164. The proposed alignment alternatives pass through flat terrain and therefore no geometrical constraints are anticipated which would result in a lower design parameter.

4.4.2 - Bridge Design Codes and Standards

165. A combination of American and European bridge design codes are generally used for designing of bridge structures in Georgia. Highway loading, HL93 of AASHTO/LRFD has been widely used and the performance, both nationally and internationally, has been found satisfactory.

166. The use of the bridge design standards was discussed within the RD, taking also into consideration the request from Kocks to use European standards (Euro Codes). As a result of the discussions, the RD confirmed that the use of AASHTO design standards is acceptable for the preliminary design.

167. Therefore, it has been proposed that the bridges be designed per AASHTO/LRFD Bridge Design Specification which includes the following control variables:

HL-93 design loading:	75-year maximum live load effect
Earthquake hazard:	7% probability of exceedance in 75 years (1,000-year return period)
Wind load:	50 years return period
Flood:	100 years return period.

168. The design codes proposed for assessing the loads and making preliminary design the structures are:

- AASHTO LRFD Bridge Design Specifications (SI Units)/2007 has generally been used for bridge loading and to design the structural components of the structure.
- AASHTO Guide Specifications for LRFD Seismic Bridge Design –2011
- Construction Norms: Bridge and Culverts SNiP 2.05.03-84 – shall only be used for definition of NK 100 live load for bridge response.
- Construction Norms and Rules "Seismic Resistant Construction" (PN 01.01.09)

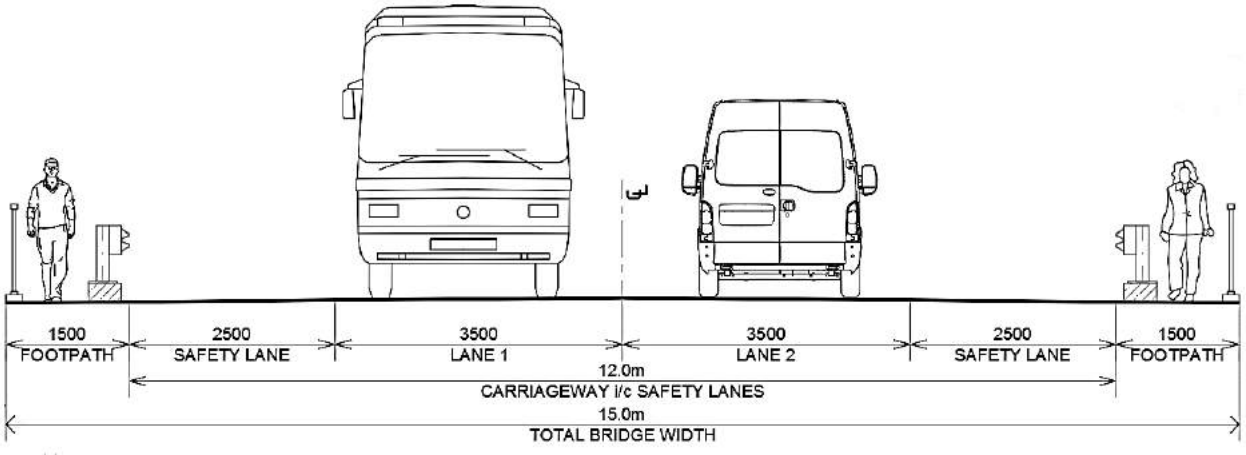
169. For any conflicting provisions among the codes – AASHTO/LRFD Bridge Design Specification (2007) shall be followed.

170. Bridge Cross-Sections. The proposed bridge carriageway geometry shall be based on the geometric and structural requirements for highway design in Georgia which include the following:

- Lane width: 3.5 m has been taken as that of the road design;
- Side lane (safety lane, varies based on road design requirements): 2.5 m;
- Footpath width: 1.5 m (0.5+0.75+0.25);
- Height of concrete barrier: 0.80m; and,
- Basic cross fall on carriageway: 2.5%, has been taken as that of the road design.

171. A 15 m total minimum bridge width as shown in Figure 6 is proposed.

Figure 6. Proposed Bridge Cross Section Under the Project



4.4.3 - Pavement Design Standard

172. The pavement design for the study road will be based on design method according to *AASHTO Guide for Design of Pavement Structures*, *1993, Volume 1,* Design Procedures for new construction or reconstruction. The AASHTO Guide for Design of Pavement Structures is based on precise input numbers for material properties, performance, reliability, and traffic. This method has already been used in Georgia and is recognized worldwide. The

design life used in the pavement design will be 20 years as stated in the terms of reference (TOR) and confirmed by the RD.

4.4.4 - Drainage Design Standard

173. For the detailed design of water crossings, calculations of peak discharges will be carried out using the Rostomov method[22] which has been widely used for road projects in Georgia. The calculations for this method follow the chapter IV of the "Technical reference to calculate river peak flows in the Caucasus". This manual is based on long-term records and statistical investigations of precipitation and river discharges of the Caucasus region.

174. For this Project, one of the most important advantages of the Rostomov method is the fact that no external precipitation data are necessary since the long-term-precipitation-records are included in the climatic coefficient *k*, which is presented in the manual as a map with isolines.

175. It should be noted that the Rostomov method gives the values of water peak discharge 15-18% higher than the boundary intensity formula given by SNiP 2.01.14-83 (determination of design hydrological properties), which was deduced for the rivers of the USSR in the 1960s. The formula of boundary intensity does not consider the global climate changes and the associated increase in the intensity of precipitations, resulting in lower values of water peak discharge. By considering the increased intensity of precipitations on the background of global climate change and increased values of water peak discharge, it is recommended to use the Rostomov method for calculation of the discharge. This method is approved in Georgia and meets modern requirements. The design-build Contractor will need to ensure that climate change considerations are factored into the final designs of all drainage structures.

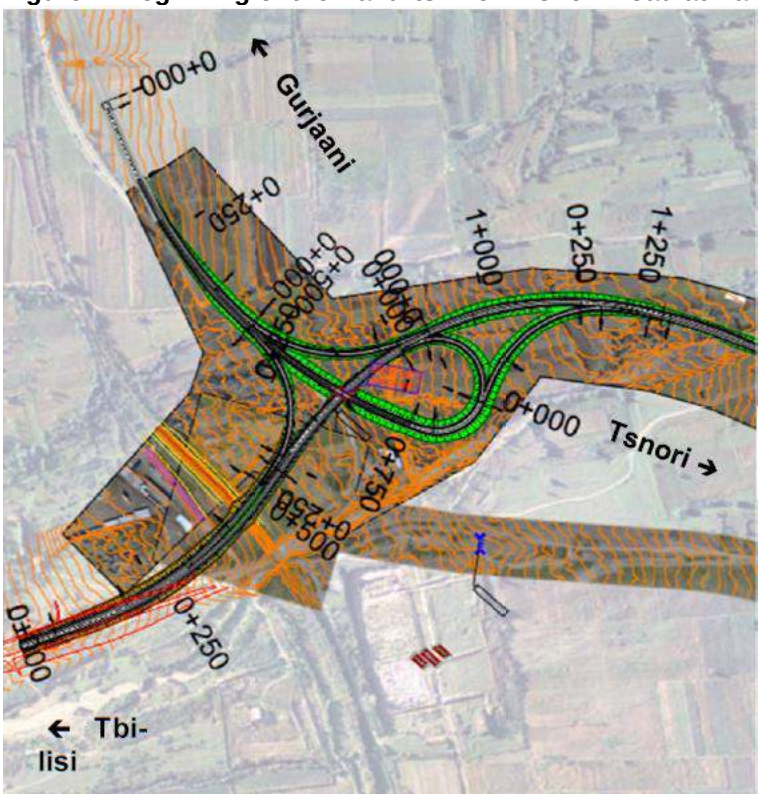
4.5 - Interchanges

176. Within the Bakurtsikhe – Tsnori road section, two grade separated interchanges are foreseen:

- At the beginning of the road section (see Figure 2) a trumpet interchange is designed to connect the Bakurtsikhe – Gurjaani bypass road section with the new Bakurtsikhe – Tsnori road section (see Figure 7).
- To provide connection with the local road network at approximately km 11+386, a grade separated diamond interchange is planned (see Figure 4).

[22] Rostomov, G. "The Rostomov Flood forrnula", Russian language. Research Institute, Tiblisi, 1969.

Figure 7. Beginning of the Bakurtsikhe – Tsnori Road at Bakurtsikhe-Gurjaani Bypass Road

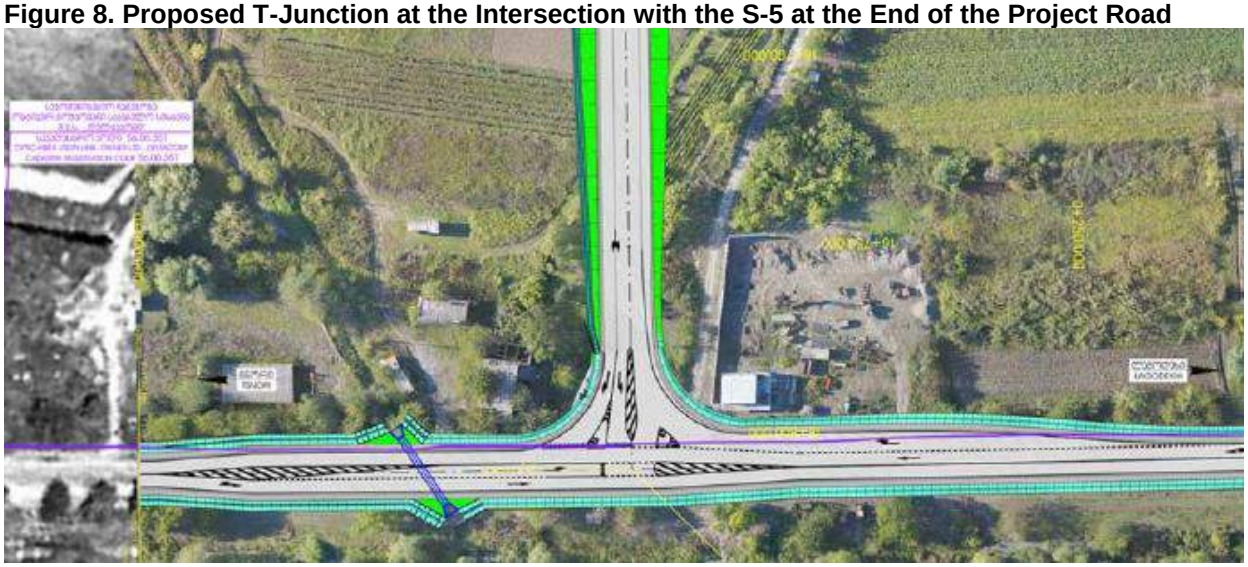


177. The trumpet interchange involves the intersection of two roads that meet in a 'T' shape. Trumpets are used exclusively when three intersection legs are present. The through traffic is placed on the direct alignment, while left-turning movement with the lower traffic volume should travel on the loop ramp.

178. The Bakurtsihke interchange is designed to minimize the impact on the on-going Bakurtsikhe – Gurjaani bypass construction and avoid both the exiting construction camp of the Contractor building the Bakurtsikhe- Gurjaani bypass and existing irrigation facilities.

179. At the intersection with the S-5 at the end of the Bakurtsikhe – Tsnori road (see Figure 2) a T-junction has been designed with separate turning lanes and islands to improve road safety. Referring to the UK Design Manual for Geometric Design of Major/Minor Priority Junctions, the capacity of the T-junction with islands is sufficient to cope with the expected traffic levels (see Figure 8). Islands are used to provide left turning vehicles with a degree of shelter from the through flow. They are highly effective in improving safety, and are cost effective, especially on wide 2-lane single carriageway roads where very little extra construction cost is involved.

Figure 8. Proposed T-Junction at the Intersection with the S-5 at the End of the Project Road



180. Since the Bakurtsikhe – Tsnori road is designed as an international road and located in a rural, relatively unpopulated area, the goal was to minimize the number of intersections in order to reduce disturbances to through traffic caused by turning traffic. Therefore, the only intersection that will provide connection with the local road network has been included in the preliminary design at km 11+386. A diamond interchange has been chosen as the best choice of interchange where the intersecting road is not access controlled.

Figure 9. Schematic Layout of a Typical Diamond Interchange

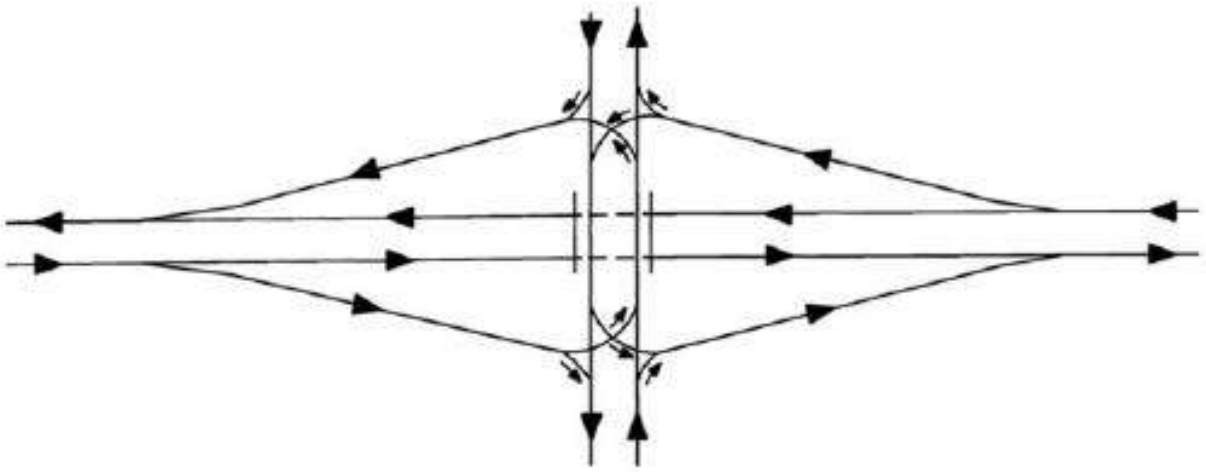
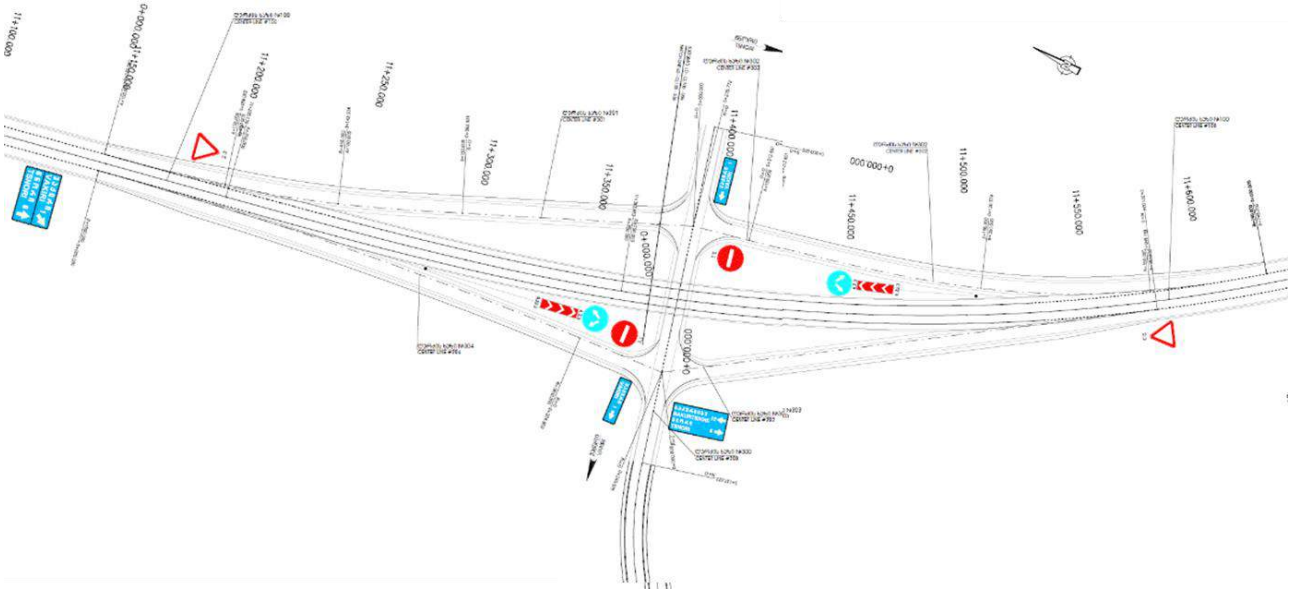


Figure 10. Layout of the Diamond Interchange at km 11+386 for Secondary Road to Existing Bakurtsikhe – Tsnori Road



181. Access roads. Access to the agricultural fields along the north side of the proposed Bakurtsikhe-Tsnori Road will be provided by a new gravel road running parallel to the Project road. This new access road should not be confused with the canal service road which currently runs parallel to the canal (south of the proposed highway) and allows for regular canal maintenance and repair works. The width of the agricultural gravel road is 4.5 m in accordance to the Georgian Road Design Standard.

182. To provide access to farmers from one side of the proposed Project road to the other, 14 underpasses are planned which will link the local feeder road network. This is possible due to the fact that the new road is designed to run on a relatively high embankment. Preliminary designs call for an embankment height of between 5 and 6 m above the adjacent ground along most of the road alignment. At the beginning and end of the new road, embankments have been designed to carry maximum heights of 11.5 m and 9 m. Since most of the road will be elevated, a significant amount of soil will need to be brought in (approximately 2.25 million m^3 of embankment fill will be required).[23] To the extent possible, soil stripped and stockpiled during site preparation (approximately 106,000 m^3 of soil will need to be stripped[24]) should be reused for the embankments.

183. To provide adequate access to the interchange at km 11+386, a secondary road will be rehabilitated/paved within the existing ROW (see Figure 4). The length of the secondary road is approximately 1,100 m and the paved carriageway width will be 6.00 m with 0.5 m gravel shoulder on both sides.

4.6 - Bridges

184. Bridge design. Upon development of the final design of the roadway from Bakurtsikhe to Tsnori, the following clusters of bridge types have been identified for crossings:

[23] Kocks Consult GmbH, Final Feasibility Study Report for Construction of Bakurtsikhe-Tsnori Road Section Project, October 2016.
[24] Ibid.

- **River crossing –** One 19 m wide bridge for crossing the Chalaubniskhevi River[25] (close to the beginning of the alignment in Bakurtsikhe) (see Figure 2).
- **Grade separation/viaduct** - Three bridges that are required at the design junctions to ensure uninterrupted flow of traffic without creating any obstruction to the local connectivity. This cluster includes two grade separation bridges (one for the trumpet interchange at the beginning of the alignment and one at the diamond interchange leading to the village of Vakiri) and one viaduct crossing the irrigation canal where the new road takes a straight alignment.
- **Underpasses** - 14 bridges dedicated to service existing local roads through the embankment of the designed highway (see Figure 11). This will accommodate vehicle traffic from farmers and local residents who need to frequently access both sides of the new road. It is expected that pedestrians will also utilize the underpasses to cross the proposed highway.
- **Channel crossing** - one bridge at the diamond interchange (see Figure 10) to cross the existing irrigation canal and connect with the secondary road.

185. In total, 19 bridges will need to be constructed under this Project. The approximate locations of these bridges are provided in the table below.

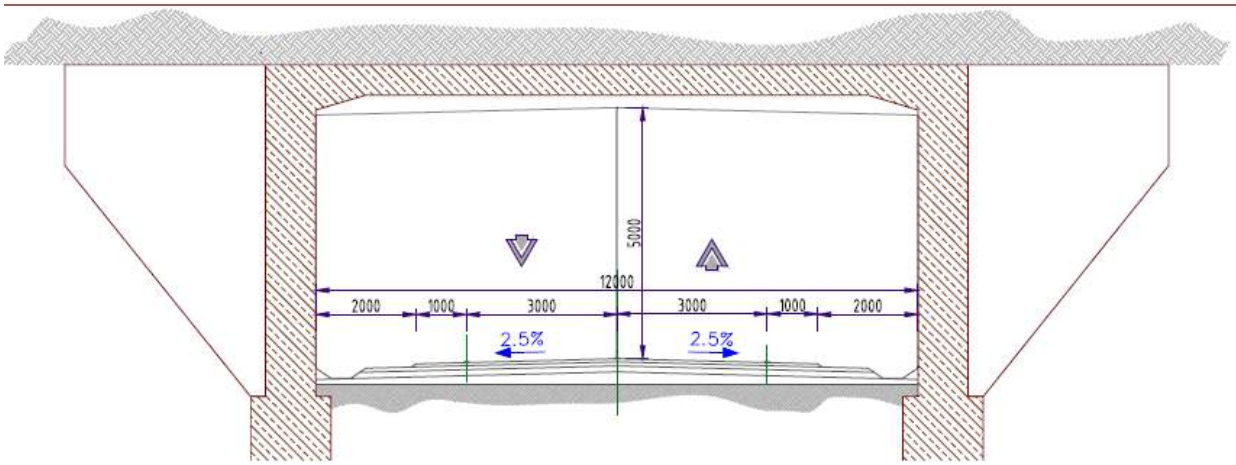
Table 19. Location of Project Bridges

ID #	Approximate Chainage, km+m	Functionality
1	0+639.850	Grade Separation
2	1+401.040	River Crossing
3	1+851.800	Viaduct
4	4+962.400	Underpass
5	5+715.000	Underpass
6	7+077.000	Underpass
7	7+597.000	Underpass
8	8+126.000	Underpass
9	8+746.000	Underpass
10	9+961.000	Underpass
11	10+484.000	Underpass
12	11+386.000	Grade Separation
13	11+400.000	Chanel Crossing
14	12+226.000	Underpass
15	13+000.000	Underpass
16	13+292.000	Underpass
17	14+193.000	Underpass
18	14+950.000	Underpass
19	15+991.000	Underpass

186. According to preliminary designs, the underpass openings shall be 12 m wide (see Figure 11) and will leave a 2 m reserve on both sides in order to accommodate for conveyance of the existing or future drainage facilities and utility lines. This is important considering that the embankment design will be bisecting the area and these underpasses provide an opportunity to maintain connectivity.

[25] The river only flows seasonally and has been identified in this assessment as the Chalaubniskhevi based on available information online.

Figure 11. Proposed Cross-Section for Minor Underpass Bridges



187. Structure types and forms. Pure concrete (a combination of reinforced concrete with pre-stressed concrete) and composite construction with structural steel has been proposed as an appropriate material type for the bridges for the following reasons:

- Availability of material;
- Local expertise;
- Maintenance requirements;
- Time and ease of construction;
- Safety issues during construction;
- Environmental hazard during construction and service life; and
- Cost

188. Classification and selection of forms. Structural types of the bridges on the road are classified according to the required arrangement of spans as follows:

189. Preliminary designs propose that integral reinforced concrete slab be used for *minor bridges* (13 m) to support the planned underpasses. It is suggested that the bridge structures be buried structures with minimum 600 mm cover on top of the slab to eliminate the need for transition slabs, drainage facilities, and handrails. Construction of such structures needs additional time but, due to savings on bridge accessories and the advantage of reduced input for maintenance, this type of the bridge is found most economical and appropriate. Being small, the effect of secondary forces generated from temperature, shrinkage and creep is minimal and can easily be accommodated with proper design of reinforcement.

190. For *small span bridges* (up to 30m of span) designed to support grade separation at the trumpet interchange and the river and viaduct crossing, it is suggested to use precast pre-stressed concrete girders. This is a construction method widely applied for similar spans and settings across Georgia.

191. A vertical clearance of 5 m is kept for the grade separation bridges throughout the carriageway section of the proposed highway. For grade separation purposes, a single span bridge with span arrangement scheme of 1 x 30 m is required. The river crossing and the viaduct bridge should be constructed in three- and four-span bridges, with span arrangement scheme of 3 x 30 m and 4 x 30 m respectively. It is suggested that the superstructure be composed of precast pre-stressed concrete I-girders. The precast I-beam slab system using composite action with the reinforced concrete deck has become a very popular method of

bridge construction in Georgia, having replaced former types of I-beams from Soviet times. There are several facilities where the bridge elements can be manufactured locally. Bridge beams/girders are cast at factory at the required length, hauled at site, and placed in position by crane. The maximum length of beam that can be manufactured and hauled is 31 m. A cast-in-situ reinforced concrete deck slab shall be placed on top of the I-beam to form a composite section.

192. I-beams are recommended for the following reasons:

- It accommodates super elevation of the carriageway by incrementally elevated positioning across the section of the superstructure, which is not possible with the adjacent box beams;
- It is most cost-effective options for such spans as locally adopted construction technology;
- Requires less time for construction;
- Easily accommodates skew layout of the deck;
- It implies less at-site construction work. Thus, reduce risk of health and environment hazard during construction work; and
- All material and technology locally available.

4.7 - Drainage Structures

193. Excessive water on the pavement, whether ponded or flowing, can represent a significant threat to drivers. Splash and heavy spray can be thrown up by moving vehicles, reducing visibility, while the water on the pavement reduces friction between the tires and road surface.

194. The Bakurtsikhe – Tsnori road will be constructed on an embankment of various heights and the pavement runoff will be discharged over the shoulders and embankment slope directly into an open side drain. However, over long stretches the road embankment height is over 4 m, which could create erosion problems of the embankment slopes. In accordance to the typical design solutions 503-09-7.84 for ‘Drain Structures on Motorways of the Common Network of USSR’, edge drains should be considered on these high embankment sections. A shallow reinforced concrete channel is foreseen at the edge of the paved shoulder to prevent surface water from running over the road edge and cause slope erosion. The depth of the longitudinal channel is limited, and sides are gently sloped to provide a forgiving environment for vehicles and ensure road safety.

195. Once water is channeled in the edge drains at the top of the embankment, it is led down the slopes by means of stepped out falls or lined chutes (see Figure 12 and Figure 13) at appropriate intervals. Ultimately the water is discharged into an open concrete stormwater drainage channel at the bottom of the embankment which runs parallel on the north side of the road (between the planned gravel access road and the new highway). Water runoff on the south side of the proposed road, where the agriculture channel is located, will be diverted down the embankment and channeled through culverts passing under the road to be discharged into the same open stormwater drainage channel on the north side of the proposed road. It should be noted that culverts managing water runoff from the roadway surface are not the same as those providing farmers with irrigation water from the agriculture canal (see Figure 12). This is important since road surface runoff can contain pollutants which could threaten the quality of water being used for irrigation. In this case, the preliminary designs call for a system in which surface runoff water and irrigation water remain separated.

196. The proposed stormwater system for the road will divert water through the stormwater drainage channels at ground level described above to larger channels that currently run perpendicular to the main irrigation canal.

197. The management of roadway runoff water is necessary for the proposed open channel system to dissipate energy, trap sediments, and slow down the runoff velocity. It is proposed that this be managed through the installation of gravel flow spreaders located at downspouts or other concentrated inflow points and gravel ripraps at various points in the constructed channel along the new road.

198. Existing Irrigation Structures. The Project area is characterized by a main irrigation canal, located east of Bakurtsikhe which extends in south-eastern direction to Tsnori. The irrigation canal belongs to the Georgian Amelioration, who regularly carries out maintenance and repair works on it using a service road. The canal is connected to 34 irrigation ditches, which provide the agricultural area with water (see Table 20). In the existing irrigation system, the water inflow is steered via a water gate in the channel.

199. After construction of the proposed alignment, the existing 34 irrigation ditches will be crossed by the Project road. In order to sustain the present irrigation system, additional culverts for irrigation purposes are planned which cross the proposed highway (see Figure 12). Generally, all of the existing irrigation infrastructure for approximately 13 km must be amended in order to continue providing farms on one side of the proposed road with water from the agricultural canal on the other side.

200. The locations of the above-mentioned irrigation ditches related to the Project road are provided below.

Table 20. Location of Irrigation Ditches Crossed by Project Road

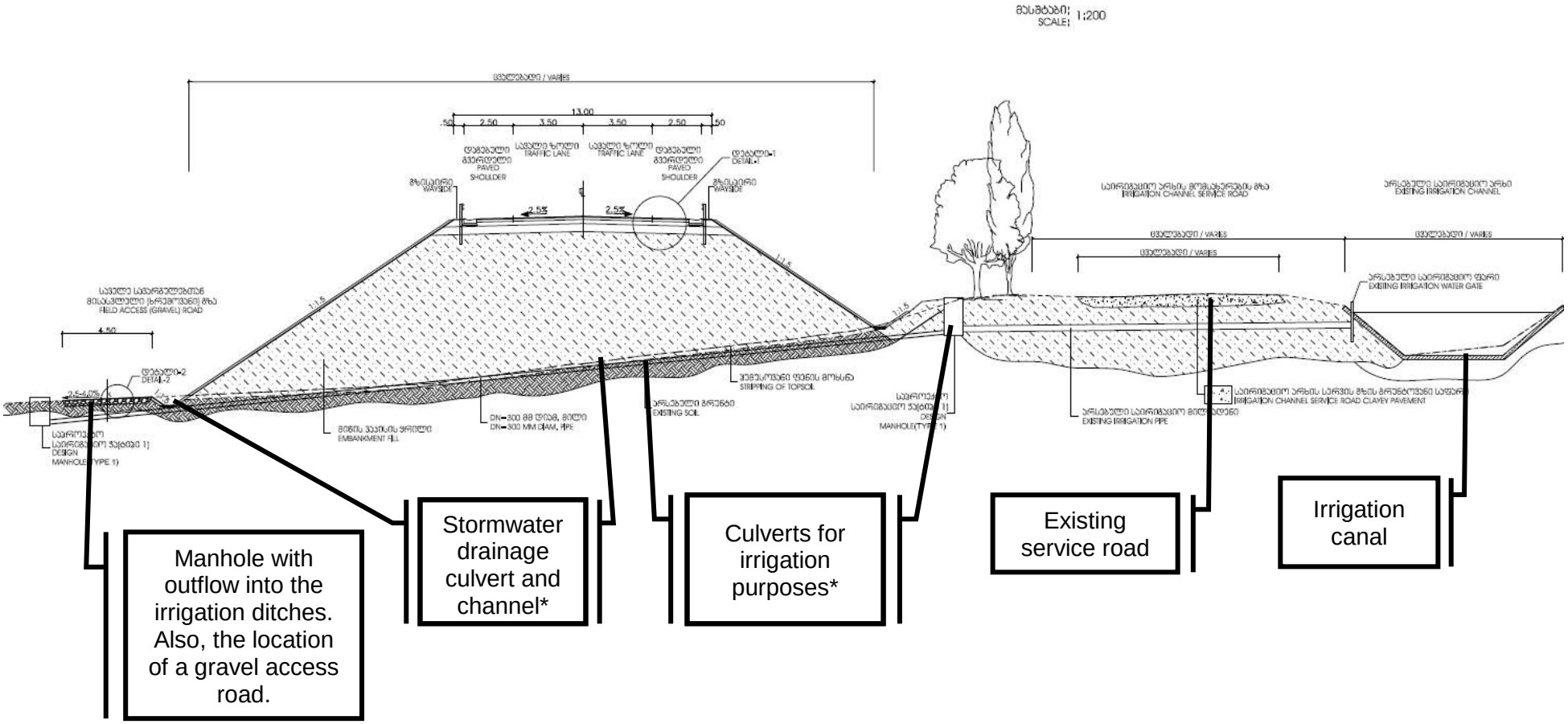
No.	Road Chainage [m]	No.	Road Chainage [m]
1	1,993	18	6,686
2	2,068	19	7,221
3	2,281	20	7,548
4	2,703	21	8,005
5	2,811	22	8,658
6	2,956	23	8,977
7	3,259	24	9,373
8	3,290	25	10,542
9	3,522	26	10,717
10	3,716	27	10,865
11	3,876	28	11,124
12	4,344	29	11,808
13	4,945	30	12,317
14	5,226	31	12,760
15	5,504	32	13,135
16	5,892	33	13,937
17	6,405	34	14,000

201. According to the Project design, the following irrigation system will be constructed:

- construction of a new manholes
- laying of a new pipeline
- construction of new outflow systems into the irrigation ditches

202. According to the applicable SNiP 2.05.03-84 standard, the Project road corresponds to category II thereby requiring Project culverts (pipe or box) be designed for a 50-year flood event.

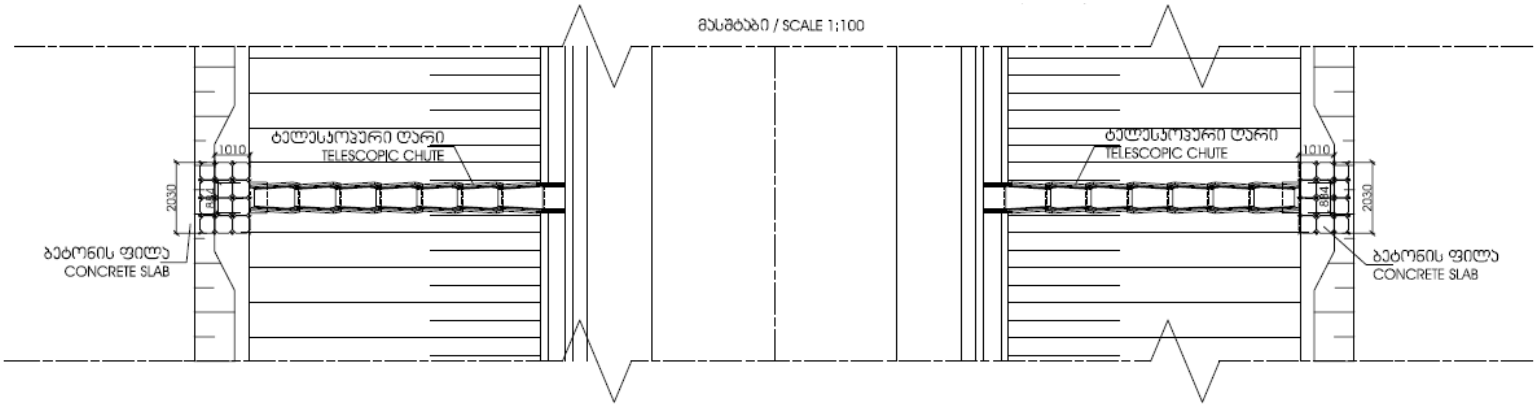
Figure 12. Extension of Existing Irrigation Pipe System



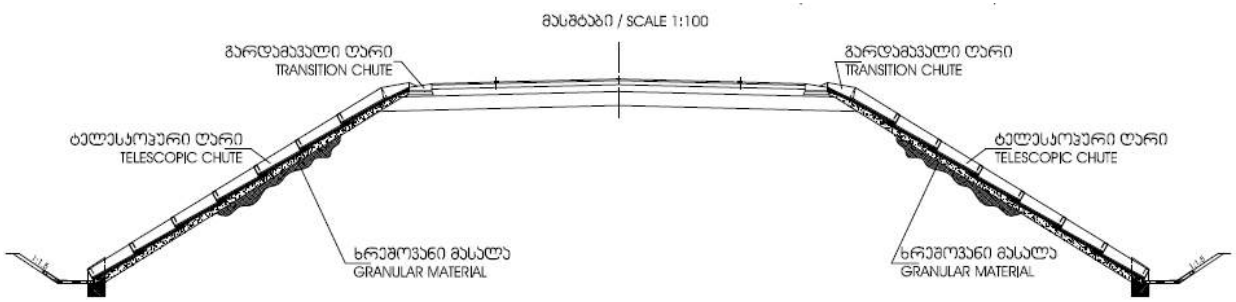
*Note: *The stormwater drainage culvert and culverts for irrigation purposes run separately underneath the proposed road embankment.*

Figure 13. Stormwater discharge from the carriageway (from above and cross section)

Stormwater Discharge from Carriageway (Top View)



Stormwater Discharge from Carriageway (Cross Section)



4.8 - Road Signing, Markings, and Road Furniture

203. The use of signs and markings shall be consistent throughout the length of the road. The road shall have edge lines and center lines on all road sections. Reflective materials (paint and signs and reflectors) will be applied.

204. Road signs. Retro-reflective sheeting for road signs should be used in accordance to ASTM D4956-13, Type VIII, or EN 12899-2. Road signing shall be carried out in accordance with GOST 10807-78, which is the Georgian legal standard for road signing.

205. Road marking design. Road markings shall be carried out in accordance with GOST 13508-74, which is the Georgian legal standard for road marking. The Contractor shall provide the following road markings on all roads, in accordance with national standards:

i. center line marking for normal conditions
ii. warning center line marking at approaches to junctions, at horizontal curves with small radii and other locations where potential hazards
iii. no overtaking center line marking where the adequate overtaking sight distance is not provided
iv. carriageway edge
v. carriageway edge line at lay byes
vi. give way lines
vii. stop line at junctions

206. Carriageway edge marking should be carried out with audio tactile profile.

207. Crash barriers. Crash barriers should comply with national standards. Crash barriers shall be placed on sections where the vertical embankment height is more than 3 m, within 15 m in horizontal direction form road edge. On dangerous sections with steep slopes and curves, where heavy vehicles are more likely to leave the road, the crash barrier should be made with sufficient strength and height to resist this. The guardrails should be equipped with reflectors.

208. It is very important that a guardrail starts well before areas where vehicles are most likely to leave the road. This extra length of crash barrier before these areas depends on the speed on the road and the distance between the guardrail and the edge line.

209. Crash barrier ends should preferably be bent back to an angle of 1:20. This length can be included in the protective section. The crash barrier ends should also be brought down in the ground for a section of 15 m. This section cannot be included in the protective section. Crash barriers shall comply with EN 1317, containment level H1 and impact class A.

210. Livestock and wildlife fencing. At locations where conflicts between traffic and animals constitute a safety problem, fencing of the road will be implemented to minimize the risks for animal related accidents. The main function of livestock and wildlife fencing is to keep animals off the road but also to funnel animals to safe crossing opportunities at underpasses.

211. Nearly the entire extent of new road is on a high embankment with guardrails on both sides. Therefore, no animals are expecting to cross the road considering also that the road is located adjacent to an irrigation channel which acts as a barrier. However, in sections with low embankment height (less than 3 m high) where there is a potential risk for livestock or wildlife crossing, fencing of the road will be considered. Mainly livestock crossings are anticipated and therefore a wire mesh fence with a height of 1.8 m is should be adequate.

The sections where fences are considered potentially necessary are summarized in Table 21 below.

Table 21. Location of Animal Fencing

Location, Chainage (from km to km)				Length (m)
Left hand side		Right hand side		
Start	End (km)	Start	End (km)	
16+690	16+800			110
		16+677	16,800	123
		0+003	0+110	107
		0+165	0+232	67
		0+003	0+087	84
		0+120	0+236	116
Total Length				**607**

4.9 - Utilities

212. Public utilities are present in the ROW and include gas, electricity, telecom, and data lines. The known affected utility lines in the Project area are shown in Table 22 and Table 23 below. Particular attention should be paid to the Rustavi-Telavi-Zhinvali main gas pipe, which has a diameter of 300 mm.

Table 22. Affected Gas and Data Utility Lines in the Project Area

Location, Chainage				Length (m)	Utility type
Left hand side		Right hand side			
Start (km)	End (km)	Start (km)	End (km)		
1+943				crossing	Gas pipeline
1+955				crossing	Silk-Net
1+963				crossing	Silk--Net
2+025				crossing	Gas pipeline
		2+650	3+550	900	Gas pipeline
		2+750	3+200	450	Silk-Net
		2+850	3+050	200	Silk-Net
		3+640	3+715	75	Silk-Net
		3+640	3+715	75	Silk-Net
		4+980	5+440	460	Delta-com
		6+680	6+825	145	Delta-com
		7+240	7+500	260	Delta-com
		8+875	9+110	235	Delta-com
		10+025	10+110	85	Delta-com
		11+385		crossing	Delta-com
		11+725	11+800	75	Delta-com
		12+875	13+000	125	Gas pipeline
0	0+297			297	Delta-com

Table 23. Affected Power Utility Lines in the Project Area

Location of Power Transmission Post (km+m)	Length of Required Relocation (m)		Remarks
	Left hand side	Right hand side	
1+358		30.0	Low voltage
1+504	10.0		High Voltage Overhead (≤10kvt)
2+125	22.0		High voltage (≥10 kvt) tower type mast
4+150	12.0		High voltage (≥10 kvt) tower type mast

4+650		8.0	High voltage (≥10 kvt) tower type mast
4+880		22.0	High voltage (≥10 kvt) tower type mast
5+070	14.0		High voltage (≥10 kvt) tower type mast
5+260		13.0	High voltage (≥10 kvt) tower type mast
6+970		10.0	High voltage (≥10 kvt) tower type mast
7+225		8.0	High voltage (≥10 kvt) tower type mast
8+950		8.0	Low voltage
9+025		8.0	Low voltage
9+095		8.0	Low voltage
9+215		8.0	Low voltage
13+000		13.0	Low voltage
14+525		8.0	High Voltage Overhead (≤10kvt)
14+595	15.0		High Voltage Overhead (≤10kvt)
14+750	20.0		post without function
14+750	10.0		High Voltage Overhead (≤10kvt)
14+850	25.0		High Voltage Overhead (≤10kvt)
14+925		25.0	High Voltage Overhead (≤10kvt)
15+040		10.0	High Voltage Overhead (≤10kvt)

213. Issues regarding the location and relocation of utility facilities are a growing concern among RD, utility owners and contractors, since utilities in the ROW could cause Project delays, safety risks, cost increases, and added inconvenience to the public.

214. It is envisaged that the Project will be implemented as design-build Project, allowing design and construction to proceed at the same time. Since both design and construction are performed under one contract, utility relocations can begin at any time the Contractor desires, but the Contractor is responsible for any utility-related construction delays that may occur.

215. The design-build Contractor's work includes all work related to existing utilities that is necessary to accommodate the Project. In general, this includes ensuring that existing facilities and their replacements will be capable of providing service at least equal to that offered by the facilities existing.

4.10 - Source of Materials

4.10.1 - Material Sources and Cut and Fill

216. A considerable volume of material will be obtained from borrow areas for construction of the road (approximately 2.25 million m^3 of embankment fill will be required).[26] Soil stripped and stockpiled during site preparation (approximately 106,000 m^3 of soil[27]) should be reused for the embankments to the extent possible. Field investigations for existing borrow areas and previous test results indicate that the naturally occurring granular material in the Project area is in most cases suitable for fill, capping, and sub-base construction but requires in most cases some processing (screening). For the production of crushed aggregates in the Project area, the preliminary designs recommend using river gravel, which is typically of good quality.

217. Existing borrow pits and quarries have been located during the preliminary design stage and assessed for their suitability to meet contract requirements regarding adequate quality and quantity. All available data and laboratory test results of existing borrow areas

[26] Kocks Consult GmbH, Final Feasibility Study Report for Construction of Bakurtsikhe-Tsnori Road Section Project, October 2016.
[27] Ibid.

and quarries including results from previous studies have been reviewed. Locations and types of material and usable quantities are presented in **Annex 6. Locations of Licensed Borrow Pits and Quarry Sites**.

218. Apart from the availability of suitable quality of the construction materials, selection of locations for borrows pits and quarry sites depend on a large number of other factors. Such factors include fragility of landscape, legal aspects, aesthetic value of the landscape, and ownership of lands, protected and sensitive areas, and approval from the prescribed authority. For example, sourcing materials from rivers and river banks is often not the preferred option from an environmental perspective due potential impact on aquatic habitat and biodiversity. Therefore, licensed borrow pits and quarry sites should be selected avoiding protected and sensitive areas, nearby settlements, water sources, and in forest areas and fertile agriculture lands.

219. At all borrow locations, permission and licenses for the use of the borrow area and exploitation of material have to be obtained from the relevant authorities or acquisition of material negotiated with operating extraction or processing establishments. Suitability of materials for intended use to be confirmed prior to construction and compliance with specification requirements has to be proven for all construction materials by the Contractor.

220. Should the Contractor choose to source the materials from an existing and operational quarry site, it should exert influence on the operator to ensure proper management measures are instituted to minimize impacts to the general environment (see Section **9.e - Aggregate and Borrow Pits Management Plan**).

221. The Contractor may also choose to identify its own source of materials; however approved licenses and permits need to be in place for the quarry and the site needs to be approved by the construction Engineer prior to using them for the Project.

222. Should the Contractor decide to open a new borrow site, the guidelines below should be followed in order to minimize impacts associated with the operation of borrow areas:

- All of the required environmental approvals should be secured and extraction and rehabilitation activities consistent with the requirements of Ministry of Economy and the MoEPA and/or permit conditions be carried out;
- Prior to operation of the borrow areas, the contractor should submit to the Engineer the following:

    1. Plan indicating the location of the proposed extraction site as well as rehabilitation measures to be implemented for the borrow areas and access roads upon project completion;
    2. A dust management plan which shall include schedule for spraying water on access road and schedule of the equipment to be used;
    3. A schedule of regular dust suppression on all unpaved access roads during the construction period, particularly in sections where sensitive receptors, such as settlements, are located;
    4. Location map of stockpiles which should be away from watercourses to avoid obstruction of flow and siltation;
    5. Cover on haul trucks to minimize dust emission and material spillage;
    6. Plan to undertake regular maintenance and repair of access roads to their original condition whenever necessary

4.10.2 - Bitumen

223. Georgia does not have any naturally occurring and commercially available sources of hydrocarbon. No bitumen or other bituminous products used for asphalt production are produced locally. All bituminous products required for the production and construction for the actual Project have to be imported from eligible neighboring or European countries. The main imports come from Turkey, but some is also imported from Azerbaijan where major road projects are ongoing which utilize most of the locally produced bitumen.

224. All imported bituminous products for this Project shall comply with the relevant European Standards. The binder recommended for the pavement of the project road should be a penetration grade bitumen 50/70 or penetration reference 50pen (40/60) or adequate modified bitumen.

4.10.3 - Cement

225. Heidelberg Cement Georgia and Kavkaz Cement Company locally produce cement. Production facilities of Heidelberg Cement/APt are in Rustavi and Kaspi. In Tbilisi, Poti, and Gomi Kavkaz Cement operates factories. Several types and grade of cement, which usually cover the need for concrete production, are produced by both companies according to the following European Standards:

- Portland cement CEM II/ A-P 32.5
- Portland cement CEM II/ A-S 32.5 N
- Portland cement CEM II/ B-M 32.5 N
- Sulfate resisting Portland cement CEM I 32.5 R-SR5
- Portland cement CEM I 42.5 N
- Blast furnace cement CEM III/a 42.5 N

226. In addition to the listed types of cement, other factories may produce different types and quality under the brand names.

227. The locally produced cement is generally suitable for the production of cement concrete to be used for the construction of structures within the Project. This will be mainly drainage structures such as culverts and bridges. The type and quality of the cement has to be chosen according the design requirements for the relevant structure.

4.10.4 - Technical and Potable Water

228. Most technical water will be sourced from the water bodies in the area. Water from irrigation canal will not be allowed for use by the Contractor however. Potable water will be sourced from existing water supply pipelines or will be provided to camps in reusable bottles – no single use bottles will be permitted.

229. Any water abstraction will be subject to permitting (see Table 17) unless using piped or existing well water. The Law of Georgia on Water 1997 (Last Amended in 2017) (See Table 2) regulates the use of water resources, determines the rights and responsibilities of water users, and regulates water abstraction and discharges. Consistent with the legislation, water within the territory of Georgia owned by the State can be abstracted only for consumption. Any actions directly or indirectly violating the State ownership rights for water are prohibited.

230. The final locations of the extraction points (for both technical and potable water) will require the approval of the Engineer and the RD prior to the start of extraction to ensure that over-extraction of water resources does not happen. Potable water will also need to be

tested regularly throughout the construction period to ensure it meets the drinking water standards of GoG.

231. The Contractor will be responsible for developing a document indicating the discharge points and water quality limits. The document must be submitted to MoEPA for approval.

4.11 - Construction Camps and Storage Areas

4.11.1 - Construction Camps

232. The Contractor will specify whether the need to establish a camp(s) will be necessary. If a camp site is to be built, its location will be selected keeping in view the availability of an adequate area, including parking areas for machinery, stores and workshops, access to communication and local markets, and an appropriate distance from sensitive areas in the vicinity. The RD and Engineer will have to coordinate to ensure that locations for the Contractors camp are appropriate and cumulative impacts are not made more significant. In addition, where practical, camp sites and ancillary facilities, such as batching plants, rock crushing, etc., should be kept separate (distance of more than 500 meters) to avoid noise and air quality impacts to accommodation areas and offices within camps. The locations and technical parameters of the camps will need to be agreed with MoEPA and approved by the Lenders.

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

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

- safe and reliable water supply;
- hygienic sanitary facilities and sewerage system;
- facilities for sewerage of toilet and domestic wastes;
- storm water drainage facilities; and
- sickbay and first aid facilities.

235. Given the linear nature of the Project, the camp locations are likely to be at either end of the section or at the interchange in the middle. However, an arrangement of such infrastructure in the vicinity of Tsnori community is not recommended. The Contractor will be required to reinstate the camp and storage areas and make good such damage or loss at his/her own expense and to the satisfaction of the RD.

4.11.2 - Storage Areas

236. Temporary storage areas will be required for certain activities, such as the storage of sand and gravels and construction equipment. The precise locations of these temporary facilities are not known at this stage and mitigation measures shall be prepared by the Contractor and reviewed by the RD to ensure that these areas are sited in approved locations. There is ample room to establish storage area in the vicinity of Bakurtsikhe, including state-owned land. Care will be taken not to encroach upon private land parcels without having obtained a lease agreement in advance.

4.12 - Traffic Studies

4.12.1 - Traffic Survey Methodology

237. The approach taken to the traffic studies has been to confirm the current level and composition of traffic on the existing road sections through traffic counts. The existing road network in the study area is summarized in the following table:

Table 24. Existing Road Network

No.	Section from	Section to	Length (km)
1	Telavi	Akura	17.59
2	Akura	Velistsikhe junction	12.22
3	Velistsikhe junction	Chumlaki	4.67
4	Chumlaki	Gurjaani	5.07
5	Gurjaani	Bakurtsikhe	8.17
6	Bakurtsikhe	Tsnori	15.91

Source: Kocks consultant

238. The traffic counts were then followed by Origin/Destination (O/D) surveys to identify the types and distances of journeys being made along the road. The O/Ds are essential for the traffic and economic evaluation because of the offline character of the proposed road improvements. The proposed alternative alignments, to the north and south, consist of a series of bypasses of the many settlements along the existing road. It is anticipated that the longer distance traffic will use the new alignment while local traffic will continue to use the existing road. The O/D surveys distinguish between longer distance and local traffic to facilitate robust forecasts of traffic usage of the proposed alternative alignments.

239. The locations selected for the traffic surveys are shown in Table 25 and in Figure 14.

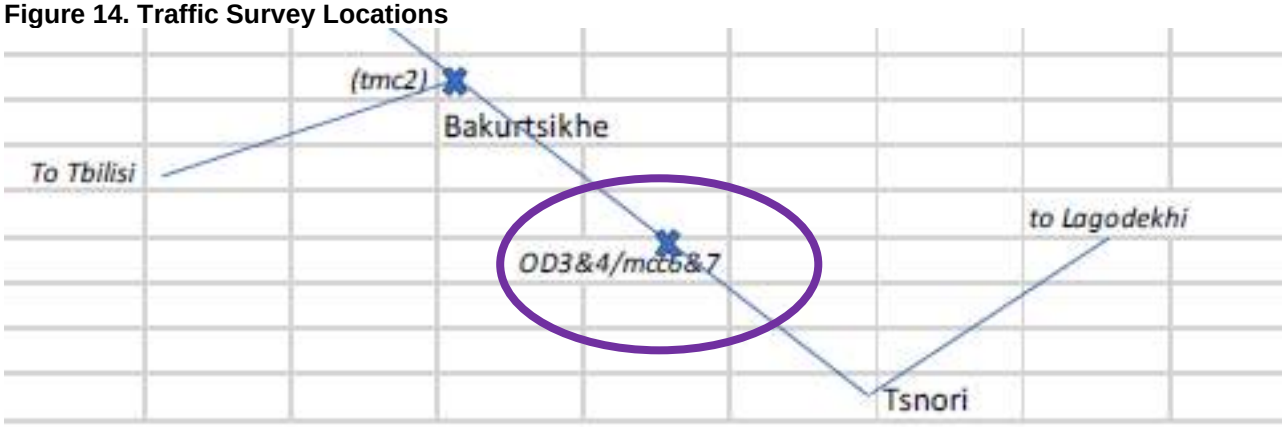
Table 25. Traffic Survey Locations

Station No.	Location	km
OD3/MCC6	Vakiri	110
OD4/MCC7	Mashnaari	114

Key: MCC = Manual Classified Count; OD – Origin/Destination Survey
Note: km values for Bakurtsikhe – Tsnori from Tbilisi
Source: Kocks consultant

240. The O/Ds were carried out directionally and therefore comprise two pairs of surveys. It was not possible, for logistical and safety reasons, to undertake surveys in both directions at the same location.

Figure 14. Traffic Survey Locations



Source: Kocks consultant

241. The following vehicle classes were used for the surveys:

- **Car/4x4** - private cars, and all other small vehicles such as 4-wheel drive vehicles, taxis and passenger vans being used as private vehicles.
- **Minibus** - minibuses and small buses of up to 15 seats being used for the transport of fare paying passengers.
- **Medium/Large bus** - standard and large buses with more than 15 seats being used for the
- transport of passengers.
- **Light goods vehicle (4-wheel)** - four-wheel vehicles vans and pick-ups used for the transport of goods.
- **2 axle goods vehicle** - Trucks with a total of two axles and six wheels.
- **3 axle goods vehicle** - 3 axle trucks with a single axle at the front and two axles at the rear.
- **4 + axle goods vehicle** - 4+ axle trucks or truck - trailer combinations with 4 or more axles in any formation.
- **Motorcycles**
- **Non-motorized transport**

242. The traffic count surveys were carried out over the period 5 to 21 June 2017. Each survey consisted of one 12-hour day (0800-2000) with the exception of the Chumlaki - Akhasheni (mcc4) control count which consisted of 7 days, 6 of 12 hours plus one of 24 hours. This count assisted in identifying daily and hourly variation in traffic flow including the proportion of night traffic.

243. Origin / Destination surveys. With the assistance of the police, motorists were stopped and interviewed at the roadside about the journeys they were making. The following information was collected:

- Time of interview
- Vehicle class
- Vehicle occupancy
- Origin of journey
- Destination of journey
- Journey purpose
- Journey frequency
- Goods carried (if any)

244. The O/Ds, and their accompanying manual classification counts (MCCs), were conducted over the period 19-22 June 2017 over one 12-hour day (0800-1800) in each traffic direction.

4.12.2 - Base Year 2017 Traffic

245. The results of the MCCs and Turning Movement Counts (TMCs) in June were used to produce estimates of AADT for 2017 for use in the economic analysis. They were converted as follows:

- Calculation of average daily traffic flows in June 2017 through application of hourly/nighttime/ daily factors derived from the 7-day control count at km 57 of the Akhmeta – Telavi– Bakurtsikhe road; the average all vehicle 12- to 24-hour factor was 1.300 (each of the main vehicle classes had their own factor, cars being 1.303, heavy goods vehicles between 1.230 and 1.329).
- Application of monthly variation factors from long-term traffic data to adjust the June flows and produce an estimate of AADT for 2017; a factor of 0.921 was applied.

246. Table 26 provides a breakdown by vehicle classification for the existing Bakurtsikhe – Tsnori road section.

Table 26. Classified 2017 AADT Estimate by Road Section

from km	to km	Car	Minibus	Medium/ Large Bus	LGV	MGV	3-ax HGV	4+ax HGV	Total
Bakurtsikhe	Tsnori	2,844	360	9	547	128	149	90	4,127

Note: Motorcycles and Non-motorized transport have been excluded from the estimates of AADT, as is convention. The traffic survey results showed that both classes have limited representation on the study road network.

Source: Kocks consultant

4.12.3 - Traffic Projections

247. Traffic forecasts have been developed for the period to 2040 covering a 20-year period from a provisional opening year of 2020.

248. Normal traffic growth. Normal growth is driven by economic development and reflects the increasing prosperity of society and the attendant increases in vehicle ownership and vehicle usage. National economic growth is best represented by growth in real GDP.

249. The International Monetary Fund's (IMF's) forecasts for Georgia over the period to 2021 have been used as a starting point for the development of central growth forecasts for the national economy. For the remainder of the evaluation period to 2040, reference was made to longer-term economic forecasting work carried out by the Organisation for Economic Co-operation and Development (OECD) for non-member countries with reference to Turkey and Russia, Georgia's two economically powerful neighbors.

250. The resulting GDP growth forecasts for Georgia are provided in Table 27 below.

Table 27. GDP Growth Forecasts for Georgia: Central Growth

from	to	% p.a.
2017	2021	5.00
2021	2030	4.10
2030	2040	3.30

Sources: Kocks consultant based on IMF/OECD

251. Normal traffic growth forecasts. The strong relationship between economic growth and traffic growth is widely recognized and in the developing stage of an economy, cars and other light passenger vehicle traffic are generally considered to grow slightly faster than GDP while goods vehicle traffic, being driven directly by the economy, is commonly in line with GDP growth. Over time the elasticity for passenger vehicles reduces and growth rates approximate to GDP rates.

252. Accordingly, 1.20 (to 2020) and 1.05 (after 2020) for car and passenger traffic have been adopted together with a conventional value of 1.0 for goods vehicles.

253. The growth rates are summarized in Table 28. Low growth takes 80%, and high growth 120%, of central growth.

Table 28. Normal Traffic Growth Rates (% per annum)

Years	Passenger Vehicles			Goods Vehicles		
2017-2021	4.7	5.9	7.0	4.0	5.0	6.0
2021-2030	3.5	4.3	5.2	3.3	4.1	5.0
2030-2040	2.7	3.4	4.1	2.6	3.3	3.9

Source: Kocks consultant

254. These growth rates have been applied to all of the modelled vehicle classes.

255. The proposed Telavi – Bakurtsikhe – Tsnori Road upgrading project consists of a completely offline route between west of Telavi and east of Tsnori. The offline project can be broken down into three components:

- Telavi – Chumlaki
- Chumlaki – Bakurtsikhe
- Bakurtsikhe - Tsnori

256. These components have the following principal alignment alternatives:

- Telavi – Chumlaki: A. North; B. South; and C. South 1
- Chumlaki – Bakurtsikhe: A. North
- Bakurtsikhe – Tsnori: A. North; B. North; and 1 C. South

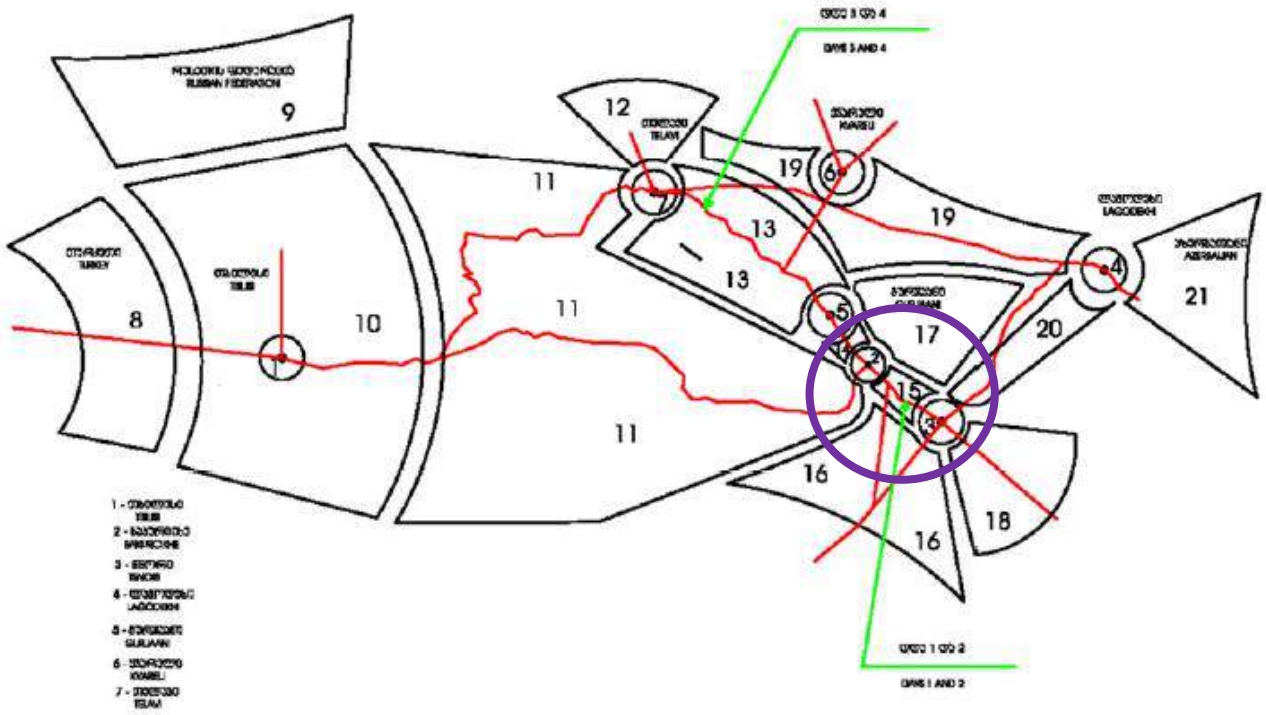
257. Alternatives for the Bakurtsikhe – Tsnori section are further described in Chapter **5.4 - Alignment Alternatives Analysis**.

258. Traffic modelling. The traffic modelling of these alternative alignments has used a combination of O/D data analysis and diversion curves on a section by section basis. The O/D data was zoned using the following zoning system and plan:

1	Tbilisi
2	*Bakurtsikhe*
3	*Tsnori*
4	Lagodekhi
5	Gurjaani
6	Kvareli
7	Telavi
8	Turkey
9	Russian Federation
10	Tbilisi region

11	Sagarejo region
12	Karajala and North Telavi
13	Local settlements between Telavi and Gurjaani
14	Local settlements between Gurjaani and Bakurtsikhe
15	*Local settlements between Bakurtsikhe and Tsnori*
16	Signaghi and settlements to the south of Bakurtsike and Tsnori
17	Settlements to the east of Gurjaani
18	Settlements to the south-east of Tsnori
19	North Kakheti
20	Settlements between Tsnori and Lagodekhi

Figure 15. Zone Plan for Coding of Origin/Destination Survey Data



Note: The zones most relevant to the Bakurtsikhe – Tsnori road section as this IEE are indicated by a purple ring in the Figure.
Source: Kocks consultant

259. Analysis of the zone coded data from the O/D surveys enabled traffic on the study corridor to be classified into one of the following broad categories:

a) Local traffic (travelling less than the equivalent of one section of the existing road between Telavi and Tsnori)
b) Intermediate traffic (travelling between one and two sections of the existing road)
c) Longer distance traffic (travelling two or more sections of the existing road)

260. It has been assumed that the first category, local traffic, will remain on the existing road and not use the alternative new alignment. Likewise, all the longer distance traffic will divert to the new alignment. These are effectively “all or nothing” assignments based on trip length.

261. After an assessment of results of the O/D surveys, and with reference to the work carried out for the Bakurtsikhe - Gurjaani Bypass on behalf of the RD Georgia, intermediate traffic has been assumed to use the proposed alternative alignment. Using the trip category proportions from the Bakurtsike – Tsnori O/D survey produces a diversion factor of between 50% and 55% (light and heavy vehicles have been modelled separately so there are slight variations between sections). This compares with 67% for the Bakurtsikhe – Gurjaani Bypass study, a figure which does not appear justified for the current study by the results of the traffic surveys. The table below gives an indication of the comparative travel distances and times between the existing road and the principal offline alternatives.

Table 29. Indication of Time and Distance Comparisons between Existing and Upgraded Road: Telavi to Tsnori

Route	Distance (km)	Time (mins)	Average Speed (kph)
Existing Road	63.6	74.0	52
North Alignment	66.8	50.1	80
South Alignment*	65.0	48.8	80

Source: Kocks consultant

262. These differences in time and speed between the proposed alternative alignments are not considered significant, so a single set of offline traffic forecasts has been produced. Traffic generation has not been included in the analysis because of the generally adequate existing condition of the road.

263. A summary of traffic forecast flows for Bakurtsikhe – Tsnori are included for Low, Central, and High growth in Table 30 and Table 31 below.

Table 30. Summary of Forecast Traffic Flows, Existing Road (AADT)

From	To	2017	2020 (Opening of New Alignment)			2040 (20 Years after Opening of New Alignment)		
		Observed	Low	Central	High	Low	Central	High
Bakurtsikhe	Tsnori	4,127	2,159	2,232	2,301	4,003	4,799	5,777

Note: Low, Central, and High refer to potential growth forecasts
Source: Kocks consultant

Table 31. Summary of Forecast Traffic Flows, New Alignment (AADT)

Year	AADT		
	Low	Central	High
2020 (Opening of New Alignment)	2,556	2,642	2,724
2030	3,628	4,063	4,571
2035	4,145	4,802	5,588
2040 (20 Years after Opening of New Alignment)	4,735	5,676	6,832

Source: Kocks consultant

264. Traffic forecast loadings. The classified traffic forecasts for Telavi – Bakurtsikhe – Tsnori have been converted into forecast axle-loadings over the twenty-year evaluation period (2020-2040) by the application of the following equivalent standard axle (ESA) values:

- Car: 0.02
- Minibus: 0.02
- Large Bus: 0.34
- LGV: 0.15
- MGV: 0.84
- HGV 3-axle: 2.25
- HGV 4+axle: 3.50

5. Analysis of Alignment Alternatives

5.1 - Overview

265. One of the objectives of an IEE is to investigate alternatives to the Project. In relation to a proposed activity, “alternatives” means different ways of meeting the general purposes and requirements of the proposed activity. The following section provides an assessment of alternative alignments as well as the ‘No-Project’ alternative. No other alternatives were identified that are feasible and meet the Project purpose.

5.2 - No-Project Alternative

266. Without the Project, the existing road would continue to be a logistic obstacle to road transport and limit the economic benefits to Georgia and surrounding economies. The condition and capacity of the existing roadway increases travel time and contributes to increased traffic safety risks (particularly from large vehicles). The surrounding villages would continue to experience through traffic, which is negatively impacting community cohesion and health and safety, especially to pedestrians, cyclists, animals, and other non-motorized road users.

267. During periods of inclement weather, such as in the winter season, traffic obstructions are common on the existing road since the current road size makes it difficult to remove snow. Traffic also intensifies during the summer and autumn seasons when the numbers of the tourists traveling along the Kakheti region increases. In the future, with growing traffic flows expected from Tbilisi and other cities to Kakheti region, the condition of the existing road is expected to deteriorate further.

268. Therefore, it can be determined that the ‘No-Project’ alternative is not a reasonable option if the overall socio-economic situation in the eastern region is to be improved.

5.3 - Existing Road Upgrading Alternative

269. Upgrading the existing road between Bakurtsikhe and Tsnori is not the preferred alternative for many of the same reasons identified in the ‘No-Project’ option described above. While upgrading the road would have a comparatively lower cost and impact on landowners compared to constructing a new road, it does not address the fundamental transport issues identified by stakeholders and the GoG. Due to the road alignment, there would be significant adverse impacts to settlements from road construction and widening if undertaken. In addition to considerable transit disruptions from road upgrading actives, the completed upgrades would fail to address existing safety issues for road users, including cyclists and pedestrians. Moreover, with traffic flow expected to increase over time, including use from heavy vehicles, the upgraded road would soon prove inadequate compared to the services of a new road.

5.4 - Alignment Alternatives Analysis

270. Three alignment alternatives were developed to bypass the villages along the existing road. The alignment alternatives aimed to minimize impacts on arable land, especially vineyards and peach plantations.

271. Alternatives were assessed during the feasibility phases through a multi-criteria analysis in which the various alternative alignments for Project were proposed, screened, and studied against functional, economic, and environmental and social criteria.

- Functional Criteria
  - Road length/travel time savings
  - Alignment features/adherence to road design standards
  - Estimated traffic

- Economic Criteria
  - Total Investment cost
  - Economic benefits (Economic Internal Rate of Return)

- Environmental and Social Criteria
  - Impact on environment/biodiversity
  - Community Impact (noise and pollution)
  - Resettlement needs/affected households

272. Careful consideration was paid to the scope of land/assets acquisition and estimated budget for cash compensation calculated with the compensation entitlements and valuation approach in accordance with the active legislation of Georgia and the ADB's Involuntary Resettlement policy.

273. All three alternatives proposed in this report are rather similar in terms of land acquisition, income loss, and potential economic impact on livelihood standards of local communities within Project affected areas. None of the alignments impinge on protected areas, parks, or key ecologically sensitive areas. No threatened or endangered species inhabit the area and there appears to be no danger of disruption of archaeological remains. Walnut trees (*Juglans regia*) are present in the wider Project area which are included in the Red List book of Georgia and identified as vulnerable. It is expected that the impact on this tree species would be comparable across all the alignment options.

274. The alternatives have been identified, named, and applied in different colors on the map below (see Figure 16). They consist of the following:

- Alternative BN – Red Line (preferred alignment);
- Alternative BS – Light Blue Line; and
- Alternative BN-1 – Dark Blue Line.

275. The BN alignment (the preferred alignment) alternative runs parallel to an agriculture irrigation canal on the northern side. The sub-alternative BN-1 crosses the canal about 5 km south of Bakurtsikhe and continuous south of the canal close to the existing railway line. The BS alternative runs over longer stretches parallel to the railway line.

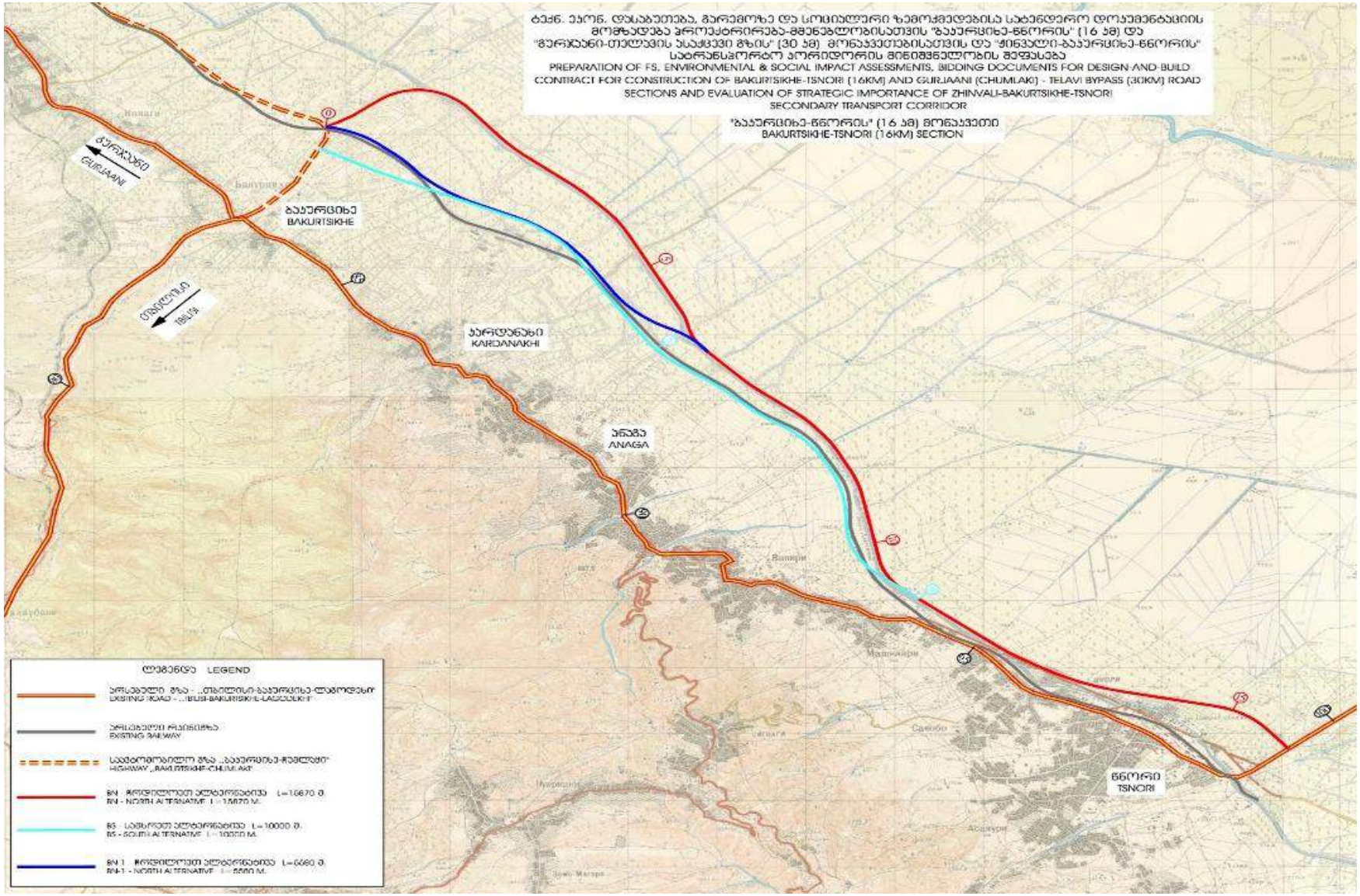
276. The length of the alternative road sections is presented in Table 32 below.

Table 32. Length of Bakurtsikhe-Tsnori Alignment Alternative

Alternative	Section Length (km)
Existing road Bakurtsikhe-Tsnori	15.91
Alternative BN (Red Line)	15.58
Alternative BS (Light Blue)	14.57
Alternative BN-1 (Dark Blue)	14.69

Note: The preferred alignment is highlighted in blue.

Figure 16. Alternative Road Sections Considered



Note: The preferred alignment is marked by a red line.

277. The selected alternatives are all economically viable, however the detailed design phase should optimize construction costs and minimize social and environmental impacts. Analysis of the alignment options revealed that the alternatives BN (red line) and BN-1 (dark blue line) were comparable. However, preliminary discussions with key stakeholder indicated a preference for the BN - Red Line alternative since it follows the irrigation canal for most of his length and bisects fewer land parcels, thereby reducing social impacts. The recommended alternative will also have fewer environmental impact since it goes through areas already affected by anthropogenic activity. The BN (red line) is also preferred in terms of geomorphology and the traffic flow management during construction phase. Therefore, the BN (red line) alternative is recommended for implementation.

6. Description of the Environment

6.1 - Physical Resources

6.1.1 - Meteorology and Climate

278. Existing climate. The territory of the Gurjaani and the Sighnaghi Municipalities, where the proposed road section is located, covers the central part of Alazani Valley and the low and medium mountain zone of Tsivi - Gombori Ridge. There are meteorological stations in both Gurjaani and Tsnori, but since there is little diversity in terms of climate zones, the baseline data presented below is from the Gurjaani meteorological station located at 415 m above the sea level. In general, the climate is temperate humid, with hot summers and moderately cold winters. The average annual temperature in the area is +12.4 ^{0}C; the average coldest month (January) is 0.9 ^{0}C; the average hottest month (August) is +23.6 ^{0}C; the average annual relative humidity of the air is 72%; and the absolute minimum and maximum temperatures were recorded as -22 ^{0}C; and +38 ^{0}C respectively. Annual total precipitation is 741mm, with a monthly total maximum of 117 mm in May, and minimum 28 mm in January. Average annual wind speed is 1.7 m/sec with western and south – western winds prevailing in the surrounding area.

Table 33. Air Temperature in ^{0}C

Months												Year Average
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
0.9	2.5	6.5	11.8	16.8	20.5	23.6	23.6	19.0	13.5	7.6	2.7	12.4

Table 34. Average/Absolute Air Temperature in ^{0}C

Absolute Minimum	Absolute Maximum	Average Maximum of the Hottest Month	Average of the Coldest 5-Day Period	Average of the Coldest Day	Average of the Coldest Period	Average Temperature at 1 p.m.	
						The Coldest Month	The Hottest Month
-22	38	29.8	-8	-4	0.8	3.2	27.9

Table 35. Air Relative Moisture (%)

Months												Year Average
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
76	73	72	72	72	68	65	64	72	78	80	78	72

Table 36. Repetition of Wind Direction and Calm in a Year (%)

Repetition of wind direction and calm in a year (%)							
N	NE	E	SE	S	SW	W	NW
5	8	12	9	7	33	18	8

279. Climate change. The annual temperatures in Gurjaani and Sighnaghi municipalities have increased by 0.4 ^{0}C between 1961 and 2014 and 0.7 ^{0}C since 1960. Warming has

taken place in each season with the exception of spring. The largest temperature changes have occurred in summer (+0.6 ^{0}C). Annual absolute maximum temperature has increased in all seasons between 1961 and 2014, with highest value in autumn (+2.1 ^{0}C). The absolute minimum temperatures are significantly warmer in winter and summer (+3 ^{0}C). The average maximum temperature between 1961 and 2014 has also increased significantly by +0.5 ^{0}C, while the annual average minimum temperature increased by +0.1 ^{0}C. Annual daily amplitude of temperature has increased in all seasons up to 0.5 ^{0}C.

280. Total precipitation has decreased between 1961 and 2014 by 18 mm or 2% compared to increasing levels (4%) observed between 1925 and 1960. As for maximum daily precipitation, values have increased between 1961 and 2014 by 6-24 mm for all seasons, except summer where a decrease by 54 mm has been observed.

281. The relative humidity of air has not changed between the 1961 and 2014 and remained within the range of 72%. Average wind speed was reduced equally in all seasons between two 1961 and 2014 by 0.3-0.4 m/sec.

282. Winter in Gurjaani and Sighnaghi municipalities has become milder overall. Almost all temperature parameters have increased (warmer) by 0.3-0.4 ^{0}C, except the average minimum, due to which freezing nights are more frequent and the risk of frost in winter is maintained. Seasonal totals of precipitation have increased by 9%. In spring, the average temperature between 1961 and 2014 has been more stable, with small increase of maximum temperature (+0.2 ^{0}C) compensated by cooler minimum temperatures (-0.3 ^{0}C). Average daily amplitude of temperature has increased by 0.5 ^{0}C, due to which the threat of frost is still maintained.

283. Summer is the warmest compared with other seasons (+0.6^{0}C) and both maximum (+0.8 ^{0}C) and minimum temperatures (+0.4 ^{0}C) have increased. Seasonal totals of precipitation have reduced significantly (average 20%). In summer, one month moderate, severe, and extreme droughts have increased. Recurrence of heat waves has also increased. Thus, summer in Gurjaani became considerably hotter and relatively drier.

284. Autumn, similar to summer, became warmer, however relatively less (+0.4 ^{0}C). The absolute maximum increased by +2.1 ^{0}C and the absolute minimum reduced by 0.4 ^{0}C. Seasonal totals of precipitation on the average have increased by 11%, which could result in increased risks of floods and mudflows.

285. Thus, between 1961 and 2014, temperatures have risen in Gurjaani and Sighnaghi municipalities with summer experiencing the highest increase (+0.6 ^{0}C) and spring the least change (+0.0 ^{0}C). Overall, precipitation has significantly decreased in summer (-20%) while increasing noticeably in autumn (+11%) over the same period.

286. As for extreme events, the increase of recurrence of one-month agricultural draughts was identified; however, the frequency of draughts for longer periods (3 – 6 months) was reduced.

287. Frost depth. Considering the cohesive subgrade along the road sections, attention has to be paid to the influence of freezing temperatures to the pavement layers and subgrade. Based on the available climatic data and temperature records, no frost penetration into the subgrade soils is expected.

6.1.2 - Geomorphology, Geology, and Soils

288. In terms of geomorphology, the surrounding territory of the Project area belongs to the Alazani Depression in western part of the intermountain plain zone of Georgia. The Alazani Depression is a continental geosynline located between the Major Caucasus range on the east and the Gombori range on the west. The direction of the Alazani Depression is NW - SE and it is filled with Quaternary alluvial-prolluvial deposits from the rivers which flowing from the Caucasus and Gombori slopes in the same direction, most notably the Alazani River. Scientists think that the Alazani Depression was formed by submergence of the Caucasus south periphery.

289. The Alazani valley bottom at first looks totally planed and homogenous, but its surface is undulating with height difference between elevations by 200-300m. These undulations are due to thick debris cones originating from the surrounding rivers. The cones are developed on both sides of the Alazani River, while the river itself flows along longitudinal geometric axis of the depression.

290. Along the Alazani valley, various alluvial terraces exist. On the right bank, at about 140-150 m height from the Alazani level, morphologically well-expressed terrace steps exist within the territories of Telavi, Tsinandali, Akhasheni, Gurjaani, Bakurtsikhe, and Tibaani. These terrace fragments, having survived from denudation of the Gombori range North slope, are covered with deluvial deposits and proluvial sandy clayey and rounded cobble deposits drawn out by the rivers flowing down the slopes. At some places, under the deluvial-proluvial deposits, alluvial deposits of the Alazani are also exposed.

291. In terms of geological structure, the road alignment is laying in two different parts, where one part is structured by main marine and marine- continental deposits, whereas the second part represents the Quaternary deposits resulting from the weathering and denudation of the first part deposits. The bottom of the north-eastern slope of the Gombori Range is formed by Neogene, Paleogene, and Cretaceous deposits. Deposits of different age are represented by the following rock varieties:

- Neogene (Aghchagil and Apsheron stages - N23ak+ap) – Continental and marine molasses - conglomerates, sandstones, clays;
- Paleogene (Upper Eocene and Oligocene - P3-P3) – clays, sandstones, argillites;

292. Soils. Forest brown soils can be found on alluvial fans and Gombori ridge slopes. In areas with higher elevation other forest brown soils of medium and small thickness can be found. Upland of Kakheti, black soils of medium and small thickness can be found and within the Alazani valley calcareous alluvial soils are present. This is an area of alluvial carbonaceous soils, which are formed on the alluvium taken from Gombori ridge by Alazani tributaries.

293. Laboratory testing. Laboratory tests have been performed by GTS GeoTechService in Tbilisi. Routine laboratory testing to obtain the relevant material properties required for the pavement design were carried out on soil samples of the base/sub-base and subgrade material recovered from the trial pits and boreholes.

294. The samples taken from *trial pits* were tested to determine the following characteristics and values:

- Natural moisture content
- Grain size distribution by sieving and hydrometer test
- Plasticity (Atterberg limits)
- Specific gravity
- Moisture density relation/Compaction test (MDD, OMC)

- California bearing ration (CBR)

295. The compaction tests were carried out using the modified Proctor.

296. CBR tests for cohesive soils were performed according American Society for Testing and Materials (ASTM)[28] method. The saturation of the subgrade during certain times cannot be excluded. To determine the influence of water on the cohesive soil, CBR tests were soaked for 4 days in water prior to performing the test.

297. The samples taken from *boreholes* were tested to determine the following characteristics and values:

- Natural moisture content
- Grain size distribution by sieving and hydrometer test
- Plasticity (Atterberg limits)
- Bulk/Dry density
- Unconfined compressive strength
- Shear resistance (angle of friction, cohesion)
- Consolidation/ Stiffness Modulus

298. In addition to the soil mechanic tests, chemical tests were performed as follows:

- Soil chemical analysis
- Determination of aggressiveness to concrete (sulphate and chloride content)

299. Field investigation. Along the three proposed alternative alignments, an initial soil investigation was carried out during the feasibility phase with four boreholes at a depth of 5 m to provide general information about the ground structure and soil conditions in the area. Following the determination of a preferred alignment (see Figure 16), a second phase of geotechnical investigations along the chosen alignment was carried out consisting of seven boreholes. Three boreholes (BH-1, BH-2 and BH4 in the table below) from the initial soil investigation, which are on or near the preferred alignment, were retained for analysis during the preliminary design. The new seven boreholes were drilled to a depth between 5 and 15 m below surface. With BH Soil-1 to BH Soil-4 (in the table below), the aim was to provide additional data of subgrade conditions for road construction and pavement design. The boreholes Br-1 to Br-2 (in the table below) were sunk to 15 m at proposed locations for new bridges.

300. The locations and designation for the ten boreholes used during geotechnical studies is provide in the table below:

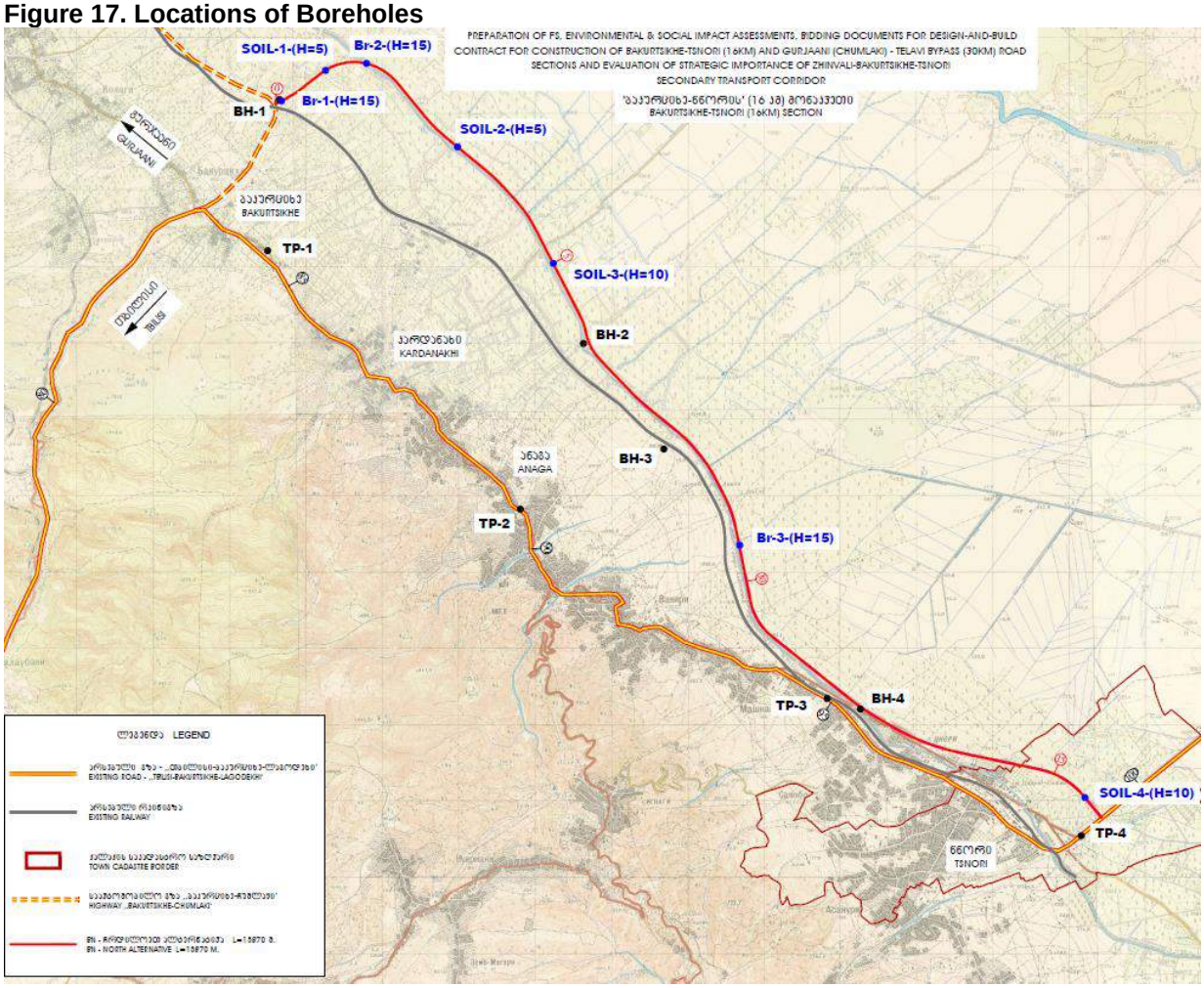
[28] https://www.astm.org/

Table 37. Locations of Boreholes

#	BH #	X	Y	Depth (m)
1	BH-1	572558	4617235	5
2	Br-1	572561	4617226	15
3	Soil-1	573136	4617625	5
4	Br-2	573651	4617722	15
5	Soil-2	574848	4616611	5
6	Soil-3	576117	4615100	10
7	BH-2	576509	4614052	5
8	Br-3	578553	4611413	15
9	BH-4	580151	4609251	5
10	Soil-4	583067	4608110	10

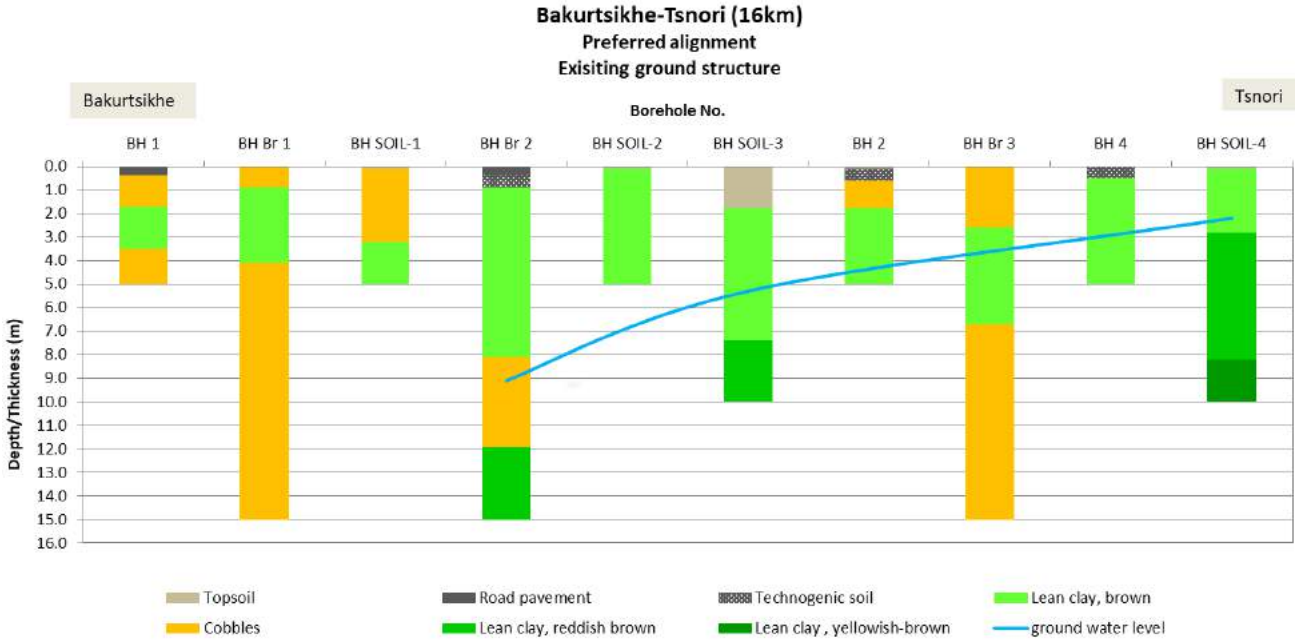
301. The locations of the boreholes are provided on a map in Figure 17 below.

Figure 17. Locations of Boreholes



302. During drilling works, ground water was encountered in a number of boreholes at a depth between 2.2 and 9.1 m below the surface (see blue line in Figure 18). Figure 18 shows the subsoil structure along the preferred project alignment for the borehole logs. Details from the field investigation results are provided in **Annex 7. Soil Analysis Results**.

Figure 18. Borehole Logs Along Preferred Alignment



303. Laboratory test results. Along the existing road section shallow trial pits (identified as TP 1 through 4 in Figure 17 above) were excavated in the carriageway down to the subgrade and samples taken. Boreholes were sunk along proposed alignment alternatives and along the preferred alignment to greater depth at selected locations and at proposed locations of new bridges and undisturbed and disturbed samples taken.

304. All samples extracted from trial pits and boreholes were delivered to the laboratory for testing and determination of characteristic soil values. The main laboratory tests are classification tests, compaction tests, determination of strength and shear strength as well as compression tests. Testing was performed according European (EN-BS) and American (ASTM/AASHTO) Standards.

305. Details from the laboratory testing results are provided in **Annex 7. Soil Analysis Results**.

6.1.3 - Hydrology

306. The central part of Georgia is covered by the Georgian and Azerbaijan hydrogeological district. The major aquifers are Tertiary rocks, which built up the artesian basins of Alazani and Lori. Among Tertiary sediments, the highest waters are observed in continental series of Aghchagil Apsheron and in loose formations of Middle Miocene. Aghchagil Apsheron series have been studied in artesian basins of Alazani and Lori and their waters contains a large amount of calcium bicarbonate.

307. The Alazani River, the second largest river of the east of Georgia, originates from the south slopes of the Caucasus Mountains and joins the Mingechauri basin at the south end of Outer Kakheti plateau. The length of Alazani River is 351 km; with a total drop – 3,000 m; an average slope of 8,55 %; and a basin area of 11,800 km^2. 1,803 different tributaries join the river and their combined length is 6,851 km. In Georgia, the largest tributaries include: Samkuristsqali River (length 18 km); Ilto River (43 km); Khodasheniskhevi River (31 km); Stori River (38 km); Turdo River (28 km); Lopota River (33 km); Chelti River (28 km); Kisiskhevi River (37 km); Duruji River (26 km); Cheremiskhevi River (35 km); Bursa River

(27 km); Papriskhevi River (32 km); Avaniskhevi River (28 km); Kabali River (48 km); Chartliskhevi River (39 km); and Matsimi River (39km).

308. The catchment basin of the Alazani River is asymmetric by the shape. 65.3% of the basin is situated on the left bank of the river. The upper part of the basin, from its head to Akhmeta town, is situated in the high and medium mountainous zone of the Caucasus Mountains. The other part of the basin, approximately 330 km length, from Akhmeta town to its head, is located on the intermountain lowland of Kakheti.

309. The river valley is a box shape with its slopes merging into the slopes of the nearby ranges. The width, depth, and speed of the flow vary from the head to the confluence. Width of the flow varies from 10-12 m (at Birkiani village) to 60-80 m (below the confluence of Agrichai River); depth from 1,0-1,5 m to 4,5-5,8 m; and speed –from 1,5-2,5 m/sec reduced to 0,8-1,2 m/sec. The bottom of the stream is gravelly at the head, while the bottom is sandy below the Chiauri bridge. The River is fed by groundwater, rain, and snow waters. Its water regime is characterized by the floods caused by the snow melt in spring, by high water caused by summer-autumn rains, and typically low water during winter.

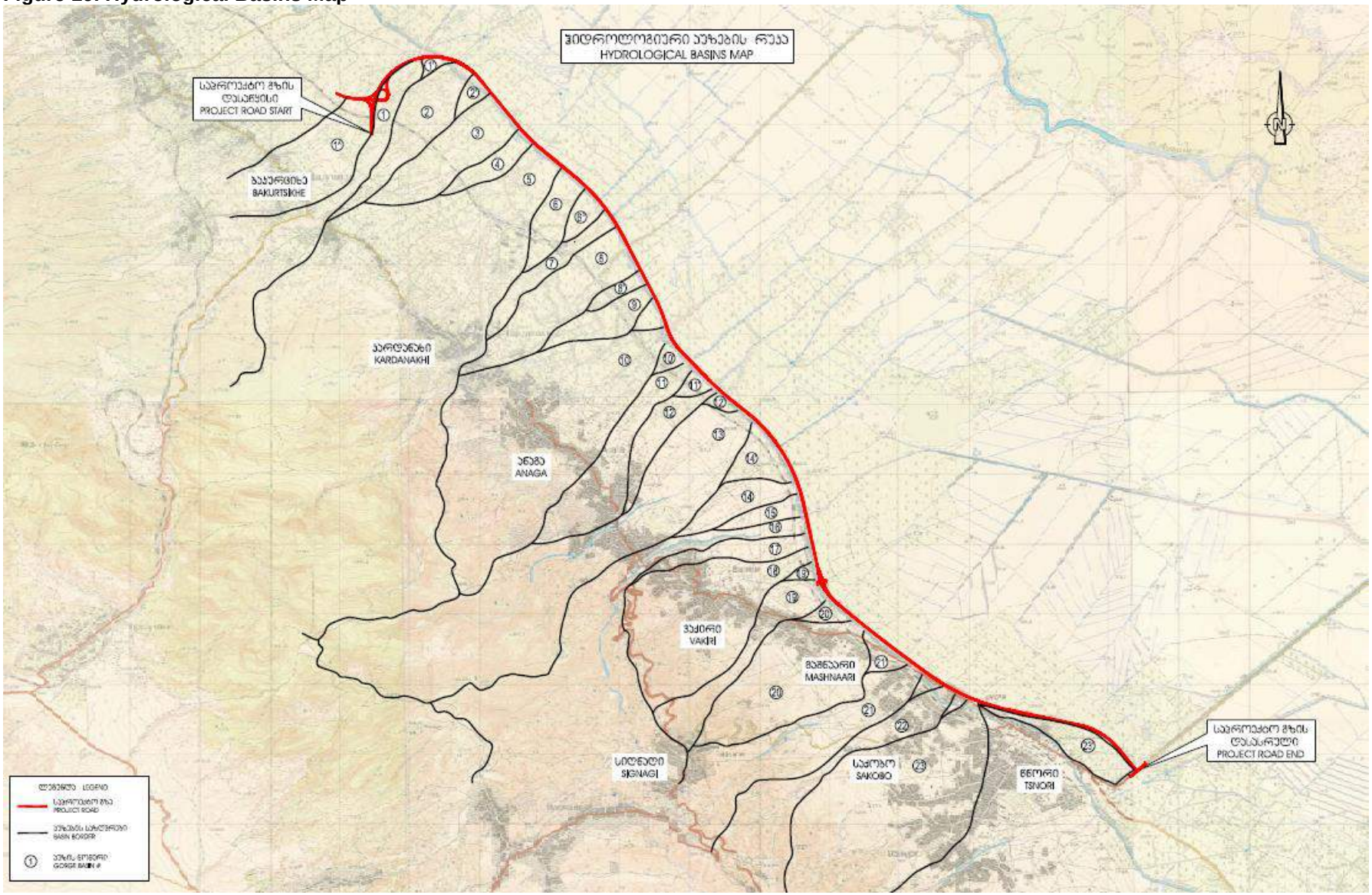
310. The Alazani River runoff during spring and summer are 65-72% of the annual runoff (spring - 35-40%, summer - 30-32%). 20-23% of the annual runoff flows occurs during autumn, but that amount can vary widely year to year. Just 8-18% of the runoff is observed in winter period. The Alazani River is approximately 4.75 km from the proposed Project alignment.

311. The proposed Project alignment is crossed by 24 gullies and nine smaller channels dispensing water from the irrigation canal. The gullies crossing the Project road are on the north-eastern slopes of the south-eastern end of Tsiv-Gombori ridge and flow into the river Alazani. A relatively permanent water flow in the gullies is fixed on the slopes of Tsiv-Gombori ridge, while the beds of the gullies near the settled areas at lower altitudes and on Alazani Plain (where the Project road is planned) are typically dry. Along these sections, water in the gullies flows only during the periods of snow-melt or intense rains. Sometimes during intense rains, water can discharge out of the gully banks inflicting significant material damage to the settled areas and agricultural fields. One of the gullies, flowing across the village Kardanakhi (which the Project road is bypassing), experiences occasional mudflows during periods of heavy rain. According to the engineering-geological studies conducted within the study area, the groundwater level is 9.5-10.5 m.

312. The Chaloubniskhevi River is a tributary of the Alazani which originates from the Gombori range and runs parallel to the S5 highway. The tributary then passes through the village of Bakurtsikhe and crosses the agriculture irrigation canal before connecting to the Alazani River. The Proposed alignment begins by crossing this tributary with a bridge. The Chaloubniskhevi River is a seasonal river that was dry when the IEE environment team visited the site in the Spring of 2019 and the water quality consultants in April and May 2019 (see Section **6.2.3 - Surface Water Quality**).

313. The gullies and watercourses crossing the Project road have been analyzed and the findings incorporated into the preliminary designs for the Project using the design standards and considerations described in Section **4.4.4 - Drainage Design Standard**. A map of the hydrological basins in the Project area is provided in Figure 19 below.

Figure 19. Hydrological Basins Map



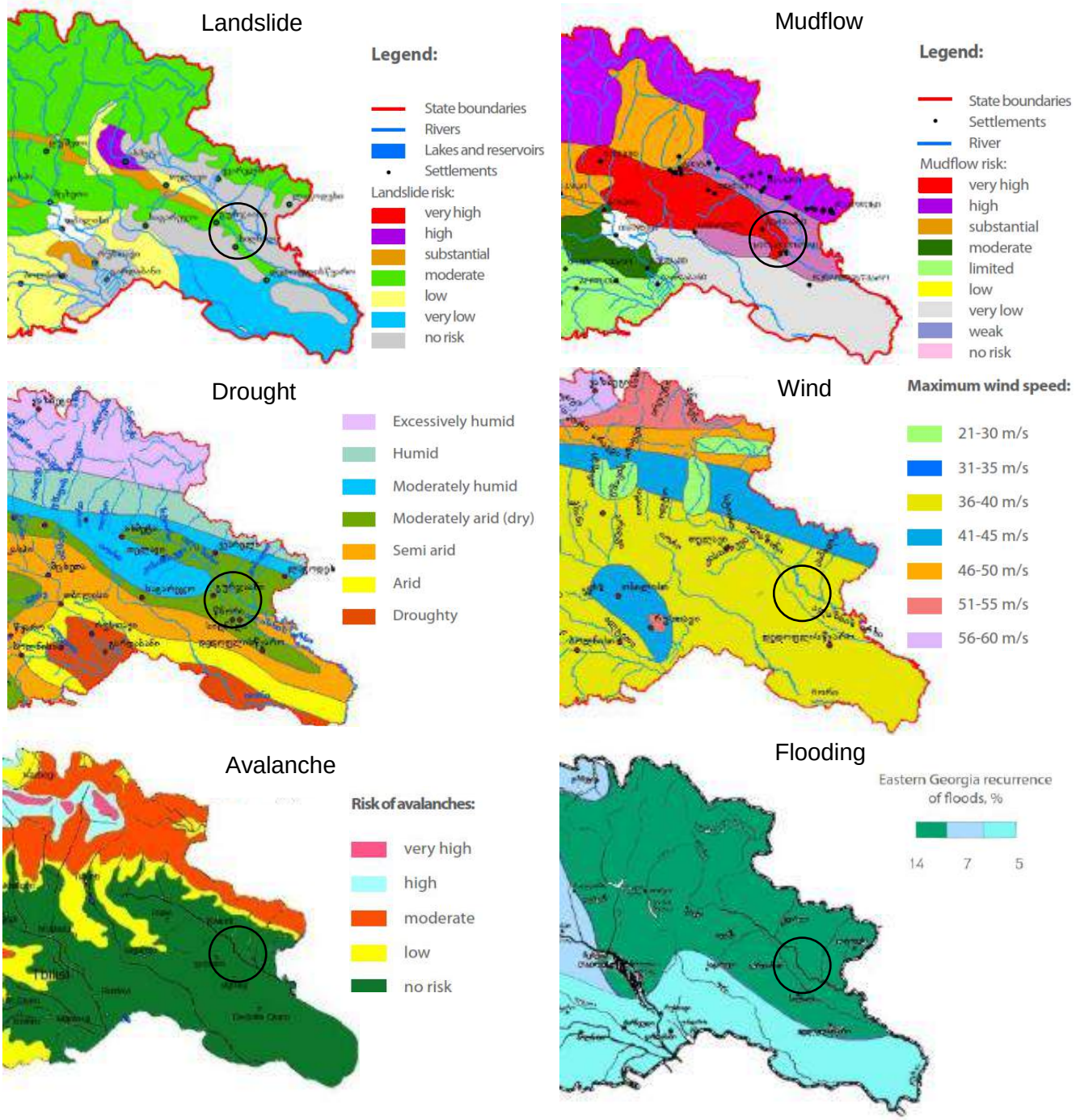
6.1.4 - Natural Hazards

314. Geological hazards are defined as geological phenomena or conditions, either natural or man-made, that are dangerous or potentially dangerous to the environment and its inhabitants. 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. Landslides, caused by heavy rainfall, flood, earthquake, erosion, and human activities, are the most common geo-hazards on land. 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.

315. The Project road is located in the transitional line between the Gombori range north-western slope and the Alazani plain, which is a south-eastward (i.e., directed toward the Alazani) gentle slope. The gullies are deeply cut in the Gombori range with V-shaped cross profiles, big inclinations of the gullies, and steep slopes. As the elevation decreases coming out of the Gombori slopes, the gullies depth and inclination of the lengthwise sections decreases. In the areas where gullies intersect with the preferred Project alignment road, the depth of the gullies is small enough that mudflows can occur during abundant precipitation. Flooding and mudflows are the main hazards in the area of the Project.

316. Hazard maps for landslide, mudflow, drought, high wind speed, and risk of avalanches in the area of Georgia where the Project is located are provided in Figure 20 below.

Figure 20. Landslide, Mudflow, Drought, High Wind Speed, Risk of Avalanches



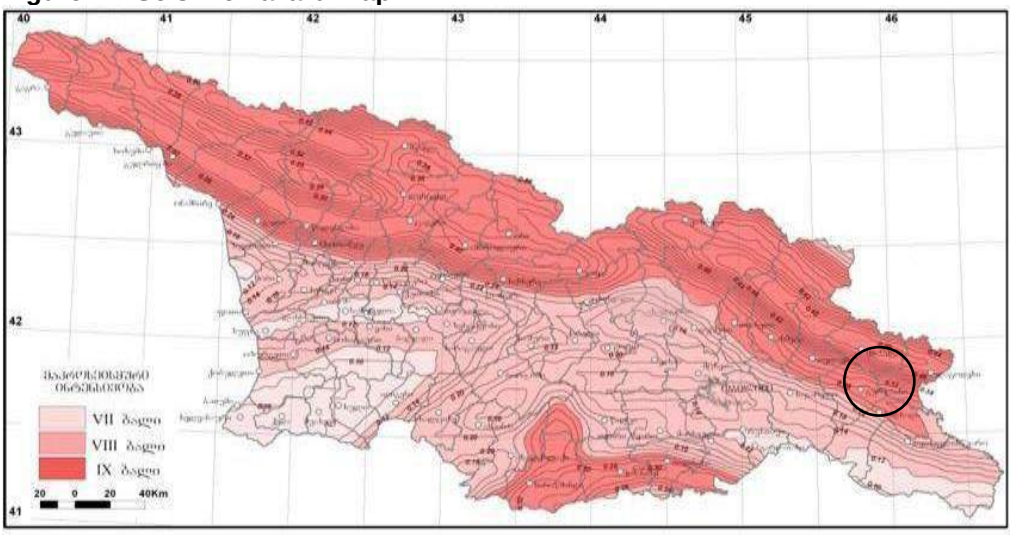
Note: Approximate location of the Project is indicated as a black ring on the maps.
Source: National Report on the State of environment of Georgia for the Period of 2007-2009

317. Seismic hazard. Georgia is located within the Mediterranean seismic belt in the active seismic zone of the Caucasus. Its architectonical movement and activity are connected with the movement of the neighboring Eurasian and Afro-Arabic rocks. Seismicity magnitude in the Project area is intensity 9 by MSK 64 scale[29] with dimensionless seismic

[29] MSK-64, is a macroseismic intensity scale used to evaluate the severity of ground shaking on the basis of observed effects in an area of the earthquake occurrence. The MSK scale has 12 intensity degrees. Magnitude VIII can be compared to 6 – 7 on the Richter scale.

coefficient A=0.28[30]. The area is subject to a maximum horizontal acceleration of 0.26g to 0.28g.[31]

Figure 21. Seismic hazard map



Note: Approximate location of the Project is indicated as a black ring on the map.
Source: Seismic Resistant Construction (PN 01.01.09)

6.1.5 - Waste

318. Waste management is provided by special service (Solid Waste Management Company of Georgia LLC) in the municipality which serves Telavi City and adjacent villages. There is no sanitary landfill in either Gurjaani Municipality (Bakurtsikhe) or Sighnaghi Municipality (Tsnori). Leachate and gases are not controlled at the Telavi landfill. Information on types and volumes of waste disposed of at the Telavi landfill is not available. Due to the fact that a majority of the villages do not have easy access to official landfills, illegal dumping is common.

319. A survey by Kocks of the area where the road corridor is planned (which includes both Gurjaani (Chumlaki) – Telavi Bypass and the Bakurtsikhe-Tsnori road sections) revealed that illegal dumping of solid waste had taken place in some areas where the service road running along the irrigation canal allows for easy access. A total amount of solid waste along the ROW is estimated to be 50-60 m^3. The composition of the waste includes approximately 10-15% asbestos sheeting; 5% plastic waste; 10%-15% construction waste; 5% old tires; and the remaining amount is household non-hazardous waste. The management of this waste will need to be completed prior to the construction of the proposed road. The potential for waste containing asbestos is a concern and will need to be verified during the pre-construction stage and handled and disposed of by skilled and experienced professionals. Specific mitigation measures around this will be further described in Section **7.2.8 - Waste Management**.

6.2 - Environmental Quality

[30] Construction Rules and Regulations “Antiseismic Construction”, PN 01.01-09, Annex No. 1, Populated Locality # 1557 “Gurjaani”
[31] Kocks Consult GmbH, Final Feasibility Study Report for Construction of Bakurtsikhe-Tsnori Road Section Project, October 2016.

6.2.1 - Ambient Air Quality

320. The Project area is predominately rural, agricultural, and relatively undeveloped. The existing service road, which runs parallel to the proposed Project road, allows for periodic maintenance of the agriculture canal. Otherwise, only farm equipment and vehicles belonging to a low number of residents frequent the area. No other potential sources of atmospheric pollution (e.g., quarries, factories, power plants) exist along the alignment. Therefore, establishing ambient air quality was not considered necessary at the preliminary design stage. Air quality data is also not available from other sources (e.g., monitoring stations) for analysis. In general, existing air quality appears to be good and is not expected to be above allowable limits set by international standards.

321. The design-build Contractor will be responsible for undertaking an air quality baseline measurement within the at the vicinity of the proposed road and ambient air quality monitoring throughout Project implementation. Typically, ambient air quality baseline monitoring consists of measuring the daily average concentration levels of total dust, PM_{10}, $PM_{2.5}$, Sulphur dioxide (SO_2), and nitrogen dioxide (NO_2).

6.2.2 - Noise

322. Three 24-hour long noise measurements were conducted along the eastern part of the Project where there are noise sensitive areas in order to determine the existing background noise levels. As the new highway is traveling through the farmlands on a new alignment, there is no existing traffic noise along the proposed alignment. Two of the measurement sites were along the new highway and one along the existing secondary road that will be rehabilitated as part of the proposed Project.

323. One of the measurement sites was at the backyard of a typical house that was next to an existing road (Receptor R4). The second one was located at the backyard of a house that was completely isolated from any local traffic (Receptor R12). Both these houses will become exposed to the new highway traffic in the future and they are the representative sites to categorize houses along the proposed Project.

324. The noise measurement site along the secondary road leading to Vakiri Village was located at the front yard of a first-row house that was fully exposed to the road (Receptor R14). A minimal number of cars were observed during the noise measurements at this road. It is anticipated that traffic volumes would be tripled after the reconstruction and access to the new highway. Figure 22, Figure 23, and Figure 24 show the noise measurement sites.

325. Measurements where conducted from 26 to 29 of March 2019. A RION NL-52 digital sound level meter, which is a class I instrument, was used for conducting the long-term noise measurement. The sound level meter was field calibrated before and after each measurement and a wind screen was used. During the measurement period weather was sunny to partially cloudy and there were no noticeable winds during the entire measurement period. Figures 4, 5, and 6 show pictures of the sound level meter at each site.

326. Average noise levels (L_{eq}) were measured and saved in the sound level meter every 15 minutes. Review of the measured data indicated that there were extraordinary noise levels during few 15-minute intervals at each of three sites; therefore, those intervals were deleted and then hourly L_{eq} levels were calculated. Figure 28, Figure 29, and Figure 30 show graphs of the measured values of hourly L_{eq}.

327. Table 38 shows the highest measured hourly average noise levels during daytime and nighttime hours at all three measurement sites. According to the measured results,

daytime peak noise level at Receptor R4 is below IFC limit of 55 dBA and the nighttime peak noise level is below limit of 45 dBA. The highest nighttime noise level was recorded at 06:00 hour, which indicates early morning activities in the village when villagers are going to attend their fields and farms.

328. Measurement results indicate that at Receptor R12 the daytime peak hour noise level is almost 55 dBA and nighttime peak hour noise level is 45 dBA, which means both are at the IFC limit. Review of the detailed measured data does not indicate any anomaly in the data, but in any case, it is unexpected to have such levels at an isolated rural area away from any major noise source such as traffic. No unusual activities or noise events were absorbed during the measurement period.

329. The daytime peak measured noise level at Receptor R14 is below IFC limits (see Table 11) but nighttime peak level is within 1 dB of the limit. Again, the highest nighttime noise level was recorded at 06:00 hour, which indicates early morning activities in the village when villagers are going to attend their fields and farms. Even though there were only 62 cars and two medium size trucks during the entire 24 hours, a typical traffic generated daily pattern can be observed at this site.

Table 38. Measured Peak Hour Noise Levels

Receptor	Daytime (07:00 – 22:00) highest hourly Leq, dBA	Nighttime (22:00 – 07:00) highest hourly Leq, dBA
R4	51.5	44.0
R12	54.7	45.1
R14	51.6	44.2

Figure 22. Noise Measurement Site at Receptor R4

Figure 23. Noise Measurement Site at Receptor R12

Figure 24. Noise Measurement Site at Receptor R14 (next to the village road)

Figure 25. Photo of the Sound Level Meter at Receptor R4

Figure 26. Photo of the Sound Level Meter at Receptor R12

Figure 27. Photo of the Sound Level Meter at Receptor R14

Figure 28. Measured Hourly Leq at Receptor R4

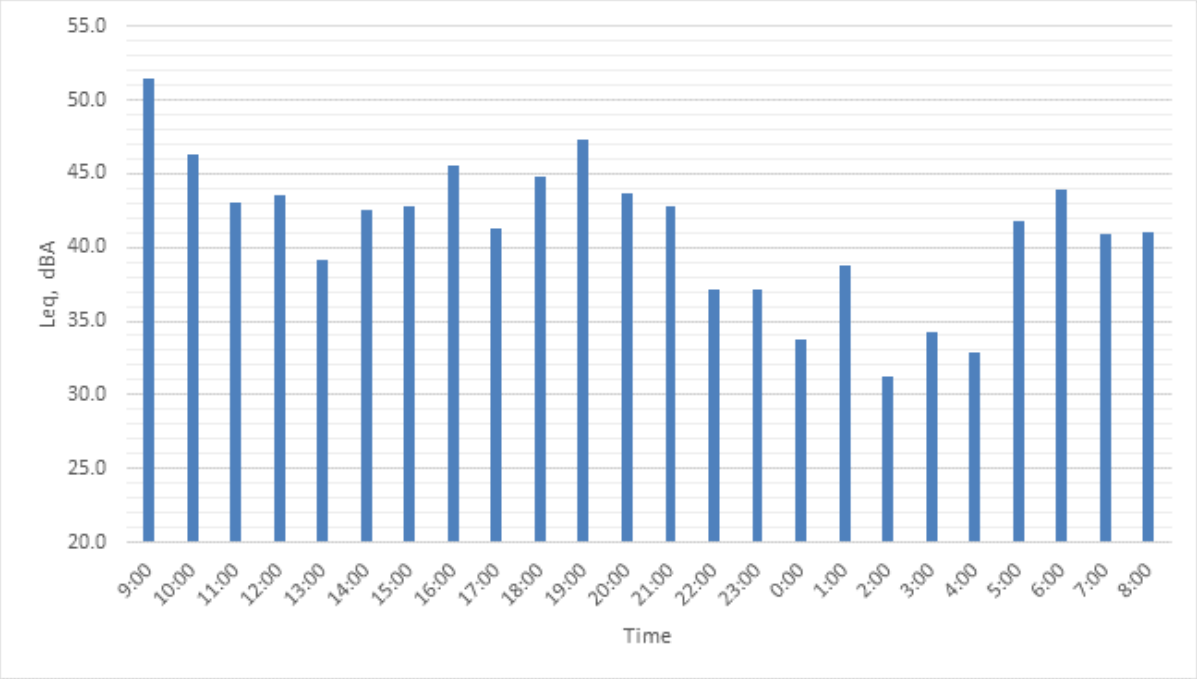


Figure 29. Measured Hourly Leq at Receptor R12

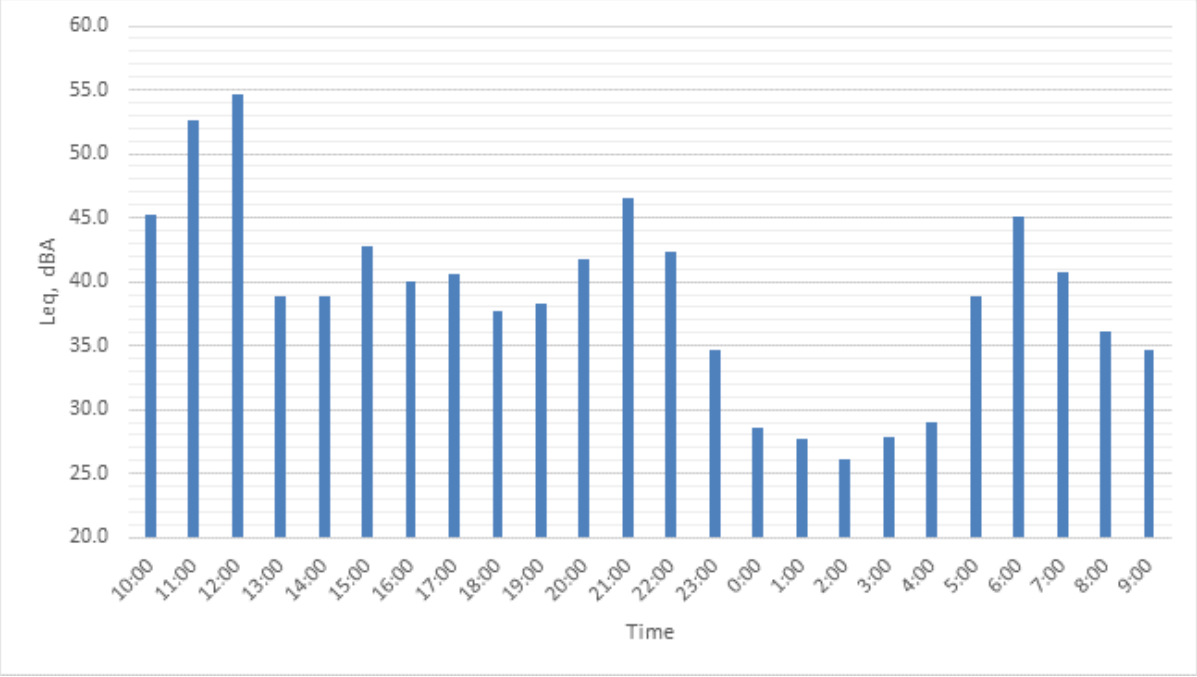
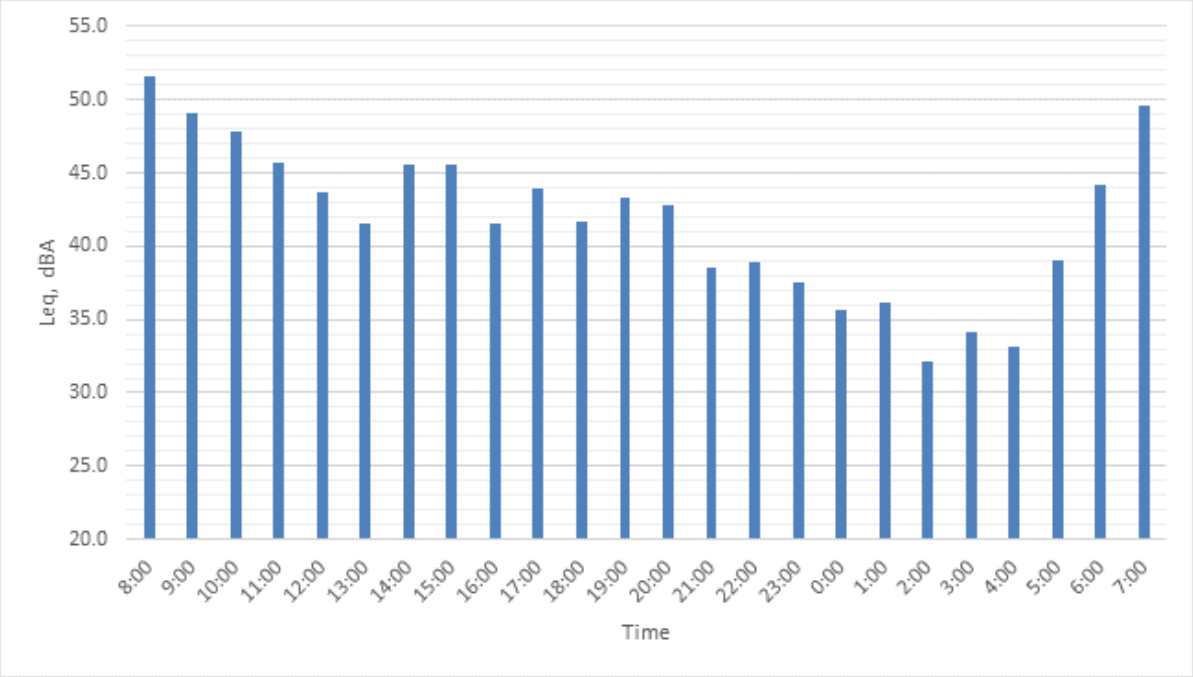


Figure 30. Measured Hourly Leq at Receptor R14



6.2.3 - Surface Water Quality

330. Monitoring of surface water was undertaken by an accredited Georgian consulting firm[32] according to ISO 17025 standard[33] on April 4th and May 22nd, 2019 to assess the status of surface water quality from the irrigation canal and the Chalaubniskhevi River. During the site visits, however, no water was found for sampling in the Chalaubniskhevi River, which has seasonal flow.

331. The points along the irrigation canal were chosen for their proximity to the proposed Project road section. Ensuring that the quality of the irrigation canal water is not polluted during construction and operation of the road is of significant importance. The amount of water in the canal and the intensity of water use changes from season to season. Therefore, one test targeted a time before the height of the agriculture season in early April, while the other targeted a time when more intensive agriculture activity was ongoing in late May.

332. The water analysis included the following 19 chemical and microbiological parameters:

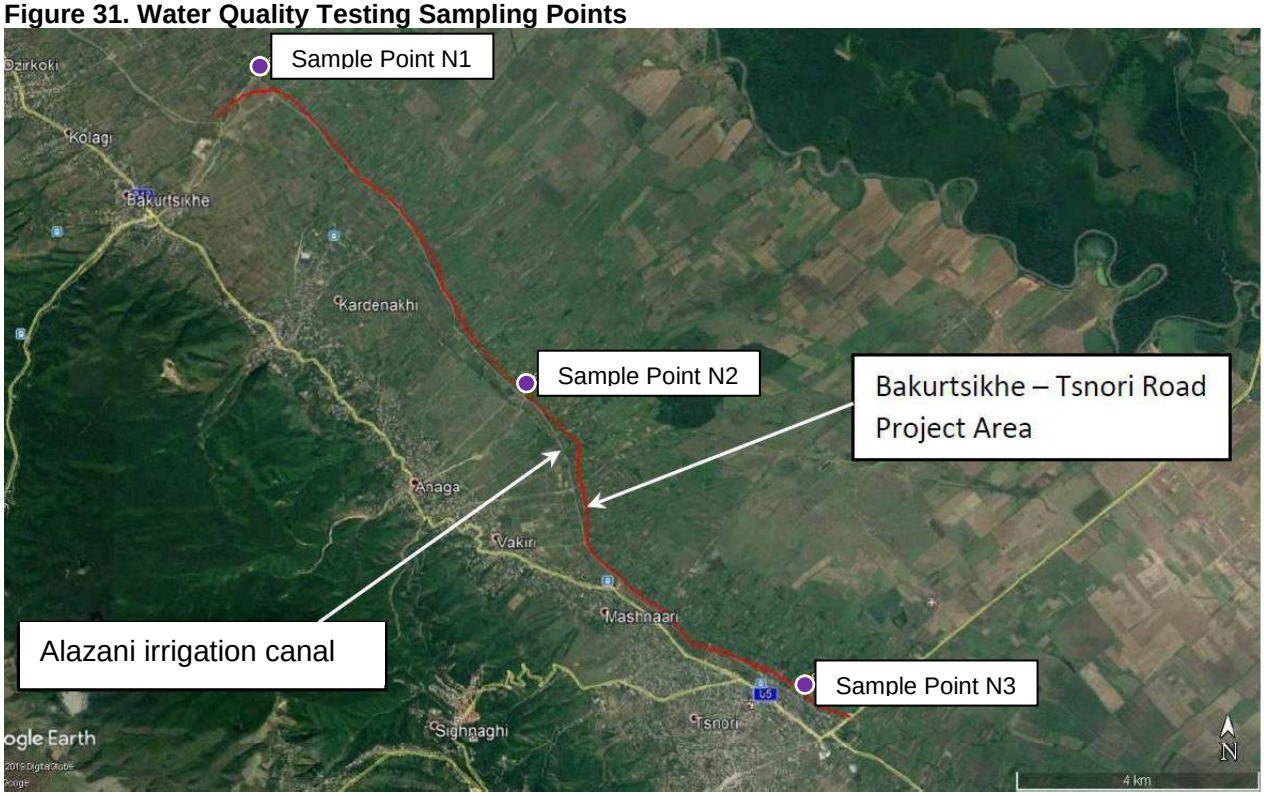
Table 39. Water Quality Testing Parameters

pH	Conductivity
Total Suspended Solids (TSS)	Biochemical Oxygen Demand (BOD_5)
Nitrite (NO_2)	Nitrate (NO_3)
Ammonium (NH_4)	N (Total)
P (Total)	Calcium (Ca^{2+})
Magnesium (Mg^{2+})	Sodium (Na^{+})
Potassium (K^{+})	Chloride (Cl^{-})
Sulphate (SO_4^{2-})	Hydrocarbonate (HCO_3^{-})
Oil & Grease	Total Coliforms
Chemical Oxygen Demand (COD)	

[32] DG Consulting Ltd
[33] https://www.iso.org/ISO-IEC-17025-testing-and-calibration-laboratories.html

333. Monitoring was undertaken at three locations along the irrigation canal: one at the start of the proposed road section; one in the middle of the section; and one at the end of the section. Figure 31 illustrates the monitoring locations and Table 40 provides a table of the monitoring locations.

Figure 31. Water Quality Testing Sampling Points



Note: Sample points are marked by purple dots.

Table 40. Water Quality Sampling Coordinates

Sampling Point	X	Y
N1	573167	4618103
N2	577654	4612884
N3	582288	4607998

334. According to the results provided from the laboratory analysis, water quality in the irrigation canal is fairly consistent across the three sampling points for both testing dates. One exception is the substantial increase in TSS which can be attributed to the flooding season that started at the end of spring and is driven primarily by snowmelt. This is a natural occurrence across waterbodies in the region.

335. For almost all of the parameters tested, the water quality results are below the maximum allowable concentration according to applicable Georgian national and IFC surface water quality standards (see Section **3.3.2 - Surface Water Quality Standards**). Notably, however, bacterial counts across the sampling points and testing dates are significantly higher than the maximum allowable concentrations identified in national standards and the IFC EHS Guidelines for Wastewater and Ambient Water Quality. While an exact explanation for this cannot be discerned from the available data, it is likely due to anthropogenic factors including potential discharges of untreated wastewater and or the presence of livestock waste. Sample points N2 and N3, where the highest counts of total coliform were recorded during the March 2019 test, is also where there is the most human presence.

336. It is expected that the quality of water will continue to change as a result of hydrological variances (i.e., from flooding and droughts) and biological processes in the water (e.g., ambient temperature changes and the presence of agricultural inputs like pesticides and fertilizer). Therefore, additional baseline testing will need to be conducted by the Contractor during pre-construction as well as ongoing monitoring during the construction phase. Surface water from the Chalaubniskhevi River will also need to be tested when present.

337. The results of the water quality monitoring are presented in Table 41 below.

Table 41. Surface Water Quality Monitoring Results

#	Parameter	Units	April 2019 Test			May 2019 Test			Maximum allowable concentration	
			N1	N2	N3	N1	N2	N3	National Standards**	IFC Standards
Chemical Parameters										
1	pH	µ/sm	8.15	8.2	8.19	8.0	7.97	7.96	6.5-8.5	-
2	Conductivity	mg/l	284	280	281	230	230	230	-	-
3	Total Suspended Solids (TSS)	mg/lO2	<2	<2	<2	15	12	16	***	50
4	Biochemical Oxygen Demand (BOD_5)	mg/lO2	<3	<3	<3	<3	<3	<3	6	30
5	Chemical Oxygen Demand COD	mg/l	<3	<3	<3	<3	<3	<3	30	125
6	Nitrite (NO_2)	mg/l	0.04	0.05	0.04	<0.007	<0.007	<0.007	3.3	-
7	Nitrate (NO_3)	mg/l	2.0	2.0	3.0	6.0	6.0	7.0	45	-
8	Ammonium (NH_4)	mg/l	0.11	0.18	0.18	0.21	0.21	0.21	0.39 (N)	-
9	N (Total)	mg/l	0.5	0.56	0.85	1.47	1.47	1.70	-	10
10	P (Total)	mg/l	0.08	0.06	0.11	0.10	0.25	0.27	-	2
11	Calcium (Ca^{2+})	mg/l	45.0	44.0	45.0	37.0	37.0	36.0	-	-
12	Magnesium (Mg^{2+})	mg/l	9.0	9.6	9.0	3.6	3.6	3.6	-	-
13	Sodium (Na^{+})	mg/l	4.35	2.9	5.18	13.87	13.46	15.32	-	-
14	Potassium (K^{+})	mg/l	0.48	0.32	0.57	1.54	1.50	1.70	-	-
15	Chloride (Cl^{-})	mg/l	7.5	7.1	7.5	4.26	4.26	3.9	<350	-
16	Sulphate (SO_4^{2-})	mg/l	24.59	24.49	25.84	26.74	25.52	29.8	<500	-
17	Hydrocarbonate (HCO3-)	mg/l	149.45	146.4	149.45	125.1	125.1	122.0	-	-
18	Oil & Grease	<5	<5	<5	<5	<5	<5	<5	0.3	10
Microbiological Parameters										
19	Total Coliforms	MPN* in 100 ml	2,700	800	1,800	1,100	4,800	5,300	500	400****

*Note: * MPN, most probable number*
*** The limits provided are based on technical requirements for protection of surface water bodies from pollution according to The Decree of Georgian Government #425, dated 31/12/2013.*
**** The increase of Natural baseline TSS value by 0.75 mg/l, or if the naturally TSS is more than 30 mg/l increase of parameter 5%.*
***** Refers to indicative value for treated sanitary sewage discharges according to the IFC EHS Guidelines for Wastewater and Ambient Water Quality. This standard is not applicable to centralized, municipal, wastewater treatment systems which are included in EHS Guidelines for Water and Sanitation.[34]*

[34] https://www.ifc.org/wps/wcm/connect/026dcb004886583db4e6f66a6515bb18/1-3%2BWastewater%2Band%2BAmbient%2BWater%2BQuality.pdf?MOD=AJPERES

6.3 - Biological Environment

6.3.1 - Botanical and Zoological Surveys

338. There are no protected areas in the vicinity of the Project area. An analysis of the biological environment by Kocks consisted of a literature review, including both primary sources and government and consultant reports, and field surveys along the Project corridor. Field surveys were performed by an environmental team and included a botanist, sociologist, and zoologist.

339. The extent of habitat by type was not quantified during the initial botanical and zoological surveys and it will be necessary for additional data to be collected as part of the detailed design work. This should include fauna surveys as well as surveys to establish extent of Natural Habitat.

340. The botanical survey took place along the entire proposed road alignment and 5 m to each side. The evaluation of botanical resources was conducted to determine if any regional red-listed special-status plants or their habitat occurs along the Project area. Special-status species are those listed under the Georgian law on “Red Book” and “Red list” of Georgia (Georgian legislative bulletin N19 1.07 2013).

341. The zoological field survey was organized for the purpose of verifying the data obtained from the literature on the animal species composition and areas of their occurrence. A simple methodology of surveying involved recording direct sightings as well as animal footprints, droppings, and dwellings was applied to collect information on key species of mammals and birds.

6.3.2 - Flora

342. The survey area is not high due to its lowland relief which ranges from 290 m to 230 m above sea level, leading to relative uniformity of plant species. From the geobotanical point of view, the survey area belongs to the geobotanical region of East Georgia area, Iveria valley district, and Kakhetian valley.

343. The largest part of the survey area runs along agricultural lands while a small portion of the area crosses populated areas, including the village Vakiri and town of Tsnori. Plains favorable for agricultural lands have been cleaned of forests and significant portion of the Project area is covered by vineyards, corn fields, and pastures.

344. The natural vegetation is represented by secondary ruderal and steppe vegetation. On the sides of the existing roads and on the edges of agricultural lands, the walnut tree *Juglans regia (*the Red List) are present which are used by the population for economic reasons and often planted.

345. The floristic composition of the research area is as follows: fescue *(Festuca valensiaca)*. wild *(Botriochloa icsheamum);* yarrow *(Achilea millenofolium)*; quaking-grass *(Briza elatior)*; sedge *(Carex schkuhi)*; honeywort *(Cerinthe minor)*; cock’s-foot *(Dachylis glomerata)*; camomile *(Dorincium herbaceum)*, red bugloss *(Echium rubrum)*, thistle *(Erungium biberschteinanum)*, rupture wort *(Filipendula vulgaris)*, Jerusalem artichoke *(Helianthemun nummelarium),* St John’s wort *(Hupericum perfolatum)*, Caucasian elecampane *(Inula aspera),* linen *(Linum tenuifolium),* sainfoin *(Onobrynchis cyrii),* lotus *(Lotus caucasicus),* Jurinea blanda, plantain *(Plantago lanceolata),* milkwort *(Pytogala trancaucasica),* creeping cinquefoil *(Potentilla recta)*, thorny burnet *(Poterium polygonatum)*, black salsify *(Schorzonera biebersteinii),* sage *(Salvia nemorosa),* scabious *(Scabiosa*

georgica), woundwort *(Stachys atherocachyx),* germander *(Teucrium nuthense, T. Polium),* and thyme *(Thymus tiflisciens).* Besides these plants were also mentioned elements of meadow and ruderal flora including pheasant's eye *(Adonis aestivalis)*; spurge *(Euphorbia stricta)*; wild mignonette *(Reseda lutea)*; lucerne *(Medicago sativa);* sweet-clover *(Melulotus officinalis);* vetchling *(Lathyrus sphaerius)* corydalis *(Anagallis arvensis)*; corn gromwell *(Lithospermum arvense)*; bindweed *(Convolus cantabrica)*; mullein *(Verbascum phleoides)*; burdock (Archtium ssp.); meadow violet *(Viola arvensis)*; orchid *(Orchis morio)*; buttercup *(Ranunculus reperns)* cow-wheat (*Melampyrum arvense*); and blue bugle *(Ajuga chia).*

346. A large number of pastures have corn gromwell *(Lithospermium arvense)* interspersed with fragrant wormwood *(Artemisia ssp.).* Besides these species in the pastures are found mullein *(Verbascum phleoides)*; bird's-foot trefoil *(Lotus caucasicus)* and fescue *(Festuca valensiaca),* in weedy sections *(Erigeron anuus)* creates backdrops here and there.

Figure 32. Photo of Vegetation and Vineyards Along the Proposed Alignment

347. In addition to the above, the following tree species are also present: white acacia *(Robinia pseudoacacia)*; *Gleditsia (Gleditsia triacanthos)*; mulberry tree *(Morus alba)*; apricot tree *(Prunus armeniaca);* ild plum *(Prunus cerasifera);* blackthorn (Prunus spinosa)*;* sweetbrier *(Rosa canina)*; blackberry *(Rubus sp.)*, Jerusalem thorn *(Paliurus spina cristii)*, etc.

348. Along the agricultural lands, which are located near populated areas, approximately 150 walnuts *(Juglans regia)* walnut trees were registered by the survey team that fall within the ROW. The approximate coordinates of the walnut trees identified are the following:

Table 42. Approximate Coordinates of Walnut Trees Identified in Project Area

#	X	Y
1.	573789	4617700
2.	574020	4617588
3.	574585	4616861
4.	574920	4615989
5.	574920	4615989
6.	576390	4613635

6.3.3 - Fauna

Inspection of the Project area revealed significant anthropogenic impacts to the natural environment. The majority of land has been deforested for wood and agricultural purposes. However, what remains in terms of habitat provides important shelter for animals. The proximity to the river, flat terrain, understory layer of vegetation, and overall isolation from noise and largescale development has allowed different species of animals to persist in the area. Most likely, the territory is used as a wildlife corridor by larger mammals on their way to Alazani River groves and surrounding forest areas which would provide much better habitat than the Project Area itself. Fish species are not known to be present in the Project area and were not included in the survey.

349. Mammals. No mammal species or their traces were observed by the Kocks survey team during their site visit in late 2017. Based on the literature review and from discussions with local inhabitants, mammals present in the wider area include the following: wolves (*Canis lupus*); jackals (*Canis aureus*); pine marten (*Martes martes*); least weasel (*Mustela nivalis*); fox (*Vulpes vuples*); badger (Meles meles); European hedgehog (*Erinaceus concolor*); Caucasian mole (*Talpa caucasica*); and small forest mouse (*Sylvaemus uralensis*). During the winter, the local population has observed roa deer (*Capreolus capreolus*) and wild boar (*Sus scrofa*).

350. The survey team's assessment concluded however that the Project area is not attractive for above-mentioned sensitive animal species considering the high anthropogenic impacts and the fact that adjacent arable lands are actively being cultivated. The area is favorable only for small mammals including hedgehog (*Erinaceus concolor*); Caucasian mole (*Talpa caucasica*); and small forest mouse (*Sylvaemus uralensis*).

351. Birds. The survey team's literature review identified potential distribution of the following bird species in the region: lesser spotted eagle (*Aguila pomarina*); peregrine falcon (*Falco biarmicus VU*); common kestrel (*Falco tinnunculus*); black kite (*Milvus migrans*); forest owl (*Strix aluco*); great spotted woodpecker (Dendrocopos major); lesser spotted woodpecker (Dendrocopos minor); jay (*Garrulus grandarius*); common cuckoo (*Cuculus canorus*); common blackbird (*Turdus merula*); wood pigeon (*Columba palumbus*); great tit (*Parus major*); Eurasian wren (*Troglodytes troglodytes*); common chaffinch (*Fringilla coelebs*); magpie (*Pica pica*); rook (*Corvus frugilegus*); common crow (Corvus cornix); seagull sp. (*Larus sp.*); hoopoe (*Upupa epops*), European bee-eater (*Merops apiaster*); and quail (*Coturnix coturnix*), among others.

352. During the team's field work within the Project area, the following small bird species were identified: jay; blackbird; bearded tit; magpie; wood pigeon; rook; and crow. The habitat for large size predatory birds (especially Red List species) is significantly restricted within the area and they do not inhabit the Project area. The area is also not a significant migratory corridor for birds and it is unlikely that such birds are found within the site.

353. Amphibians. Favorable conditions for amphibians are present within the Project area and based on the literature review: green toad (*Bufo viridis*); common toad (*Bufo bufo*); Caucasian parsley frog (*Pelobates caucasicus*); as well as marsh frog (*Rana rididunda*) may be present. Due to significant distance from the Alazani River and other important water bodies, populations of various amphibians should not be large on the Project area. That is likely why the number of animals preying on them is also small.

354. Reptiles. Reptiles were not identified during the survey, but the presence of the irrigation canal could provide favorable habitat for the European Pond Terrapin among other species of reptiles in the larger Project area.

355. Invertebrates. The following groups of invertebrate animals are represented within the study area based on the literature: nematodes (*Nematoda, Oligocheta*); leeches (*Hirudinea*); molluscs (*Mollusca*); crustacea; arachnida; and insects.

6.4 - Social-Economic Information

356. A general socioeconomic profile of the wider Project area is provided below. A stand-alone LARP has been also developed for the Project in accordance with ADB's SPS (2009). In addition to defining entitlement, fair compensation, livelihood restoration, and the movement of community structures and assets, the LARP provides an analysis on census data and a socioeconomic profile of project affected households. The LARP should be referred to for full details on Project affected people.

6.4.1 - General Profile

357. Gurjaani Municipality. Gurjaani is an administrative-territorial unit in Kakheti region bordered by five administrative municipalities: from the west – Sagarejo Municipality, from the south-east – Sighnaghi Municipality, from the north-west – Telavi Municipality, from north – Kvareli Municipaliry, and from the east – Lagodekhi Municipality. Within the Kakheti region, Gurjaani Municipality is the smallest administrative-territorial unit with an area of 846 km. The municipality includes 39,430 ha of agricultural land and 27,730 ha of forest. The population is approximately 70,000 according the official website of the local self-government authorities of Georgia (which is about 1.8% of the Georgian population). The town of Gurjaani is the seat of the Gurjaani Municipality.

358. There are 34 state secondary schools and one non-state secondary school in Gurjaani Municipality; one secondary professional and one higher education institution (Kakheti branch of the Tbilisi Business State Institute in village Bakurtsikhe); 34 libraries; five theaters; and five Museums.

359. Bakurtsikhe, where the Project road begins, is located on the right side of the Alazani River, on the banks of the Chalaubniskhevi River, 440 meters above the sea level, and 8 km from Gurjaani. According to the official census, 2,574 people lived in the village in 2014.

360. Sighnaghi Municipality. Sighnaghi municipality is an administrative-territorial unit in Kakheti region and from the north-west and west the municipality is bordered by Gurjaani and Sagarejo municipalities, from the south-east by Dedoplistskaro municipality, and from the north and north-east Lagodekhi municipality and the Republic of Azerbaijan. Sighnaghi municipality has an area of 1,251 km² and according to official data has a population of 42,652. There are 19 settlements in the municipality, two cities, and 17 villages. This includes the town of Tsnori close where the proposed alignment ends, which has a population of 4,815 according to the 2014 census data.

361. Migration. There is a natural decrease of population in Kakheti, both in cities and villages due to in- and out- migration. Based on surveys carried out by the GoG in the region, there are a number of deserted villages in Kakheti. The out-migration in Kakheti, as well as across Georgia, is having a sharp negative impact on the demographic indicators of population and the local economy. Due to the lack of prospects for finding a job, young people often leave the region leading to an ageing population, especially in villages.

362. Employment. According to official data from 2016, the unemployment rate in Kakheti is 11.8%, which is quite high. Most of the population in this region is self-employed. According to official statistics distribution of population of 15 years old of age and older

according to economic activities in Kakheti region according to data from 2006-2016 is as follows:

Table 43. Economic Activities in Kakheti Region

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Total workforce population (in thousands)	214.9	208.0	205.3	206.9	196.0	195.0	199.7	196.4	196.3	192.0	192.7
Employed (in thousands)	201.0	197.1	186.2	184.1	174.2	177.6	186.6	183.9	186.2	180.7	182.3
Hired (in thousands)	46.3	42.0	44.3	48.0	44.8	41.8	44.2	47.2	45.6	53.2	49.7
Self-employed (in thousands)	154.6	155.0	141.5	136.0	129.3	135.8	142.4	136.6	140.6	127.4	132.5
Uncertain (in thousands)	0.1	0.0	0.4	0.1	0.1	0.0	0.0	0.1	0.0	0.1	0.1
Unemployed (in thousands)	13.9	10.9	19.1	22.8	21.8	17.4	13.1	12.5	10.1	11.3	10.4
Population outside workforce (in thousands)	90.7	78.7	86.7	86.7	81.0	82.7	78.4	73.4	76.4	77.1	71.6
Unemployment rate (in percentages)	6.5	5.3	9.3	11.0	11.1	8.9	6.5	6.4	5.2	5.9	5.4
Activity level (in percentages)	70.3	72.5	70.3	70.5	70.8	70.2	71.8	72.8	72.0	71.4	72.9
Employment level (in percentages)	65.8	68.7	63.8	62.7	62.9	64.0	67.1	68.2	68.3	67.1	69.0

363. Industry. In Gurjaani and Sighnaghi municipalities, there are several small-scale wood processing enterprises, however, they are limited in scale. There are no large industrial or manufacturing facilities located near the Project corridor.

364. In the Kakheti region there are a number of agribusinesses (mostly in Telavi municipality) offering products to farmers. These can be found in almost all villages and support the local population according to demand.

365. The main source of income is self-employment, which is mostly expressed in the outdoor trade on the roadside. The majority of outdoor traders begin selling Churchkhela (a traditional Georgian candle-shaped candy) to drivers along the roadways as soon as the winter period starts. Other basic income sources for the population include trading (wine, vodka, vegetables, and meat), agriculture, and the service field.

366. Agriculture. 38% of Georgia's agricultural land is in the Kakheti region. Kakheti ranks first in Georgia in this category of lands and is therefore a leading region in the production of cereals and livestock. Horticulture, grain production, gardening, essential oils, meat, and milk production are also developed.

367. Viticulture is a leading sector in Kakheti region and the Gurjaani and Sighnaghi municipalities are no exception. The main source of income for the population in the Project area is viticulture, although most of the agricultural plots belong to private companies or companies that have long-term leasing agreements to producing wine. Part of the local population is employed in the enterprises, but the income from this alone is often not sufficient.

368. Watermelon is also cultivated in large quantities and the local population trades mainly with fruit in summer and garlic, pumpkin, and other items in winter. Farmers supply local merchants with seasonal products, as well as shipping products to relatively large cities, however, this activity is seasonal and does not provide a stable income for the whole year. In addition, due to frequent droughts in the Kakheti region, it is difficult to plan ahead on what income can be generated through agriculture. Consequently, the population seeks to be employed in the private sector for a stable income, which is not always easy to find in the region.

Table 44. Livestock and poultry number in Kakheti region, by the end of the year (thousand head)

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Cattle stock (including buffalo)	97.0	87.5	89.2	82.8	87.2	94.1	105.7	123.2	110.0	110.6	97.2
Cow and buffalo stock	52.3	43.9	49.3	48.2	47.3	49.4	53.9	63.0	58.0	60.7	49.3
Pig stock	46.8	7.4	10.4	22.8	14.6	15.3	25.5	35.3	30.1	27.3	25.5
Mother pig stock	10.2	1.2	2.5	4.6	2.5	5.3	7.2	8.2	5.8	5.9	5.1
Sheep stock	266.1	313.9	300.2	269.4	276.0	294.3	368.5	468.6	494.1	474.4	482.0
Mother sheep stock	176.8	196.2	174.6	181.4	188.2	199.2	262.6	335.8	388.2	327.4	369.3
Goat stock	11.8	14.4	14.3	15.7	14.3	16.1	16.2	20.8	16.9	13.8	23.3
Mother goat stock	7.4	9.8	9.7	10.7	9.0	11.1	10.9	13.6	11.5	8.6	17.3
Number of all kinds of poultry (thousand bird)	878.7	804.8	1,004.4	1,088.5	1,088.0	1,025.4	945.4	1,117.2	1,177.5	1,201.7	1,186.8
Number of bee families (thousand tons)	28.6	41.7	57.4	52.9	39.0	37.3	34.4	46.9	35.7	45.4	45.4

Note: The main source for 2006-2015 research sampling base was the 2004 agricultural account, and the research sampling base for 2016-2017 was revised and has been founded on the 2014 agricultural account. Based on that and for the purpose to ensure the comparability of the 2014-2017 indexes the calculation has been made of 2014 and 2015 data. Accordingly, the data for 2014-2017 is not comparable with data from 2006-2013.

Table 45. Livestock production in Kakheti region (thousand tons)

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Meat production, total	12.2	10.5	8.8	8.3	7.8	7.3	7.9	9.1	9.8	10.6	9.6
Production of bovine cattle meat	4.7	3.3	3.0	4.1	2.5	2.5	2.5	3.0	2.5	2.5	3.1
Pork meat production	3.3	2.7	1.2	0.9	1.8	1.5	2.2	3.2	3.7	3.8	2.5
Sheep and goat meat production	2.9	3.1	3.3	1.8	2.1	1.9	1.3	1.4	2.3	2.6	2.6
Poultry meat production	1.3	1.4	1.3	1.5	1.4	1.4	1.8	1.3	1.2	1.5	1.3
Milk production (mln liter)	40.0	40.9	42.6	39.5	42.2	45.2	46.6	54.3	56.0	60.1	53.7
Cow and buffalo milk production (mln liter)	37.4	37.9	40.0	36.9	39.5	42.3	43.2	49.5	50.6	54.8	48.5
Sheep and goat milk production (mln liter)	2.6	3.0	2.6	2.6	2.7	2.9	3.4	4.8	5.4	5.3	5.2
Egg production (mln pcs)	45.0	60.5	67.9	65.0	60.4	83.0	85.0	87.6	92.2	101.4	115.9
Wool production (thousand tons)	0.7	0.8	0.8	0.8	0.6	0.8	0.8	0.9	1.2	1.4	1.1
Honey production (thousand tons)	0.3	0.3	0.4	0.1	0.5	0.4	0.5	0.6	0.6	0.7	0.8

Note: the first table note also applies to this table.

369. As it is shown in the tables above, livestock and poultry production in Kakheti region is quite developed. One of the main income sources of the population is also animal husbandry. Grazing of the cattle from other municipalities on Gurjaani or Sighnaghi pastures is not observed. Cattle breeding, as well as sheep and goats farming are common.

370. As it was noted, most of the income of the population in this area comes from the production of agricultural products, and viticulture in particular. In the vicinity of the new road (Kardenakhi, Vakiri, Tsnori) the main population has outdoor shops constructed where they sell beef and pork meat. There is no processing industry in the area however or medium and/or large types of farms.

371. Agricultural services such as veterinary services and mechanization centers are poorly developed in the area. There is the Agricultural Service in Gurjaani-Sighnaghi, but the non-governmental sector mainly carries out introduction of new technologies in this field.

372. A decrease of agricultural productivity has been observed in the recent years which has been attributed to ineffective farming techniques, insufficient irrigation, and bad weather conditions. A reduction in productivity is also caused by the high costs of equipment and fuel. Due to the lack of agricultural equipment, their poor condition, and the absence of funds, a considerable part of available arable land is not cultivated in the territory of Gurjaani-Sighnaghi municipalities. Approximately 80% of arable lands of the municipality need irrigation, but the lack of irrigation systems and the poor condition of the irrigation systems that exist have hampered efforts. In addition, 5% of the arable lands require drainage, but there is no drainage system in the municipality.

373. Tourism. Tourism has an important place in the economy of both municipalities. Tourism is especially promoted by the city of Sighnaghi which is considered one of the most picturesque towns of Georgia. The city's charm and architectural style, as well as natural location have drawn tourists year after year. The city is located in a high-lying site and overlooks the Alazani Valley and the Caucasus Ridge. Sighnaghi was established in the end of the XVIII century, in the territory of the fortress built by Erekle II and its surroundings. However, an archaeological survey finds that this area has played an important role since the Paleolithic, Neolithic, and Bronze Age.

374. Today Sighnaghi is often called the city-museum. In 2007, the town was renovated and opened museums and hotels which has provided the local population with a significant source of income.

375. Also, in Gurjaani and Sighnaghi municipalities there are many old historical temples and monastery complexes that attract tourists. The Project area is less interesting and valuable from the touristic viewpoint however. There are no touristic routes here and there are no historical and cultural monuments of international importance or tourist attractions (e.g., temples, museums, hotels, restaurants, etc.).

6.4.2 - Historical and Cultural Heritage

376. There are many architectural monuments in Gurjaani-Sighnaghi municipalities, including the VIII-IX c. Gurjaani Kvelatsminda. The Kvelatsminda Monastery is located a few kilometers away from the village of Vachnadziani which is revered for its Georgian architectural. Near the village of Vejini is a fortress built with cobble-stone. There are several churches inside the fort, including the Easter Ascension and St. Mary's churches. In the village of Kardenakhi, the Church of Sabatsminda of XIII c. is preserved. Near to Cheremi is the Georgian architectural monument Tsverdabali, and the site of former city is also located

here. In the Sighnaghi municipality, the Bodbe Monastery, St. Nino's Monastery Complex, and Episcopacy are historically and architecturally important.

377. Despite the numerous historic and cultural monuments located in the Gurjaani and Sighnaghi municipalities, there are no known historical or cultural sites present in the Project area. The closest historic monument is located in the village Akura, which is approximately 25 km away from Bakurtsikhe.

7. Impact Assessment and Mitigation

7.1 - Impact Assessment Methodology

7.1.1 - Introduction

378. This IEE has been undertaken following a systematic process that (i) evaluates the potential impacts the Project could have on aspects of the physical, biological, social/ socio-economic, and cultural environment; (ii) identifies preliminary measures that the Project will take to avoid, minimize/reduce, mitigate, offset, or compensate for potential adverse impacts; and (iii) identifies measures to enhance potential positive impacts where practicable. This has been organized as per the various phases of the project lifecycle to provide a comprehensive assessment of the risks and impacts.

379. There are various techniques to identify and assess interactions of environmental project-factors; however, all environmental impact assessments should describe the action generating the impact, predict the nature and magnitude of environmental effects, interpret the results, and prevent negative effects on the environment. The impact assessment methodology used here provides a basis to characterize the potential impacts of the Project. It is based on models commonly employed in impact assessment and takes into account international best practices.

380. It should be noted however that the impact assessment provided in this IEE is based on preliminary designs for the Project road and not the detailed designs. While a considerable amount of the design work has been completed by Kocks and it is anticipated that changes to the final design will be limited[35], the mitigation measures developed as a result of the impact analysis provided here may be subject to change. Since the EMP in this IEE is considered a 'live document', any needed changes to manage potential Project related impacts can be addressed as additional information becomes available. The Contractor will also be required to develop a Specific Environmental Management Plan (SEMP) outlining how they (the Contractor) intend to implement the EMP and ensure that all of the mitigation and monitoring is completed according to the implementation arrangements specified in this IEE and the EMP.

381. Impact identification and assessment starts with screening and categorization to determine if the project falls within ADB requirement for impact assessment (IA) and to determine the category of IA required. Once screened and categorized, the environment assessment team proceeded with the following principal impact assessment steps:

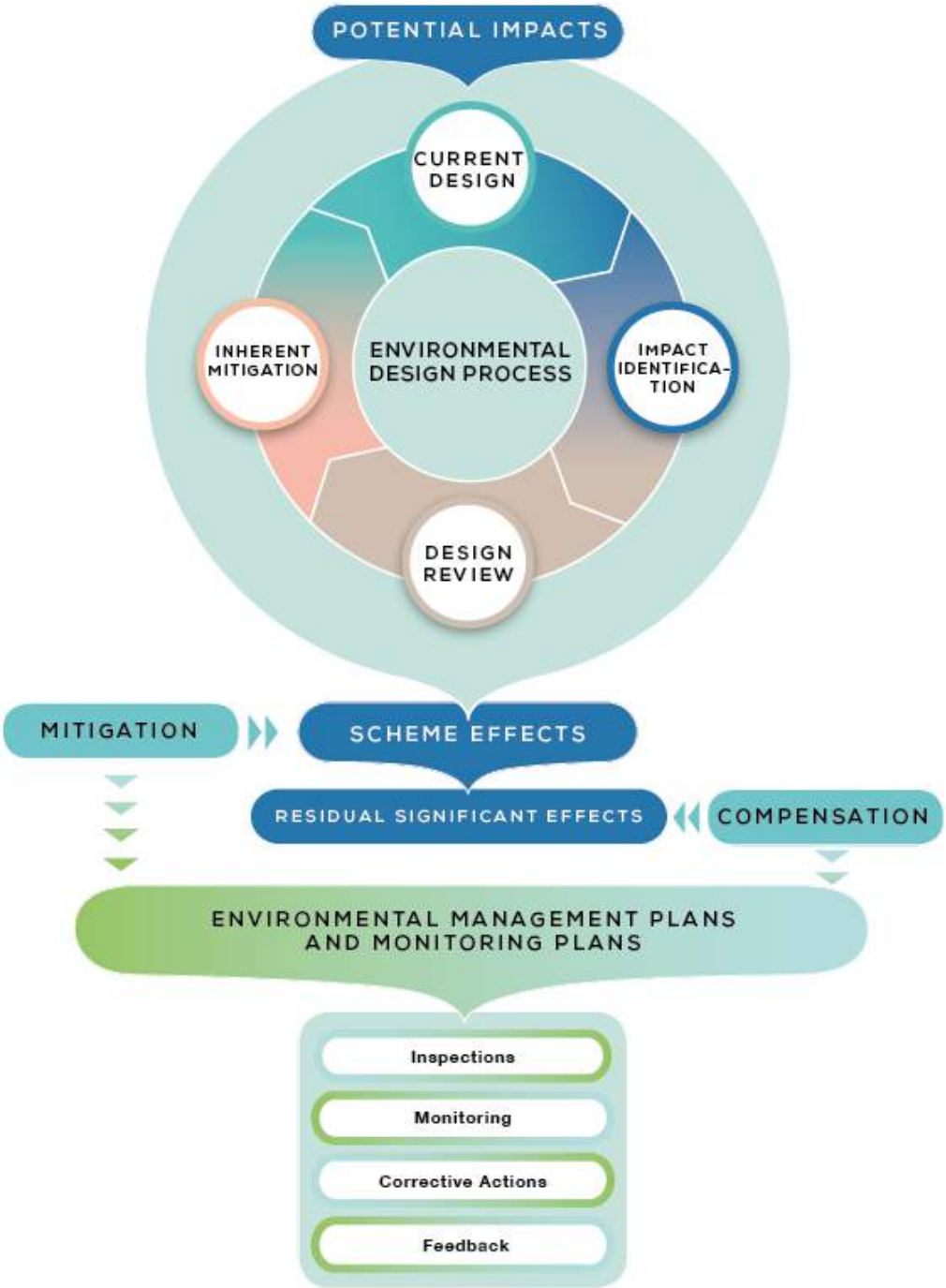
- Impact scoping (i.e., prediction / identification): to determine what could potentially happen to resources/receptors because of the Project and its associated activities.
- Impact evaluation: to evaluate the significance of the predicted impacts by considering their magnitude and likelihood of occurrence, and the sensitivity, value and/or importance of the affected resource/receptor.
- Mitigation and enhancement: to identify appropriate and justified measures to mitigate negative impacts and enhance positive impacts.
- Residual impact evaluation: to evaluate the significance of impacts assuming effective implementation of mitigation and enhancement measures.

382. The IA process is an iterative process with interaction between project designers/proponents and the impact assessment team. This iterative design process is

[35] Davit Getsadze, Roads Department, pers. comm. 2019

presented in Figure 33 below. Through this iterative process, the project is continually improved in terms of its environmental acceptability.

Figure 33. Environmental Design Approach to IA



Source: IEE Good Practice Note - Impact Assessment Process for IEE. Central and West Asia Department (CWRD), ADB, June 2019.

7.1.2 - Impact Scoping and Identification

383. The prediction and identification of environmental impacts were based on the following:

(i) input from interested and affected parties;

(ii) desktop research of information relevant to the proposed Project;
(iii) site visit and professional assessment by environment specialist engaged by the implementing agency;
(iv) evaluation of the feasibility studies and proposed design scope; and
(v) the environment specialist's past experience.

384. For actions to be carried out in the execution of the Project, we consider the Site Preparation, Construction, and Worksite Closure Phase (together) and the Operation Phase.

7.1.3 - Impact Evaluation

385. Once the prediction of potential impacts is complete, each potential impact is described in terms of its various relevant characteristics (e.g., type, timing, scale, duration, frequency, extent). The terminology and designations used to describe impact characteristics are shown in Table 46. While the impact evaluations provided in Section **7.2 - Impacts and Mitigation Measures** are comprehensive, assessment of impact tables for only the most significant impacts have been developed to provide more in-depth analysis.

Table 46. Impact Evaluation Terminology and Designations

Characteristic	Definition	Designations
Phase of the Project	The phases of the Project life cycle.	• Site Preparation, Construction, and Worksite Closure Phase (i.e., project closure phase) • Operation (including maintenance) Phase
Nature	A descriptor indicating the positive, negative, and neutral perceptions of the Project.	• **Positive or beneficial impact** – When impact is considered to represent improvement to baseline condition or introduce a new desirable factor; • **Negative impact** - When impact is considered to represent adverse change from the baseline or introduce a new undesirable factor. • **Neutral impact** - When impact is considered to represent neither beneficial nor adverse changes from the baseline or introduce no desirable/ undesirable factor.
Type	A descriptor indicating the relationship of the impact to the Project (in terms of cause and effect).	• **Direct** - Impacts that result from a direct interaction between the Project and a resource/receptor. • **Indirect** - Impacts that follow on from the direct interactions between the Project and its environment as a result of subsequent interactions within the environment. • **Induced** - Impacts that result from other activities (which are not part of the Project) that happen as a consequence of the Project. • **Cumulative** - Impacts that arise as a result of an impact and effect from the Project interacting with those from another activity to create an additional impact and effect. • **Accidental -** impacts that result from accidental (unplanned) events within the project (e.g., fuel spillage during refueling) or in the external environment affecting the project. In these cases, the probability of the event occurring is considered.
Duration	The time period over which a resource / receptor is affected	• **Temporary** - Impact duration can range from relatively short (less than four years) to long (beyond the life of the Project). • **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. • **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 that endures substantially beyond the project lifetime
Extent	The "reach" of the impact (e.g., confined to a small area around the Project Footprint, projected for several kilometers, etc.).	• **Local** - When impact due to the proposed Project related activities is restricted within Area of Influence which has been determined as 5 km for social resources and 10 km for environmental and ecological resources. Furthermore, the area of influence is defined with respect to project activities for each component in the impact scale depending upon resource/ receptor and its interaction with the environmental, ecological, and social attributes. • **Regional** - Impacts extend beyond the area of influence to affect regionally important environmental resources or are experienced at a regional scale as determined by administrative Boundaries. • **International** – Includes impacts that extend or occur across a national boundary.
Scale	The size of the potential impact (e.g., the size of the area with the potential to be damaged or impacted, the fraction of a resource that could potentially be lost or affected, etc.).	• No fixed designations. This is intended to be a numerical value or a qualitative description of "intensity".
Frequency	Frequency of impact when intermittent	• Refers to the *return period* for impacts which will recur over and over again. The impacts as one off or varying frequency.
Probability	The likelihood or chance an impact will occur.	• **Definite** - Impact will occur with high likelihood of probability. • **Possible** - Impact may occur but could be influenced by either natural or project related factors. • **Unlikely** - Impact unlikely unless specific natural or Project related circumstances occur.
Reversibility	Refers to the permanence of the impact	• **Reversible** or **Irreversible** - Potential for recovery of the endpoint from a negative impact.

7.1.4 - Determining Magnitude of Impact Effect

386. Once impacts were characterized, they were assigned a 'magnitude'. Magnitude essentially describes the intensity of the change that is predicted to occur in the resource/receptor as a result of the impact. Magnitude designations themselves are universally consistent, but the descriptions for these designations vary on a resource/receptor-by-resource/receptor basis.

387. Magnitude is typically a function of some combination (depending on the resource/receptor in question) of the following impact characteristics:

- Duration
- Extent
- Scale
- Frequency

388. Magnitude (from small to large) is a continuum. Evaluation along the continuum requires professional judgement and experience. Each impact on a case-by-case basis and the rationale for each determination is noted. The universal magnitude designations are:

- Positive;
- Negligible;
- Minor;
- Moderate; and
- Large.

389. Some impacts will result in changes to the environment that may be immeasurable, undetectable, or within the range of normal natural variation. Such changes are regarded as having no impact and characterized as having a negligible magnitude. In the case of impacts resulting from unplanned events, the same resource/ receptor-specific approach to concluding a magnitude designation is used. The likelihood factor is also considered, together with the other impact characteristics, when assigning a magnitude designation.

390. In the case of a potential ***positive*** impact, no magnitude designation (aside from 'positive') is assigned in the assessment of impact tables. It is considered sufficient for the purpose of this IEE to indicate that the Project is expected to result in a potential positive impact without characterizing the exact degree of positive change likely to occur.

391. In the case of potential impacts resulting from unplanned events, the same resource/receptor-specific approach to concluding a magnitude designation is utilized. However, the 'likelihood' factor is considered, together with the other impact characteristics, when assigning a magnitude designation.

7.1.5 - Defining Sensitivity

392. In addition to characterizing the magnitude of impact, the other principal impact evaluation step taken was to define receptor sensitivity. Receptor sensitivity takes into consideration the receptor's resilience and value. Receptor resilience (or conversely, vulnerability) describes the ability of the receptor to withstand adverse impacts. It takes into consideration not only activity-impact-receptor pathways, but also environmental characteristics of the receptor that might make it more or less resilient to change. As such, a receptor can be considered as existing within a spectrum of 'vulnerable' to 'resilient', with the former more likely to experience significant impacts as a result of a given change. Receptor value takes into consideration its quality and its importance as represented, for example, by its conservation status, its cultural importance and / or its economic value. It recognizes that, for a given intensity impact, different receptors (either directly or indirectly) may be deemed to be of greater importance and as such the significance of the impact is greater than the impact intensity alone.

393. The sensitivity designations used herein for all resources/receptors are: **Low**, **Medium**, and **High**.

394. For ecological impacts, sensitivity is assigned as low, medium or high based on the conservation importance of habitats and species. For socio-economic impacts, the degree of sensitivity of a receptor is defined as the level of resilience (or capacity to cope) with sudden social and economic changes.

7.1.6 - Impact Significance

395. Once magnitude of impact and sensitivity of resource/receptor have been characterized, the significance can be assigned for each impact (see Figure 34). Impact significance within assessment of impact tables is designated using the matrix shown in Table 47.

Figure 34. Impact Significance Determination

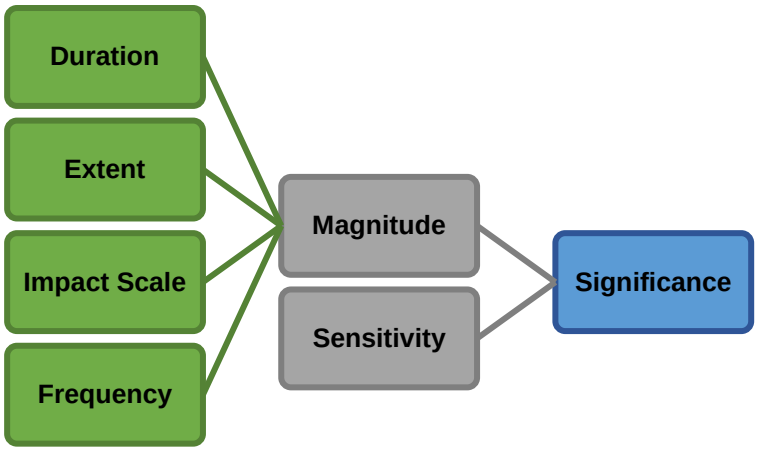


Table 47. Impact Significance Matrix

		Sensitivity of Resource/Receptor		
		Low	**Medium**	**High**
Magnitude of Impact	**Negligible**	Negligible	Negligible	Negligible
	Minor	Negligible	Minor	Moderate
	Moderate	Minor	Moderate	Major
	Large	Moderate	Major	Major

396. The matrix applies universally to all resources/receptors, and all impacts to these resources/receptors, as the resource/receptor-specific considerations are factored into the assignment of magnitude and sensitivity designations that enter into the matrix.

397. It should be noted that impact prediction and evaluation take into account any embedded controls (i.e., physical or procedural controls that are already planned as part of the Project design). This avoids the situation where an impact is assigned a magnitude based on a hypothetical version of the Project that considers none of the embedded controls. For example, the preliminary designs for the road provide farmers and residents access to the agricultural fields along the north side of the Bakurtsikhe – Tsnori Road through construction of underpasses to the local feeder road network.

398. An impact of **negligible** significance is one where a resource/receptor (including people) will essentially not be affected in any way by a particular activity or the predicted effect is deemed to be 'imperceptible' or is indistinguishable from natural background variations.

399. An impact of **minor** significance is one where a resource/receptor will experience a noticeable effect, but the impact magnitude is sufficiently small and/or the resource/receptor is of low sensitivity. In either case, the magnitude should be well within applicable standards.

400. An impact of **moderate** significance has an impact magnitude that is within applicable standards but falls somewhere in the range from a threshold below which the impact is minor, up to a level that might be just short of breaching a legal limit. Clearly, to design an activity so that its effects only just avoid breaking a law and/or cause a major impact is not best practice. The emphasis for moderate impacts is therefore on demonstrating that the impact has been reduced to a level that is as low as reasonably practicable. This does not necessarily mean that impacts of moderate significance have to be reduced to minor, but that moderate impacts are being managed effectively and efficiently.

401. An impact of **major** significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors. An aim of environmental impact assessment is to get to a position where the Project does not have any major residual impacts, certainly not ones that would endure into the long-term or extend over a large area. However, for some aspects there may be major residual impacts after all practicable mitigation options have been exhausted. An example might be the visual impact of a facility. It is then the function of regulators and stakeholders to weigh such negative factors against the positive ones, such as employment, in coming to a decision on the Project.

402. The impact significance rating process serves two purposes: firstly, it helps to highlight the critical impacts requiring consideration in the approval process (both positive and negative); secondly, it serves to show the primary impact characteristics, as defined above, used to evaluate impact significance.

7.1.7 - Identification of Mitigation and Enhancement Measures

403. Once the significance of a potential impact was characterized, socially, environmentally, and technically, acceptable and cost-effective measures to manage and mitigate potential impacts were identified and defined. Mitigation measures are developed to avoid, reduce, remedy, or compensate for potential negative impacts, and to enhance potential environmental and social benefits.

404. The approach taken to defining mitigation measures is based on a typical mitigation hierarchy, as described in Table 48.

Table 48. Mitigation Hierarchy

Avoid at Source, Reduce at Source: avoiding or reducing at source through the design of the Project (e.g., avoiding by siting or re-routing activity away from sensitive areas or reducing by restricting the working area or changing the time of the activity);
Abate on Site: add something to the design to abate the impact (e.g., pollution control equipment, traffic controls, perimeter screening and landscaping);
Abate at Receptor: if an impact cannot be abated on-site then control measures can be implemented off-site (e.g., noise barriers to reduce noise impact at a nearby residence or fencing to prevent animals straying onto the site);
Repair or Remedy: some impacts involve unavoidable damage to a resource (e.g., agricultural land and forestry due to creating access, work camps or materials storage areas) and these impacts can be addressed through repair, restoration, or reinstatement measures; and **Compensate in Kind, Compensate Through Other Means:** where other mitigation approaches are not possible or fully effective, then compensation for loss, damage and disturbance might be appropriate (e.g., planting to replace damaged vegetation, financial compensation for damaged crops or providing community facilities for loss of fisheries access, recreation, and amenity space).

7.1.8 - Residual, Induced, and Cumulative Impact Evaluation

405. The residual impact is what remains following the application of mitigation and management measures and is thus the final level of impact associated with the development of a proposed project. Residual impacts also serve as the focus of management and monitoring activities during Project implementation to verify that actual impacts are the same as those predicted in the IEE Report.

406. For activities with significant impacts, the environmental assessment process is required to identify suitable and practical mitigation measures that can be implemented. The implementation of the mitigations is ensured through compliance with the EMP and the Contractor's SEMP. After first assigning significance in the absence of mitigation, each impact is re-evaluated assuming the appropriate mitigation measure(s) is/are effectively applied, and this results in a significance rating for the residual impact.

407. The significance of residual impacts are qualified as **Negligible**, **Minor**, **Moderate**, and **Major**. Negative impacts deemed to be Moderate or Major after the application of the intended mitigation measures would receive ongoing management and monitoring during the various project phases. Additional mitigation measures will be suggested where applicable.

408. In some cases, it may only be possible to reduce the impact to a certain degree such as where an impact could not be completely avoided. All key residual significant impacts are described in this report with commentary on why further mitigation is not feasible.

7.1.9 - Induced and Cumulative Impact Evaluation

409. Cumulative impacts are generally considered as those which are additive or interactive in nature that arise as a result of an impact from the Project interacting with an impact from another activity to create an intensified impact.

410. As identified within Section XVI of the ADB's Environmental Assessment Guidelines (the guideline document has since been updated by the Environmental Safeguards: A Good Practice Sourcebook draft working document), as it applies to assessment of project impacts, they are specifically defined as those impacts which:

(i) are caused by the aggregate of past, present, and future actions;
(ii) are the total effect, including both direct and indirect effects, on a given resource, ecosystem, and human community of all actions taken, no matter who has taken the actions;
(iii) need to be analyzed in terms of the specific resource, ecosystem, and human community being affected;
(iv) cannot be practically analyzed beyond a reasonable boundary; the list of environmental effects must focus on those that are meaningful;
(v) rarely correspond to political or administrative boundaries;
(vi) may result from the accumulation of similar effects or the synergistic interaction of different effects;
(vii) may last for many years beyond the life of the project that caused the effects; and
(viii) should be assessed in terms of the capacity of the affected resource, ecosystem, and/or human community to accommodate additional effects.

411. Induced Impacts can be defined as adverse and/or beneficial impacts on areas and communities from unintended but predictable developments caused as a result of a project, which may occur later or at a different location.[36] A good example would be housing development and land clearance along the edge of a newly constructed road.

7.1.10 - Management, Monitoring, and Audit

412. The final stage in the environmental assessment process is definition of the basic management and monitoring measures that are needed to identify whether: (i) impacts or their associated project components remain in conformance with applicable standards; and (ii) mitigation measures are effectively addressing impacts and compensatory measures and offsets are reducing effects to the extent predicted.

413. Commitment is made to regular monitoring and verification of the implementation of the management plans and the undertaking of remedial actions where needed. Monitoring and verification will be reported and made available for inspection upon request. All incidents will be reported and corrective actions will be taken as necessary according to management plan recommendations and RD procedures. This will enable and facilitate a process of continuous improvement. All grievances received will be addressed and investigated.

414. 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; and
- continuation of the IEE as an iterative process through to the construction and operational environment and social management systems, which will be based on continual improvement.

7.2 - Impacts and Mitigation Measures

[36] ADB - Environmental Safeguards: A Good Practice Sourcebook draft working document, December 2012.

7.2.1 - Soil and Relief

Scope of the Assessment

415. This section explains the potential impacts on soil, geology, and relief conditions from the proposed Project.

416. Note that some of the conditions and effects described, particularly with regard to contamination and hydrogeology, may interact with other parameters such as ecology and surface water. Such interactions are described where appropriate.

Identification of Sensitive Receptors

417. Potential impacts within the Project sites, as well as adjacent receptors including the irrigation canal, have been considered. Borrow pit and quarry sites selected for sourcing construction materials are also identified as potentially sensitive since at this time their locations are unknown.

Assessment of Potential Impact: *Site Preparation, Construction, and Worksite Closure Phase*

418. Key potential impacts on soils, geology, and relief arise from the following activities:

- soil disturbing activities and excavation associated with construction leading to loss of soil structure, quantity, and quality;
- accidental events (spills, uncontrolled releases) associated with the storage, handling, and disposal of hazardous materials, including fuels;
- storage and disposal of non-hazardous waste; and
- inappropriate management of borrow pits.

419. Geological impacts. Soil works, including vegetation clearance, grading, and levelling, compaction, backfilling, and construction of various structures must be carried out at the site and access roads. Changes to soil structure may be caused by mechanical disturbance from these activities. Exposure of soil to rain and wind may in turn cause erosion and loss of top soil.

420. The material for levelling will be a combination of excavated soil on site (approximately 106,000 m^3 of soil[37]), as well as additional soil brought in from other locations. These sites have yet to be identified by the Contractor. Since most of the road will be elevated, a significant amount of soil will need to be brought in (approximately 2.25 million m^3 of embankment fill will be required).[38] The excavated materials suitable for backfilling will be temporarily stockpiled onsite. To the extent possible, soil stripped and stockpiled during site preparation should be reused for the embankments. This phase of the Project is generally the most intensive in terms of potential for topsoil loss. Poor topsoil management can lead to a loss of topsoil through either the air (as dust) or as sediment entrained within surface water flows. Soil erosion can also result from poor management of stockpiled soils, excavated areas, and general construction areas.

[37] Kocks Consult GmbH, Final Feasibility Study Report for Construction of Bakurtsikhe-Tsnori Road Section Project, October 2016.
[38] Ibid.

421. Additionally, soil will be compacted at the site and access roads, the lay down areas, and the construction camp (if established) to ensure soil stability. Movement of heavy vehicles in the construction area will also result in soil compaction and damage to the soil structure. This compaction of the soil may potentially result in changed hydrological characteristics, such as reduced permeability and water infiltration to the soil, which could create additional surface runoff (and increase the flow velocity of this runoff), as well as reducing infiltration into the subsurface.

422. If compaction and erosion are not managed, associated potential impacts could include excessive sedimentation of local waterways, loss of topsoil and reduction in soil fertility, and detrimental changes to site hydrology. As a result of excavation and construction of the roadway embankment, the water regime (mainly towards waterlogging) of the soil on the adjacent sections of land (e.g., farmland running parallel to the proposed alignment) may change. However, soil compaction and erosion due to construction activities will only be in the vicinity of the Project site, which is limited. Loss of topsoil, if not controlled, can result in a waste of valuable topsoil resource which can be used in rehabilitation activities and or/agriculture.

423. As mentioned, the locations of borrow pits and quarries for the Project have yet to be determined. While a number of licensed quarry sites have been located and assessed for their suitability to meet contract requirements regarding adequate quality and quantity (see **Annex 6. Locations of Licensed Borrow Pits and Quarry Sites**), quarrying activity at some sites is likely to result in greater impacts on habitats and the species they support than others. Even if the habitats are not directly removed by excavation, they can be indirectly affected and damaged by environmental impacts – such as changes to ground water or surface water that causes some habitats to dry out or others to become flooded. Nevertheless, with careful planning and management, it is possible to minimize the effect on biodiversity.

424. Soil contamination. Contamination of soil in the construction phase may result from the inappropriate transfer, storage, and disposal of petroleum products, lubricants, chemicals, hazardous materials, liquids, and solid waste. These impacts are particularly associated with construction camps and staging areas where the majority of potentially contaminating chemicals are stored, and during refueling of equipment.

425. It is noted that soil and groundwater contamination due to improper construction waste storage and disposal would be the result of contaminated surface water runoff being discharged from waste storage and disposal areas. The production and discharge of this contaminated surface water is assessed within Section **7.2.4 - Surface and Groundwater**. It is considered that this impact has therefore covered and will not be re-assessed within the context of impacts to soil. This is also the case with the impacts due to improper discharge of waste water and runoff, which if directed to either a surface water, groundwater, or soil receptors would all be subject to similar impacts and thus mitigation, management, and monitoring measures.

Table 49. Assessment of Potential Impacts to Impact of Soil Fertility and Quality (prior to mitigation) – *Site Preparation, Construction, and Worksite Closure Phase*

Impact	Loss of topsoil resources and contamination of soil during construction.		
Impact Nature	**Negative**	**Positive**	**Neutral**
	Geological impacts and soil contamination are **negative**.		
Impact Type	**Direct**	**Indirect**	**Induced**
	The impacts on soil and relief form construction activities are **direct**. The potential impacts related to improper operation of quarry and burrow pits is considered **indirect**.		

Impact Duration	**Temporary**	**Short-term**	**Long-term**	**Permanent**
	Impacts are considered **long-term** as a loss of topsoil may occur over a period longer than the construction phase.			
Impact Extent	**Local**	**Regional**	**International**	
	Impacts to spoil and relief are expected to be largely focused around the Project area (**local**), however many of the licensed quarry and borrow pit sites the Contractor may utilize (see **Annex 6. Locations of Licensed Borrow Pits and Quarry Sites**) are **regional**.			
Impact Scale	The scale of this impact is expected to be moderate given that approximately 106,000 m^3 of soil will need to be stripped and stockpiled.[39]			
Frequency	This impact will occur throughout the construction phase, with the most intensive time being during the clearance activities, vegetation clearance, grading, and levelling, compaction, backfilling, and construction of various structures.			
Impact Magnitude	**Positive**	**Negligible**	**Minor**	**Moderate**	**Large**
	Potential impacts associated with topsoil loss are anticipated to be **moderate** based upon the extent and scale.			
Receptor Sensitivity	**Low**	**Medium**	**High**	
	The resource sensitivity (being the soil) is considered to be **medium** as it a valuable asset which can be easily lost or contaminated due to inappropriate management practices.			
Impact Significance	**Negligible**	**Minor**	**Moderate**	**Major**
	The combination of a *medium* resource sensitivity and *moderate* impact magnitude will result in **moderate** impact significance.			

Management and Mitigation Measures: *Site Preparation, Construction, and Worksite Closure Phase*

- Soil Management
  - 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.[40]
  - Sand and aggregates will be stored in a hopper or bunker which shields the materials from winds. The bunker should enclose the stockpile on three sides. The walls should extend one meter above the height of the maximum quantity of raw material kept on site and extend two meters beyond the front of the stockpile. The hopper or bunker will be fitted with water sprays which keep the stored material damp at all times.
  - Store cement in sealed, dust-tight storage silos. All hatches, inspection points and duct work will be dust-tight.
  - Temporary detention ponds or containment to control silt runoff will be provided.

[39] Ibid.

[40] Topsoil management must comply with requirements set in the Government regulations (N424, dated 31 December 2013) on topsoil removal, storage, use and recultivation. Good management practice experience must be also taken into account. Stockpile must have a natural angle of slope of up to 40° depending on texture and moisture content but, if stable stockpiles are to be formed, slope angles will normally need to be smaller. For stockpiles that are to be grass seeded and maintained, a maximum side slope of 1 in 2 (25°) is appropriate. If the soil is to be stockpiled for more than six months, the surface of the stockpiles should be seeded with a grass/clover mix to minimise soil erosion and to help reduce infestation by nuisance weeds that might spread seed onto adjacent land. Sites of temporary storage of excess material will be agreed with the local municipalities.

  - Intercepting ditches and drains will be created to prevent runoff entering construction sites.
  - Soil compaction may be reduced by strictly keeping to temporary road boundaries.
  - Slopes of embankment will be protected from erosion by vegetation and slope drainage.
  - Disturbed vegetation must be replanted immediately after the construction/disturbance stops.
  - Appropriately set up temporary construction camps (if determined needed) and storage areas to minimize the land area required and impact on soil erosion.
- Soil Contamination
  - Use of offsite fueling and maintenance facilities will be encouraged. However, if 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 refueling of all plant, vehicles and machinery will not be allowed within 50 m of any watercourse, drain or channel leading to a water course.
  - Onsite repairs /maintenance/fueling activities shall be limited. Priority shall be given to offsite commercial facilities. If impossible, a designated area and/or secondary containment for the on-site repair or maintenance activities must be provided.
  - 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.
  - 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.
  - Wastewater Management Plan (see Section **9.a - Waste Management Plan**) and proper sewage collection and disposal system will be implemented to prevent pollution of watercourses (if discharge in surface water is planned).
  - The treatment of hazardous materials encountered in site clearance shall comply with any specific requirements given by the MoEPA, as well as relevant legislation and any other health and safety measures.
  - Water will not be drained to the area where crops may be/are cultivated.
  - A no fly-tipping policy shall be followed.
  - Waste collection area must be sited so as to avoid draining by runoff directly to a water body.
  - Materials to be disposed of will be assessed and where required tested to confirm its chemical characteristics so that it can be categorized as inert, non-hazardous, or hazardous waste as appropriate.
  - Adequate training on environmental protection and safety shall be provided to the staff.
- Quarries
  - Licenced borrow pits and quarry sites will be selected avoiding protected and sensitive areas, nearby settlements, water sources, and in forest areas and fertile agriculture lands.
  - The Contractor will carry out operation of quarries and borrow pits, as well as extraction of gravel from river terraces (if utilized), in strict accordance with the conditions of a license issued by the Ministry of Economic Development (MoED) and cleared by the MoEPA; and

- The Contractor will be responsible to develop, agree, and strictly adhere to Aggregate and Borrow Pits Management Plan (see Section **9.e - Aggregate and Borrow Pits Management Plan**).

Residual Impacts: *Site Preparation, Construction, and Worksite Closure Phase*

426. During the construction phase, a range of waste materials will be generated due to the daily activities of the construction workforce (e.g., generation of food waste) as well as a range of general construction waste such as concrete, steel pipes, plastic pipes, steel plates, structural steel, and wooden crates during the civil works phase of construction.

427. The clearing of land surfaces will modify the land structure due to the removal of vegetation coverage and of surface layers of the land. This removal may expose the land to erosive processes due to wind and rain, however soil measures can be implemented to protect from contamination, improve retention, and support reuse.

428. Based upon the implementation of the above management and mitigation measures, the residual impact level can be reduced to **minor**.

Assessment of Potential Impact: *Operation Phase*

429. Emissions and dust. Impacts on soil from operation of the road will primarily result from the following:

- Emissions of solid particles
- Emissions of liquid matters
- Road maintenance operations

430. The highest degree of contamination does not necessarily have to occur in direct vicinity of the road (except, of course, the closest – marginal part), but lies somewhat further out. This depends on the method of dispersion of pollutants and given local conditions.

431. Solid particles are emitted from the highway as fine dust and widely spread by wind. Distinction is made between large and tiny dust particles. Large particle dust is usually sedimented on green leaves near the road, while finer dust is dispersed by wind to more distant areas as dust suspension or aerosol. Sedimentation of dust on plants reduces the penetration of light and intensity of photosynthesis. Additionally, the dust sediment on the back side of leaves precludes normal transpiration causing physiological disorders. This results in reduced growth of the plant. Additional dust related impacts and mitigation measures are covered in Section **7.2.2 - Air Quality**.

432. Soil contamination from liquids dripping out of vehicle engines (e.g., fuel, motor oils, oil from gear-box and brakes, windshield washing liquids, and anti-freezing products) regularly contribute to the total pollution loading from roads and vehicles. Some of the stated liquids contain heavy metals including lead, cadmium, copper, nickel, vanadium, and molybdenum. The quantity of these substances depends primarily on the traffic intensity (i.e., number of moving vehicles). It is difficult to predict the range and quantity of pollutants released accurately due the wide range of materials that can be released, and the unpredictable nature of the occurrence of leaks and accidents.

433. Increased impervious surfaces. The increased impervious surfaces from the Project footprint are expected to cause an increased flow rate of runoff. This has the potential to cause soil erosion and sedimentation. However, the drainage channels included in the

preliminary designs should accommodate this increased flow rate and the potential impacts can be minimized.

434. Road maintenance impacts. Maintenance operations include the clearance of snow or ice in winter the cleaning of drainage systems, resurfacing of roads and refurbishment of street furniture. Ice breaking salt/material may lead to increase of sodium and chlorine ions in surface runoff and respectively the soil. 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 ions are completely soluble and very mobile, toxic to aquatic life, and has the potential to negatively impact 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 in environment is less prominent due to ion exchange. With consideration of the climate, excessive use of salt and sand during winter months in the Project area is not required and significant impact is unlikely.

435. Finally, litter from users of the road will generally result in elevated levels of solids which may or may not break down in the environment. Littering may harm animals, humans, and spread chemicals in the environment. Litter in the environment can also affect recreational values in an area.

Table 50. Assessment of Potential Impacts to Soil Fertility and Quality (prior to mitigation) – *Operation Phase*

Impact	Potential for soil erosion and contamination from vehicle circulation and maintenance activities during the operation of the road.				
Impact Nature	**Negative**	**Positive**	**Neutral**		
	Potential impacts to soil would be considered **negative**.				
Impact Type	**Direct**	**Indirect**	**Induced**		
	Impacts are considered an **indirect** result of the Project that follow on from the direct interactions between the Project and its environment.				
Impact Duration	**Temporary**	**Short-term**	**Long-term**	**Permanent**	
	Impacts can be expected throughout the lifetime of the road. The duration of potential impacts is therefore **long-term**.				
Impact Extent	**Local**	**Regional**	**International**		
	Potential impacts would be limited to the Project site footprint, as well as areas immediately downstream of the Project site, and hence would be considered to be **local**.				
Impact Scale	The scale of this impact is expected to be small given that it will occur over a relatively limited area around the proposed road.				
Frequency	Impacts related to vehicle related dust, emissions, and trash will be released continuously throughout the operation period. Impacts to soil due to erosion from increased rainwater runoff would occur during rainfall events and will be more frequent during the rainy season. Road maintenance impacts related to clearance of snow or ice in winter will be seasonal.				
Impact Magnitude	**Positive**	**Negligible**	**Minor**	**Moderate**	**Large**
	Potential impacts to soil in the Project area from operation of the road are expected to be of **minor** magnitude.				
Receptor Sensitivity	**Low**	**Medium**	**High**		
	Existing soil quality in the Project area is generally fair, but soil is susceptible to erosion. Overall sensitivity is rated as **medium**.				
Impact Significance	**Negligible**	**Minor**	**Moderate**	**Major**	
	The combination of a *medium* resource sensitivity and *minor* impact magnitude will result in **minor** impact significance.				

Management and Mitigation Measures: *Operation Phase*

- Limit dispersion of fine dust and aerosol to the narrowest area possible through protective revegetation activities on both sides of the road.
- Awareness raising and education of community on waste management (no illegal dumping or littering).
- Periodic inspections will be done to detect signs of slope instability and ensure revegetation where necessary.
- Regular maintenance and cleanup of the drainage system (including litter collection) to prevent impact on soil erosion or flooding.
- Phytoremediation can be considered as one of the most effective mitigation measures of soil pollution.

Residual Impacts: *Operation Phase*

436. If the recommended mitigation measures are implemented, residual impact significance would be **negligible**.

7.2.2 - Air Quality

Scope of the Assessment

437. The air quality impact assessment has focused on the following components of the Project:

- Site Preparation, construction, and worksite closure (i.e., project closure) phase activities with potential air quality impact:
  - Fugitive dust emissions from construction of the bridge and approach roads, including excavation and filling, materials handling, vehicle movement on the haul roads, and wind erosion of open stockpile areas or open bare ground
  - Emissions from vehicle movement and non-road machineries
- Operational phase activities with potential air quality impact:
  - Pollutant emissions from vehicle circulation such as CO, VOCs, NO_2, and CO_2, the greenhouse gas (GHG) which is primarily responsible for global warming
  - Maintenance activities

Identification of Sensitive Receptors

438. The primary human representative air sensitive receptors (ASRs) that will potentially experience air quality impacts from activities during the construction and operation phase of the Project are in the town of Tsnori and the village of Vakiri due to their relative proximity to the proposed alignment and because they are the natural entry points for construction equipment. More broadly, there are sensitive receptors along the transport corridor which will potentially be affected by mobilization of equipment, construction materials/vehicles, staff, and consumables. Impacts on the agriculture in the areas adjacent to the proposed road have also been considered as a sensitive receptor. Finally, there are the effects on regional or global receptors from GHG emissions contributing to climate change which also needs to be considered.

Assessment of Potential Impact: *Site Preparation, Construction, and Worksite Closure Phase*

439. General. Potential sources of impacts to air quality include:

- site preparation and levelling;
- excavation of soil to create building and equipment foundations;
- pile driving for bridge equipment foundations;
- exhaust emission from movement of heavy machinery (e.g., heavy loaders and trucks);
- loading and unloading of materials;
- concreting works, including operation of concrete batching plant, and asphalt plant;
- operation of diesel generators and other diesel-based construction machineries; and
- dust generated from stockpiles of materials, waste, loose earth, and transporting wastes on vehicles.

440. Dust. Dust is the major air quality problem from construction sites and caused primarily by excavation, loading, transportation, and unloading works. Dust is an issue for a variety of reasons, including:

a) ***Health and safety problems***. Dust may irritate eyes and worsen the effects of asthma. Dust can reduce visibility for drivers on roads and be blown long distances by the wind.
b) ***Impact on ecology***. Dust blowing onto watercourses may damage ecology by increasing sedimentation, reducing sunlight, and suffocating fish. It may also affect plant growth and change the species of plants growing in an area.
c) ***Crop damage***. Dust can affect plant and fruit growth, especially dusts that are highly alkaline, for example limestone and cement dust. Dust deposited during light rainfall can cause the soil surface to form a crust increasing runoff.
d) ***Inconvenience to local people***. Dust can coat outdoor laundry, homes, and vehicles.
e) ***Damage to equipment***. Dust can increase abrasion of moving parts in equipment and clogging of air filters within the construction site.

441. Emissions. Vehicles and equipment exhaust emissions can lead to increases in levels of nitrogen oxides (NOx), sulfur dioxide (SO_2), particulate matter (PM_{10} and $PM_{2.5}$), volatile petroleum hydrocarbon constituents, and carbon monoxide (CO), which are key pollutants of concern with respect to human health. It is difficult to accurately quantify or predict dust or exhaust emissions arising from construction activities however. Emissions from vehicles and building machinery will depend on the status of its technical maintenance, quality of fuel, and speed. Fuel use efficiency in old vehicles is generally low and exhaust emissions are higher. At the same time, the new road alignment will allow for more constant speeds which will result in optimal efficiency of circulating vehicles thereby reducing emissions.

442. Impacts from vehicle emissions decrease rapidly with increasing distance from the source and are not likely to be significant at distances of more than 200 m from the source. Impacts are usually minor at a distance of more than 50 m with limited number of vehicles using access roads. Since the contract period for the design and construction works is estimated at 24 months, consisting of different construction activities, air quality impacts generated from these activities will not be static.

443. In addition to these mobile source emissions, there is also the potential for stationary emissions from the activities if a camp site is established by the Contractor, as well as the concrete and asphalt plants. Emissions from camps will be mostly due to heating and power generations in diesel generators, resulting in SO_2, PM, NOx, VOC, and CO emissions. At the asphalt plants and concrete sites, there will be VOC, SO_2, and PM emissions. The locations of construction facilities, the concrete and asphalt plants, and crushing units have yet to be determined at this time.

444. The locations of machinery stationing and material storage are also unknow and will be identified by the Contractor. The few kilometers of the proposed section which runs closest to settled areas of Tsnori is considered the most sensitive.

Table 51. Assessment of Potential Impacts to Air Quality, Air Pollutants (prior to mitigation) – *Site Preparation, Construction, and Worksite Closure Phase*

Impact	(i) Fugitive dust emissions associated with the materials handling, wind erosion of open areas, and truck movements on access roads within the construction worksites; (ii) operation of concrete batching plant; and (iii) Air emissions including NO_2, SO_2, PM_{10} and $PM_{2.5}$ from construction equipment and truck circulation within the work areas.			
Impact Nature	**Negative**	**Positive**	**Neutral**	
	Impact on the environment is **negative**.			
Impact Type	**Direct**	**Indirect**	**Induced**	
	Impacts are considered an **indirect** result of the Project that follow on from the direct interactions between the Project and its environment.			
Impact Duration	**Temporary**	**Short-term**	**Long-term**	**Permanent**
	Impacts are limited to the site preparation, construction, and worksite closure phase and are therefore considered **short-term**.			
Impact Extent	**Local**	**Regional**	**International**	
	Impacts are considered to be **local** in nature.			
Impact Scale	The fugitive dust impacts are expected to be limited, localized (within 100 m from the worksite boundary), and short-term (i.e., throughout the construction period). The air quality impacts are therefore expected to be small in scale.			
Frequency	Fugitive dust and air emissions related to construction will last through the site preparation, construction, and worksite closure phase.			
Impact Magnitude	**Positive**	**Negligible**	**Minor**	**Moderate**	**Large**
	Impact magnitude is considered to be **minor** as there is a large separation distance between the Project site boundary and most ASRs.			
Receptor Sensitivity	**Low**	**Medium**	**High**	
	The receptor sensitivity is considered **medium** as the ASRs identified are largely residential areas.			
Impact Significance	**Negligible**	**Minor**	**Moderate**	**Major**
	Significance of impact is considered to be **minor**.			

<u>Management and Mitigation Measures</u>: *Site Preparation, Construction, and Worksite Closure Phase*

- <u>Construction Dust</u>
  - Dust generating areas will be controlled by water spraying, particularly under dry weather conditions.
  - Stockpiles will be planned and sited to minimize the potential for dust generation by taking into account prevailing wind directions and the locations of sensitive receptors.
  - The drop height of potentially dust generating materials will be kept as low as possible.
  - Where practicable, stockpiles will be located away from sensitive receptors.
  - If crushing of construction materials is required, crushers will be located away from sensitive receptors. Keeping at least 300 m distance from residences windward to concrete production plants shall be ensured.
  - Obtaining an environmental impact permit for an asphalt plant (if planned to run own facility).

  - On-site speed limits will be applied and enforced for trucks travelling on unpaved surfaces (20 km/h).
  - Trucks transporting spoil or other dusty materials off-site will be covered before leaving the sites.
  - Wheel washing facilities will be available and used so that trucks leaving the site do not spread dust onto neighboring roads.
  - Public roads used by site traffic will be swept regularly to prevent accumulation of dirt.
  - Conveyor belts (e.g. at batching plants and rock crushing plants) shall be fitted with wind-boards, and conveyor transfer points and hopper discharge areas shall be enclosed to minimize dust emission.
  - Wherever possible, use electrically-powered equipment rather than gas or diesel-powered equipment.
- Emission and Ambient Air Quality
  - The design-build Contractor will be responsible for undertaking an air quality baseline measurement at and within the vicinity of the proposed road prior to construction. The Contractor will also monitor ambient air quality throughout Project implementation.
  - Construction machines will not be left running in periods between work or will be throttled down to a minimum.
  - The burning of waste or vegetation on site will be prohibited.
  - Special attention will be given in storage and handling of petrochemicals in order to avoid environmental hazards and risks.
  - Maintenance procedures will be implemented in order to keep equipment in good working condition to minimize exhaust emissions caused by poor performance.
  - Training will be provided for the operators of equipment and truck drivers regarding the air pollution potential of their activities.

Residual Impacts: *Site Preparation, Construction, and Worksite Closure Phase*

445. It is considered unlikely that exhaust or dust emissions associated with the construction of the proposed Project would be capable of having a significant effect on nearby sensitive receptors.

446. Assuming that the above management measures will be implemented and monitored over time, the residual impact is assessed as **negligible / minor**. Ongoing monitoring should occur to track implementation and evaluate the mitigation measures.

Assessment of Potential Impact: *Operation Phase*

Emissions. Impact during operation will be related to dust and exhaust emissions from vehicles using the highway. The quantity of pollutant emissions by vehicles depends on a variety of factors, such as type and composition of fuel, efficiency of combustion (e.g., age, wear of vehicles), presence of emission control equipment (i.e., catalyzer), composition of vehicle types (e.g., abundance of trucks, average age and actual performance of engine types), traffic flow characteristics on a specific road section (i.e., average speed, free flow, or congested traffic), and road characteristics (i.e., incline). Increasing speed of the vehicle demands higher fuel supply and therefore results in larger amounts of emitted pollutants. That being said, increased transport efficiency along the new road where a constant speed can be maintained, and traffic is reduced will result in less emissions for vehicles than the existing road where the flow, speed, and traffic levels are variable.

447. Climate Change Impacts ***Caused*** by the Project. The concentration of GHG in the atmosphere beyond the level of naturally occurring concentrations could result in more heat being held within the atmosphere.

448. Transport is considered as the major GHG emitter in Georgia and the increase of emissions from the sector is determined by the following factors:

- Annual growth of the car fleet
- Large share of older vehicles in the fleet
- High traffic of transit vehicles, in particular HGVs
- Fuel quality

449. Traffic accounts for over 60% of CO_2 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 machines, firefighting trucks, etc.). Among the transport related greenhouse emissions, CO_2 dominates with 99.3%.

450. The design speed of the Project road is 100 km/h. Increased speed along the route would result in larger amounts of emitted CO_2 gases, but would also help to avoid emissions due to vehicles travelling at very low speed or being stuck in traffic. One of the measures for CO_2 emissions reduction is proper management of vehicle speed.

451. Other factors influencing CO_2 emissions are hard to foresee. For example, it is possible that in the near future the consumption of low-carbon fuel (such as biofuel and synthetic fuel) will considerably increase resulting in lower emissions than predicted. From a longer-term perspective, as Georgia progresses in the implementation of recommendations for EU approximation, regulations of the age and technical condition of vehicles will stiffen and control over the quality of fuel will enhance, leading to the decrease of impact from the movement of vehicles.

452. Road vehicle emissions on neighboring vineyards. The proposed alignment is adjacent to an area of intensive agriculture and vehicle emissions pose potential risks (in terms of quality, quantity, and value of products) to the horticulture fields, fruit orchards, and vineyards being cultivated. In order to quantify potential air quality impacts on local agricultural associated with projected traffic levels on the Bakurtsikhe-Tsnori Road Section, an air quality impact assessment study[41] was conducted by an international engineering and environmental consultancy[42] (the “Consultancy”) using appropriate air quality modelling methods.

453. As part of the assessment, the Consultancy first carried out a literature review of the potential effect of air pollution from road traffic on vegetation in general, and vines and viticulture in particular. The review documented the mechanisms by which pollution may affect vegetation and identified thresholds below which no adverse effects would be expected. Then an air quality modeling study was carried out through the following steps:

- A road transport emission inventory was developed for the proposed road. This was based on data relating to traffic flows and speeds, vehicle fleet age, fuel type and technology information.

[41] East-West Highway (Bakutsikhe -Tsnori) Improvement Project, Georgia Assessment of air quality impacts on vineyards. ED 12424100 | Issue Number 2 | Date 13/05/2019
[42] Ricardo Energy & Environment

- A representative vehicle fleet for Eastern Georgia was derived from available information, subdividing vehicle categories by age, emissions technology, and fuel type.
- A road transport emissions inventory covering the new road sections, together with relevant connecting road links was compiled. The study focused on the key substances of concern with regard to potential impacts on viticulture, comprising: oxides of nitrogen (NOx/NO_2), SO_2, fine particulate matter (PM_{10} and $PM_{2.5}$) and dust, including resuspension of dust from the road surface.
- Background pollutant concentrations were derived from air quality monitoring carried out at a nearby location.
- Meteorological observations recorded at Tbilisi International Airport were obtained to calculate atmospheric dispersion.
- The dispersion of emissions from the new road[43] was modelled using the latest version of the ADMS-Roads modelling package (version 3.4). ADMS-Roads is an internationally-used advanced Gaussian plume dispersion model which includes advanced features for the treatment of boundary layer stability, vehicle-induced turbulence and street canyons.
- Model results were presented as high-resolution air pollution maps superimposed on digital mapping to allow areas of maximum impacts and exceedance of relevant thresholds to be identified. Additionally, tabulated concentrations at example farming receptors at various distances from the road were calculated.
- Based on the review of air pollution impacts on vegetation, the model results were interpreted to identify zones where impacts may be expected to be significant.
- Finally, the options for monitoring and mitigation of impacts were identified.

454. The locations of approximately 900 individual land parcels adjacent to the new road were identified for the analysis based on official cadaster data and land title registration information maintained by the National Agency of Public Registry (NAPR) within the Ministry of Justice. Each parcel can be identified by a parcel code: these have also been used to support the RD's land acquisition and resettlement actions associated with the Project. The analysis assumed that all land parcels adjacent to the proposed road grow wine grapes or have the potential to do so.

455. The assessment of significance of model results was carried out by considering the forecast levels of airborne pollutant levels and dust deposition rates at these land parcels. The assessment was based on the combined levels of air pollution resulting from baseline levels (due to other sources) combined with the contribution from traffic using the new road.

456. The literature review conducted by the Consultancy confirmed that airborne levels of SO_2 and oxides of nitrogen could potentially have adverse effects on the vineyards and identified concentration levels which would ensure that any impacts can be avoided with a good level of confidence. The World Health Organization (WHO) sets recommended limits for concentrations (levels) of key air pollutants that are harmful to human health, based on global synthesis of scientific evidence. These limits are published in Air Quality Guidelines Global Update 2005[44] and cover particulate matter (PM), ozone, nitrogen dioxide, and sulfur dioxide, but do not cover effects on vegetation. However, the WHO (2000) also publishes Air Quality Guidelines for Europe[45], which includes an evaluation of ecotoxic effects, and effects of air pollutants on vegetation. Although these guidelines are for Europe, the critical levels

[43] Detailed road geometry information was provided by Kocks Consult GmbH.
[44] Air Quality Guidelines Global Update 2005. World Health Organization Europe. https://www.who.int/airpollution/guidelines/en/ Accessed 4th April 2019.
[45] Air Quality Guidelines for Europe, Second Edition, 2000. World Health Organization Europe. https://www.who.int/airpollution/guidelines/en/ Accessed 4th April 2019.

and critical loads that are presented have relevance to vegetation anywhere with a comparable climate to Europe, such as Georgia.

457. Definitions of critical levels and critical loads are given by WHO (2000) as follows:

- **Critical level** is the concentration of pollutants in the atmosphere above which direct adverse effects on receptors such as plants, ecosystems or materials may occur according to present knowledge.
- **Critical load** is a quantitative estimate of an exposure, in the form of deposition, to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge.

458. In the Consultancy's assessment for this Project, critical *levels* for the gaseous pollutants were used since critical levels are more suited to the study of effects at organism level, whereas critical loads are more suited to study of ecosystem effects. In the case of this Project, the Consultancy's assessment was concerned with effects on vine and other fruit crops, with a focus on effects on individual and multiple plants, but we are not concerned about changes in species composition (for example) within ecosystems. The Consultancy also did not consider deposition of SO_2 or NOx to soil. They concluded that any effects on soil pH are likely to be small, and over-ridden by good agricultural soil management that should include pH correction where it is needed. Furthermore, acidifying effects of fertilizer applications are expected to exceed effects of pollution deposition.

459. Critical levels relevant to effects of gaseous road traffic pollution on agriculture are given in Table 52, from the WHO Air Quality Guidelines for Europe, 2000.

Table 52. Critical Levels Relevant to Road Traffic Pollution Effects on Agriculture, from the WHO Air Quality Guidelines for Europe, 2000

Pollutant	Vegetation category	Critical level (µg m^{-3})	Time period
Sulphur dioxide	Agricultural crops	30	Annual and winter mean
NOx	Vegetation	75	Short-term exposure
NOx	Vegetation	30	Annual mean

460. The Consultancy's literature review also indicated that excessive deposition of dust could potentially have an adverse effect on the grape vines. For PM pollution (dust), the WHO does not provide critical levels or loads for vegetation. In published studies of effects of dust on plants or crops, generally deposition rates are given in units of mass per unit area of leaf. There are many reports in the scientific literature about cement, limestone, and coal dusts, but these were not considered in the Consultancy's analysis. Rather, the Consultancy focused on chemically inert dusts and roadside dusts, however for these there are few reports and usually levels or deposition rates are not given. In the absence of established thresholds for effects of dust deposition on agricultural plants, or established evidence of effects of realistic deposition loads, the use of established thresholds for dust nuisance of 200 mg m^{-2} day^{-1} to 80 mg m^{-2} day^{-1} as the assessment benchmark is recommended according to the Environmental Agency for England.[46] The higher benchmark of 200 mg m^{-2} day^{-1} is used as an indicator of potential for dust nuisance in normal situations, such as wind-blown agricultural dust affecting residential properties. The more demanding benchmark of 80 mg m^{-2} day^{-1} is used as an indicator of potential for dust nuisance in situations where the dust is made up of particularly dark materials, such as coal dust or soot, and is less relevant to the agricultural setting of this study.

[46] Environment Agency for England, "Monitoring Particulate Matter in Ambient Air around Waste Facilities," Version 2, July 2013

461. The assessment criteria proposed by the Consultancy for this Project are the WHO critical levels for **SO_2 (30 µg m^{-3} annual mean exposure)** and **NOx (30 µg m^{-3} annual mean exposure; 75 µg m^{-3}, short-term exposure)** (see Table 52) and **200 mg m^{-2} day^{-1} for dust**. It is recognized that there is large and unquantified uncertainty about effects of dust on vegetation, because of a lack of quantitative research studies.

462. With regards to the results of the Consultancy's assessment of air quality impacts, there was significant uncertainty mainly due to the lack of baseline air quality monitoring data, and a lack of information on vehicle emissions. Bearing these uncertainties in mind, the study indicated that the following numbers of sites may be at risk of exceeding standards and guidelines for air quality and dust deposition:

Table 53. Results Table for Assessment of Air Quality Impacts on Vineyards

Pollutant	Number of land parcels exceeding standard/guideline		
	2020	2025	2035
Oxides of nitrogen - NOx (µg.m^{-3})	19	16	12
Dust deposition - PM_{10} deposition (mg m^{-2} day^{-1})	0	6	10
Sulphur dioxide - SO_2 (µg.m^{-3})	0	0	0

Note: The number of land parcels exceeding the standard/guideline for each time period are not cumulative.

463. As shown above, the predicted Project contributions (PCs) to annual mean SO_2 concentrations at the affected vineyards for each of the modelled years would not have any significant effects. The modeled results show that PCs to annual mean SO_2 concentrations in air are less than 1% of the assessment criterion at all modelled locations for all modelled years.

464. Table 54 presents vineyards by parcel code exceeding the threshold for 24-hour mean NOx concentrations with the proposed roadway in place for the three modelled years. Because of background levels of NOx in the environment and uncertainties in the assessment, a modelled emissions contribution from vehicles on the new road of 15 µg m^{-3} or more could potentially result in total levels above 75 µg m^{-3}. Therefore, the left side of the table below shows all the vineyards where the contribution from the new road would be 15 µg m^{-3} or more (these are highlighted in blue). The right side of the table shows the approximate areas within which the modelled contribution from the new road combined with the background level is forecast to exceed the air quality guideline level of 75 µg m^{-3}.

465. For all modelled years, a small number of vineyards, comprising a relatively small area, are found to exceed the criterion of 75 µg m^{-3}. The number of vineyards exceeding the threshold decrease over time, as projected improvements in the vehicle fleet emissions technology counteract the projected increase in traffic flows along the roadway. As this projected improvement in emissions is subject to significant uncertainty, results in the table below assume that vehicle emissions underperform by 30%. While the magnitude of these effects is dependent on the average speed; in this assessment, it has been assumed that the increase in traffic flows will not affect the average speed as even with these increases the road is not near its capacity.

Table 54. Maximum Predicted 24-hour Mean Airborne NOx Concentration for Vineyards Where Contribution is Forecast to Exceed 15 µg.m^{-3}

Parcel Code	Maximum contribution to 24-hour mean NOx concentration (µg.m^{-3})*			Area where contribution + background is forecast to exceed the air quality guideline of 75 µg.m^{-3} (m^2)**		
	2020	2025	2035	2020	2025	2035
585	15.8	14.8	12.6	60	0	0
676	31.7	29.7	25.5	450	380	380
679	36.5	34.3	29.7	60	60	60
680	18.4	17.2	14.8	60	60	0
683	15.3	14.4	12.4	60	0	0
684	17.1	16	13.7	380	190	0
702	16.1	15.1	12.9	60	60	0
723	20.7	19.4	16.7	60	60	60
739	29.1	27.3	23.5	190	190	60
743	15.3	14.3	12.4	60	0	0
745	29.4	27.6	23.8	60	60	60
751	19.3	17.9	15.1	130	130	130
752	19.7	18.5	16	60	60	60
673-1	17.7	16.4	13.7	60	60	0
673-3	42.6	39.7	33.8	320	320	320
673-4	31.4	29.5	25.4	190	190	130
733-3	39.1	36.6	31.4	130	130	130
779-7	9.1	15	16.5	0	0	130
779-8	17	15.9	13.7	60	60	0
779-9	15.7	14.7	12.6	60	0	0
779-10	13.2	21.2	23.1	0	60	60

*Note * The air quality guideline for 24 hour mean NO_2 levels is 75 µg m^{-3}. Because of background levels in the environment and uncertainties in the assessment, a modelled contribution from the new road of 15 µg m^{-3} or more could potentially result in total levels above 75 µg m^{-3}. These entries show all vineyards where the contribution from the new road would be 15 µg m^{-3} or more.*

*** These entries show the approximate areas within which the modelled contribution from the new road combined with the background level is forecast to exceed the air quality guideline level of 75 µg m^{-3}.*

466. Table 55 presents vineyards exceeding thresholds for dust deposition with the proposed roadway in place for the three modelled years. The predicted dust deposition impacts increase over time as projected traffic flows increase; both the number of vineyards affected and the total area of exceedance of each criterion increase. The majority of PM_{10} emissions from the road are from resuspension of dust on the road rather than from vehicle exhausts and are therefore not affected by improvements in vehicle technology. In contrast, NOx impacts decrease over time as the result of projected improvements in vehicle emissions technology.

Table 55. Maximum predicted 24-hour mean dust deposition rate for vineyards where deposition is forecast to exceed 200 mg.m^{-2}.day^{-1}

Parcel Code	Maximum contribution to PM_{10} deposition rate (mg.m^{-2}.day^{-1})		
	2020	2025	2035
676	162.6	212.9	338.2
679	172.2	226.3	362.4
723	114.6	150.4	240.1
739	141.1	185.1	294.8

745	155.8	204.4	326
751	110	142.7	222.3
752	113.8	149.4	238.8
673-3	188.1	245.3	386.3
673-4	163.6	214	339.4
733-3	171.3	224.1	355.4

467. Figure 38 in **Annex 5. Modelled Pollutant Levels at Individual Land Parcels** presents the maximum predicted impacts of annual mean NOx concentrations at each vineyard for 2020, the year of maximum predicted PCs. The majority of impacts are associated with areas where the modelled traffic speed is decreased as the result of speed limits near junctions. Figure 39 in **Annex 5. Modelled Pollutant Levels at Individual Land Parcels** presents the maximum predicted impacts of 24-hour mean NOx concentrations at each vineyard for 2020, the year of maximum predicted impacts. As for dust deposition, the majority of impacts are associated with areas where the modelled traffic speed is decreased as the result of speed limits near junctions. Figure 40 in **Annex 5. Modelled Pollutant Levels at Individual Land Parcels** presents the maximum predicted impacts of particulate matter deposition at each vineyard for 2035. Impacts are spread fairly consistently along the road, as calculated PM_{10} emissions from resuspension are not speed-dependent.

Table 56. Assessment of Potential Impacts to Local Air Quality from Pollutants (prior to mitigation) – *Operation Phase*

Impact	Release of air pollutants including NO_2, SO_2, PM_{10} and $PM_{2.5}$ from vehicle circulation on the new road.				
Impact Nature	**Negative**		**Positive**		**Neutral**
	Potential impacts are considered to be **negative**.				
Impact Type	**Direct**		**Indirect**		**Induced**
	Impact on from air pollutants within the general population from the Project can be considered **indirect**. The new road will increase road capacity and connectivity and with greater volumes of traffic, the amount of air pollutants released will also grow. This can be considered an **induced** impact.				
Impact Duration	**Temporary**	**Short-term**		**Long-term**	**Permanent**
	Impacts are considered **long-term** as the impacts will occur throughout the operation of the road.				
Impact Extent	**Local**		**Regional**		**International**
	The impacts to air quality from pollutants is being considered in this case as **local**.				
Impact Scale	Impact scale on people and the environment scale varies in time and space, depending on several characteristics, such as proximity to roads, the composition of the vehicle fleet, and traffic patterns. The pattern of population exposure depends on both pollution levels and population activities.				
Frequency	Emissions will be released throughout the operation period but will vary in intensity over time and space.				
Impact Magnitude	**Positive**	**Negligible**	**Minor**	**Moderate**	**Large**
	The magnitude of impact is expected to be **minor** considering the proposed road is located in a relatively isolated area with few ASRs within 50 m.				
Receptor Sensitivity	**Low**		**Medium**		**High**
	Considering the human health implications from long-term exposure to air pollutants, the receptor sensitivity is considered **high**.				
Impact Significance	**Negligible**	**Minor**		**Moderate**	**Major**
	As per the impact assessment methodology defined in Section **7.1.6 - Impact Significance**, the combination of high resource sensitivity and minor impact magnitude will result in an overall **moderate** potential impact.				

Table 57. Assessment of Potential Impacts to Atmospheric Air Quality, GHG Emissions (prior to mitigation) – *Operation Phase*

Impact	Potential impacts on climatic condition due to GHG emissions.				
Impact Nature	**Negative**	**Positive**	**Neutral**		
	Potential impacts to climate and human health would be considered to be **negative**.				
Impact Type	**Direct**	**Indirect**	**Induced**		
	Impact on health from air pollutants and emissions within the general population from the Project can be considered **indirect**.				
Impact Duration	**Temporary**	**Short-term**	**Long-term**	**Permanent**	
	Impacts are considered **long-term** as the impacts will occur throughout the operation of the road.				
Impact Extent	**Local**	**Regional**	**International**		
	Greenhouse gases can potentially affect the Earth's climate.				
Impact Scale	Impacts from GHG emissions have the potential to affect the Earth's climate and therefore are considered global in nature.				
Frequency	Emissions will be released throughout the operation period based on vehicle use patterns.				
Impact Magnitude	**Positive**	**Negligible**	**Minor**	**Moderate**	**Large**
	GHG will be emitted from operation of the road. The magnitude of impact is considered to be **minor** relative to the relevant World Health Organization (WHO) Ambient Air Quality Guidelines as recommended in the IFC EHA Guidelines.				
Receptor Sensitivity	**Low**	**Medium**	**High**		
	The greenhouse effect is enhanced by greenhouse gas emissions of anthropogenic nature. The concentration of GHG in the atmosphere beyond the level of naturally occurring concentrations could result in more heat being held within the atmosphere. Receptor/resource sensitivity is rated as **medium**.				
Impact Significance	**Negligible**	**Minor**	**Moderate**	**Major**	
	Overall, the impact significance, based on magnitude and sensitivity, will be **minor**.				

Table 58. Assessment of Potential Impacts on Vineyards (prior to mitigation) – *Operation Phase*

Impact	Effects of road traffic pollutants on vegetation or agricultural production, and vineyards specifically.				
Impact Nature	**Negative**	**Positive**	**Neutral**		
	The nature of the impacts from traffic pollutants on agriculture including vineyards is **negative**.				
Impact Type	**Direct**	**Indirect**	**Induced**		
	Impacts on vineyards from traffic emissions is considered an **indirect** impact.				
Impact Duration	**Temporary**	**Short-term**	**Long-term**	**Permanent**	
	Emissions will be released continuously throughout the operation period.				
Impact Extent	**Local**	**Regional**	**International**		
	The extent of potential impacts on vineyards close to the new road is forecast to be relatively low and therefore identified as **local**.				
Impact Scale	Impacts on the vineyards predicted by the Consultancy are mitigated as a result of the separation of the roadway from the remaining vineyards by a buffer region of up to 20 m. Across this distance, emissions from the road				

	mix with ambient air, reducing pollutant concentrations in the plume and therefore limiting impacts on the vineyards. The roadway is also elevated, which further reduces PCs at vineyard level.				
Frequency	Emissions will be released continuously throughout the operation period based on vehicle use patterns.				
Impact Magnitude	**Positive**	**Negligible**	**Minor**	**Moderate**	**Large**
	Using best estimates of baseline air quality and appropriate assessment criteria, the Consultancy identified less than 20 land parcels that could be affected in 2020 and 22 land parcels in 2025 and 2035 respectively, out of approximately 900 individual land parcels. These affects are likely to be marginal (e.g., concentrated in the portion of the land parcels closest to the road). It is therefore concluded that the impact magnitude should be considered as **minor** significance.				
Receptor Sensitivity	**Low**		**Medium**		**High**
	In the case of the vineyards potentially affected by emissions to air, in view of their regional economic importance and sensitivity to air pollution, it is considered that they should be considered as **high** sensitivity.				
Impact Significance	**Negligible**		**Minor**	**Moderate**	**Major**
	Impact significance is **moderate**.				

<u>Management and Mitigation Measures</u>: *Operation Phase*

468. <u>General.</u> The primary measures for reduction of air pollution impacts during operation is arrangement and maintenance of vegetation barriers along the road. To reduce CO_2 emissions from the transportation sector, attention should be given to more efficient vehicles and alternative fuels. Depending on the policy reforms enacted in the future towards controlling vehicle fleet and technical condition of individual cars, as well as enhancing quality control of fuel, emissions in may decrease or, at least, not increase perceptibly as a result of forecasted increase of traffic. Mitigation measures suggested for construction stage should also apply to road maintenance works (the measures should be relevant to the type of activity and the scale of impact).

469. <u>Road vehicle emissions on neighboring vineyards</u>. In view of the uncertainty in the study conclusions, it is recommended that a program of monitoring should be carried out before and after operation of the road commences. The following procedure for monitoring and mitigation of impacts on adjacent vineyards is recommended:

- **Step 1**: Before the new road opens, measure baseline levels of nitrogen dioxide and dust deposition at illustrative locations
- **Step 2**: Review the baseline findings and update the Consultancy's initial assessment provided above using the identified NOx and PM_{10} air quality guidelines. In light of the improved data on baseline air quality, identify whether mitigation may potentially be required
- **Step 3**: Once the new road is operational, repeat the measurements of levels of nitrogen dioxide and dust deposition at the same locations
- **Step 4**: Review the findings of this assessment to confirm whether mitigation is required
- **Step 5**: If necessary, implement appropriate mitigation

470. Low-cost monitoring techniques are available to enable this survey to be carried out efficiently. It is recommended that baseline and operational phase monitoring for nitrogen dioxide should be carried out using a low-cost diffusion tube technique (see Table 59). It is recommended that baseline and operational phase monitoring for dust deposition should be carried out using a low-cost sampling technique (see Table 59).

Table 59. Air Quality Monitoring Techniques - Nitrogen Dioxide Diffusion Tube and Dust Deposition Gauge

Diffusion Tube	A small (10-15 cm) plastic or metal tube containing an adsorbent material which traps specific airborne chemicals when exposed to the atmosphere over a period of time, typically 1 – 4 weeks. The adsorbent material is then analyzed in a laboratory to determine the average air concentration during the exposure period.	
Dust Deposition Gauge	An instrument designed to collect dust falling onto a surface with a defined area over a period of time (typically 1 to 4 weeks). The amount of dust collected is weighed in a laboratory, and the average dust deposition rate in units of grams per square meter per day is determined.	

471. If monitoring data shows that mitigation is found to be advisable, the most practicable and effective mitigation package is likely to include the following measures:

1. Planting of vegetation barriers at the closest boundary of the vineyards to the road
2. Use of solid fencing as part of the elevated road construction, adjacent to the road
3. Sweeping and watering of roads
4. Ongoing monitoring to confirm effectiveness

472. Regular sweeping and/or watering of roads is an effective means of reducing dust resuspension. This would be the recommended primary means of reducing the impact of the road on dust deposition at nearby vineyards. If indicated by the model results, this measure could be targeted to limited areas of the new road, where potentially significant impacts on vineyards are forecast to occur.

473. As reported in the Consultancy's study, roadside hedges have been identified as a potentially effective way to reduce the effects of particulate air pollution. Varshney and Mitra (1993)[47] found that hedges restricted air pollution by trapping around 40% of particulate matter (PM), the majority of which originated from traffic movement. For roadside PM mitigation, large leaf species were the most effective, but were less effective as distance from the source increased.[48]

474. Farmer (1993)[49] reported that trees and shrubs are very efficient at filtering road dust and supported this by citing several studies with measurements of dust retention on foliage.

[47] Varshney, C.K. & Mitra, Indrani. (1993). Importance of hedges in improving urban air quality. Landscape and Urban Planning. 25. 85-93. 10.1016/0169-2046(93)90124-V.
[48] As cited in Rahul, J. & Jain, M. (2014). An Investigation in to the Impact of Particulate Matter on Vegetation along the National Highway: A Review. Research Journal of Environmental Sciences, 8, 356-372.
[49] Farmer A M, 1993. The effects of dust on vegetation a review." *Environ. Pollut.*79, 63-75.

Similar conclusions were made by Janhall (2015).[50] A study by Abhijith & Kumar (2019)[51] on the impact of green fencing on open road conditions found that PM monitoring at locations consisting of hedge only fencing, had a greater reduction on concentration of particles than mixed hedge/tree and tree only sites.

475. Since grape vines are deciduous, and many trees and shrubs that might be used for mitigation are deciduous, this mitigation action could be used in a precautionary way. The literature reviewed by the Consultancy showed that green fencing can help to mitigate the impact of road usage on nearby vineyards. In the case of the road scheme under consideration here, the effectiveness of this measure would be enhanced by planting vegetation belts on the sloping surface of the road embankment, to as high a level as practicable, and extending as far as possible towards the vineyards. The planting of hedges in this way, where there is sufficient space, would have a reasonable likelihood of providing benefits by reducing dust deposition at the adjacent vineyards. Vegetation density, rate of growth and leaf surface area should be key considerations in selecting effective species of plant.

476. In order to ensure a protective approach, considering the economic importance of the wine sector in the region, mitigation measures will need to be implemented in the areas of the proposed road where land parcels have been identified by the Consultancy's assessment as potentially exceeding thresholds for airborne NOx concentration and dust deposition (see Table 54 and Table 55). Mitigation measures should include planting of vegetation barriers (i.e., trees and hedges) at the closest boundary of the vineyards to the road. Where practicable, vegetation should also be on the sloping surface of the road embankment and extending as far as possible towards the vineyards in line with recommendations. It should be noted that all of the land parcels identified as potentially exceeding thresholds for dust deposition for the time periods modeled (2020, 2025, and 2035) are included in the list of parcels potentially exceeding thresholds for airborne NOx concentration. Therefore, only 21 parcels will need vegetation barriers planted at the closest boundary of the vineyards to the road. This mitigation measure also allows the Contractor to fulfil its responsibility for replanting any trees cut as a result of the Project using species native to the area.

477. Modelling future air emissions is not considered necessary in light of the recommendations outlined above for air quality monitoring before and after operation of the road commences. Moreover, the Project area is rural, agricultural, and largely undeveloped. Besides a limited number of vehicles using the existing Vakiri village secondary road and the service road running parallel to the irrigation canal, including vehicles used by local residents, the circulation of farm equipment, and maintenance vehicles, there are no other potential sources of atmospheric pollution (e.g., quarries, factories) which exist along the proposed alignment. In general, the air quality appears to be good and is not expected that future air quality levels will be above the applicable national standards or international guidelines for protection of human health.

Residual Impacts: *Operation Phase*

478. Residual impacts from the generation of GHGs and other air pollutants will remain throughout the lifecycle of the Project. This is an unavoidable consequence of vehicles powered by fossil fuels, but as noted, more fuel-efficient cars may in the future lead to a

[50] S Janhall, "Review on urban vegetation and particle air pollution – Deposition and dispersion," Atmospheric Environment 105 (2015) 130-137
[51] K.V. Abhijith, Prashant Kumar. Field investigations for evaluating green infrastructure effects on air quality in open-road conditions**.** *Atmospheric Environment*, 2019

decrease in the emissions generated on the Project road. Overall, the residual impact is considered to be **minor**.

479. Residual impacts to neighboring vineyards from road emissions are anticipated to be relatively small in areas where impacts were forecast to occur and can be effectively mitigated with the monitoring and mitigation measures identified above. Under these circumstances, the overall residual impacts are considered to be **negligible**.

7.2.3 - Noise and Vibration

Scope of the Assessment

480. Scoping of potential noise impacts has been undertaken in two stages:

- First, potential interactions between Project activities and sensitive receptors have been identified; and
- Second, taking into consideration the information gathered on the extent and nature of Project activities, and the existing conditions / sensitivities of the baseline, these potential interactions have been prioritized in terms of their potential to cause significant impacts.

481. A noise modelling study was undertaken by an international noise and vibration engineer[52] and a Georgian consulting firm[53] in 2019 which has identified the potential impacts related to noise on sensitive receptors and the necessary mitigation measures. The scope of the analysis covered:

- Conducting background noise measurements
- Predicting construction noise and vibration levels for different constructions phases;
- Traffic noise modeling for years 2020, 2030, and 2035 using information included in the Project traffic study developed during feasibility stage (see Section **4.12.3 - Traffic Projections**);
- Identification of possible noise impacts at sensitive noise receptors based on modeling; and
- Identifying feasible and reasonable construction mitigation measures and traffic noise mitigation options if there would be impacts after project completion.

482. Noise and vibration impacts may occur during various construction phases. Noise and vibration limits outlined in Section **3.3.4 - Noise and Vibration Standards** will be followed for this Project.

483. The simplest definition of noise is 'unwanted sound' which can be produced by many sources such as construction equipment; operating machine tools; as well as friction between road surfaces/tires and engines of vehicles traveling on the road.

484. Vibration is a mechanical phenomenon whereby oscillations occur about an equilibrium point. Noticeable vibration is usually an undesirable situation. For example, the vibrational motions created by impact pile driving, trucks, construction equipment, and tools in an operation are typically unwanted.

Identification of Sensitive Receptors

[52] Mr. Areg Gharabegian, PE
[53] DG Consulting Ltd

485. The nearest human sensitive receptors that may potentially experience impacts from the Project during construction and operational phases are located in the settled areas near Tsnori at the end of the proposed road section. Settled areas along the secondary road (see Figure 4), which will be upgraded as part of the Project, may also experience elevated noise and vibration levels due to related road upgrading work and from use by construction vehicles for the new road alignment. While detailed designs for the secondary road have yet to be completed by the Contractor, this access road will be the only junction connecting the existing S-5 with the new road section between Bakurtsikhe and Tsnori. Therefore, it is expected that the use of the secondary road would increase as well as traffic related noise during the operation phase.

Assessment of Potential Impact: *Site Preparation, Construction, and Worksite Closure Phase*

486. Noise from construction activity. Each construction phase has its unique noise characteristics due to use of different equipment items. The potential sources of noise and vibration during the preparation, construction, and worksite closure phases of the Project include equipment, machinery, and transportation used for the construction activities. The heavy equipment used will be the major sources of noise and vibration. This will include preparing concrete foundations for bridge piers, retaining walls, and structures. There is expected to be an increase in traffic and thereby in traffic noise impacts to receptors near the existing secondary road from the transportation of equipment, construction materials, and workers. The relative isolation of most of the Project site will reduce noise-related disturbance to humans and, as the alignment is going through mainly farmlands, there would be minimal impact on fauna.

487. Construction noise levels at receptors will fluctuate depending on the type and number of equipment, their duration of use and the distance from receptor. The construction activities generating significant levels of noise include:

- preparing and compacting the base for the new roadway;
- bridge construction; and
- laying down asphalt on the new roadway.

488. The main sources of noise and vibration during construction of the Project include:

- construction machinery;
- drilling activities;
- haulage and general vehicle movements;
- concrete mixing and aggregate production systems; and
- construction camps / ancillary facilities.

489. The location of the proposed road and its relative isolation from sensitive noise receptors for a majority of the alignment provide the Contractor with options to locate major stationery sources of noise far from the settled areas. No nighttime construction activities are planned; therefore, there would be no nighttime impacts.

490. Table 60 represents typical noise levels from various construction equipment items. It should be noted that the values indicated in the table may differ depending on the brand and age of machinery provided/used by construction company.

Table 60. Construction Equipment Noise Emission Levels

Equipment	Typical noise level (dBA) approximately 15 m from source
Clamshell	93
Crane	85
Drilling Machines	85
Ditcher/Trencher	80
Scrapers	85
Angle dozers	85
Front loaders	80
Concrete mixer truck	80
Shovel loaders	85
Excavators	83
Bulldozers	85
Roller	78
Grader	83
Paver	80
Dump/flatbed Truck	80
Tractor	84
Concrete pump	81
Backhoe	77
Compactor	78
Impact pilling	100

491. The noise impact assessment completed was performed by identifying sensitive receptors (settlements, dwellings) within minimum distances from alignment boundaries. Calculations have been updated but they need to be finalized by the Contractor when the construction work schedule details and equipment types are determined.

492. The calculation used to determine average construction noise exposure for each piece of equipment is based on the following equation from US Federal Highway Administration Construction Noise Handbook:

$$L_{eq} = L_{max} + 10 \log(UF) – 20 \log(D/15)$$

Where:

a. L_{eq} is the average noise level in A-weighted decibels, dBA,
b. L_{max} is the maximum noise level at 15 meters in A-weighted decibels, dBA,
c. UF is the Usage Factor or the ratio of time equipment is in operation each hour,
d. D is the distance (in meters) from the geometric center of construction activity.

493. Table 61 presents results of the calculated noise levels for different construction activities at 5, 15, and 50 m from the construction activities. It is assumed that the location of the acoustic center for all equipment is at the center of construction activity for each phase. Several bridges are anticipated to be constructed over the existing local roads as part of the proposed Project. It is preferable to use drill and cast in place columns (CIDH) for these bridges instead of impact pilling; however, due to the soil conditions or other reasons, contractor may choose to use impact pilling.

494. As houses are close to a portion of the secondary road that will be reconstructed as part of the proposed Project, there would be possible noise impact from construction activities such as removing any existing asphalt and compacting the base dirt. However, duration of the anticipated noisy construction activities would be short and during daytime. Therefore, residences may not object to the noise, especially when they will be directly benefiting from the reconstructed road as they are the main users of that road.

495. Results also indicate that during impact pilling the predicted noise levels would exceed 90 dBA at 15 m, which is the daytime noise limit for the construction. According to the Project drawings, there would be no noise sensitive receptors at 15 m from the bridge construction activities; therefore, no impacts are anticipated. However, during most of the construction activities noise would be noticeably higher than the background, which is low due to absences of any major noise sources, and it may annoy some nearby residences. No nighttime construction activities are planned; therefore, there would be no nighttime impacts.

Table 61. Construction Noise Levels for Different Phases

No. of Items	Equipment Type	Maximum Equipment Noise Levels at 15 Meters dBA	Hourly Equivalent Noise Levels			Hourly Equipment Usage Percentage	Percent time at full power	Effective Equipment Usage Factor Percentage
			At 5 Meters, dBA	At 15 Meters, dBA	At 50 Meters, dBA			
Roadway construction work								
Phase 1:	**Demolition and removal of the existing secondary access road asphalt**							
1	Excavator	83	88	78	67	60%	50%	30%
2	Dump Truck	80	76	67	56	15%	30%	5%
1	Backhoe	77	80	70	60	40%	50%	20%
1	Back up Alarms	85	87	77	66	15%	100%	15%
		Combined L_{eq}	**91**	**81**	**71**			
Phase 2:	**Preparing and compacting the base for the new roadway**							
1	Excavator	83	83	73	63	20%	50%	10%
4	Dump Truck	80	75	65	54	10%	30%	3%
1	Compactor	78	80	70	60	35%	50%	18%
1	Roller	78	80	70	59	30%	50%	15%
1	Grader	83	83	73	63	20%	50%	10%
3	Back up Alarms	85	88	78	68	20%	100%	20%
		Combined L_{eq}	**94**	**84**	**74**			
Phase 3:	**Laying down asphalt on the new roadway**							
1	Roller	78	82	72	61	40%	60%	24%
3	Dump Truck	75	70	60	49	10%	30%	3%
1	Front loader	80	81	71	61	25%	50%	13%
1	Backhoe	73	72	62	51	15%	50%	8%
1	Back up Alarms	85	87	77	66	15%	100%	15%
		Combined L_{eq}	**89**	**79**	**69**			
Bridge construction work								
Phase 4:	**CIDH for bridge columns**							
1	Drilling Machines	85	90	80	69	50%	60%	30%
1	Concrete pump	81	81	71	61	10%	100%	10%
1	Crane	85	86	76	66	25%	50%	13%
3	Concrete mixer truck	80	74	64	54	5%	50%	3%
		Combined L_{eq}	**92**	**82**	**72**			
Phase 5:	**Impact pilling for bridge columns**							
1	Impact pilling	100	101	91	81	25%	50%	13%
1	Crane	85	86	76	66	25%	50%	13%
2	Flatbed truck	80	74	64	54	5%	50%	3%
		Combined L_{eq}	**101**	**91**	**81**			
Phase 6:	**Preparing wood forming for the bridges and pouring concrete**							
2	Small tools/wood cutting	75	77	67	57	25%	70%	18%
4	Concrete mixer truck	80	77	67	57	10%	50%	5%
2	Concrete pump	81	81	71	61	20%	50%	10%
1	Back up Alarms	85	80	70	59	3%	100%	3%
		Combined L_{eq}	**88**	**78**	**68**			

496. Vibration. Impact pilling and dirt compacting using vibratory roller as well as wheel compactors would generate the highest vibration levels. Results of the measured vibration levels from numerous impact pilling have indicated that impact pilling would not cause any structural damage, even cosmetic at distance beyond 50 m from the pilling location. As according to the Project drawings there are no structures within 50 m of impact pilling, no impact is anticipated. However, vibration from the impact pilling can annoy some people at distance up to 100 m. Therefore, vibration levels are expected to be felt only locally near construction sites of the bridges and should not have negative impacts on a large number of residents. Prior to construction, the status of the nearest buildings will be checked to avoid unjustified complaints from the community regarding damages caused by construction related vibration.

497. Activities related to the compacting of dirt for the new roadway or secondary road would be another source of high vibration level. No structural damages are anticipated beyond 30 m from dirt compacting. If there are structures with such distance, especially along the secondary access road, then level of the force for the vibratory roller must be reduced to avoid any possible impacts. It is not anticipated that a wheel compacter will be used for the reconstruction of the secondary access road. Residences of the row of houses located on the south side of the highway may be annoyed from the vibration for the short periods of time when dirt compacting activities are in front of their houses.

Table 62. Assessment of Potential Impacts Noise and Vibration (prior to mitigation) – *Site Preparation, Construction, and Worksite Closure Phase*

Impact	Noise and vibration emissions resulting from the use of machinery and equipment and vehicle circulation.				
Impact Nature	**Negative**	**Positive**	**Neutral**		
	Noise impact from the construction activities is **negative**.				
Impact Type	**Direct**	**Indirect**	**Induced**		
	Noise impact from the construction activities is **direct**.				
Impact Duration	**Temporary**	**Short-term**	**Long-term**	**Permanent**	
	Noise impact from the construction activities will last through the construction phase and is considered **short-term**.				
Impact Extent	**Local**	**Regional**	**International**		
	Noise impact from construction equipment and activities is **local**.				
Impact Scale	Impacts include the Project Area as well as any specific construction related sites outside of the Project Area such as borrow pits, quarries, and work camps.				
Frequency	Throughout the construction period but varying over time and space.				
Impact Magnitude	**Positive**	**Negligible**	**Minor**	**Moderate**	**Large**
	Noise emissions and construction related vibration will be of short-term nature and limited to civil engineering works and site deliveries.				
Receptor Sensitivity	**Low**	**Medium**	**High**		
	The identified noise sensitive receptors are residential, the sensitivity of the receptor is considered as **medium**.				
Impact Significance	**Negligible**	**Minor**	**Moderate**	**Major**	
	As the impact magnitude is *minor* and the receptor sensitivity is *medium*, the impact significance is considered as **minor**.				

Management and Mitigation Measures: *Site Preparation, Construction, and Worksite Closure Phase*

- Restrict construction hours to between 07:00 to 20:00 hours within 500 m of the houses and other noise sensitive receptors.
- Set optimum travel speed during offsite travel.
- Install temporary noise barriers made of plywood or acoustical blankets around noisy operation where necessary to comply with project noise limits.
- Train staff in construction best practice.
- Regular maintenance of equipment such as lubricating moving parts, tightening loose parts, and replacing worn out components.
- Use newer equipment with improved noise muffling and ensure that all equipment items have the manufacturers' recommended noise abatement measures, such as mufflers, engine covers, and engine vibration isolators intact and operational. Newer equipment will generally be quieter in operation than older equipment. All construction equipment should be inspected at periodic intervals to ensure proper maintenance and presence of noise control devices (e.g., mufflers and shrouding, etc.).
- Shut down or throttle down between work periods for machines and construction plant items (e.g., trucks) that may be in intermittent use.
- Reduce the number of equipment operating simultaneously as far as practicable.
- Orientate equipment known to emit noise strongly in one direction so that the noise is directed away from receptors as far as practicable.
- Locate noisy plants as far away from receptors as practicable.
- Avoid transportation of materials on- and off-site through existing community areas during nighttime hours.
- Use material stockpiles and other structures, where practicable, to screen noise sensitive receptors from on-site construction activities.
- Record and respond to complaints according to the established grievance redress mechanism.
- Keep nearby residences informed in advance about noisy activities during various construction phases.
- Perform independent periodic noise and vibration monitoring to demonstrate compliance with Project noise and vibration limits.
- When there is a possibility of human annoyance from construction activities, conduct such activity only during weekday daytime hours when the ambient background noise and vibration is higher and many residents are away from their homes at work.
- Use CIDH method for bridge columns instead of impact pilling near noise sensitive areas if it is practical.
- Reduce force of the vibratory roller on the portion of the secondary access road where there are houses along the road to avoid vibration impacts.

Residual Impacts: *Site Preparation, Construction, and Worksite Closure Phase*

498. Despite the fact that comprehensive mitigation measures have been set to manage construction noise and vibration, there may still be instances where construction works may result in unanticipated elevated noise levels and vibration. However, these will only be temporary and localized. Good oversight and regular monitoring from the Contractors Health, Safety and Environment (HSE) team and the Engineer's environmental manager should limit noise impacts to the extent possible. Residual impacts are assessed as **negligible / minor**.

Assessment of Potential Impact: *Operation Phase*

499. Traffic noise and vibration studies have been conducted for the Project to determine compliance with the operational limits and recommend mitigation measures as needed.

500. Noise analysis. Main components for conducting a traffic noise study are roadway alignment, location, and elevation of receptors, traffic volumes, as well as distribution of the volume between different vehicle types and traffic speed. Using this information, future traffic noise levels can be predicted using a computer model. The sources of noise during operation phase will be running engines, friction between tires and the road, and sonic signals created by vehicles.

501. A computer noise model was developed using SoundPLAN to predict traffic noise levels for years 2020, 2030, and 2035 and analyze possible noise impacts. SoundPLAN is a three-dimensional noise modeling program that utilizes ray-tracing techniques to predict noise levels. SoundPLAN not only considers sound propagation over distance from multiple sources, but also considers shielding from intervening structures and barriers, reflections off of buildings and walls, atmospheric absorption of sound, as well as ground effects on the sound propagation between sources and receivers. The three-dimensional model was developed using aerial photographs, CAD/DTM files, and future development plans.

502. Traffic volume is one of the main input items for conducting traffic noise study. Besides traffic volumes, types of the vehicle are also important. Table 63 provides traffic volume distribution by daytime and nighttime as well as by vehicle type. It has been assumed that this distribution will be same for all the future years.

Table 63. Day and Night Traffic Distribution

Day/Night split (hrs)	Car	Minibus	Bus	LGV	MGV	HGV 3	HGV 4+	Total
07:00 – 22:00	88.2%	93.6%	100.0%	84.6%	92.4%	90.7%	87.1%	88.1%
22:00 – 07:00	11.8%	6.4%	0.0%	15.4%	7.6%	9.3%	12.9%	11.9%

Notes: LGV = large goods vehicle, MGV = medium goods vehicle, and HGV = heavy goods vehicle

503. Using the information provided in Table 63 and forecasted traffic for the future years provided by the Project traffic specialist, the traffic distribution has been calculated for three different years and then this data is used for predicting traffic noise impacts. Table 64 represent detailed information about traffic volumes and distribution. It is assumed that the traffic speed for all the vehicles types will be 90 km/h. As the new highway will be located in a rural area, per project traffic specialist, there would be no peak traffic hour. Therefore, average hourly noise levels (L_{eq}) for daytime and nighttime are predicted for a typical hour. Certain categories of vehicles identified in the traffic report are combined into the categories that are used for the noise modeling.

Table 64. Traffic Distribution for Noise Modeling

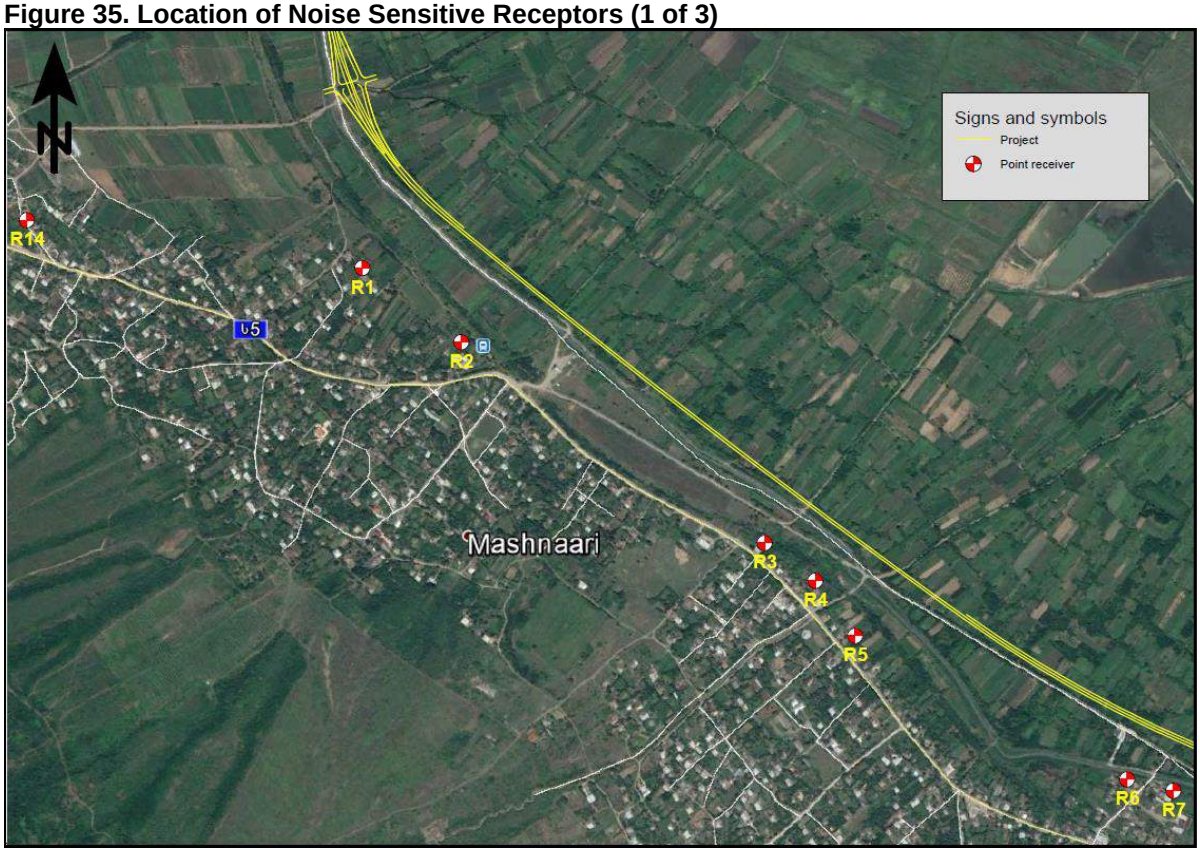
Year		Cars				Buses			Medium Trucks				Heavy Trucks				Total
		Car	Minibus	Daily	Hourly	Bus	Daily	Hourly	LGV	MGV	Daily	Hourly	HGV 3	HGV 4+	Daily	Hourly	
2020	ADT	1793	227	2020	--	7	7	--	337	97	434	--	113	68	181	--	2,642
	Day	1581	212	**1793**	**120**	7	**7**	**0.3**	285	90	**375**	**25**	102	59	**161**	**11**	2,336
		88.2%	93.6%			100.0%			84.6%	92.4%			90.7%	87.1%			
	Night	212	15	**227**	**25**	0	--	--	52	7	**59**	**7**	11	9	**20**	**2**	306
		11.8%	6.4%			0.0%			15.4%	7.6%			9.3%	12.9%			
2030	ADT	2774	351	3125	--	11	11	--	507	146	653	--	170	103	273	--	4,062
	Day	2447	329	**2776**	**185**	11	**11**	**0.5**	429	135	**564**	**38**	154	90	**244**	**16**	3,595
		88.2%	93.6%			100.0%			84.6%	92.4%			90.7%	87.1%			
	Night	327	22	**349**	**39**	0	--	--	78	11	**89**	**10**	16	13	**29**	**3**	467
		11.8%	6.4%			0.0%			15.4%	7.6%			9.3%	12.9%			
2035	ADT	3279	415	3694	--	13	13	--	600	173	773	--	201	122	323	--	4,803
	Day	2892	388	**3280**	**219**	13	**13**	**0.5**	508	160	**668**	**45**	182	106	**288**	**19**	4,249
		88.2%	93.6%			100.0%			84.6%	92.4%			90.7%	87.1%			
	Night	387	27	**414**	**46**	0	--	--	92	13	**105**	**12**	19	16	**35**	**4**	554
		11.8%	6.4%			0.0%			15.4%	7.6%			9.3%	12.9%			

Note: Bold numbers are used as input to the SoundPLAN computer program.

504. There is no traffic study for the secondary road that goes through village of Vakiri that will be fixed as part of this Project. The RD suggested that there will be 200 cars per day on that road. It is assumed that all of that traffic would be during daytime hours.[54] Based on this information and traffic observation during the noise measurements, 12 cars and two medium trucks per peak hour and a speed of 40 km/h is assumed for the purpose of the noise analysis for all three future years. Presently road surface is in a poor condition; therefore, additional noise is generated when cars travel on the road. This additional noise will go away as the road in resurfaced.

505. Fourteen noise sensitive receptors were identified to determine the traffic noise impacts. Figure 35, Figure 36, and Figure 37 show locations of these receptors and Table 65 presents predicted hourly daytime and nighttime peak noise levels at these receptor locations. In addition, noise contours were developed for day and night average hours for years 2020, 2030, and 2035 plus day-night average noise levels for these three years. These contour maps are included in **Annex 4. Noise Contour Maps**. Predicted noise levels at each receptor and contours are representing noise levels at 1.5 meters above the ground.

Figure 35. Location of Noise Sensitive Receptors (1 of 3)



[54] Davit Getsadze, Roads Department, pers. comm. March 20, 2019

Figure 36. Location of Noise Sensitive receptors (2 of 3)

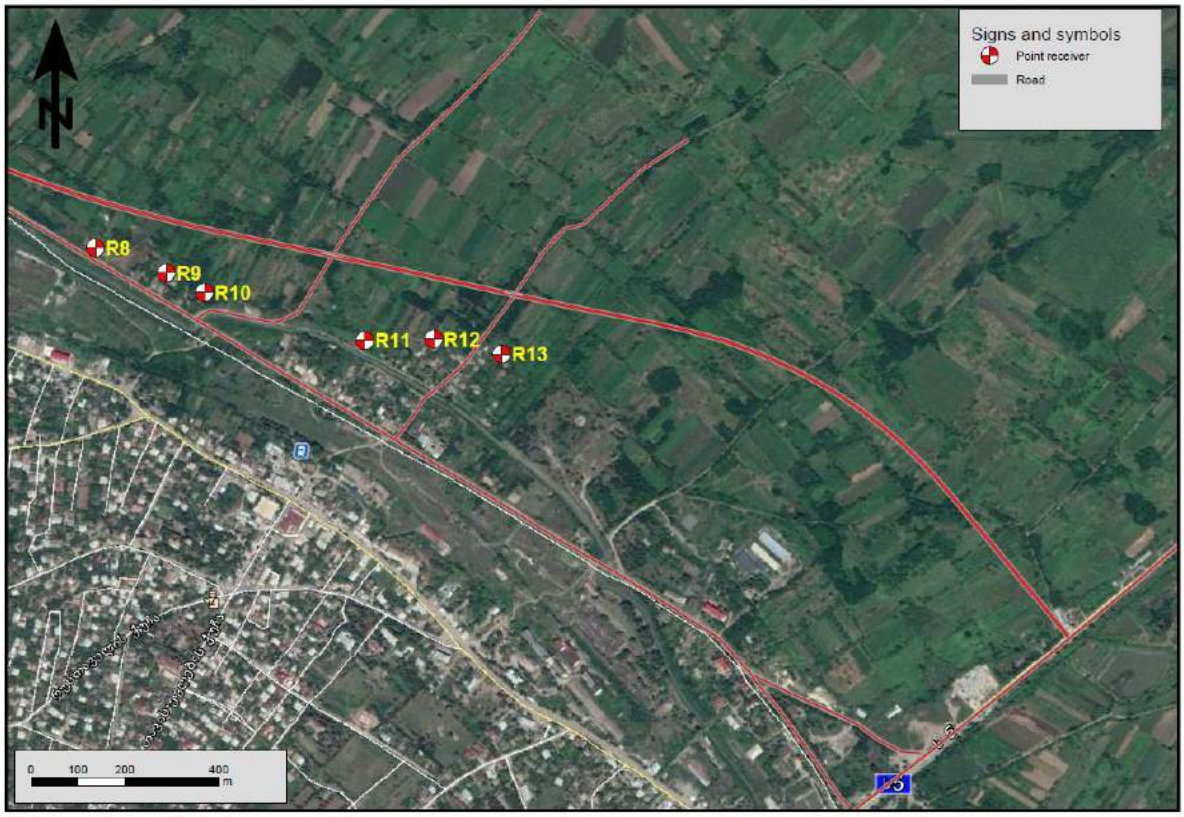


Figure 37. Location of Noise Sensitive receptor (3 of 3)

506. Table 65 provides existing and predicted noise levels for years 2020, 2030, and 2035. Noise levels were measured only at three of the 14 receptor locations. One of the

noise measurement sites was along the secondary access road which is representing houses along that road. However, the other two measurements sites represent noise levels at other nearby grouping of houses with similar conditions. Utilizing measured data at Receptors R4 and R12, existing noise levels were estimated at the other nearby receptor locations.

507. Results of the analysis indicate that daytime noise levels for all three years would be below IFC 55 dBA noise limit. However, predicted nighttime noise levels at some receptor locations would be approaching or above nighttime noise limit of 45 dBA. As the existing peak nighttime noise levels is already at 45 dBA at Receptors R8 through R13; therefore, per IFC guidelines, the nighttime noise limits for these sites will be 48 dBA (45 + 3). This means that there would be no nighttime noise impacts at Receptors R8 through R13.

508. Predicted noise levels for year 2035 at Receptors R4 and R6 is 44.6 dBA. Even though this is below the IFC 45 dBA limit, it can be considered approaching the limit and at the limit, if values are rounded. At this point no noise mitigation measures are recommended due to the uncertainties related to the forecasted traffic values for 15 years into the future, but it is recommended to conduct noise measurements 10 years and then 15 years after opening of the propose highway to determine the exact traffic noise levels at the nearby noise sensitive receptors. If measured limits are at above the noise limits, then appropriate noise mitigation measures such as noise barriers at the shoulder of the elevated road should be considered.

Table 65. Existing and Future Predicted Traffic Noise Levels

Receptors	Existing peak hour Leq, dBA		2020 average hour Leq, dBA		2030 average hour Leq, dBA		2035 average hour Leq, dBA	
	Day	Night	Day	Night	Day	Night	Day	Night
R1	54.7	45.1	41.9	35.2	43.7	37.0	44.5	37.9
R2	51.5	44.0	43.9	37.0	45.5	38.8	46.3	39.7
R3	51.5	44.0	48.6	41.8	50.3	43.6	51.1	44.4
R4*	51.5	44.0	48.7	42.0	50.4	43.8	51.2	44.6
R5	51.5	44.0	45.6	38.7	47.2	40.5	48.0	41.4
R6	51.5	44.0	48.5	41.9	50.3	43.7	51.1	44.6
R7	51.5	44.0	48.3	41.6	50.0	43.4	50.9	44.3
R8	54.7	45.1	51.6	44.9	53.4	46.7	54.1	47.6
R9	54.7	45.1	51.3	44.6	53.0	46.4	53.8	47.3
R10	54.7	45.1	50.8	44.1	52.5	45.9	53.3	46.8
R11	54.7	45.1	48.7	42.0	50.4	43.8	51.2	44.7
R12*	54.7	45.1	51.2	44.6	53.0	46.4	53.7	47.3
R13	54.7	45.1	50.2	43.4	51.9	45.3	52.6	46.1
R14*‡	51.6	44.2	50.0	--	50.0	--	50.0	--

*Notes: Existing and future predicted noise levels that are within the IFC dBA noise limit are identified in **green**. Existing and future predicted noise levels that already exceed the IFC dBA noise limit but that do not result in an increase of more than 3 dBA over existing ambient noise at the nearest receptor location off-site are identified in **yellow**.*
** Noise measurement site*
‡ There would be no night-time traffic related noise as it is assumed that would be no traffic during night-time hours on the access road.

509. Vibration from the vehicular traffic is negligible from well-maintained highways. If there are expansion joints or potholes on the highway, then there may be some vibration when heavy trucks are passing over them. However, even in these cases, vibration levels are hardly noticeable beyond the shoulder of the roadway. No vibration impacts are anticipated from the operation of the proposed highway at the nearby sensitive receptors.

Table 66. Assessment of Potential Impacts to Noise and Vibration (prior to mitigation) – *Operation Phase*

Impact	Noise impact from circulating vehicles during operational phase.				
Impact Nature	**Negative**		**Positive**		**Neutral**
	Noise impact from the operational activities is **negative**.				
Impact Type	**Direct**		**Indirect**		**Induced**
	Noise impact from the operational activities is **indirect**.				
Impact Duration	**Temporary**	**Short-term**		**Long-term**	**Permanent**
	Noise impacts will occur for as long as the road is operational and is considered **long-term**.				
Impact Extent	**Local**		**Regional**		**International**
	Noise impact from the operation activities will be limited to the areas around the highway and is **local**.				
Impact Scale	The impacts have the potential to disturb people and fauna along the entire road, however traffic noise impact studies indicate levels will be within IFC standards and no noise mitigation measures are recommended at this time. It should be noted however that no Noise and Vibration modelling has been done to date for the Vakiri Village access road.				
Frequency	The frequency of noise impacts would fluctuate throughout the operation period.				
Impact Magnitude	**Positive**	**Negligible**	**Minor**	**Moderate**	**Large**
	The proposed road is relatively isolation from sensitive noise receptors and predicted noise levels comply with the IFC noise criteria. However, a new noise source will be introduced to the rural area once the Project is operational. Therefore, the magnitude of the noise impact is considered **minor**.				
Receptor Sensitivity	**Low**		**Medium**		**High**
	Considering the physical and psychological health consequences of regular exposure to consistent elevated sound levels, sensitivity is considered as **high**.				
Impact Significance	**Negligible**	**Minor**		**Moderate**	**Major**
	As the impact magnitude is *negligible* and the receptor sensitivity is *high*, the impact significance is considered as **moderate**.				

Management and Mitigation Measures: *Operation Phase*

510. Once the Bakurtsikhe-Tsnori road section enters into operation, RD should conduct monitoring of noise levels and depending on the outcome implementing additional mitigation measures if necessary.

511. The Contractor, before preparing the detail design, will be asked to prepare the Noise and Vibration modelling for the access road leading from the proposed Bakurtsikhe-Tsnori road section to the S-5 (see Figure 4). The modelling will indicate whether mitigation measures need to be developed and implemented to address noise levels during the operation phase along the secondary road.

512. Additional measures may be required later during operation where monitoring reveals exudences of noise limit or if complaints from residents are received.

Residual Impacts: *Operation Phase*

513. Results of the traffic noise impact analysis indicate that there would be no noise impact per IFC guidelines; however, a new noise source will be introduced to the rural area once the Project is operational. Monitoring of the nearby noise sensitive sites will be required

in the future to determine actual noise levels in these areas. Where they exceed IFC standards, the RD will consult with the affected owners to determine the most acceptable noise mitigation measures. Overall, the residual impact is considered **minor**.

7.2.4 - Surface and Groundwater

Scope of the Assessment

514. The surface water and groundwater impact assessment has focused on the following components of the Project:

- potential impacts on the hydrology or quality of the water environment from physical intervention and intentional and accidental discharges to water during construction; and
- potential impacts on the water environment during operation of the project including at the bridges, the irrigation channel, and along the roadway.

515. Note that as previously mentioned, some of the conditions and effects described, particularly with regard to contamination and hydrogeology, may interact with other parameters such as ecology and soil.

Identification of Sensitive Receptors

516. Surface water receptors along the Project alignment include rivers and water courses. All of these receptors are vulnerable to physical disturbance, for example from construction of the road and any river crossings; introduction of pollutants, including sediment, to rivers that will affect their water quality, which in turn will affect their ecology and economic importance; or contamination of runoff that may eventually reach drinking water supplies or agricultural fields.

517. In the Project area, the irrigation canal is identified as the most prominent potential receiving body. This canal services farms on both sides of the proposed road section and impacts to the quality of the canal water has the potential to create health impacts to the local population. Groundwater contamination could impact the availability for groundwater for users in surrounding communities. Potential impacts to the Chaloubniskhevi River, which is tributary to the Alazani River, have also been considered since the Project alignment will be crossing it at the start of the road section.

Assessment of Potential Impact: *Site Preparation, Construction, and Worksite Closure Phase*

518. General. During the construction and operation phases, different activities have the potential to generate wastewater, accidental spills, sedimentation, and increased water consumption, which could lead to impacts on the hydrology and quality of surrounding freshwater bodies.

519. Impacts on the water environment during preparation works and works during construction of the road and bridges may be generated from the following sources:

- 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 riverbeds;
- penetration of the contaminated sewage water into surface waters;
- contamination of groundwaters by infiltrated contaminated surface water; and
- littering.

520. Road and bridge construction, as well as relocation of utility infrastructure, will disturb surface soils and could affect surface water in the Project area through increased sedimentation of rivers, such as cutting and filling operations, excavation of pipeline trenches, bridge constructions, and embankment works.

521. Groundwater. The scale of impact on groundwater will depend on the 'depth' of water horizon. The risk of impact on shallow aquifers which are more vulnerable may exist. The impact probability in the bridge construction areas, where extensive excavation compared to that during the road construction works is needed, is higher. During drilling works conducted as part of the geotechnical investigations (see Section **6.1.2 - Geomorphology, Geology, and Soils**), ground water was encountered in a number of boreholes at a depth between 2.2 and 9.1 m below the surface. The ground water encountered is increasingly closer to the surface as the alignment approaches the town of Tsnori (see Figure 18).

522. In-river construction. Construction of bridge foundations has the potential to disturb river sediment and further increase suspended solid concentration in river and canal water bodies. The impacts to the Chaloubniskhevi riverbed are expected to be minimal considering the intermittent short-lived period of disturbance and that fact that this seasonal river is typically dry part of the year.

523. Water contamination. Surface water contamination may occur during the construction phase due to accidental leaks or spills of chemicals or hazardous materials such as oils, lubricants, or fuel from heavy equipment; improper chemical/fuel storage; inappropriate disposal of domestic wastewater; washdown water from construction equipment; and from waste materials if not stored and disposed of properly. These issues have been covered fully in Section **7.2.1 - Soil and Relief**.

524. During construction, runoff water will need to be managed through an arrangement of settling ponds. Water collected in the pond can be used for dust suppression (assuming it is not contaminated) or other use as technical water. Part of the water will evaporate, and accumulated sediments can be removed/disposed of safely. Settling ponds may be constructed directly on compacted earth or with a high-density geotextile sheet covering the ground and ridges.

525. A settling basin is required for management of waste water from concrete production/batching on site. The decision on the need for a concrete batching plant on the Project site rests with design-build Contractor identified through tendering.

526. Water quality testing. The proposed road crosses the Chalaubniskhevi River near Bakurtsikhe and runs parallel to the agriculture canal for approximately 13 km. The canal is also crossed at km 11+386 where an interchange along the proposed alignment provides access to secondary road leading to the S-5 (see Figure 4 and Figure 9). Since the quality of surface and ground water can quite easily be contaminated or polluted during the construction stage and pose a threat to the local ecology and the health of livestock and humans, a water quality testing was undertaken to establish a baseline for monitoring. The results and analysis are provided in Section **6.2.3 - Surface Water Quality**.

527. While most of the water quality results meet applicable Georgian national and IFC surface water quality standards (see Section 2.3.2 - Surface Water Quality Standards), bacterial counts across the sampling points and testing dates are significantly higher than the maximum allowable concentrations. While an exact explanation for this cannot be discerned from the available data, it is likely due to anthropogenic factors including potential discharges of untreated wastewater and or the presence of livestock waste. It will be necessary for the Contractor to monitor water quality in the irrigation canal throughout the site preparation, construction, and worksite closure phase and to ensure total coliform counts do not substantially increase above baseline testing results.

Table 37. Assessment of Potential Impacts to Hydrology (prior to mitigation) – *Site Preparation, Construction, and Worksite Closure Phase*

Impact	Potential for impacts to surface and ground water due to: (i) contamination from accidental releases of hazardous substances such as fuels, oils or lubricants; (ii) improper chemical/fuel storage; and (iii) wastewater discharges and sediment laden runoff. Potential secondary impacts to downstream users of irrigation canal.				
Impact Nature	**Negative**	**Positive**	**Neutral**		
	Potential impacts to surface and ground water **negative**.				
Impact Type	**Direct**	**Indirect**	**Induced**		
	Impacts from Project activities to surface and groundwater resources would be **direct.**				
Impact Duration	**Temporary**	**Short-term**	**Long-term**	**Permanent**	
	The construction phase will last approximately 24 months. The duration of potential impacts is therefore **short-term**.				
Impact Extent	**Local**	**Regional**	**International**		
	Potential impacts would be limited to the Project site footprint, as well as areas immediately downstream of the Project site, and therefore are considered to be **local**.				
Impact Scale	Construction activities will take place within the Project area. The scale of potential impacts is potentially large due to the activities planned as part of the Project and its proximity to sensitive receptors (e.g., the irrigation canal).				
Frequency	Impacts to surface and groundwater resources could occur intermittently but repeatedly throughout the day for the duration of the construction phase.				
Impact Magnitude	**Positive**	**Negligible**	**Minor**	**Moderate**	**Large**
	The potential impacts to surface water quality in the Project area are expected to be of **moderate** magnitude.				
Receptor Sensitivity	**Low**	**Medium**	**High**		
	Surface water quality analysis from the baseline surveys indicated that the surface water near the Project site had elevated levels of total coliform and total suspended solids. The Project is near sensitive receptors with regards to surface water quality, such as agricultural lands, which rely on surface water for irrigation. Overall sensitivity is rated as **high**.				
Impact Significance	**Negligible**	**Minor**	**Moderate**	**Major**	
	The combination of a *high* resource sensitivity and *moderate* impact magnitude has the potential to result in an impact of **major** significance.				

<u>Management and Mitigation Measures</u>: *Site Preparation, Construction, and Worksite Closure Phase*

528. Water quality analysis in the canal using the same parameters tested for the baseline (see Table 41) in accordance with international best practice will be required of the Contractor monthly during the construction phase. In addition, an updated baseline of the water quality in the canal should be established since it is expected that water quality will

continue to change as a result of hydrological variances (i.e., from flooding and droughts) and biological processes in the water (e.g., ambient temperature changes and the presence of agricultural inputs like pesticides and fertilizer). Surface water from the Chalaubniskhevi River should also be tested when water is present.

- Discharges and Sediments
    - Monthly water quality analysis in the canal using the same parameters tested for the baseline in accordance with international best practice.
    - Discharge of any untreated water into surface water bodies will be strictly prohibited.
    - Discharge of cement contaminated water will be prohibited.
    - Discharge into the irrigation canal will not be permitted.
    - To prevent runoff contamination, paving should be performed only in dry weather.
    - In disturbed soil areas, compacted straw (straw bales), silt fence, fiber rolls, gravel bags, or other approved sediment control must be ensured. At a minimum, all bare soil (whether it's an abutment slope or a stockpile) must be protected before it rains.
    - Regularly, and particularly following rainstorms, inspect and maintain drainage systems and erosion control and silt removal facilities to ensure proper and efficient operation at all times.
    - Vegetation must be preserved where feasible, in particular in the areas near the river bank to avoid erosion/sedimentation. Revegetate areas promptly, where practicable and appropriate.
    - The construction camp (if needed), permanent or temporary, will not be located within 500 meters of any river, or irrigation canal.
    - Areas where concrete mixers can wash out leftover concrete without polluting the environment will be provided. This may be in the form of a lined settling pond. Drivers will be informed of these locations and the requirements to use these settling ponds on a routine basis by the Engineer.
    - Wastewater Management Plan (see Section **9.a.i - Wastewater Management Plan**) and proper sewage collection and disposal system will be available to prevent pollution of watercourses (if discharge in surface water is planned, other than the canal).
- Waste Management
    - Materials and waste must be stockpiled so as to avoid erosion and washing off into surface water bodies. Drainage trenches must be established to divert surface runoff from the site.
    - Implement proper storage of the construction materials and wastes to minimize the potential damage or contamination of the materials.
    - Implement construction materials inventory management system to minimize over-supply of the construction materials, which may lead to disposal of the surplus materials at the end of the construction period.
    - Segregate hazardous and non-hazardous waste and provide appropriate containers for the type of waste type.
    - Store waste systematically to allow inspection between containers to monitor leaks or spills.
    - Dispose of waste by licensed contractors.
    - Storm water drainage and wastewater will be treated in accordance to the applicable World Bank/IFC guidelines.
- Hazardous Substances
    - Use of offsite fueling and maintenance facilities will be encouraged. Should any temporary fuel tank be available, it must be located at least 50 m away from any watercourse, drain, or channel leading to a water course. 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. The bund will be able to accommodate 110% of the volume of the tank.
- Onsite repairs /maintenance and fueling activities should be limited.
- Onsite vehicles and equipment shall be inspected regularly for leaks and all leaks shall be immediately repaired. 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.
- Tire washing unit, if any, must be equipped with drainage settling facilities. The washout pit must be cleaned immediately upon 75% filling.
- No washing of vehicles etc. in the rivers or irrigation canal will be allowed.
- 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 Contractor will be responsible for developing a Spill Management Plan (see Section **9.j - Spill Management Plan**) and an Emergency Response Plan (see Section **9.h - Emergency Response Plan**).
- The Contractor will implement a training program to familiarize staff with emergency procedures and practices related to contamination events.
- Operating personnel will be trained to visually inspect discharged water quality for oil and grease traces (that will be visible on the surface) periodically and take appropriate corrective actions.

Residual Impacts: *Site Preparation, Construction, and Worksite Closure Phase*

529. Impacts to surface water quality are expected to be short-term and localized in nature and can be controlled and minimized with the implementation of good construction practices and adequate wastewater treatment systems on-site. Potential impacts to surface hydrological patterns is expected to be short-term and localized in nature and can be controlled with the implementation of good construction practices and adequate water drainage systems on-site.

530. If the recommended mitigation measures are implemented, residual impact significance would be **minor / moderate**.

Assessment of Potential Impact: *Operation Phase*

531. Major possible impacts on water during operation of the road will be:

- sedimentation and pollution of waters with heavy metals and petroleum hydrocarbons caused by road surface runoff and accidental spills;
- increased flow rate of runoff from the increased impervious surfaces from the Project footprint;
- pollution from generic waste (i.e., littering, illegal dumping);
- cross contamination of groundwater in case of surface water pollution;
- increase of groundwater level caused by the load of the road structure; and
- pollution during maintenance works (e.g., application of salt and sand).

532. Hydrology and drainage studies. The preliminary designs for the road and bridges follow the design standards provided in Section **4.4 - Design Standards and Considerations**. Preliminary designs for all pipe or box culvert water crossings are for a 50-

year flood event, which is equivalent to a 2% annual exceedance probability flood. All the Project bridges have been preliminarily designed for a 100-year flood event, which is equivalent to a 1% annual exceedance probability flood. In cases where the exit velocity and flow depth of water from culverts and pipes does not approximate the natural flow condition in the downstream channel, ripraps will be installed to dissipate energy and prevent erosion.

533. For proposed underpasses/bridges in some sections of the alignment, deep foundations are recommended based on results from geotechnical studies. It has also to be considered that bridge foundations in river or stream banks have to be placed in sufficient depth below to prevent risks from scouring. The peak discharges of the mudflow current of Chalaubniskhevi River have also been considered in that bridge design. During the detailed design phase, at all proposed bridge/underpass locations, geotechnical investigations will need to be carried out at exact foundation locations to sufficient depth in order to obtain required information for the final foundation design.

534. Surface and groundwater pollution. Pollution of surface and groundwater from operation of the highway may occur from regular operational and maintenance as well as from traffic accidents involving cargo vehicles transporting hazardous substances.

535. Concentrations of pollutants in runoff varies, but studies done by the US Federal Highway Administration can provide illustrative estimates. Table 67 shows the relationship between traffic flows and concentrations of pollutants in the runoff.

Table 67. Concentration of Pollutants in Highway Runoff

Pollutant	Mean concentration (mg/l) for highways with	
	<30,000 vehicles/day	>30,000 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

536. Accidents involving cargo vehicles may also result in dumping or spillage of the carried matter causing pollution to enter watercourses. However, construction of the Bakurtsikhe-Tsnori road section is expected to decrease traffic accidents and minimize needs for road repair.

Table 68. Assessment of Potential Impacts to Surface and Groundwater (prior to mitigation) – *Operation Phase*

Impact	Potential for impacts to surface and groundwater from vehicle circulation and maintenance activities during the operation of the road.			
Impact Nature	**Negative**	**Positive**	**Neutral**	
	Potential impacts to water resources would be **negative**.			
Impact Type	**Direct**	**Indirect**	**Induced**	
	Impacts from the Project on surface and ground water would be **indirect**.			
Impact Duration	**Temporary**	**Short-term**	**Long-term**	**Permanent**

	These impacts would be carried through the life of the road and are considered **long-term**.				
Impact Extent	**Local**		**Regional**		**International**
	Potential impacts would be limited to the Project site footprint, as well as areas downstream of the Project site, and therefore would be considered **local**.				
Impact Scale	The overall scale of impact is considered to be small. The scale of potential impacts due to release of hazardous materials from a roadway accident is potentially large, but accidental release is an unlikely, unplanned occurrence.				
Frequency	Impacts to surface and groundwater could occur intermittently but repeatedly for the duration of the operation phase.				
Impact Magnitude	**Positive**	**Negligible**	**Minor**	**Moderate**	**Large**
	Potential impacts to water quality in Project area due to inappropriate waste disposal and runoff are expected to be of **minor** magnitude considering the preliminary design features.				
Receptor Sensitivity	**Low**		**Medium**		**High**
	The Project is near sensitive water receptors, including the canal which provides local farmers water for irrigation. The overall sensitivity is rated as **high**.				
Impact Significance	**Negligible**	**Minor**	**Moderate**		**Major**
	The combination of a *high* resource sensitivity and *minor* impact magnitude will result in an overall **moderate** Impact.				

Management and Mitigation Measures: *Operation Phase*

537. As described in Section **4.7 - Drainage Structures**, water from the proposed Bakurtsikhe-Tsnori road section will be led down the slopes by means of stepped out falls or lined chutes (see Figure 13) at appropriate intervals ultimately discharging into an open concrete stormwater drainage channel at the bottom of the embankment which runs parallel to the road. Pretreatment of roadway runoff water be managed through the installation of stone ripraps at various points in the constructed channel along the new road. The initial designs also include construction of a new gravel access road which will run parallel to the proposed stormwater channel (see Figure 13). While it is expected that stormwater will normally be diverted along the stormwater management system to existing channels and away from the Bakurtsikhe-Tsnori road section, this design has the potential to provide greater capacity to pretreat water runoff during larger storm events. In these cases, water can flow through the stone aggregate of the proposed access road before infiltrating into the substrate. This will further minimize risks of scour during large storms and increases bank stability.

538. Open channels should be designed with a trapezoidal or parabolic cross section. A parabolic shape is preferred for maintenance and hydraulic reasons. The size of the channel should be designed appropriately to ensure adequate management of stormwater amounts based on the surface area of the roadway anticipated levels of rainfall. Maintenance is a crucial element that ensures the long-term performance of open channels. The RD will conclude a long-term contract with a Road Maintenance Contractor to maintain the road in the operation phase. The RD will need to ensure that this responsibility is included in the service Road Maintenance Contractor's SOW, in addition to being financed and monitored accordingly.

539. Other mitigation measures include the following:

- Perform maintenance paving of the road sections and bridge decks only in dry weather to prevent runoff contamination.
- Use staging techniques to reduce the spread of paving materials during the repair of potholes and worn pavement. These can include covering storm drain inlets and manholes during paving operations, using erosion and sediment controls to decrease runoff from repair sites, and using drip pans, absorbent materials, and other pollution prevention materials to limit leaks of paving materials and fluids from paving machines.
- Comply with relevant mitigation measures defined for water protection during construction.
- Clean-up of the roadside strips through regular maintenance.

Residual Impacts: *Operation Phase*

540. If the recommended mitigation measures are implemented, residual impact significance would be **minor**.

7.2.5 - Ecology and Biodiversity

Scope of the Assessment

541. This chapter provides an assessment of the potential effects on sensitive ecological and biodiversity receptors from the Project. It identifies and assesses the potential construction and operational impacts of the development and formulates an appropriate mitigation strategy. The scope of this assessment is to:

- examine and analyze baseline data with regard to the proposed development;
- identify the significance of any potential direct/indirect impact on the ecology and biodiversity of the proposed development site and its immediate environs; and
- identify appropriate and effective means of mitigating the potential adverse impacts arising from the construction and operation of the road and associated infrastructure.

542. Impacts have been evaluated and assessed through using information derived from desk-based studies and from site specific field surveys. Baseline ecological information is provided in Chapter **6.3 - Biological Environment** of this IEE.

Identification of Sensitive Receptors

543. Approximately 150 walnuts (Juglans regia) walnut trees were registered during the botanical survey which fall within the ROW. This species is included in Red List book of Georgia and identified as vulnerable.

7.2.5.1 - Habitat / Flora

Assessment of Potential Impact: *Site Preparation, Construction, and Worksite Closure Phase*

544. As described in the baseline section of this IEE covering Flora (Section **6.3.2 - Flora**), the natural vegetation within Bakurtsikhe-Tsnori road section area has been heavily altered due to agricultural activities. Plains favorable for agricultural lands have been cleared of forests, leading to the absence of forest cover. The area is primarily characterized by agriculture fields, including vineyards, horticulture, and fruit trees. The preferred alignment also runs parallel to the existing irrigation canal, which has further reduced the amount of vegetation that will be lost.

545. Site clearance. Approximately 77 ha of land to be cleared of trees, shrubs, and general waste to accommodate for the associated working areas.[55] This will result in loss of plants, contributing to a decline in their numbers, as well as loss of habitat for species of mammals, birds, insects and herpetofauna that they provide. Preliminary quantities of trees to be cut during the site clearance is provided below.

Table 69. Quantities of Trees to be Cut

Designation	Number of trees to be cut
Large trees (D>240mm)	537
Medium trees (160mm < D ≤ 240mm)	1,075
Small trees (80mm < D ≤ 160 mm	3,764

Note: 'D' represents diameter.

546. The botanical survey implemented by the Kocks environment team revealed approximately 150 walnut trees (*Juglans regia)* within the ROW. As a protected species, Georgian legislation requires compensatory payment for each tree cut down. The approximate coordinates of walnut trees identified in the ROW are the following:

#	X	Y
1.	573789	4617700
2.	574020	4617588
3.	574585	4616861
4.	574920	4615989
5.	574920	4615989
6.	576390	4613635

547. The initial botanical and zoological surveys did not identify the extent of habitat by type (i.e., natural habitat versus modified habitat), and it will be necessary that a survey be conducted as part of the detailed design work to ensure that impacts can be correctly quantified, and any replanting requirements to meet ADB's requirements for No Net Loss for Natural Habitat can be properly met.

548. Invasive alien species. Site clearance/preparation and movement of equipment results in the removal of top soil which can negatively influence several soil functions which are relevant in nature and environmental protection (e.g., carbon storage, and a decrease in biological activity). The spread of invasive alien species (IAS) is also facilitated by disturbances such as site clearance through increased movement of people, vehicles, machinery, vegetation, and soil. Invasive flora species can rapidly germinate in disturbed areas whereby affecting the ability of native vegetation communities to re-establish. Overall, IAS present a very high risk to biodiversity globally. With the implementation of appropriate mitigation measures and monitoring, the risks associated with IAS on the Project can be managed appropriately.

Indirect impacts. In addition to the direct impacts to vegetation resulting from the construction phase of the Project, there are also a number of potential indirect impacts on vegetation cover. For example, pollution of the surrounding areas with construction material waste; soil and water contamination from; soil compaction or, harmful aim emissions, etc. As a result of such impacts recovery of the natural functioning of the vegetation can take several years, which will have negative impact on the ecosystem. These potential impacts and the mitigation measures needed to address risks have been covered in previous

[55] Kocks Feasibility Study, 2018.

sections of this chapter (see **7.2.2 - Air Quality**, **7.2.4 - Surface and Groundwater**, and **7.2.1 - Soil and Relief**.

Table 70. Assessment of Potential Impacts to Habitat / Flora (prior to mitigation) – *Site Preparation, Construction, and Worksite Closure Phase*

Impact	Impacts to flora on the Project area, not including agricultural flora, from site development and construction of Bakurtsikhe-Tsnori Road Section.				
Impact Nature	**Negative**	**Positive**	**Neutral**		
	The impact on vegetation in the Project area is **negative**.				
Impact Type	**Direct**	**Indirect**	**Induced**		
	Unavoidable **direct** impacts to vegetation will result from clearing and construction in the ROW. There is also the potential for **indirect** impacts (e.g., soil and water contamination) due to poor construction practices.				
Impact Duration	**Temporary**	**Short-term**	**Long-term**	**Permanent**	
	The loss/ conversion of habitats will be **permanent**. Potential indirect impacts are considered **long-term**.				
Impact Extent	**Local**	**Regional**	**International**		
	The impacts on vegetation are expected to be **local**.				
Impact Scale	It is anticipated that approximately 77 ha of land will be cleared of trees, shrubs, and general waste to accommodate for the associated working areas.				
Frequency	Impacts will occur during the construction period, however most of the impact will occur during the site preparation phase in advance of construction.				
Impact Magnitude	**Positive**	**Negligible**	**Minor**	**Moderate**	**Large**
	While the natural vegetation within Bakurtsikhe-Tsnori road section area has been heavily altered due to agricultural activities, green areas remain which will be lost. Therefore, without considering the impacts to agricultural flora, the impact magnitude is identified as **moderate**.				
Receptor Sensitivity	**Low**	**Medium**	**High**		
	Receptor sensitivity to the impact is identified as **medium**. This designation is also influenced by the fact that approximately 150 walnut trees (*Juglans regia)* protected under the Georgian Red List were identified in the ROW. It is expected that some of the tree will be on private property, while other will be on buffer areas.				
Impact Significance	**Negligible**	**Minor**	**Moderate**	**Major**	
	Impact significance prior to the implementation of mitigation measures is considered **moderate**.				

Management and Mitigation Measures: *Site Preparation, Construction, and Worksite Closure Phase*

- Impacts to Vegetation Coverage
  - To ensure that impacts to habitat can be correctly quantified, and that any replanting requirements can be properly established, the Contractor shall conduct a pre-construction site survey to identify the extent habitat by type.
  - The Contractor shall identify through a site survey if any Georgian Red-listed tree species are located within five meters of the site boundary. This survey will form part of the Contractor's Clearance, Revegetation, and Restoration Management Plan (see Section **9.k - Clearance, Revegetation, and Restoration Management Plan**). Where walkover surveys pre-construction reveal that protected plant species in the area will be lost, the contractor will be responsible for replanting any trees cut on a 1:10 basis.

- Delimitation of areas to be cleared before the beginning of the construction activities in order to limit as much as possible the surface of vegetation to be cleared.
- Fencing critical root zone of the trees at the boundary with the Project Area.
- Recultivation of disturbed sites after completion of works.
- Use of temporary or existing roads for delivery of construction materials.
- Training of the staff in environmental and safety issues, including protection of vegetation outside the boundaries of the Project corridor.
- The Contractor shall be responsible for replanting of any non (Georgian) Red-listed trees cut which are not already included as part of the LARP on a 1:3 basis using species native to the area.
- All efforts will be made to minimize removal of mature/significant trees and maintain connectivity between areas of forest habitats.
- Any reseeding or replanting of selected areas to be restored will use locally collected seed mixes and saplings.
- A local source of indigenous saplings suitable for replanting programs will be identified in advance to facilitate restoration.

Residual Impacts: *Site Preparation, Construction, and Worksite Closure Phase*

549. The restoration and re-planting programs will take time to reverse the impacts from clearing of vegetation and habitat in the area. While there many uncertainties associated with revegetation, including slow rates or unsuccessful revegetation, proper implementation of the Clearance, Revegetation, and Restoration Management plan will ensure successful rehabilitation of disturbed areas.

550. Based upon the implementation of the above management and mitigation measures, the residual impact level can be reduced to **minor**.

Assessment of Potential Impact: *Operation Phase*

Damage to and disturbance of flora species. No direct impact on flora is expected during operation of the planned section of the road. Indirect impacts to flora near the road may result from 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. The IEE includes analysis on these impacts in Sections **7.2.5.1 - Habitat / Flora** and **7.2.1 - Soil and Relief**.

551. Emissions. 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 tires 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. Related impacts and mitigation measures are covered in Sections **7.2.2 - Air Quality**, **7.2.4 - Surface and Groundwater** and **7.2.1 - Soil and Relief**. The potential impacts to agriculture, and vineyards in particular, from emissions and air pollution have been covered in Section **7.2.2 - Air Quality**.

Table 71. Assessment of Potential Impacts to Habitat / Flora (prior to mitigation) – *Operation Phase*

Impact	Impacts on vegetation in the Project area, not including agricultural flora, in the operation phase from vehicle circulation and maintenance of the road.		
Impact Nature	**Negative**	**Positive**	**Neutral**
	The impact on the biodiversity is **negative**.		

Impact Type	**Direct**		**Indirect**		**Induced**
	Impact from the operation and maintenance of the road is considered as **indirect**.				
Impact Duration	**Temporary**	**Short-term**	**Long-term**	**Permanent**	
	Impacts will result from operation of the road throughout its lifetime.				
Impact Extent	**Local**		**Regional**		**International**
	The impacts to flora will be **local**.				
Impact Scale	The scale of the impact will be limited to the green areas adjacent to the roadway.				
Frequency	Throughout the operation period.				
Impact Magnitude	**Positive**	**Negligible**	**Minor**	**Moderate**	**Large**
	Considering the indirect and local extent of potential impacts to flora discussed above, the overall magnitude of this impact is **minor**.				
Receptor Sensitivity	**Low**		**Medium**		**High**
	The overall sensitivity is considered **medium**.				
Impact Significance	**Negligible**	**Minor**	**Moderate**	**Major**	
	The significance of this impact is **minor**.				

Management and Mitigation Measures: *Operation Phase*

552. In addition to ensuring the success rates of recultivated sites after completion of works through the implementation of the Clearance, Revegetation, and Restoration Management plan (see Section **9.k - Clearance, Revegetation, and Restoration Management Plan**), the following mitigation measures should be employed in the operation phase: (i) Monitoring of the presence of invasive species; (ii) Roadside waste collection and regular clean up (sweeping) of the road; and (iii) Preservation of roadside vegetation.

Residual Impacts: *Operation Phase*

553. Residual impacts to flora in the operations phase can be reduced to **negligible** through implementation of the above identified migration measures. The restoration and re-planting programs will however take time to reverse the impacts from clearing of vegetation and natural habitat in the area.

7.2.5.2 - Fauna

554. As described with fauna baseline section (see Section **6.3.3 - Fauna**), the habitat around the Project area has been transformed because of anthropogenic impacts and development. There remain, however, strips and pockets of habitat with trees and shrubs between the fields and the canal and service road which will be lost under the footprint of the proposed road or because of its construction. While this remaining habitat is likely to be considered entirely modified, such areas still provide important habitat to fauna. That being said, the Project is not expected to have significant impact on the fauna that do exist in the area and there are no protected areas nearby or protected or known priority species present.

Assessment of Potential Impact: *Site Preparation, Construction, and Worksite Closure Phase*

555. Habitats. As indicated above, construction of the road will lead to approximately 77 ha of land being cleared of trees and shrubs. While some of the preferred alignment is void of any vegetation due to its location along the irrigation canal, the excavation and removal of

vegetation will result in a loss of habitat for species of mammals, birds, insects, and herpetofauna. The ecological receptors most affected include those that have limited mobility such as terrestrial flora, reptiles, and amphibians. Loss of habitat can also affect more mobile species which lose breeding, nesting, and feeding sites. It should be mentioned that the road corridor and habitat to be lost does not specifically connect any key areas together and therefore does not have wider importance for fauna beyond the Project area.

556. Land preparation will also create exposed bare earth areas that are vulnerable to erosion (wind and/or runoff) until infrastructure construction or replanting is completed to stabilize the surface. Erosive processes transport and deposit sediment to downstream habitats (both aquatic and terrestrial). The indirect impact has the potential to degrade downstream habitat areas or change habitat characteristics, and as such influencing suitability for native flora and fauna communities. Issues and mitigation measures connected with erosion have been previously covered in Section **7.2.1 - Soil and Relief**.

557. Invasive alien species. Alien animals also have the potential to be introduced or increased in abundance. These animals may adversely impact native fauna because of increased competition for resources, predation, or habitat degradation. Invasive species have the capacity to exacerbate their role in ecosystem degradation through combination threats by habitat change, climate change over-exploitation of ecosystem resources, and pollution, which further enhances their threat to biodiversity. While IAS present a very high risk to biodiversity globally, the implementation of appropriate mitigation measures and monitoring can manage the risks associated with IAS on the Project.

558. Species disturbance and mortality. Fauna mortality can occur during vegetation clearing activities in the event individuals are struck by vehicles and machinery. Animals that are unable to disperse during clearing activities are vulnerable to being injured or destroyed through interaction with machinery or falling debris. It is likely that most individuals will disperse from clearing locations into adjacent habitats, however some less mobile species may experience a localized reduction in abundance during this period, such as amphibians, reptiles, and small mammals.

559. Accidental release or spill from the storage and handling of hazardous materials can be toxic to flora and fauna locally and downstream if substances are released into the aquatic environment. Irresponsible dumping of waste on soil will reduce soil quality and inhibit biological activity, whilst dumping in water bodies will reduce water quality, which will impact the aquatic ecosystem. Contamination of both ecosystems will result in adverse impacts on the food chain for both terrestrial and aquatic organisms. Potential related impacts are covered in Sections **7.2.1 - Soil and Relief** and **7.2.4 - Surface and Groundwater**.

560. The Chalaubniskhevi River is a seasonal river with flows occurring most often in the spring and during intense periods of inclement weather. No aquatic species have been identified in the river which may be impacted by the Project.

561. Disturbances and displacement of resident fauna due to noise, light, and/or vibration as a result of construction activities (excavation, clearing, spoil disposal, potential work camp, plant and vehicle movement, and pile driving) will occur. These impacts have the potential to influence fauna breeding, roosting, or foraging behavior of native fauna. The consequences of these influences are dependent on the extent of disturbance and the characteristics of the receptor.

562. Poaching. Construction staff involved on-site, such as workers and site managers, can engage in poaching and illegal exploitation of wildlife. Due to the limited presents of wildlife in the area, this is not considered a significant threat however.

Table 72. Assessment of Impacts to Fauna (prior to mitigation) – *Site Preparation, Construction, and Worksite Closure Phase*

Impact	Impacts on terrestrial and aquatic biodiversity resulting from construction of the Bakurtsikhe-Tsnori Road Section.			
Impact Nature	**Negative**	**Positive**	**Neutral**	
	The impact on the terrestrial and aquatic biodiversity is **negative**.			
Impact Type	**Direct**	**Indirect**	**Induced**	
	Direct terrestrial habitat loss in the Project footprint in areas to be developed. This includes terrestrial habitat where the proposed road and associated infrastructure will be constructed (i.e., the access road) as well as aquatic habitat loss due to the footprint of bridge piers, culverts, and pipes.			
Impact Duration	**Temporary**	**Short-term**	**Long-term**	**Permanent**
	The loss/ conversion of wildlife habitat will be **permanent**. Impacts to fauna resulting from construction activities (e.g., species disturbance and mortality) is considered **short-term** and limited to the construction period.			
Impact Extent	**Local**	**Regional**	**International**	
	The impact is expected to be **local** for habitats.			
Impact Scale	It is anticipated that the Project will require the clearing of approximately 77 ha. The botanical and zoological surveys did not quantify the extent of habitat by type however, so it is not possible to assess the amount of habitat to be lost or its type (e.g., natural vs. modified).			
Frequency	Impacts will occur through the construction period, however most of the impact will occur during site preparation in advance of construction.			
Impact Magnitude	**Positive**	**Negligible**	**Minor**	**Moderate**	**Large**
	Considering the magnitude of impacts to each habitat discussed above, and the uncertainty around the quantity and type of habit to be lost, the overall magnitude of this impact is **moderate**.			
Receptor Sensitivity	**Low**	**Medium**	**High**	
	Given the area affected is likely the habitat around the Project area has been transformed because of anthropogenic impacts and development, and the habitat available has been shown not to support any priority species, the overall receptor sensitivity is considered **low**.			
Impact Significance	**Negligible**	**Minor**	**Moderate**	**Major**
	The overall significance of this impact is considered **minor**.			

<u>Management and Mitigation Measures</u>: *Site Preparation, Construction, and Worksite Closure Phase*

563. Since the initial botanical and zoological surveys did not quantify the extent of habitat by type, it will be necessary that a survey be conducted as part of the detailed design work to ensure that impacts can be correctly quantified, and any replanting requirements can be properly established. A fauna survey should also be carried during the habitat assessment with the aim of understanding fauna and fauna habitat values within the site to inform pre-construction planning and revise relevant mitigation measures if necessary.

564. The following mitigation measures should be carried out in order to minimize impact on wildlife during the construction phase:

- <u>Impacts to Habitat</u>
  - To ensure that impacts to habitat can be correctly quantified, and that any replanting requirements can be properly established, the Contractor shall conduct a pre-construction site survey to identify the extent habitat by type.

  - Delimitation of areas to be cleared before the beginning of the construction activities in order to limit as much as possible the surface of vegetation to be cleared.
  - Recultivation of disturbed sites after completion of works.
  - Implementation of air, water, soil impact mitigation measures (described in sections above).
  - Waste management – regular clean-up of the areas, management of waste according to the type and category.
  - Ensure construction camp waste areas are properly managed so animals are not attracted that could be injured or ingest inappropriate food.
  - Care will be taken to avoid introduction of new invasive species to, and spread of existing invasive species within, the Project area through: washing of vehicles, equipment and supplies before entry to the Project area; monitoring for invasive species; and control/eradication of invasive species where found.
  - Commitment will be made to raise awareness of values of natural habitat areas and poaching animals will be strictly prohibited to apply for all Contractor staff.
  - Training of the staff in environmental and safety issues, including protection of vegetation outside the boundaries of the project corridor.
- Impacts to Species
  - A fauna survey will be carried during the habitat assessment with the aim of understanding fauna and fauna habitat values within the site to inform pre-construction planning and revise relevant mitigation measures if necessary.
  - Where possible remove vegetation outside the core breeding season from spring to early summer to allow species to find alternative breeding sites or to disperse after breeding.
  - Commitment will be made to raise awareness of values of natural habitat areas and poaching animals will be strictly prohibited to apply for all Contractor staff.
  - Boundaries of ROW and operation area will be strictly kept to - to avoid impact on the adjacent vegetation.
  - Cover excavations left open at night.
  - Ensure any excavations include slopes or boards to ensure species can self-rescue should they fall in.
  - Avoid leaving water filled excavations.
  - Avoid night working if at all possible when many species will be most active.
  - Works will not be lit except in exceptional circumstances or required for safety reasons.
- Impacts to Distribution
  - Vehicles and machinery will be maintained in accordance with industry standard to minimize unnecessary noise generation.

Residual Impacts: *Site Preparation, Construction, and Worksite Closure Phase*

565. Accidents involving wildlife are likely to be minor given the fact that around the proposed road there few species are present, and restoration any trees cut which are not already included as part of the LARP on a 1:3 basis (1:10 basis for protected species) using species native to the area will provide wildlife future refuge.

566. Residual impacts to fauna can be reduced to **negligible** through implementation of the above identified migration measures.

Assessment of Potential Impact: *Operation Phase*

567. Main impacts on fauna during operation in general may include:

- fauna mortality cause by road traffic;
- higher levels of disturbance and stress to fauna, including that related to noise;
- barrier effect (reduced connectivity);
- modification of light conditions;
- indirect impact from dust, particles (abrasion from tires and brake linings); oil, fuel (e.g., in case of traffic accidents), including chronic contamination due to bioaccumulation; and
- possible pollution of water with runoff – impact on aquatic life.

568. Livestock and Wildlife Fencing. Animal-vehicle collisions are a major issue for traffic safety and kill and maim wildlife, pets, and humans. These incidents are however mostly under-reported since they are not always notified to the police.

569. As described in Section **4.8 - Road Signing, Markings, and Road Furniture**, fencing of the road will be installed to minimize the risks for animal related accidents at locations where conflicts between traffic and animals constitute a safety problem. The main function of livestock and wildlife fencing is to keep animals off the road but also to funnel animals to safe crossing opportunities at underpasses.

570. Nearly the entire extent of new road is on a high embankment with guardrails on both sides. Therefore, no animals are expecting to cross the road considering also that the road is located adjacent to an irrigation channel which already acts as a barrier. However, in sections with low embankment height (less than 3 m high) where there is a potential risk for livestock or wildlife crossing, fencing of the road will be considered. The primary concern would be with livestock crossings, therefore a wire mesh fence with a height of 1.80 m is considered adequate. The sections where fences are considered potentially necessary are summarized in Table 21 found in Section **4.8 - Road Signing, Markings, and Road Furniture**.

Table 73. Assessment of Impacts to Fauna (prior to mitigation) – *Operation Phase*

Impact	Impacts on terrestrial and aquatic biodiversity resulting from operation of the road.				
Impact Nature	**Negative**		**Positive**		**Neutral**
	The impact on the terrestrial and aquatic biodiversity is **negative**.				
Impact Type	**Direct**		**Indirect**		**Induced**
	The loss of habitat connectivity and the barrier effect on terrestrial fauna is considered **direct** around the areas to be developed. **Indirect** effects can be expected from noise, light, and air emissions.				
Impact Duration	**Temporary**	**Short-term**	**Long-term**		**Permanent**
	Impacts to fauna resulting from vehicle circulation and maintenance activities will last for as long as the road is in operation and is therefore considered **long-term**.				
Impact Extent	**Local**		**Regional**		**International**
	The impact is expected to affect **local** fauna.				
Impact Scale	It is anticipated that the Project will require the clearing of approximately 77 ha. The botanical and zoological surveys did not quantify the extent of habitat by type however, so it is not possible to assess the amount of habitat to be lost or its type (e.g., natural vs. modified).				
Frequency	Impacts will occur throughout the operational period of the road.				
Impact Magnitude	**Positive**	**Negligible**	**Minor**	**Moderate**	**Large**
	Considering the Project area has been considerably impacted anthropogenically, including infrastructure like the irrigation canal and service road which act as barriers to fauna, the overall magnitude of this impact is considered **minor**.				

Receptor Sensitivity	**Low**	**Medium**		**High**
	The overall sensitivity is considered **medium**.			
Impact Significance	**Negligible**	**Minor**	**Moderate**	**Major**
	The significance of this impact is **minor**.			

Management and Mitigation Measures: *Operation Phase*

571. The same management and mitigation measures described for habitat / flora apply to fauna. They include ensuring the success rates of recultivated sites after completion of works through the implementation of the Clearance, Revegetation, and Restoration Management plan (see Section **9.k - Clearance, Revegetation, and Restoration Management Plan**). In addition, the following mitigation measures should be employed in the operation phase: (i) Monitoring of the presence of invasive species; (ii) Roadside waste collection and regular clean up (sweeping) of the road; and (iii) Preservation of roadside vegetation.

Residual Impacts: *Operation Phase*

572. Impacts cause by the generation of traffic noise in the operation phase is unavoidable. Considering the state of existing habitat, residual impacts to fauna can be reduced to **negligible** through implementation of the above identified migration measures. The restoration and re-planting programs will take time however to reverse the impacts from clearing of vegetation and natural habitat in the area.

7.2.6 - Landscape

Scope of the Assessment

573. The development of the Project will be introducing a number of new elements into the existing landscape and visual environments. This analysis considers how the Project, as described in Chapter **4. Project Description,** may have an impact on the landscape (essentially as an impact on an environmental resource with its own defined intrinsic value) and visual amenity (defined as one of the interrelated effects on population and how various groups experience and perceive changes in the values attributed to the landscape).

574. The analysis presents a purely qualitative assessment of the impacts and no quantitative modelling, viewshed analysis, or photomontage development has been undertaken. It is based purely on information readily available as secondary sources (primarily online mapping databases) and information gathered during site visits for the purposes of gaining quantitative environmental data (e.g., water quality, soil quality, air quality baseline). Additionally, no stakeholder engagement was undertaken to determine the various values that particular visual sensitive receptors place on various elements of the landscape.

Identification of Receptors

575. Receptors include residential properties, workplaces, road users, pedestrians, and other outdoor sites used by the public which would be likely to experience a change in existing views as a result of the construction and operation of the Project.

Assessment of Potential Impact: *Site Preparation, Construction, and Worksite Closure Phase*

576. Activities during construction that will affect the aesthetics of the area include:

- removal of existing areas of soft landscape;
- construction movement including cranes;
- increased volume of HGV delivering supplies including concrete and road construction material;
- temporary construction facilities;
- the introduction of new built structures into the landscape, including interchanges, road carriageway, and bridges;
- topsoil/material storage areas;
- alteration of topography and landform;
- introduction of increased traffic levels; and
- movement of construction material on existing road network.

577. After the completion of the construction works, machinery and vehicles, construction materials, and wastes will be removed from the territory. In addition, temporary structures will be demolished, labor force will leave the Project zone, reinstatement of the temporary developed territories will be carried out that will reduce the impact.

Table 74. Assessment of Impacts to Landscape (prior to mitigation) – *Site Preparation, Construction, and Worksite Closure Phase*

Impact	Landscape and visual impacts during construction phase.				
Impact Nature	**Negative**		**Positive**		**Neutral**
	Construction of the road will directly affect the character of the area with the removal of vegetation across the site and excavation of large areas of soil. The presence of a work camp, an influx of workers, and the circulation of heavy machinery and equipment will also contribute to a change in the landscape.				
Impact Type	**Direct**		**Indirect**		**Induced**
	Impacts would be **direct**.				
Impact Duration	**Temporary**	**Short-term**	**Long-term**		**Permanent**
	The construction phase is expected to occur over a two-year period and impacts are therefore considered to be **short-term**.				
Impact Extent	**Local**		**Regional**		**International**
	Potential impacts would likely be limited to the footprint where the construction works are being undertaken at any given time and where the associated facilities are installed (i.e., concrete batching plant, workers camps, etc.).				
Impact Scale	The removal of vegetation and soil excavation within the Project area would occur across a significant number of land parcels being utilized for agriculture. At the same time, works will generally be restricted to a very refined corridor, and would not occur along the entire length of this corridor at any one time, thereby reducing the overall scale.				
Frequency	It is likely that this impact will occur only once.				
Impact Magnitude	**Positive**	**Negligible**	**Minor**	**Moderate**	**Large**
	The precise impact magnitude to villages and tourists is uncertain, however as it assumed that all elements of construction will be visible in views at intermediate distances from areas which they frequent – this includes villages and agricultural areas. The construction of linear infrastructure will be visible across a large area of the landscape considering the presence of villages and towns at higher elevations. Based on this, the impact magnitude is considered to be **moderate**.				
Receptor Sensitivity	**Low**		**Medium**		**High**
	The sensitivity is considerate to be **medium**.				

Impact Significance	**Negligible**	**Minor**	**Moderate**	**Major**
	The combination of a *medium* impact magnitude and a *medium* receptor sensitivity will result in **moderate** impact significance.			

Management and Mitigation Measures: *Site Preparation, Construction, and Worksite Closure Phase*

- Implementation of air, water, soil impact mitigation measures (described in sections above).
- Visual impact of construction works will be mitigated by keeping to the boundaries of the worksites and traffic routes; preservation of vegetation; cleanup and good management of construction sites and camps; timely removal of waste from the area; material stock control (to avoid accumulation of surplus material on the site).
- Implementation of mitigation measures defined for soil, vegetation, and waste management.
- Develop and have approved a comprehensive Clearance, Revegetation, and Restoration Management Plan (see Section **9.k - Clearance, Revegetation, and Restoration Management Plan**).
- After completion of works, ensure that the worksite is cleaned up; surplus materials, temporary structures, and machinery have been removed; and recultivated in compliance with the plan mentioned above has been implemented.
- Carefully position site compounds within the landform (i.e., away from habituated areas and Tsnori community in particular).
- Retention and protection of existing vegetation and landscape features and other key elements within the proposed development corridor.
- Borrow areas for materials shall not be located in productive land, forested areas and near water courses such as rivers, streams, etc.
- Commitment to high quality design, materials, and specification for the road and river crossings.

Residual Impacts: *Site Preparation, Construction, and Worksite Closure Phase*

578. Cut slopes, embankments, and the bridges will have an impact on the landscape within the area throughout the Project lifecycle. The mitigation measures outlined above may go some way to enhancing the aesthetic value of the Project especially as vegetation grows back around construction zones, and in all likelihood any negative opinion of the new road in terms of visual impact will decrease over time as people get used to the altered landscape.

579. If the recommended mitigation measures are implemented, residual impact significance can be reduced to **minor**.

Assessment of Potential Impact: *Operation Phase*

580. When in place, the new alignment will change the landscape substantially as a completely new structure on the relatively flat landscape. The impact will be long-term, and the main recipients of impact will be local residents in Tsnori and those using the roadway. For travelers passing through, the landscape will not be not be familiar and changes will not be noticeable.

581. Revegetation will go a long way to restore and potentially improve the aesthetic views of the area. In addition to mitigating the impression of the landscape disturbance, vegetation planted along the road will act as a windbreak and reduce impact to wildlife habitat (see Sections **7.2.2 - Air Quality** and **7.2.5.2 - Fauna**). Also, the location of the road

at the bottom of shallow sloping valley where high hedgerows of vegetation will remain present along the irrigation canal will shield the road from view in many sections.

582. With time, the community will get accustomed to the new infrastructure, and any visual discomfort related to the change will diminish. While perceptions of visual change are subjective, the impacts should be considered negligible over time.

Table 75. Assessment of Impacts to Landscape (prior to mitigation) – *Operation Phase*

Impact	Landscape and visual impacts during operation phase.			
Impact Nature	**Negative**	**Positive**	**Neutral**	
	While people are expected to welcome the benefits provided by the new road, operation of road is likely to viewed by many as a **negative** change in the visual amenity of the area.			
Impact Type	**Direct**	**Indirect**	**Induced**	
	Impacts would be **direct**.			
Impact Duration	**Temporary**	**Short-term**	**Long-term**	**Permanent**
	Considering the lifetime of major infrastructure like the road being proposed, this impact is considered **long-term**.			
Impact Extent	**Local**	**Regional**	**International**	
	Impacts will be restricted to those in the immediate area who are able to view elements of the Project directly or who travel along the new roadway.			
Impact Scale	Since the road will be introduced into an area primarily characterized by agriculture, and the length of the road across the landscape, the scale is considered significant.			
Frequency	It is likely that this impact will occur only once.			
Impact Magnitude	**Positive**	**Negligible**	**Minor**	**Moderate**	**Large**
	The precise impact magnitude to villages and tourists is uncertain, however it is assumed that parts of the road infrastructure will be visible across a large area of the landscape. Based on this, the impact magnitude is considered to be **medium**.			
Receptor Sensitivity	**Low**	**Medium**	**High**	
	The sensitivity is considered to be **medium**.			
Impact Significance	**Negligible**	**Minor**	**Moderate**	**Major**
	The combination of a *medium* impact magnitude and *medium* receptor sensitivity means that the impact significance is expected to be **moderate**.			

Management and Mitigation Measures: *Operation Phase*

- Regular cleanup of the road and adjacent areas.
- Preservation/maintenance of roadside vegetation to shield the visual change in the landscape related to the new infrastructure.
- Proper implementation of the Clearance, Revegetation, and Restoration Management plan (see Section **9.k - Clearance, Revegetation, and Restoration Management Plan**).
- Implementation of mitigation measures set for pre-construction and construction stages of the project during the road maintenance works as appropriate.

Residual Impacts: *Operation Phase*

583. The restoration and replanting programs will take time to reverse the impacts from clearing of vegetation and natural habitat in the area. Successful revegetation has the

potential to reduce visual impacts, or perhaps even improve, the landscape and visual environment.

584. If the recommended mitigation measures are implemented, residual impact significance can be reduced to **minor**.

7.2.7 - Socio-Economic

Scope of the Assessment

585. This assessment describes the potential socio-economic impacts associated with the construction and operation of the Project. The key objectives include the following:

- Identify and assess potential project-related socio-economic impacts across the project cycle.
- Determine whether the proposed Project has positive or adverse effects on individuals, households, and institutions.
- Describe, where appropriate, the general mitigation measures that will be incorporated into the Project.

586. A draft RAP and Resettlement Policy Framework[56] (RPF) were prepared for the Secondary Roads Sector (SRS)[57] by the RD in line with the World Bank's OP 4.12 Involuntary Resettlement Policy and effective legislation of Georgia.

587. A LARP has been developed for the Project in line with national legislation and fitting the requirements of the ADB resettlement policy. The LARP entailed consultations with the stakeholders, especially the APs and their community, to understand the extent of impact and validate the severity and compensation measures. As part of the LARP, a detailed assessment of loss of land, structures, and other assets under the Project was undertaken.

Identification of Receptors

588. The primary impacted receptors are Project affected people. Others important receptor include local businesses and workforce, regional and national workforce, and the regional and national government of Georgia. Interviews and analysis from a preliminary social survey with affected communities and roadside businesses undertaken by Kocks (see **Annex 3. Interviews and Analysis from Preliminary Social Survey with Affected Communities and Roadside Businesses**) indicates that small roadside businesses operating on the existing road expect to lose business as a result of reduced traffic flows.

Assessment of Impact: *Site Preparation, Construction, and Worksite Closure Phase*

589. Land Acquisition and resettlement. As indicated above, a stand-alone LARP has been developed for the Project in accordance with ADB's SPS (2009). The LARP defines

[56] The RPF-RS approved in fall of 2015 served as the main guiding document for the development of Resettlement Action Plans (RAPs) for each road section proposed for rehabilitation within the framework of the Secondary Road Asset Management Project (SRAMP) supported by WB.
[57] The RPF for SRS was developed during the preparation of the Secondary Road Asset Management Project (SRAMP) partially financed by the WB. The objective of the SRAMP was to contribute to the implementation of the Government's Five-year rolling Program for Improvement and Preservation of the Secondary Road Assets for 2016-2021 and enhancement of the country's systems in secondary roads assets programming, planning, budgeting, contracting and monitoring on a program level.

entitlement, fair compensation, livelihood restoration, and the movement of community structures and assets. The LARP should be referred to for full details on the following: (i) cut-off date and eligibility criteria for project affected people (APs) to receive cash compensation and additional rehabilitation measures; (ii) legal framework and institutional involvement; (iii) description of grievance redress mechanism; (iv) the valuation methodology utilized to determine unit rates per each type of loss to be cash compensated; (v) compensation entitlements; and (vi) participation and consultation procedures which will be employed to compensate and restore the livelihoods and living standards of APs. The LARP should be referred to for full details on Project affected people.

590. Employment and economy. The Project will generate a range of skilled and unskilled employment opportunities. Based on similar projects, there is the potential that 60% of direct employment opportunities will be available to the regional workforce during construction. The extent to which the regional or local population will benefit from employment opportunities created by the Project will depend partially on the skill-level of the positions to be filled. The number of people employed by the Project will decrease dramatically at the end of the construction phase.

591. The construction of the Project will result in temporary economic impacts from procurement of goods and services by the Project in construction and related industries (construction vehicles and machinery, construction materials, etc.) and goods and other services such as transport, catering, laundry, food supply, security services, etc. Procurement of goods and services for the project is expected to contribute to the economy to the extent that these outputs are purchased locally, regionally, or nationally.

592. Temporary economic impacts will also stem from induced economic effects of spending on goods and services by construction workers who will have increased disposable income and the ability to spend more money in the local economy. The magnitude of worker spending will depend on the percentage of local or regional (resident) vs. national vs. foreign workers and the duration of their contracts.

593. The payment of leases for land by the Contractor to be used for the Project could potentially provide beneficial impacts to landowners in the Project area. In addition to this, the rehabilitation of roads within the entire area of the Project will give owners better and easier access to their land, enabling them to better develop their activities.

594. The Project will likely result in long-term capacity enhancement for the local workforce during the construction period. Specifically, this includes long-term benefits from on-the-job and formal training opportunities for individual workers, and the possibility for capacity enhancements for local and national companies who would have won tenders for work on components of the Project. Civil works contracts will include provisions to encourage employment of women.

595. Therefore, it is considered that the impacts related to employment opportunities during the construction phase will be largely positive.

596. Community infrastructure and services. An increase in population in the local area (due to employment opportunities and immigration) is likely to place additional pressure on existing infrastructure and services (e.g., healthcare, roads). The result is often a short-term reduction in capacity of existing infrastructure and services to meet the needs of the local villagers (as well as the additional population added by the Project). For example, the use of the existing road infrastructure may lead to short-term deterioration of the road and or reduced access to agricultural fields, residences, and business. This is most relevant in Tsnori, and for farmers and residents adjacent to the proposed road alignment. During road construction the access to the adjacent agricultural fields should be maintained. The use of

the maintenance road of the irrigation channel for construction traffic needs to be agreed with the Georgian state-owned Melioration Ltd under the Ministry of Agriculture.

597. As described in Section **4.9 - Utilities**, the utilities present in the right-of-way include gas, electricity, telecom, and data lines. All of the service operators have supplied information on the location of the utilities to the RD. This information will be provided to the Contractor for coordination with relevant utility operators.

598. The design-build Contractor's work includes all work related to existing utilities that is necessary to accommodate the Project. In general, this includes ensuring that existing facilities and their replacements will be capable of providing service at least equal to that offered by the existing facilities. The Contractor's responsibilities could be summarized as follows:

- Identifying potential conflicts, verifying locations and all other necessary information about utilities;
- If a utility discovered requiring relocation that was not previously identified, undertaking the efforts necessary to identify its ownership and all other necessary information about such utility;
- All coordination with utility owners required in connection with the Project or utility work;
- Designing/constructing utility relocations;
- Completing all prior rights research, obtaining prior rights documentation and preparing agreements for relocation/adjustment of utilities, and all associated works

- Removal of all utilities abandoned as a result of the work.

599. Community health and safety. There are a number of potential health and safety related impacts which may result from construction activity on the Project, including:

- **Traffic accidents**. An increase in traffic can lead to an increase in congestion, leading to frustration on the part of local villagers. The key issue however is the potential for an increase in accidents or incidents, which can lead to injuries and/ or fatalities.
- **Presence of new infrastructure**. There can be safety issues with the establishment of new infrastructure – e.g., community members falling in unsecured trenches or interacting with unsecured equipment. This can lead to onsite accidents and injuries.
- **Management of hazardous materials and waste onsite**. It is particularly important that these materials are managed appropriately so as not to contaminate the surrounding water sources. There are a number of activities that will generate hazardous waste (e.g., chemical cleaning of equipment during the pre-commissioning process). This issue is covered in Section **7.2.8 - Waste Management**.

600. The Project will employ a range of people during construction and operation. There is potential for the workforce to introduce and/ or increase the rate of spread of communicable diseases in the Project area. This includes the introduction of a new disease and/ or a more virulent strain of an existing disease. An increase in the transmission of communicable diseases may occur as the result of the introduction of workers into the area, creation of vector habitat, and/ or the presence of commercial sex workers.

601. Social cohesion. Although employment opportunities bring positive economic benefits, they also can result in social issues. These are largely associated with the following:

- **An increase in disposable income within the local villages***.* Although this can have positive benefits such as improvement education, it may also result in negative impacts, such as an increase in the use of drugs and alcohol and an increase in the price of commodities and food; and
- **The introduction of new people in an area***.* This can lead to conflict within local communities. This stems from a variety of issues including differences in ethnicity and/ or religious values as well as jealousy that 'outsiders' have successfully secured positions within the Project.

602. Occupation health and safety (OHS). Project workers will be exposed to different hazards during construction including noise and vibration, dust, handling heavy materials and equipment, falling objects, work on slippery surfaces, fire hazards, and chemical hazards such as toxic fumes and vapors etc.

603. Workers' rights and OHS need to be considered to avoid accidents and injuries/deaths, loss of worker-hours, labor abuses and to ensure fair treatment, fair remuneration, and working and living conditions. Core Labour Standards outlined in the International Labour Organization (ILO) Declaration on Fundamental Principles and Rights at Work, and the relevant national labor laws will be followed. Equal remuneration and other relevant clauses for female workers will also be included. Employment of child laborers is prohibited and a clause to this effect will be included in contract agreements.

604. The Contractor shall provide workers with an effective grievance mechanism. This mechanism should involve an appropriate level of management and address concerns promptly, using an understandable and transparent process that provides timely feedback to those concerned, without any retribution.

605. Environmental emissions. The construction and operation of the Project will generate noise, vibration, and dust, which have been covered extensively in Sections **7.2.2 - Air Quality, 7.2.3 - Noise and Vibration**, and **7.2.1 - Soil and Relief**.

606. Construction camps. The establishment of Contractor's work camp may cause adverse impacts if various aspects such as liquid and solid waste management, equipment maintenance, materials' storage, and provision of safe drinking water are not addressed properly. The site for the work yard will be selected by the Contractor in agreement with the Municipality, RD, and the Engineer.

607. Workers' living facilities may have various impacts on the adjacent communities. In order to manage community impacts, construction Contractor will be obligated to develop community relations management plan. This plan should incorporate findings of the preliminary community impact assessment and also provide tools to identify, manage and mitigate any additional negative impacts on the surrounding communities that may arise during operation of workers' accommodation facilities.

608. Development of a Laydown Area and Construction Camp Management Plan (see Section **9.n - Laydown Area and Construction Camp Management Plan**) will be required of the Contractor, which will propose preventive/mitigation measures for environmental impacts of laydown areas and the construction camp, i.e., offices, accommodation facilities, testing facilities/laboratories, batching areas, storage and stockpiling areas, workshops, vehicle washing areas and all other areas/facilities required for the undertaking of activities

required for completion of the Project. The Management Plan should contain procedures for establishing and operating laydown areas and work camps in order to safeguard nearby communities and environment resources.

609. The development of a Waste Management Plan (see Section **9.a - Waste Management Plan**) covering the provision of garbage bins, regular collection and disposal in a hygienic manner, as well as proposed disposal sites for various types of wastes (e.g., domestic waste, used tires, etc.) and consistent with applicable national regulations will also be required of the Contractor prior to construction.

610. Cultural Heritage. There are no known ancient above ground resources in the Project area and there is no indication that an archaeological site may exist there. Nonetheless, a chance find procedure has been developed in coordination with the RD and the Ministry of Culture and Monument Protection and in accordance with the law on Cultural Heritage of Georgia (see **Annex 8. Chance Find Procedure**). In the event of unanticipated discoveries of cultural or historic artefacts (movable or immovable) in the course of the work, the Contractor shall take all necessary measures to protect the findings.

Table 76. Assessment of Impacts to Employment and Economy (prior to mitigation) – *Site Preparation, Construction, and Worksite Closure Phase*

Impact	Impact to employment and economy.			
Impact Nature	**Negative**	**Positive**	**Neutral**	
	Increase in employment opportunities and demand for goods and services are largely **positive**.			
Impact Type	**Direct**	**Indirect**	**Induced**	
	Direct impacts local villages and workforce are expected due to the creation of Project related employment opportunities. **Induced** economic effects of spending on goods and services by construction workers who will have increased disposable income and the ability to spend more money in the local economy is also expected. Temporary economic impacts will also stem from induced economic effects of spending on goods and services by construction workers who will have increased disposable income.			
Impact Duration	**Temporary**	**Short-term**	**Long-term**	**Permanent**
	The impact is can primarily be considered **short-term** since most benefits are limited to the site preparation, construction, and worksite closure phase.			
Impact Extent	**Local**	**Regional**	**International**	
	The Project will provide employment opportunities for local villages as well as from population centers in the wider area. Therefore, the impact is **regional**.			
Impact Scale	The impact scale is difficult to predict will depend on the percentage of local or regional (resident) vs. national vs. foreign workers and the duration of their contracts. The extent to which the regional or local population will benefit from employment opportunities created by the Project will also depend partially on the skill-level of the positions to be filled.			
Frequency	Throughout the construction phase of the Project.			
Impact Magnitude	**Positive**	**Negligible**	**Minor**	**Moderate**	**Large**
	The impact is **positive**.			

Note: In the case of a potential positive impact, no magnitude designation (aside from 'positive') is assigned.

Table 77. Assessment of Impacts to Impact on Community Health (prior to mitigation) – *Site Preparation, Construction, and Worksite Closure Phase*

Impact	Impact on community health, safety, and security due to increased traffic; the transport, storage, and use and/or disposal of materials (e.g., fuel and chemicals); access to structural elements or components of the project; and

	introduction of infection disease (both vector borne and other communicable diseases).			
Impact Nature	**Negative**	**Positive**	**Neutral**	
	Potential impacts to the local area are **negative**.			
Impact Type	**Direct**	**Indirect**	**Induced**	
	Impacts related to the construction activities are **direct**. Potential impacts related to the introduction of infection disease in the local area are **indirect**.			
Impact Duration	**Temporary**	**Short-term**	**Long-term**	**Permanent**
	Impact has the potential to have a lasting effect.			
Impact Extent	**Local**	**Regional**	**International**	
	The impact is considered to be **local**.			
Impact Scale	The impact scale is difficult to predict. In light of the substantial work anticipated for the Project, and the two-year construction period, the scale of potential impacts could be potentially large if not managed appropriately.			
Frequency	The impact likely occurs during the construction phase with the rare frequency.			
Impact Magnitude	**Positive**	**Negligible**	**Minor**	**Moderate**	**Large**
	The impact magnitude is considered **moderate**.			
Receptor Sensitivity	**Low**	**Medium**	**High**	
	In consideration of the potential impact to human health, receptor vulnerability is identified as **high**.			
Impact Significance	**Negligible**	**Minor**	**Moderate**	**Major**
	Without management and mitigation measure in place, the potential impact significance is **major**.			

Table 78. Assessment of Impacts to Community Infrastructure and Services (prior to mitigation) – *Site Preparation, Construction, and Worksite Closure Phase*

Impact	Impact on community infrastructure and services.			
Impact Nature	**Negative**	**Positive**	**Neutral**	
	The following impacts are negative: (i) Road access restrictions to traffic during to construction phase; (ii) increased water and energy demand for construction; (iii) increased demand on health services; and (iv) the disruption of services, including energy, to surrounding communities due to relocation of utilities.			
Impact Type	**Direct**	**Indirect**	**Induced**	
	The impact to community infrastructure and services is **direct**.			
Impact Duration	**Temporary**	**Short-term**	**Long-term**	**Permanent**
	Impact is likely to be **temporary** for some impacts (e.g., road access restriction, disruption of services) and **short-term** for others (e.g., increased demand on health services).			
Impact Extent	**Local**	**Regional**	**International**	
	The impact is limited to **local** villages and towns around the Project.			
Impact Scale	The impact scale is considered small due to the relatively limited number of people to be affected by increased demand and disruption of infrastructure and services.			
Frequency	The impacts will occur intermittently during the construction phase.			
Impact Magnitude	**Positive**	**Negligible**	**Minor**	**Moderate**	**Large**
	The impact magnitude is likely to be **minor** overall considering the above analysis.			
Receptor Sensitivity	**Low**	**Medium**	**High**	
	The sensitivity of receptors is considered to be **medium** for temporary and short-term impact on community infrastructure and services.			

Impact Significance	Negligible	Minor	Moderate	Major
	The overall significance is likely to be **minor**.			

Management and Mitigation Measures: *Site Preparation, Construction, and Worksite Closure Phase*

- Impacts on Employment and Economy.
  - Establish a local recruitment and Employment and Procurement Procedure (see Section **9.f - Employment and Procurement Procedure**). Development of the plan should involve consultation with relevant stakeholders, including government authorities and local villagers.
  - Review opportunities to establish a skills training program with an aim of training interested local villagers to contribute to the Project.
  - Inform local villagers of job opportunities in a timely manner.
  - Inform local businesses of contracting opportunities in a timely manner.
  - Workers will not be restricted from joining or forming workers organizations or from bargaining collectively, and the contractor will not discriminate or retaliate against workers who form or join collectives or bargain collectively.
  - Working relationships and conditions of work are also to be managed and monitored in implementing the Project.
- Impacts on Community Infrastructure and Services
  - Provide signs advising road users that construction is in progress, specifically at the points where the new road connects with the S-5.
  - Employ flag persons to control traffic when construction equipment is entering or leaving the work area.
  - Post traffic advisory signs (to minimize traffic build-up) in coordination with local Authorities.
  - Prompt restoration of accidentally damaged private property and/or infrastructure.
  - Define and observe schedules for different types of construction traffic trips (e.g., transport of pre-cast sections, haulage of spoils, delivery of construction materials, etc.).
  - Keep the community informed about the schedule of works which could cause temporary restriction of services and the potential duration of the 'impact' in advance.
- Land Acquisition, Resettlement
  - The key mitigation for land use is implementation of the LARP.
  - Written agreements with local landowners for temporary use of the property will be required and sites must be restored to level acceptable to the owner within a predetermined time period.
- Noise, Vibration and Dust
  - Refer to mitigation measures provided in respective Sections of **7.2.3 - Noise and Vibration**.
- Impacts on Social Cohesion
  - Locate construction camp away from communities in order to avoid social conflict in competition for resources and basic amenities such as water supply.
  - Give qualified local residents priority in hiring of construction workers.
  - Encouraging employment of women.
  - Maximize goods and services sourced from local commercial enterprises.
- Occupational and Public Health and Safety

- Conduct orientation for construction workers regarding health and safety measures, emergency response in case of accidents, fire, etc., and prevention of HIV/AIDS and other related diseases.
- Report all accidents and near misses and collect statistics to be used to identify trends and requirements for further training or 'safety stand-downs' where incident numbers are growing.
- Stable footpaths/access with sturdy guardrails to the bridge work sites shall be provided.
- Ensure the grievance mechanism is functional and understood by the community.
- The Contractor will develop and implement Traffic Management and Waste Management plans (see Sections **9.c - Traffic Management Plan** and **9.a - Waste Management Plan**).
- Implementation of Stakeholder Engagement Plan.
- Provide first aid facilities that are readily accessible by workers.
- Provide fire-fighting equipment at the work areas, as appropriate, and at construction camps where fire hazards and risks are present.
- Provide adequate sanitation facilities for all workers at the workers'/construction camps.
- Ensure that all wastewater emanating from the project site are treated consistent with national regulations.
- Ensure proper collection and disposal of solid wastes consistent with local regulations.
- Provide personnel with appropriate safety equipment such as safety boots, helmets, gloves, protective clothes, breathing mask, goggles, ear protection, etc. and ensure that these are properly worn as required.
- Ensure reversing signals are installed on all construction vehicles.
- Implement fall prevention and protection measures whenever a worker is exposed to the hazard of falling more than two meters, falling into operating machinery or through an opening in a work surface.
- Implement precautions to ensure that objects (e.g., equipment, tool, debris, pre-cast sections, etc.) do not fall onto or hit people, vehicle, and properties in adjoining areas.
- Barriers should be installed to keep pedestrians away from hazardous areas such as constructions sites and excavation sites.
- Signage should be installed at the periphery of the construction site to warn and direct traffic and pedestrians.
- Provide security personnel in hazardous areas to restrict public access.
- Strictly impose speed limits on construction vehicles along residential areas and where other sensitive receptors such as schools, hospitals, and other populated areas are located.
- Educate drivers on safe driving practices to minimize accidents and to prevent spill of hazardous substances and other construction materials during transport.
- Provisions will be incorporated into all sub-contracts to ensure the compliance with the SEMP at all tiers of the sub-contracting.
- The areas where risk of injuries from falling objects exist will be marked with rope or flagging to minimize risks and injuries.
- Flag persons will be employed to control traffic when construction equipment is entering or leaving the work area.
- Road signs will be provided in accordance with approved traffic management plan (See Section **9.c - Traffic Management Plan**).
- Construction and work sites will be equipped with sanitary latrines that do not pollute surface waters and are connected to septic tanks, or waste water treatment facilities.

- Cultural Heritage
    - Implementation of chance finds procedures to appropriately (see **Annex 8. Chance Find Procedure)** manage unanticipated discoveries of cultural or historic artefacts (movable or immovable) in the course of the work.

Residual Impacts: *Site Preparation, Construction, and Worksite Closure Phase*

611. No significant residual impacts are anticipated if the LARP is implemented correctly. However, there will still be disruption to the local community during the LARP implementation process. A GRM has been prepared to manage complaints received during this process (see Chapter **9. Grievance Redress Mechanism**).

612. After the Project construction phase, many local workers may be without employment. However, the Project will have provided them, in many instances, with additional skills and experience to work on similar projects in other locations. The extent to which the regional or local population will benefit from employment opportunities created by the Project will depend partially on the skill-level of the positions to be filled. The residual impact to the economy is assessed as **minor**.

613. Due to the nature of construction activities under the Project, occupational health and safety measures can reduce but not eliminate exposure to workers from various physical hazards. Assuming that the above management measures will be implemented and monitored over time, the residual impact was assessed as **minor**. Ongoing monitoring should occur to track implementation and evaluate the management measures.

614. Project-related workforce and activities will inevitably increase demand for social infrastructure and services. The ability of local service providers to respond in a timely and appropriate manner to increased service demands will be contingent on the availability of increased resources to meet those demands. The residual impacts are expected to be **negligible / minor**.

Assessment of Impact: *Operation Phase*

615. Impacts on community health and safety. According to statistics, the 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 that might be cultivated adjacent to the road. Health risks associated with noise, and air quality during the operation phase are covered in Section **7.2.3 - Noise and Vibration** and **7.2.2 - Air Quality**.

616. Due to the anticipated higher average vehicle speed on the new road (as compared to existing road), there is a potential that there may be more frequent high-speed accidents and correspondingly more severe injury implications. On the other hand, the geometry of the new road, improved drainage, and two-lanes will provide safer driving conditions for road users. The impacts on traffic safety will likely be positive for the overall scope of the new road section.

617. Preliminary designs for the road include the construction of 14 underpasses dedicated to servicing existing local traffic through the embankment of the designed highway (see Figure 11). This is meant to accommodate vehicle traffic from farmers and local residents who need to frequently access both sides of the new road. While the number is expected to be low, pedestrians and bicyclists will also need to utilize the underpasses to cross the highway along the planned alignment to avoid being highly exposed and

vulnerable to speeding traffic on the main roadway. Underpasses, if not designed appropriately, can pose safety risks to both pedestrians and vehicles.

618. Connectivity and accessibility. The operational stage of the Project is expected to improve connectivity for the transport of goods, services, and people leading to a better economic growth potential of the region. This would include better accessibility for businesses in the region to expand their geographical markets and resources to other areas and countries.

619. Access to areas being utilized by farmers and their livestock will be retained as the design incorporates 14 bridges with box culverts for crossing underneath the road (see **4.6 - Bridges**).

620. Employment opportunities. Under Project operation, employment for the operation and maintenance activities of the road and bridge will be required, resulting in long-term employment opportunities for the local, regional, and national workforce. However, employment opportunities will be limited.

621. Based on interviews conducted by Kocks in November and December of 2017 (see **Annex 3. Interviews and Analysis from Preliminary Social Survey with Affected Communities and Roadside Businesses**), roadside businesses operating on the existing road are expecting to lose income as result of the reduced traffic. It is recommended that a component be integrated into the Project that supports outside vendors who may be negatively affected. One mitigation measure could entail creating a centralized marketplace for vendors where the section of new road will connect to the S-5 highway in the town of Tsnori.

Table 79. Assessment of Impacts to Connectivity and Accessibility (prior to mitigation) – *Operation Phase*

Impact	Impacts to connectivity and accessibility resulting from the operation of the Project road.				
Impact Nature	**Negative**		**Positive**		**Neutral**
	Improved road traffic capacity, connectivity, and safety are expected to provide socioeconomic benefits.				
Impact Type	**Direct**		**Indirect**		**Induced**
	Road traffic capacity and connectivity will be **directly** impacted by construction of the road. Improved safety to drivers and pedestrians will also be directly impacted. There is the potential for **induced** development in the area, including along the secondary road that will be resurfaced as part of the Project (see **4.3 - Section Layout**) and connected to the new highway.				
Impact Duration	**Temporary**	**Short-term**	**Long-term**	**Permanent**	
	Positive impacts will be experienced for as long as the road is operational.				
Impact Extent	**Local**		**Regional**		**International**
	It is expected that the new road section will play a positive role in enhancing economic growth both **locally** and **regionally**. Improved safety features will benefit all users, but mostly those living locally.				
Impact Scale	The scale of positive impacts is expected to be large and measurable over time.				
Frequency	Throughout the operational period of the road.				
Impact Magnitude	**Positive**	**Negligible**	**Minor**	**Moderate**	**Large**
	The impact is considered **positive**.				

Note: In the case of a potential positive impact, no magnitude designation (aside from 'positive') is assigned.

Management and Mitigation Measures: *Operation Phase*

Final designs of the underpasses will need to accommodate for pedestrian and bicyclists use and must include features to ensure health and safety. The underpasses should provide adequate width for users to pass each other comfortably, lighting, road signing, and markings to increase pedestrians' perceptions of security and comfort. Luminaries and associated electrical equipment should be vandal and weather resistant. The underpasses must also be protected from flooding and well maintained by the Road Maintenance Contractor.

Residual Impacts: *Operation Phase*

622. No significant residual impacts are anticipated if the LARP is implemented correctly.

623. The proposed Project plays an important role in connecting several regions of the country and two international transport corridors linking Georgia with Azerbaijan (via S-5 Tbilisi-Bakurtsikhe-Lagodekhi) and Russia (E-117). It is expected that the road section will play a positive role in enhancing economic growth locally and regionally. The Project will provide opportunities for local businesses in the neighborhoods surrounding the Project.

624. Project impact on traffic safety will be both positive and negative through the operation phase. The Potential operational health and safety and environmental risks will also continue into the operation phase as a result of maintenance of the structures over the long-term.

625. Considering the above, residual socio-economic impacts from the Project in the operation phase can be considered **moderate** and largely positive.

7.2.8 - Waste Management

Scope of the Assessment

626. Waste and waste management is a cross-cutting issue and has been covered in each impact analysis section within the IEE. This section will therefore focus on providing only relevant new information rather than a specific impact assessment on waste management.

627. It should also be noted that in the time of the preparation of this IEE report, information on many of the specifics regarding waste management were not available (e.g., areas allocated for temporary storage of hazardous waste; whether camps will be established, and whether quarries or spoil disposal sites will be opened). These potential impacts and the mitigation measures to prevent, reduce, or control adverse environmental effects will be provided in the Contractor's SEMP.

Identification of Receptors

628. The resources (physical, biological, human, or cultural environment) and receptors that may be impacted in relation to waste generation and management include the following:

Resources	Receptors
• Physical environment including land, air quality and water resources (addressed elsewhere).	• Construction workers • Full time and temporary workers during operation

- Biological environment, primarily being the terrestrial environment
- Human environment including subsistence resources, community health, welfare, amenity and safety, employment and incomes, business and economic activity, existing government services, land use and traffic
- Contractors and visitors to the site
- Residents within the area of influence
- Adjoining industrial facilities
- Workers in or near waste disposal locations
- Residents near waste disposal locations
- Government bodies/businesses providing waste management services

Assessment of Impact: *Preparation, Construction, and Worksite Closure Phase*

629. The following construction waste will be generated during the construction and operation of the road:

- Inert materials like padding soil, sand and gravel mix, concrete, which will be processed and used as a construction material in backfilling, shaping, and landscaping operations.
- Potentially harmful and hazardous substances such as construction camp waste (if camps are developed), crushed stone from crushing, empty containers used to store fuel, lubricants and chemicals, ferrous scrap, electrode stubs –these wastes have to be properly disposed of as per national regulations.
- Timber waste from tree felling and other organic substances from site clearing – these should be stockpiled at designated areas outside construction sites and removed during the period of felling and grubbing. A possible solution is to sell these materials as fire wood to local residents (subject to national legislation).

630. Non-hazardous waste. It will be necessary for the Contractor to classify waste streams (hazardous, non-hazardous, or a waste that requires a full assessment to determine classification – so-called 'mirror entry' waste) and manage them according to international best practice and Georgian law.

631. Solid non-hazardous and inert waste will likely be removed to the Telavi city municipal waste dump however this will need to be confirmed by the Contractor. Solid Waste Management Company of Georgia LLC is responsible for operation of landfills and waste collection is carried out by municipalities (waste management utilities).

632. The Contractor will need to develop a Waste Management Plan, Wastewater Management plan, and Spoil Disposal Plan for review and approval by the RD before construction begins. Guidance and direction on what needs to be covered within these management plans is provided in **Annex 9. Thematic Management Plans**.

633. Hazardous waste. Inadequate management of hazardous waste generated during construction may cause soil, ground, and surface water pollution as described in the sections above. Therefore, hazardous wastes will be handed over to licensed companies authorized for utilization of this types of the waste.

634. Based on the survey conducted by Kocks of the area where the road corridor is planned (which includes both Gurjaani (Chumlaki) – Telavi Bypass and the Bakurtsikhe-Tsnori road sections) illegal dumping of solid waste has taken place in some areas along the irrigation canal, including waste containing asbestos (see **6.1.5 - Waste**). Asbestos-containing waste (ACW) may also be found during demolition of buildings in the ROW.

635. Asbestos is well recognized as a health hazard and asbestos fibers associated with these health risks are too small to be seen with the naked eye. Breathing asbestos fibers

can cause a buildup of scar-like tissue in the lungs called asbestosis and result in loss of lung function that often progresses to disability and death. Asbestos also causes cancer of the lung and other diseases such as mesothelioma of the pleura which is a fatal malignant tumor of the membrane lining the cavity of the lung or stomach. Epidemiologic evidence has increasingly shown that all asbestos fiber types, including the most commonly used form of asbestos, chrysotile, causes mesothelioma in humans.[58, 59, 60]

636. If asbestos is located on the Project site during walkover surveys or examination of houses to be demolished during the detailed design and pre-construction stages, the Contractor will be responsible for developing an ACW Management plan to avoid, reduce, or manage any potential adverse impacts related to asbestos on the environment and/or humans caused by the Project implementation (see **Annex 13. Asbestos-Containing Waste Management Plan**).

7.2.9 - Cumulative Impacts

637. The Bakurtsikhe-Gurjani Bypass road section is being financed by the World Bank and is nearing completion. The end of the section is located outside of Bakurtskhe and is where the Bakurtskhe-Tsnori section covered under this IEE begins. The section of Gurjaani-Bakurtsikhe bypass road will connect Tbilisi-Bakurtsikhe-Lagodekhi international road with Akhmeta-Telavi-Bakurtsikhe secondary road. Similar to the Bakurtskhe-Tsnori section, the construction of the Bakurtsikhe-Gurjani section allows vehicles to bypass a number of towns (Bakurtsikhe, Kolagi, Dzirkoki, Chandari, Vejini, and Chumlaki) where congestions and road conditions have posed issues. It is not expected that cumulative impacts will result from the activities of this Project.

638. There is no other known or anticipated future development in the region which will result in cumulative impacts with the Bakurtskhe-Tsnori section

639. Any cumulative impacts that arise from this Project will primarily result from the construction of the main Project components and associated facilities. Assuming all components are started simultaneously, without mitigation, cumulative impacts will be “moderate” in magnitude during the peak construction (likely for the first six months of the construction). After this, the magnitude of cumulative impacts will likely lessen to “low” magnitude. The sensitiveness of the resources, natural and artificial, within the main areas of influence has been taken into account, together with the types of works involved and their intensities.

640. The potential cumulative impacts would be dust, noise, road space limitation leading to slow mobility, access blocking, disruption of social services and economic activities, community and workers’ health and safety hazards, generation of solid wastes and spoils. To reduce the cumulative impacts down to acceptable levels:

(i) civil works must be well planned, strategized and completed promptly;
(ii) the contractor should implement SEMP fully, and key institutions should act their roles in EMP implementation effectively;

[58] "Asbestos (Chrysotile, Amosite, Crocidolite, Tremolite, Actinolite, and Anthophyllite)" World Health Organization (WHO), International Agency for Research on Cancer (IARC) Monographs on the Evaluation of Carcinogenic Risks to Humans, Volume 100C, 2012.
[59] Pira et. al. *"Mortality from cancer and other causes in the Balangero cohort of chrysotile asbestos miners." Occup Environ Med* 2009;66:12 805-809.
[60] Wang X, Lin S, et. al. "Cause-specific mortality in a Chinese chrysotile textile worker cohort" JC School of Public Health and Primary Care, The Chinese University of Hong Kong, Hong Kong, China.

(iii) there must be adequate consultations with stakeholders, including vehicle operators, and local authorities and coordination, particularly regarding expected cumulative impacts. vehicle operations should temporarily adjust to the circumstances to relieve some road space limitations and for public safety and convenience;
(iv) the GRM should be disclosed (through public meetings, display at strategic places and media) to the communities affected by the cumulative impacts.

8. Public Consultation and Information Disclosure

8.1 - General

641. National regulations. Under the EAC, construction of international and interstate roads as well as construction and operation of tunnels and/or bridges on the international and interstate roads falls under activities subject to EIA (see **3.2 - Environmental Legislation of Georgia**). Public consultation is a mandatory part of the EIA process in Georgia. The competent authority for the EIA process is MoEPA.

642. 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 organization 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.

643. 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 EIA procedure. According to paragraphs 6 and 7 of the Law, the project owner prepares EIA 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 MoEPA, and local administrative authorities.

644. It should be noted that that a new procedure which applies to screening, scoping and EIA stages is has been introduced which replaced the Law on Environmental Impact Permit. However, because this Project was started prior to January 1, 2018, when the new law came into effect, the procedures laid out in the original law apply. More information on this and relevant permit application and issuance procedures are provided in Chapter **3. Policy, Legal, and Administrative Framework**.

645. In accordance with the Law on Environmental Impact Permit, public consultation occurs once a draft of the national EIA 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 also does not contain any specific requirements for development of stakeholder engagement plans (SEP) and/or stakeholder engagement beyond completion of the EIA process.

646. ADB Safeguards Policies. According to the ADB SPS (2009):

647. "*The borrower/client will carry out meaningful consultation with affected people and other concerned stakeholders, including civil society, and facilitate their informed participation. Meaningful consultation is a process that:*

1. *Begins early in the project preparation stage and is carried out on an ongoing basis throughout the project cycle;*
2. *Provides timely disclosure of relevant and adequate information that is understandable and readily accessible to affected people;*
3. *Is undertaken in an atmosphere free of intimidation or coercion;*

4. *Is gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups; and*
5. *Enables the incorporation of all relevant views of affected people and other stakeholders into decision making, such as project design, mitigation measures, the sharing of development benefits and opportunities, and implementation issues.*

Consultation will be carried out in a manner commensurate with the impacts on affected communities. The consultation process and its results are to be documented and reflected in the environmental assessment report."

8.2 - Objectives of Consultations

648. 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. The objectives of these consultations are:

- to inform and educate the common public, especially potentially impacted communities/ individuals and stakeholders about the proposed project activities;
- to familiarize the people with technical, environmental, social, and economic issues of the project for better understanding;
- to solicit the opinion of the affected communities/ individuals on environmental issues and assess the significance of impacts due to the proposed development;
- to foster cooperation among officers of RD, the communities, and the stakeholders to achieve a cordial working relationship for smooth implementation of the project;
- to identify the environmental issues relating to the bridge and approach roads construction work;
- assess the views of the beneficiary communities and their willingness to participate in the project in a bottom up planning and decision-making process;
- to secure people's inputs in respect of project planning, selection of mitigation measures, and monitoring strategies; and
- to ensure lessening of public resistance to change by providing them a platform in the decision-making process.

8.3 - Methodology Used for Consultations

649. The RD is committed to transparent and respectful dialogue with stakeholders throughout the lifecycle of the project. The approach to stakeholder engagement adopted by the RD is in line with Good International Industry Practice (GIIP) for EIA and ensures that all stakeholders with an interest in the Project have been identified and consulted.

650. Stakeholder engagement should include:

a) the provision of relevant, timely, and accessible information to stakeholders in a culturally appropriate and understandable format;
b) 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; and
c) a grievance mechanism to guide a response and resolution process for stakeholder concerns or grievances.

651. The stakeholder engagement approach employed by the RD for the Project focuses on:

- national and good international practice requirements for public consultation and disclosure that the company will conform to;
- identifying project stakeholders;
- strategy, format, and timetable for consultation and information disclosure from feasibility design phase through operation phase;
- the RD's resources and management structure for developing and implementing the stakeholder engagement activities;
- grievance mechanism(s) for stakeholders; and
- means of reporting on consultation and disclosure activities.

652. Resources and responsibilities. The 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.

653. The RD Environmental and Social team will be responsible for (i) communication with stakeholders, within the scope of its field of competence, throughout the IA process; and (ii) consideration of the comments received from the stakeholders in the final version of the IEE report.

654. The Contractor will be responsible for nomination of a Community Liaison Officer (CLO) and implementation of grievance procedure. During the project implementation phase, the Contractor's staff will be responsible for communicating with the local community and handling grievances. The RD will be kept informed (a copy of the grievances, if any, will be sent to the RD) and will closely monitor the grievance resolution mechanism. The scale of RD's involvement will depend on the scale and subject of the grievance raised.

655. 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:

- 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; and
- monitoring any grievances received and their resolution.

656. The stakeholder engagement process will be revised and updated as needed and appropriate during construction phase of the project.

8.4 - Stakeholder Engagement Activities

657. The process of public consultation for the Bakurtsikhe-Tsnori road section commenced at the conceptual design stage once the environmental and social screening and scoping of the proposed works had been undertaken.

658. The Kocks environment team ensured provision of public orientation meetings prior to commencement of RAP related surveys, to ensure that project affected community, local government, and all stakeholders were aware of the meaning and objectives of the planned

activities. Thorough studies and onsite surveys were undertaken by Kocks commencing late October 2017 and completed in early March 2018.

659. During preliminary social surveys carried out in November-December 2017, 28 private and legal persons with businesses along the existing road were interviewed. Analysis from those initial consultations is provided in **Annex 3. Interviews and Analysis from Preliminary Social Survey with Affected Communities and Roadside Businesses**.

660. In line with standards described in Section **8.1 - General** above, two public information meetings with local community representatives in the Project impact corridor and other key stakeholders were undertaken on February 21, 2018; one in Gurjaani Municipality and in Signagi Municipality. Minutes from those meetings are provided in **Annex 2. Stakeholder Engagement Meeting Minutes**.

661. Stakeholder consultations with the RD and Kocks representatives were undertaken by the environmental consultant as part of the development of this IEE in late 2018 through early 2019. This was supported by the environmental specialist's field visit to the Project area in November 2018. Consultations by the resettlement specialist have also been undertaken as part of the LARP development according to the ADB's SPS (2009). These can be found in the stand alone LARP document.

662. Further consultations with stakeholders will be undertaken as part of the disclosure process for this IEE and the LARP. The findings of these consultations will be added to this report once they become available.

8.5 - Public Disclosure

663. This draft IEE report will be disclosed through the RD's web page prior to public consultation, and the finalized document will be re-disclosed by RD and be posted on the ADB's web page. The RD will arrange public consultation meeting on the draft IEE report and ensure incorporation of stakeholders' feedback. The minutes of the public consultation meeting will be included in the finalized IEE report.

664. During the IEE report disclosure period, hard copies as well as the electronic version of non-technical summary of IEE will be available at the following addresses:

- Local government of Gurjaani Municipality – address: №13 Noneshvili Avenue;
- Roads Department of Georgia – Address: Tbilisi, #12 Al. Kazbegi Avenue.

665. Also, the draft IEE report and later – its finalized version will be available for downloading from the following web sites:

- Roads Department of Georgia: www.georoad.ge
- Website of the MoEPA: www.mepa.gov.ge

666. During the disclosure period, stakeholders will have an opportunity to send comments at the following e-mail addresses: maya_vashakidze@yahoo.co.uk

9. Grievance Redress Mechanism

667. Grievance Redress Mechanisms (GRMs) are a locally based, formalized way to accept, assess, and resolve community feedback or complaints. They provide predictable, transparent, and credible processes to all parties, resulting in outcomes that are relatively low cost, fair, and effective. They build on trust as an integral component and facilitate corrective action and pre-emptive engagement. GRMs also set out a timeframe in the resolution of complaints.[61] The Project GRM will serve as a venue for receiving and addressing project-affected peoples' concerns and grievances about environment and social related impacts. It will address concerns promptly through an understandable and transparent process that is accessible to all members of the community, gender responsive and culturally appropriate. The overall approach of the GRM is to deal with grievances at a local level first in an efficient manner and escalate to the next level or higher level of authority if grievance cannot be resolved.

668. The ADB Accountability Mechanism (AM) provides an independent forum and process for people to voice and seek solutions to their problem as well as alleged non-compliance by ADB with its operational policies and procedures. As ADB adheres to early problem prevention and problem-solving, Project complaints and concerns should first be addressed promptly and effectively at the Project, through the GRM, and operational levels. The AM is the "last resort" process for dealing with problems and compliance issues that were not prevented or solved at GRM and operational levels.

669. The GRM should be established and operated in compliance with the Georgian Regulations and ADB Policy requirements. The ADB's 2009 Safeguards Policy Statement[62] requires the borrower/client to establish a mechanism that will receive and facilitate the resolution of affected persons' concerns and grievances about physical and economic displacement and other Project impacts, paying particular attention to vulnerable groups.

9.1 - Georgian Regulations

670. The Administrative Code of Georgia is the legal document defining the rules and procedures for any grievance review and resolution within the national regulatory framework. According to the law, the Administrative body receiving officially lodged claims is obliged to review the claims and engage the claimant in the grievance review and resolution process, and issue final decision in that regard.

671. Clause 181 of the law defines the content and the grievance submission forms. In particular, the grievance package should include: a) Name of the administrative body to whom the complaints are addressed; b) Name, address and contact details of the claimant; c) Name of the administrative body, who's decisions or administrative acts are the subject of complain; d) Name of the administrative act or decision, which is subject of complain; e) Content of the claim; f) The context and facts, based on which the complaint is substantiated; g) list of attachments

672. Clauses 194 and 198 define the rules and procedures ensuring participation of the claimants in the grievance review process.

673. According to the clause 202, the decision issued by the Administrative Body in relation with the reviewed claim has a status of individual administrative legal act.

[61] World Bank. 2014. Global Review of Grievance Redress Mechanisms in World Bank Projects. Washington, DC. © World Bank.
[62] ADB. 2009. *Safeguards Policy Statement.* Manila.

674. The standard period given for the issuance of the decision in relation with the grievance is one month.

9.2 - Grievance Redress Mechanism Structure

675. The IEE includes in its scope the establishment of a responsive, readily accessible and culturally appropriate grievance redress mechanism (GRM) capable of receiving and facilitating the resolution of affected persons' concerns and grievances related to the project. An established grievance redress mechanism allows an AP to appeal any decision, practice or activity arising from land or other assets compensation that they disagree with. The scope of the GRM is to address issues related to involuntary resettlement, social and environmental performance, and information disclosure.

676. The APs will have the right to file complaints and/or queries on any aspect of the project, including environmental issues and other social aspects such as land acquisition and resettlement. Under the adopted grievance mechanism, the APs may appeal any decision, practice or activity related to the project. All possible avenues will be made available to the APs to voice their grievances. The GRM will ensure that grievances and complaints on any aspect of the project are addressed in a timely and effective manner.

677. The fundamental objectives of the GRM are:

- To reach mutually agreed solutions satisfactory to both, the Project and the APs, and to resolve any grievances locally, in consultation with the aggrieved party;
- To facilitate the smooth implementation of the IEE and LARP, particularly to cut down on lengthy litigation processes and prevent delays in Project implementation;
- To facilitate the development process at the local level, while maintaining transparency as well as to establish accountability to the affected people.

678. APs were fully informed of their rights and of the procedures for addressing complaints whether orally or in writing during the IEE and LARP consultations and surveys and will be informed again when the compensation is disbursed. Care will be taken to prevent grievances rather than relying solely on the redress process. This can be achieved by establishing extensive communication and coordination between the affected communities, the EA, and local governments in general.

679. The GRM consists of two systems: (i) the project-specific system established at the municipal level; and (ii) a regular system established at RD. Local Grievance Redress Mechanisms (LGRM), are established at a municipal level as a project-specific instrument and function for the duration of Project implementation. The Grievance Redress Commission (GRC) was formed as an informal structure within the RD / MRDI to record and ensure grievance review and resolution.

680. Local Grievance Redress Mechanism (LGRM). The LGRM is an informal, project-specific grievance redress mechanism established to administer grievances at Stage 1. This informal body will be established at project affected site/community level.[63] The core team of LGRM will be formed by the local social safeguards/resettlement officers of RD / MRDI, Contractor, and Engineer. The chief social safeguards/resettlement specialist of RD / MRDI is nominated as a coordinator of LGRM (Coordinator). Currently, the key local resettlement officer of RD / MRDI is Mamuka Gelekva. Social safeguards/Resettlement specialist of the

[63] The LARP should be referred to for details on site/community level representation for the LGRM.

Engineer will be nominated as a Secretary of LGRM responsible for establishment and maintenance of the local level grievance log and recording all grievances.

681. Participation of municipality representatives in LGRM is important, as very often significant part of grievances is directed by project affected people (PAPs) to the local municipalities. Apart from that, there are many issues at local level that may require involvement of local authorities (i.e., issues related to determination of the land ownership rights; impacts on community infrastructure, etc.).

682. LGRM will be established as an informal structure prior to Project construction and will be fixed by the minutes of meeting. Internal regulations of LGRM will be developed by LGRM Coordinator and will be reviewed and adopted by the majority of LGRM members. The LGRM will include following members:

Table 80. Local Grievance Redress Mechanisms (LGRM) Members

Name	Position	Status
Mamuka Gelekva	The chief social safeguards/resettlement specialist of RDMRDI	Coordinator
Archil Jorbenadze	ADB Project Coordinator RDMRDI/ETCIC	ADB Monitoring

683. LGRM members will be identified in the Project LARP and this IEE will be updated to reflect its members.

684. The Grievance Redress Commission (GRC). The GRC was formed by the order (No. 224) of the Head of the RD as a permanent and functional informal structure, engaging personnel of RD from all departments to work on Land Acquisition and Resettlement (LAR) and environmental issues and complaint resolution. It consists of 17 permanent members, two secretaries and three non-permanent members without the right of vote. This includes the top management of the RD / MRDI, safeguard or LAR units, legal other relevant departments (depending on the specific structure of the IA). The GRC is involved in Stage 2 of the grievance resolution process. The order states that if necessary, a representative of local authorities, NGOs, auditors, APs and any other persons or entities can be included in the Commission as its members. The list of the permanent members is presented in the following table:

Table 81. Grievance Redress Commission (GRC)

No	Name of Member	Position
1	Irakli Karseladze	Head of the Commission
2	Aleksandre Tevdoradze	Deputy Head of the Commission
3	Levan Kupatashvili	Member
4	Giorgi Tsereteli	Member
5	Koba Gabunia	Member
6	Salome Tsurtsumia	Member
7	Pikria Kvernadze	Member
8	Davit Sajaia	Member
9	Giorgi Eragia	Member
10	Nodar Agniashvili	Member
11	Mikheil Ujmajuridze	Member
12	Nino Mtsuravishvili	Member
13	Gia Sopadze	Member
14	Akaki Mshvidobadze	Member
15	Davit Kaladze	Member
16	Davit Getsadze	Member
17	Pavle Gamkelidze	Member
18	Girogi Tsagareli	Non-permanent member of commission
19	Mariam Begiashvili	Non-permanent member of commission
20	Archil Jorbenadze	Non-permanent member of commission

9.3 - Grievance Redress Process

685. Stage 1: grievance resolution at the local level and LGRM. Stage 1 of the grievance resolution process comprises collection of the grievances that have been submitted at the local level (to affected Municipalities; Contractor; RD / MRDI local representatives, etc.) and review and resolution of the grievances that could be administered at the local level without engagement of the GRC. The type of complaints that could be resolved at the local level include usually construction related environmental and social impacts, like damage of assets, community infrastructure, dust emissions or noise impacts, traffic safety issues, etc. LGRM has no competence to resolve many LAR related issues, like verification of the inventory of losses and repeated valuation of lost assets, however LGRM should support collecting such type grievances and directing them to the GRC central office for further review and resolution under the Stage 2 process. All types of grievances that have not been successfully resolved at the LGRM level through the Stage 1 process, will be redirected to the GRC with the supporting documents describing the efforts of LGRM to resolve the grievance.

686. After the grievance enters the LGRM through the local entry points (Municipality and contact persons nominated by RDMRDI, CW Contractor, Engineer) or from RD / MRDI central office, Coordinator and Secretary of LGRM together with the representative of Contractor shall meet with the aggrieved affected person (AP) and sign the minutes that record a description of the grievance, the dates when the grievance is submitted, and brief content of the agreements made. After receiving the grievance, the LGRM is the body where the grievance should be redirected and it should be the responsibility of LGRM to fix the grievance and check its validity. Despite the opinion of the Contractor, in case if the majority of the LGRM members decide that the damage is subject for compensation by Contractor, the Contractor is obliged to pay compensation or restore the damaged asset. In case if

Contractor refuses to fulfil their obligation, the local GRM directs the grievance to RD / MRDI and RD / MRDI management either enforces Contractor to pay compensation, or RD / MRDI pays compensation itself and later deducts the compensation amounts from next payments to Contractor. More detailed procedure in that regard should be agreed with ADB.

687. During the meeting with AP, they shall be informed of the overall grievance mechanism including their right to refuse the solutions offered under the grievance resolution procedures of Stage 1. Grievances submitted are registered in grievance log which is locally managed by the secretary of LGRM and the same logs will be sent to RD / MRDI weekly. These logs then are integrated within the entire log system centrally managed by the secretary of GRC (see below). Response should be sent to complainants at this stage together with the minutes and plan of agreed actions within 10 days of the reception of the grievance. If the AP is not satisfied with the solutions offered by the RD / MRDI, the grievance case will proceed to Stage 2. This mechanism enables unimpeded implementation of the Project and timely satisfaction of complaints. If the AP is not satisfied, the secretary of LGRM should assist him/her in lodging an official complaint in accordance with the procedures of Stage 2 (the plaintiff should be informed of his/her rights and obligations, rules and procedures of making a complaint, format of complaint, terms of complaint submission, etc.). The secretary of LGRM will assist the AP to collect and submit supplementary documents needed for grievance review at the Stage 2 and will supplement the grievance package with notes and documents describing the efforts of GRCE to resolve the grievance at Stage 1.

688. Stage 2 – GRC review of AP's complaint. For Stage 2 of grievance resolution process the RD / MRDI has established a GRCN as a formal mechanism that will be called upon each time a complaint reaches the Stage 2. The GRC notifies the AP about the receipt of the grievance within 10 days, reviews the written complaints of APs which were not satisfied at Stage 1 or are not of competence of LGRM, and within one month informs the AP about the decision in compliance with the Administrative Code of Georgia. If the complainant is not satisfied with the decision of GRC, then she or he may proceed with a court case.

689. The internal regulations for the GRC allows, if necessary, engagement of representative of local authorities, NGOs, auditors, APs and any other persons or entities in the work of commission. The GRC will convene every time a grievance is escalated to Stage 2. GRC has an appointed person as a secretary/convener responsible also for keeping the records of the minutes from GRC meetings. GRC has nominated person responsible for monitoring and keeping the log of grievances for this project, as well as other ADB financed projects. The GRC Monitor is responsible to track implementation of the GRC decision. GRC will be immediately notified if there are delays or hurdles in carrying out the decision. GRC will allocate all necessary resources to ensure implementation of a decision.

690. Stage 3 – Court decision. If complainants are not satisfied with the decision of the GRC, they have the right to bring the case to the court. The aggrieved AP can take a legal action not only about the amount of compensation but also any other issues, e.g. occupation of their land by the contractor without their consent, damage or loss of their property, restrictions on the use of land/assets, etc. The decision of the court is final.

Table 82. Grievance Resolution Process

Steps	Process
Step 1	The complaint is informally reviewed by the local resettlement officer, which takes all necessary measures to resolve the dispute at local level. The response time is 10 days. The grievance has to be logged. RD / MRDI appropriate person have to be informed.

	If the grievance is not solved during the negotiations, the local resettlement officer has to assist the aggrieved APs to formally lodge the grievances to the RD / MRDI.
Step 2	The aggrieved APs shall submit their complaints to the GRC within 1 week after completion of the negotiations at the village level. The aggrieved AP shall produce documents supporting his/her claim. The GRCN member secretary has to review the complaint and prepare a Case File for GRC hearing and resolution. A formal hearing has held with the GRC at a date fixed by the GRC member secretary in consultation with Convener and the aggrieved APs. The hearing will include resettlement specialist, social safeguards specialist, and any other relevant employee or consultant. The hearing will be led by the Head of the RD / MRDI or by Deputy Head. The decisions from the majority of the members will be considered final from the GRC at Stage 2 and will be issued by the Convener and signed by other members of the GRC. The case record will be updated and the decision will be communicated to the complainant AP. The response period after decision is one week.
Step 3	If the RD / MRDI decision fails to satisfy the aggrieved APs, they can pursue further action by submitting their case to the appropriate court of law (Rayon Court). The aggrieved AP can take a legal action not only about the amount of compensation but also any other issues (e.g., occupation of their land by the contractor without their consent, damage or loss of their property, restrictions on the use of land/assets, etc.).

9.4 - GRC Records and Documentation

691. RD will keep record of all complaints received for its use as well as for any review by ADB during regular supervisions. The records in Grievance Logs should include the following information:

- Number of claims
- Name and contact details of the claimant
- Date of receiving claim
- Form of claim – (oral or written)
- The entry point/source that received the claim initially
- The brief description of the essence of claim
- Identification number or index of the package of documents related to the case
- The interim status of the grievance resolution process (key actions planned or agreed: stages, dates and participants of negotiations with the AP with GRC (stage 2)
- Final status of the grievance resolution (a. pending; b. closed to satisfaction of both parties; and c. Negative decision – GRM denies the claim)
- Date of the final decision of GRM/ date of closure

692. Additional information on the resolution of LARP related grievances is provided in the LARP.

9.5 - Communication

693. Prior to start of site works, the Contractor shall:

- Communicate the GRM to communities in the project impact zone.
- Set-up and publicize a 24-hour hotline for complaints.
- Ensure that names and contact numbers of representatives of GRCE, the RD and the Contractor are placed on the notice boards outside the construction site.

694. In addition, it is recommended that the RD consult with PAP representatives prior to implementation of the GRM to make any necessary revisions, if appropriate, to make the process more effective and ensure PAPs ownership/active participation in the process.

695. The complaints resolution process was presented formally during the public consultations. The grievance redress mechanism will also be presented during routine community meetings in the Project area during the construction phase of the Project.

10. Environmental Management and Institutional Requirements

10.1- Introduction

696. Through a systematic assessment, the IEE has identified a number of environmental and social impacts which may potentially result from the construction and operation of the Project. In order to manage and mitigate these impacts, a range of measures have been developed to reduce the overall residual impacts to acceptable levels and as low as reasonably practicable. Implementing and tracking the effect of these management and mitigation measures is an essential element to ensuring that the assessed residual impact levels are confirmed.

697. The Environmental Management Plan (EMP) provides details on the implementation of mitigation measures, monitoring program, cost estimates, and institutional arrangement to ensure that no significant adverse impacts results from the investment.

698. The basic objectives of the EMP are to:

- establish the roles and responsibilities of all parties involved in the Project's environmental management;
- ensure implementation of recommended actions aimed at environmental management and its enhancement; and
- ensure that the environment and its surrounding areas are protected and developed to meet the needs of the local communities including other stakeholders and safeguard and the interests of the common people.

699. The environmental mitigation measures have been differentiated into the following three stages: (i) Pre-Construction Phase; (ii) Site Preparation, Construction and Worksite Closure (i.e., project closure) Phase; and (iii) Operation Phase.

700. Pre-Construction Stage. The mitigation measures adopted during design or pre-construction stage include the following scope of management actions:

- baseline monitoring pre-development (e.g., noise monitoring, ecological surveys, walkover surveys);
- environmental engineering design requirements for operations phase (e.g., to ensure that the necessary mitigation measures for key environmental variables such as climate change are investigated and incorporated into the final design);
- approvals, permits, and licensing requirements for construction (e.g., licenses for quarry operation and relocation of utilities); and
- environmental management planning to be undertaken during the construction phase (i.e., thematic management plans. Guidance and direction are provided in **Annex 9. Thematic Management Plans**).

701. Site Preparation, Construction and Worksite Closure Phase. To address the adverse impacts during construction, the EMP includes measures to avoid, minimize, or mitigate potentially adverse impacts and risks and, as a last resort, propose compensatory measures. Various physical, biological, and socio-economic impacts have been summarized in the EMP.

702. Operation Phase. The operation phase mitigation measures cover good operating practices to ensure the sustainable management (i.e., to avoid and / or minimize environmental damage) of the environment through the operational life of the road section.

703. The EMP is provided in **Annex 1. Environmental Management and Monitoring Plans** and will be included into the bidding documents so that bidders can consider and incorporate their environmental responsibilities into their bid proposals.

10.2 - Environmental Monitoring Plan (EMoP)

704. A companion document of the EMP, the Environmental Monitoring Plan (EMoP) provides the procedures and actions that recognize and analyze environmental and social changes consequent to the pre-construction, construction, and operational phases of the Project. The monitoring ensures that:

- legal standards for environmental parameters are not exceeded;
- mitigation measures are implemented in the manner described in the ESMP;
- changes to baseline environmental and social conditions during the project activities are continually monitored;
- early warning of environmental and social damage is recognized so that action may be taken, if possible, to prevent or reduce the seriousness of the unwanted impact; and
- corrective actions or new adaptive management programs are implemented, as required, if proposed mitigation measures are unable to reduce and/or eliminate potential project related impacts or meet the predetermined level of performance.

705. Regular monitoring of air quality, water quality and noise levels against Georgian and IFC standards shall be carried out throughout the construction and commissioning periods. The party responsible for monitoring will be the Engineer who will report the results to the RD. The reports shall clearly indicate the monitoring dates, times, locations, weather conditions, types of equipment used and calibration information.

706. A monitoring plan defining all parameters to be monitored, with tentative location, project stages for measurements, implementation and institutional responsibility for different environmental components is prepared for all stages of project and presented in **Annex 1. Environmental Management and Monitoring Plans**.

10.3 - Specific EMP (SEMP)

707. The SEMP is the document that the Contractor shall prepare outlining how it (the Contractor) intends to implement the EMP and ensure that all of the mitigation and monitoring is completed according to the implementation arrangements specified in this EMP and the IEE as a whole.

708. The SEMP will describe the precise location of the required mitigation / monitoring, the persons responsible for the mitigation / monitoring, the schedule and reporting methodology. The SEMP and all of its thematic management plans (i.e., topic and location specific plans) will be submitted to the Engineer and RD for approval at least 10 days before taking possession of any work site. No access to the site will be allowed until the SEMPs are approved by the Engineer and RD, and where indicated in the tables below, the ADB. The SEMP will include the following thematic management plans:

Table 83. Approvals for Thematic Management Plans

Plan	Approvals		
	Engineer	**RD**	**ADB**
Waste Management Plan	Yes	Yes	No
Wastewater Management Plan	Yes	Yes	No
Spoil Disposal Management Plan	Yes	Yes	Yes
Soil Erosion Management Plan	Yes	Yes	No
Traffic Management Plan	Yes	Yes	No
Method Statement for Temporary Roads	Yes	Yes	No
Aggregate and Borrow Pits Management Plan	Yes	Yes	No
Employment and Procurement Procedure	Yes	Yes	No
Occupational and Community Health and Safety Management Plan	Yes	Yes	No
Emergency Response Plan	Yes	Yes	No
Air Quality Plan	Yes	Yes	No
Spill Management Plan	Yes	Yes	No
Clearance, Revegetation, and Restoration Management Plan	Yes	Yes	No
Noise Management Plan	Yes	Yes	No
Biodiversity Management Plan	Yes	Yes	Yes
Laydown Area and Construction Camp Management Plan	Yes	Yes	Yes *(for Construction Camp Management plan if needed)*
Asphalt, Rock Crushing, and Concrete Batching Plant Management Plans	Yes	Yes	No
Bridge Construction Method Statement	Yes	Yes	Yes
Chance Finds Procedure	Yes	Yes	No

709. Direction and guidance on what the above-mentioned thematic management plans should cover is provided in **Annex 9. Thematic Management Plans**. A template for the SEMP is provided in **Annex 10. Specific Environmental Management (SEMP) Plan**.

10.4 - Reporting and Review of the EMP

710. Reporting. The following reporting requirements will be followed during the implementation of the EMP and Contractor's SEMP:

Table 84. Reporting Requirements

Responsibility	Requirement	Submitted to
Contractor	Quarterly Environmental and Social Reports	Engineer / RD

Engineer	Monthly Environmental, Social and Health and Safety Reports, to include at least the following items:
	• Summary of Works to Date.
	• Status of EMP.
	• Status of Licenses and Permits.
	• Summary of camp site and work site inspections, i.e. observational monitoring by the Engineer.
	• Results of instrumental monitoring undertaken by the Contractor, including:
	  ○ Air Quality
	  ○ Noise
		RD

	○ Soil ○ Surface Water • Non-compliances identified during the reporting period. • Update on previously identified non-compliances. • Correspondence with the Contractor regarding environmental and social issues. • Findings from stakeholder meetings (per the SEMP). • Table of grievances and actions to manage on-going grievances. • Summary of accidents during the reporting period. • Summary of meetings between the Engineer and Contractor regarding environmental, social and health and safety issues. • Overview of training provided by the Contractor during the reporting period.	
RD / Engineer	Bi-annual Environmental and Social Reports summarising the findings of the monthly and quarterly reports prepared by the Contractor and the Engineer	ADB/ RD

711. Review of EMP. The EMP shall be reviewed periodically to evaluate environmental controls and procedures to make sure they are still applicable to the activities being carried out. Reviews will be undertaken by the Contractor's Environmental and Social Officer (ESO) and Engineer as follows:

- The full EMP shall be reviewed at least annually;
- Relevant parts of the EMP shall be reviewed following a reportable incident;
- In case any issues of failure of mitigation measure to reduce the impact occurs;
- Relevant parts of the EMP shall be reviewed following the receipt of an updated site specific or topic specific plan; and
- At the request of stakeholders.

712. The review shall include analysis of the data collection and analysis of data, monitoring reports, incident reports, complaints/grievances and feedback from stakeholders.

10.5 - Bid Documents

713. The Bid Documents for the potential design-build Contractor will contain two sections relating to environmental issues, firstly a basic clause indicating that the Contractor will be responsible for following the requirements of the EMP and that he should prepare his own SEMP for the Project. Secondly, the EMP shall be repeated in its entirety as an Annex to the Bid Documents so as the bidder is aware of his environmental requirements under the Project and help him put environmental costs to his proposal.

10.6 - Contract Documents

714. The Contract documents will follow a broadly similar pattern to the Bid documents. It is not considered necessary to repeat the mitigation measures verbatim in a list of environmental contract provisions, rather the Contract will specify that the Contractor is responsible for implementation of the EMP via his SEMP. Again, the EMP will be included as an Annex to the Contract so the Contractor will be liable for any non-conformance with the EMP, and thereby this IEE.

10.7 - Contractor Requirements

715. The Contractor will be responsible for the preparation of the SEMP. The SEMP will need to be fully compliant with the EMP and this IEE as a whole and will need to be prepared within 30 days from completion of the final designs and approved 10 days prior to access to the site.

716. The Contractor is also responsible for engaging external services from a certified laboratory for instrumental monitoring of air quality, noise, soil, and water during the construction phase (see Annex 1, Section **1.d - Environmental Monitoring Plan**).

717. Furthermore, at completion of the construction phase and prior to the start of the defect liability period, the Contractor shall be responsible for preparing an Operational Phase EMP for the Project. The Contractor shall implement the plan during the defect liability period and hand over the plan to the RD for continued implementation after this period.

718. Environmental and Social Officer. During construction, the Contractor must retain the expertise of an ESO to implement and continually update the SEMP and to oversee and report on the operation throughout the contract period.

719. The required qualifications of the ESO are as follows:

- Degree in environmental sciences and related expertise
- Fluent in Georgian and English
- Experience of at least one construction project of a similar size and scale

720. The ESO will be responsible for the preparation of weekly environmental checklists and an environmental section of the Contractor's monthly progress reports that shall be submitted to the Engineer for review. The Engineer shall provide a template of the checklist to the Contractor.

721. The monthly reports, which will include the weekly environmental checklists, shall contain sections relating to:

1) general progress of the Project;
2) environmental Incidents; e.g., spills of liquids, accidents, near misses etc.;
3) progress of any environmental initiatives, e.g., energy savings, recycling, etc.;
4) records of any environmental monitoring, both observational and instrumental; and
5) conclusions and recommendations.

722. The ESO shall provide relevant training at the construction camp (if constructed) and also at construction sites. The ESO shall keep a record of all monthly training undertaken.

723. The ESO will also act as the Focal Person at the Project site for receiving and fixing grievances in the Log Book. The ESO shall also manage all social and labor related issues. The ESO will also act as the Contractors 'Environmental Manager' as required by Article 15 of the Waste Management Code (2015).[64]

724. Health and Safety Specialists. The Contractor shall also hire qualified Health and Safety Specialists (HSSs) for the Project duration. According to Georgian Law at least 1 HHS is required for every 50 workers. The HSSs shall have at least five years on-site experience of similar sized infrastructure Projects. A Lead HSS shall be nominated to lead

[64] Article 15 – Environmental Manager **-** The persons under Article 14 of this Law shall nominate a suitable person as a company environmental manager.

the health and safety team, the Lead HSS will also deputize for the ESO when he is absent from the site.

725. The HSS shall report directly to the ESO. The main responsibilities of the HSS will be:

- Provide health and safety (H&S) training, including daily toolbox training sessions at each work site.
- Approve H&S Plans for specific work activities.
- Conduct routine site inspections and issue internal stop notices if necessary, for unsafe activities.
- Maintain H&S statistics log for near misses, as well as incidents.
- Provide H&S input to Contractor reports.

726. Community Liaison Officer. The Contractor will be responsible for nomination of a Community Liaison Officer (CLO) who will ensure that the grievance mechanism is available to all stakeholders, involves an appropriate level of management and addresses concerns promptly. They will ensure that the process is understandable and transparent and provides feedback to those concerned without any retribution.

727. Staff costs. The following table provides a summary of the anticipated staff cost.

Table 85. Contractor Environmental, Health and Safety, and Community Liaison Staff Costs (estimates)

#	Position	No. of Months*	Month Cost ($)	Total Cost ($)
1	Environmental and Social Officer	24	1,500	36,000
2	Health and Safety Specialist	24 per HSS	1,500	36,000 per HSS
3	Community Liaison Officer	24	1,500	36,000

*Note: * the number of months is based on available time estimates for construction, however there is the potential that additional staff months will be required.*

10.8 - Engineer Requirements

728. The Engineer is tasked with specific responsibility to review designs and ensure safeguard compliance of civil works – with particular emphasis on the monitoring of implementation of EMP through the Contractor's SEMP and related aspects of the project. The specific tasks will include the following:

729. Prior to commencement of the works:

- organize a training program for MRDI and RD staff on how the environmental aspects of the project will be monitored, giving emphasis on SEMP evaluation; compliance monitoring of construction activities and preparation of corresponding reports; supervision responsibilities and interaction with contractors; and documentation, resolution and reporting of non-compliance issues and complaints;
- ensure pre-construction survey requirements have been implemented to ensure that findings can be used for completion of the detailed design and to establish any additional mitigation requirements for example in terms of replanting;
- provide guidance to the RD's environment specialist on the environmental and social aspects of the project with emphasis on compliance monitoring and reporting;
- assist the RD with establishing and operating the grievance redress mechanism, including creating a grievance chart (format to be agreed with the RD) which is to be updated on a weekly basis;

- evaluate the environmental aspects of the contractors' method statements and working drawings and recommend corrective actions needed, if any, to ensure compliance with the project's environmental and social requirements;
- review the Contractors' SEMP and all topic specific (such as waste) and site specific (such as construction camp) plans; recommend modifications to these documents to be compliant with: (a) the environmental and social requirements of the construction contracts as reflected in the EMP; and (b) the conditions of environmental approvals of the Government, if required;
- develop the compliance monitoring system to be used during the construction period for monitoring the contractors' performance relative to environmental requirements, including the preparation of: (a) monitoring and corrective action forms and checklists; (b) inspection procedures; and (c) documentation procedures;
- conduct orientation sessions with the contractors on the compliance monitoring system to be used, notification of non-compliance, and the process of requiring contractors to implement corrective measures when necessary; and
- provide guidance to the contractors on how their respective SEMP will be implemented including the: (a) requirements for each mitigation measure; and (b) implementation schedule of each mitigation measure taking into consideration the general requirement that no specific construction activity will be approved to be commenced if the associated mitigation measures for such activity are not ready before work commences.

730. During implementation of the works:

- supervise the implementation of the SEMPs and its relevant topic and site specific EMPs;
- evaluate the contractors' submitted works activities and schedules relative to the requirements of the approved SEMP;
- undertake monthly inspection, monitoring and reporting of construction sites and all construction-related facilities (workers' camps, asphalt batching plants, concrete batching plants, borrow pits, disposal sites for tunnel and other spoil and unsuitable materials, equipment maintenance areas, fuel and materials storage sites, project-specific quarries and crushers, etc.) to assess the contractors' compliance with the SEMP and the Project EMP.
- require the contractors to update their respective SEMP when necessary;
- monitor the contractors' compliance with health and safety, and labor requirements of the project as stipulated in the contract documents and their approved health and safety, and labor plans (including the outcome of labor audits), and require the contractors to provide updated plans when necessary;
- record non-conformance cases, inform contractors of improvements needed, respond to contractors' proposals, prepare corrective action plans for contractors, and monitor their implementation;
- assess and approve use of temporary construction areas identified during construction such as camps, laydown areas, access roads, etc.;
- include environmental and social monitoring in monthly monitoring reports for submission to the RD; and
- draft semi-annual environmental safeguard monitoring reports, as required by ADB;

731. Upon completion of the works:

- prepare a report on the project's environmental and social compliance performance, including lessons learned that may help MRDI and the RD in their environmental

monitoring of future projects. The report will be an input to the overall project completion report.

732. The Engineer should retain the use of national environmental specialists and national health and safety specialist to provide oversight of the Contractor's environmental performance as outlined above. Terms of reference for the specialists is provided below.

733. National Environmental Specialist. He/she will (i) review all documents and reports regarding the integration of environmental mitigation measures including contractor's environmental action plan, (ii) supervise the contractors' compliance to EMP and BAP, and (iii) prepare monthly compliance reports.

734. Qualified with a degree in environmental sciences or equivalent. Preferably five years' experience in conducting environmental impact assessments and implementation of environment mitigation plans and/or monitoring implementation of environmental mitigation measures during implementation of projects including highway projects funded by developing partners.

735. National Occupational Health and Safety Specialist. Professionally qualified specialist in all health and safety aspects of major civil works construction, including high level bridgeworks and road works, preferably with 5 years of experience with projects similar to the Project. The specialist will be responsible for ensuring that all aspects of the Project comply with the health and safety provisions of the Project's civil works contracts, and with relevant Georgian laws and regulations.

Table 86. Engineer Environmental, Health and Safety Staff Costs (estimates)

#	Position	No. of Months*	Month Cost ($)	Total Cost ($)
1	National Environmental Specialist	24	1,500	36,000
2	National Occupational Health and Safety Specialist	24	1,500	36,000

*Note: * the number of months is based on available time estimates for construction, however there is the potential that additional staff months will be required.*

10.9 - Project Management Unit Requirements

736. 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.

737. During the pre-construction and construction phase, the RD and their staff will be responsible for:

- Reviewing and approving the SEMP and all the site and topic specific EMPs.
- Weekly site visits to audit site works.
- Approving bi-annual monitoring reports from the Engineer.
- Reporting on any key issues to lenders and management.
- Engage external expert(s) to undertake annual independent verification of monitoring information submitted to ADB, to determine if various EMP/SEMP provisions are being implemented in thorough and timely manner and in accordance with budget identified within the EMP/SEMP.
- Review (annually) the EMP/SEMP and approve the changes.

738. 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.

739. A review of the capacity of the RD was undertaken as part of this IEE. The review indicates that the existing RD has sufficient expertise to adequately manage the Contractor's environmental performance. The RDs safeguard department has extensive experience of implementing road projects for a range of donors, including ADB. As such no further capacity building is recommended within the RD. Staffing needs to grow proportionally as the portfolio grows to ensure projects are covered adequately by the PIU. Furthermore, as western Georgia is a significant area of project work, resources must be allocated to this region so that coverage is adequate.

740. Copies of the site records, certificates, permits, and documents shall be maintained kept by the RD. This includes:

- Work program and schedule
- Environmental permits and licenses
- Approval for using the site for topsoil stockpiling from local municipal authorities and/or owners
- List of equipment
- Agreement with Solid Waste Management Company of Georgia (non-hazardous waste disposal)
- Agreement with company(ies) authorized for management of hazardous waste
- Records of maintenance and cleaning schedules for sediment and oil/grease traps
- Records of quantity of discharged wastewater and concentration of pollutants; Records of sewage disposal (if relevant)
- List of mitigation measures
- Waste disposal records
- Log of material inventories and consumption
- Route/program of construction material transportation
- Equipment control and maintenance log
- Copies of correspondence related to environmental issues
- Chance find records (if any)
- Complaints register
- Incidence register (environmental limits expedience forms, injuries records, etc.)
- Corrective and preventive action request records
- Training records

11. Cost Estimate of Environmental Mitigation Measures

741. Most costs associated with the environmental recommendations of the EMP are a normal part of preparing the bid and contract documents and ensuring that proper environmental provisions are incorporated therein. The installation of septic systems at construction camps, for example, is an environmental necessity, but not generally considered an "environmental cost".

742. Currently only preliminary designs have been developed and costs associated with implementation of mitigation measures identified within the EMP will become better defined once detailed designs are completed as part of the design-build contract. Therefore, only unit costs for mitigation measures are provided for the additional "environmental costs" needed which go beyond what would normally be included in a project budget.

Table 87. Rough Cost Estimate for Mitigation Measures and Monitoring

Action	Number of Units / Unit cost /US$	Cost estimate / US$	Timing	Frequency and duration
Fencing around Red List species (over 8 cm in diameter)	$50 per tree	TBD*	Preparation Phase	Once, to be maintained throughout the construction period.
Habitat and fauna survey	One habitat and fauna survey: $1,500	$1,500	Preparation Phase	Pre-Construction Stage
HIV/AIDS Training	3 trainings x $1,000 per training	$3,000	Pre-construction phase and construction phase	Three times: Once during pre-construction phase, and twice during construction phase
Habitat restoration	- $5 seedlings (5-6 y/o) - $1.5 seedlings (2-3 y/o) - $10 seedlings (GEO Red List)	TBD*	Construction Phase	Once according to Clearance, Revegetation, and Restoration Management Plan, and as necessary during the construction phase
Environmental Staff (Contractor)	Environmental and Social Officer: 24 months x $1,500 per month	$36,000	Construction Phase	Throughout the construction phase
	Health and Safety Specialist (HSS): 24 months per HSS** x $1,500 per month x 4 specialists (based on estimate for 200 workers)	$144,000	Construction Phase	Throughout the construction phase
	Community Liaison Officer: 24 months x $1,500 per month	$36,000	Construction Phase	Throughout the construction phase
Environmental Staff (Engineer)	National Environmental Specialist: 24 months x $1,500 per month	$36,000	Construction Phase	Throughout the construction phase
	National Occupational Health and Safety Specialist: 24 months x $1,500 per month	$36,000	Construction Phase	Throughout the construction phase

Air Quality Monitoring	Monthly (5 locations): $200 per site	$24,000	Construction Phase	Monthly, throughout the construction phase
Noise Monitoring	Monthly (5 sites): $200 per	$24,000	Construction Phase	Monthly, throughout the construction phase
Surface Water Quality Monitoring	Monthly (5 sites): $200 per	$24,000	Construction Phase	Monthly, throughout the construction phase
River or channel protection structures	$2,000 per sq. m	TBD***	Construction Phase	Throughout the construction phase
Planting of vegetation barriers for vineyards	- $5 Seedling (5-6 y/o) x 5 seedlings per land parcel x 21 land parcels - $1.5 Seedling (shrubs) x 5 seedlings per land parcel x 21 land parcels	$683	Construction phase and potentially operation phase	Once during construction phase, and as necessary during the operation phase
Monitoring of road vehicle emissions on neighboring vineyards	Air monitoring survey with NO_2 diffusion tube and dust deposition gauge: $25,000****	$25,000	- One year prior to opening of the new road - One year when the new road is operational	- Total monitoring survey duration is 24 months - Sample duration is 24 x one month at each of six sampling sites for NO_2 and dust deposition
Grand Total	**$390,183**			

*Note: * Prior to the commencement of works, the Contractor will undertake a survey of all trees within 5 meters of the boundary of the staked site and identify if any Georgian red-list species are located within this zone. The Contractor shall be responsible only for replanting trees cut which are not already included as part of the LARP.*

***According to Georgian Law at least 1 HHS is required for every 50 workers.*

**** This should be based on final design.*

*****This cost assumes that NO_2 and PM are measured at the same time at the same location.*

12. Conclusions and Recommendations

12.1 - Primary Environmental Impacts and Mitigation Measures

743. This IEE study has identified the potential for both positive and negative environmental and social impacts to occur as a result of the Project. A general description of primary environmental impacts and mitigation measures identified is provided below:

i. Primary Impacts During Site Preparation, Construction, and Worksite Closure Phase

- Water quality. Without mitigation, one of the principal impacts during construction will be on water bodies, particularly during construction along the irrigation canal. The activities posing the highest risk to deterioration in the surface water environment would be the temporary works associated with bridge and road construction and release of contaminants, sediment loading, and other runoff into watercourses. Surface water quality analysis from the baseline surveys indicated that the surface water near the Project site had elevated levels of total coliform and total suspended solids. Therefore, water quality will be measured regularly throughout the construction phase and emphasis will be placed on local consultations with farmers along the proposed alignment. Control of water, materials, and construction equipment will be of utmost importance during construction. Canal, river, and riverbank protection measures will need to be elaborated in the detailed design stage.
- Noise and dust. The dust generated and mobilized by construction activities is likely to impact on residents and vegetation, including crops, close to the Project construction sites. However, dust suppression measures are clearly specified and will be implemented to manage dust to acceptable levels. Noise will be managed to the extent possible using best practice and mitigation measures aimed at reducing and or directing construction related sounds that may impact sensitive noise receptors.
- Health and safety. Project workers will be exposed to different hazards during construction including noise and vibration, dust, handling heavy materials and equipment, falling objects, work on slippery surfaces, fire hazards, drowning and chemical hazards such as toxic fumes and vapors etc. There are a number of potential health and safety related impacts which may result from construction activity on the Project, including traffic accidents, presence of new infrastructure, management of hazardous materials and waste, and spread communicable disease. Potential risks will be eliminated or reduced using good practice and known control and management solutions.
- Terrestrial habitat. It is unlikely that construction of the new road section will exert any significant additional impact on the existing flora and fauna in the Project area over and above the current situation due to the presence of largely modified habitat. However, approximately 77 ha of land will need to be cleared of trees, shrubs, and general waste to accommodate for the associated working areas.[65] This will result in loss of plants, contributing to a decline in their numbers, as well as loss of habitat for species of mammals, birds, insects and herpetofauna that

[65] Kocks Feasibility Study, 2018.

they provide. The Contractor shall be responsible for replanting of any trees cut which are not already included as part of the LARP on a 1:3 basis using species native to the area. To ensure that impacts can be correctly quantified, and any replanting requirements can be properly established, the extent of habitat by type will be surveyed as part of the detailed design work by the Contractor.

- As mentioned above, a number of walnut trees (*Juglans regia*) that are included in the Red List book of Georgia were registered by the Kocks survey team in the Project ROW. It is not known at this time how many of these trees will be lost, and the Contractor will need to identify protected walnut trees, as well as any other protected species, through a site survey prior to construction. This survey will form part of the Contractor's Clearance, Revegetation, and Restoration Management Plan. Where walkover surveys pre-construction reveal that protected plant species in the area will be lost, the contractor will be responsible for replanting cut trees on a 1:10 basis.
- Socio-Economic. Several socio-economic beneficial impacts are expected including: (i) generation of skilled and unskilled employment opportunities; (ii) induced economic effects of spending on goods and services by construction workers; and (iii) long-term capacity enhancement for the local workforce.

ii. Primary Impacts during Operation Phase

- Community health and safety. One of the key potential positive impacts during operation will be reduced traffic safety risks (particularly from large vehicles) for communities where the existing road passes since much of the traffic is expected to use the new highway once constructed. While higher traffic speed on the proposed highway could result in increased risk to drivers, the risk will be reduced through installation of road signs, pavement marking, installation of guide posts and steel guardrails, cast in situ concrete parapets in the dividing strip, and enforcement of speed limits to ensure traffic regulations and safety. In general, construction of the new road will improve community health and safety, especially to pedestrians, cyclists, animals, and other non-motorized road users.
- Noise. Results of the traffic noise impact analysis indicate that there would be no significant noise impact per IFC guideline limits. Therefore, no noise mitigations such as noise barriers are needed. However, a new noise source will be introduced to the rural area once the Project is operational. Monitoring of the nearby noise sensitive sites will be required in the future to determine actual noise levels in these areas.
- GHG emissions. The Project road section will help to increase the economic development of the region and result in increased traffic. This will lead to higher levels of GHG emissions. The overall contribution to GHG emissions will be low and no adverse air quality impacts are expected at the air sensitive receptors in the vicinity of the Project site above what already exists.
- Air quality. To quantify potential air quality impacts on local vineyards associated with projected traffic levels, an air quality impact assessment study was conducted as part of this IEE by an international engineering and environmental consultancy using appropriate air quality modelling methods. 21 parcels have been identified as potentially exceeding thresholds for airborne NOx concentration and dust deposition based on modeling results for years 2020, 2025, and 2035 (see Table 53). In view of the uncertainty in the study conclusions, a program of monitoring will be carried out before and after operation of the road commences to determine

whether implementing appropriate mitigation measures is necessary. In order to ensure a protective approach, considering the economic importance of the wine sector in the region, mitigation measures will need to be implemented in the areas of the proposed road where land parcels have been identified by the assessment as exceeding guideline thresholds. Mitigation measures should include planting of vegetation barriers (i.e., trees and hedges) at the closest boundary of the vineyards to the road.

12.2 - Conclusions and Recommendations

744. Based on the analysis of information and feedback received from various stakeholders, this IEE concludes that potential significant physical, biological, or socio-economic environment impacts from the Bakurtsikhe-Tsnori Road Section Project can be addressed and it is unlikely that there will be any significant environmental impacts remaining after planned mitigation and offset measures. The Project will have short term impacts during construction which can be mitigated to an acceptable level through measures which seek to reduce the potential for harm to the environment and human health.

745. Residual impacts for the most significant potential impacts (see assessment of impact tables in Section **7.2 - Impacts and Mitigation Measures**) are identified below. Residual impacts are qualified as **Negligible**, **Minor**, **Moderate**, and **Major** according to the assessment method described in Section **7.1 - Impact Assessment Methodology**.

Table 88. Summary of Residual Environmental Impacts

Environmental Factor	Project Phase	Potential Impacts	Pre-mitigation Impact Significance	Residual Impact Significance
Soil Fertility and Quality	Site Preparation, Construction, and Worksite Closure	Loss of topsoil resources and contamination of soil during construction.	**Moderate**	**Minor**
	Operation	Potential for soil erosion and contamination from vehicle circulation and maintenance activities during the operation of the road.	**Minor**	**Negligible**
Air Quality	Site Preparation, Construction, and Worksite Closure	(i) Fugitive dust emissions associated with the materials handling, wind erosion of open areas, and truck movements on access roads within the construction worksites; (ii) operation of concrete batching plant; and (iii) Air emissions including NO_2, SO_2, PM_{10} and $PM_{2.5}$ from construction equipment and truck circulation within the work areas.	**Minor**	**Negligible / Minor**

	Operation	Release of air pollutants including NO_2, SO_2, PM_{10} and $PM_{2.5}$ from vehicle circulation on the new road.	**Moderate**	**Minor**
		Potential impacts on climatic condition due to GHG emissions.	**Minor**	**Minor**
		Effects of road traffic pollutants on vegetation or agricultural production, and vineyards specifically.	**Moderate**	**Negligible**
Noise and Vibration	Site Preparation, Construction, and Worksite Closure	Noise and vibration emissions resulting from the use of machinery and equipment and vehicle circulation.	**Minor**	**Negligible / Minor**
	Operation	Noise impact from circulating vehicles during operational phase.	**Moderate**	**Minor**
Surface and Groundwater	Site Preparation, Construction, and Worksite Closure	Potential for impacts to surface and ground water due to: (i) contamination from accidental releases of hazardous substances such as fuels, oils or lubricants; (ii) improper chemical/fuel storage; and (iii) wastewater discharges and sediment laden runoff. Potential secondary impacts to downstream users of irrigation canal.	**Major**	**Minor / Moderate**
	Operation	Potential for impacts to surface and groundwater from vehicle circulation and maintenance activities during the operation of the road.	**Moderate**	**Minor**
Ecology and Biodiversity (Habitat / Flora)	Site Preparation, Construction, and Worksite Closure	Impacts to flora on the Project area, not including agricultural flora, from site development and construction of Bakurtsikhe-Tsnori Road Section.	**Moderate**	**Minor**

	Operation	Impacts on vegetation in the Project area, not including agricultural flora, in the operation phase from vehicle circulation and maintenance of the road.	**Minor**	**Negligible**
Ecology and Biodiversity (Fauna)	Site Preparation, Construction, and Worksite Closure	Impacts on terrestrial and aquatic biodiversity resulting from construction of the Bakurtsikhe-Tsnori Road Section.	**Minor**	**Negligible**
	Operation	Impacts on terrestrial and aquatic biodiversity resulting from operation of the road.	**Minor**	**Negligible**
Landscape	Site Preparation, Construction, and Worksite Closure	Landscape and visual impacts during construction phase.	**Moderate**	**Minor**
	Operation	Landscape and visual impacts during operation phase.	**Moderate**	**Minor**
Socio-Economic	Site Preparation, Construction, and Worksite Closure	Impact to employment and economy.	***Positive****	**Minor**
		Impact on community health, safety, and security due to increased traffic; the transport, storage, and use and/or disposal of materials (e.g., fuel and chemicals); access to structural elements or components of the project; and introduction of infection disease (both vector borne and other communicable diseases).	**Major**	**Minor**
		Impact on community infrastructure and services.	**Minor**	**Negligible / Minor**
	Operation	Impacts to connectivity and accessibility resulting from the operation of the Project road.	***Positive****	**Moderate**

Note: It is considered sufficient for the purpose of this IEE to indicate that the Project is expected to result in a potential positive impact prior to mitigation without characterizing the exact degree of positive change likely to occur.

746. Based on the analysis provided in this IEE, the classification of the Project as Category B per ADB SPS is confirmed.

747. Interviews and analysis from a preliminary social survey with affected communities and roadside businesses undertaken by Kocks in November and December of 2017 (see **Annex 3. Interviews and Analysis from Preliminary Social Survey with Affected Communities and Roadside Businesses**) indicates that small roadside businesses operating on the existing road expect to lose business as a result of reduced traffic flows. It is recommended that a component be integrated into the Project that supports outdoor vendors operating on the existing road who are likely most vulnerable to this change. One mitigation measure could entail creating a centralized marketplace for the vendors where the section of new road will connect to the S-5 highway in the town of Tsnori.

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Annexes

Annex 1. Environmental Management and Monitoring Plans

Annex 2. Stakeholder Engagement Meeting Minutes

Annex 3. Interviews and Analysis from Preliminary Social Survey with Affected Communities and Roadside Businesses

Annex 4. Noise Contour Maps

Annex 5. Modelled Pollutant Levels at Individual Land Parcels

Annex 6. Locations of Licensed Borrow Pits and Quarry Sites

Annex 7. Soil Analysis Results

Annex 8. Chance Find Procedure

Annex 9. Thematic Management Plans

Annex 10. Specific Environmental Management (SEMP) Plan

Annex 11. Occupational and Community Health and Safety Plan Template

Annex 12. Soil Disposal Assessment Template

Annex 13. Asbestos-Containing Waste Management Plan

Annex 1. Environmental Management and Monitoring Plans

1.a - Management Plan for Pre-Construction Phase

Table 89. Management Plan for Pre-Construction Phase

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
Pre-Construction Stage					
EMP contractual obligations	Implementation of Project EMP and Specific Environmental Management Plan (SEMP)	• Prior to commencement of civil works, the Contractor shall prepare a Specific EMP (SEMP) for Engineer endorsement and RD approval. The SEMP shall also be reviewed by ADB. The SEMP will present detailed implementation plan based on the Contractor's actual construction methodologies, work schedule, type/specifications, and number of construction plants to be used • The SEMP shall be (a) consistent with the SEMP template included in the IEE (see **Annex 10. Specific Environmental Management (SEMP) Plan**); (b) consistent with the project EMP; and (c) prepared based on the Contractor's activities and corresponding locations. • The SEMP will provide the following: i. Contractor's organizational structure showing the implementation, supervision and reporting and responsibilities of key personnel ii. The Project program and work activities iii. The Contractor's topic and site-specific plans as follows: ○ Waste Management Plan ▪ Wastewater Management Plan ▪ Spoil Disposal Management Plan ○ Soil Erosion Management Plan ○ Traffic Management Plan ○ Method Statement for Temporary Roads	Contractor Cost	Contractor to Implement Mitigation	Engineer, RD, ADB

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
		○ Aggregate and Borrow Pits Management Plan ○ Employment and Procurement Procedure ○ Occupational and Community Health and Safety Management Plan ○ Emergency Response Plan ○ Air Quality Plan ○ Spill Management Plan ○ Clearance, Revegetation, and Restoration Management Plan ○ Noise Management Plan ○ Biodiversity Management Plan ○ Laydown Area and Construction Camp Management Plan ○ Asphalt, Rock Crushing, and Concrete Batching Plant Management Plans ○ Bridge Construction Plan • The Occupational and Community Health and Safety Management Plan shall be consistent with the template provided in the IEE (see **Annex 11. Occupational and Community Health and Safety Plan Template**). • The Soil Disposal Management Plan shall utilize the assessment template include in the IEE (see **Annex 12. Soil Disposal Assessment Template**). • The Contractor will develop and implement an ACW Management plan in collaboration with the RD if asbestos-containing waste is identified in the ROW or in buildings to be demolished (see IEE **Annex 13. Asbestos-Containing Waste Management Plan**). • The Contractor will retain the expertise of a qualified Environment and Social Officer (ESO) and Community Liaison Officer (CLO). • The Contractor will obtain all necessary permits and approvals before commencing construction activities.			

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
Training	Contractors training and awareness raising programs	• All personnel shall be required to undergo a project site induction that includes the environmental requirements of the Project.	Contractor Cost	Contractor to Implement Mitigation	RD, ADB
Climate Change	Future climate changes may cause damage to the bridge and approach roads	• Further climate change studies must be carried out as necessary to ensure that climate change considerations have been incorporated in the design of the bridge and approach roads.	Project Cost	Contractor to Implement Mitigation	RD
Noise/Vibration	Vibration emissions resulting from the use of machinery and equipment and vehicle circulation	• The status of the buildings nearest to the project site will be surveyed. The surveys will cover the following aspects: o Overall condition of the structures, both exterior and interior. o Documentation of defects and preexisting cracks observed in the structure using digital imagery along with notes, measurements, and sketches. o The findings of the survey shall be agreed upon by the property owner who shall be in attendance during the survey and will sign official documentation agreeing to the findings of the survey. • Conduct additional pre-construction noise survey to confirm site conditions. Incorporate findings of such investigations in the updated IEE and EMP if necessary. • Prepare noise and vibration modelling for the Vakiri Village access road to determine whether mitigation measures need to be developed and implemented to address noise levels during the operation phase.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
Flora and Fauna Habitat, Distribution, and Species	Rehabilitation of the secondary road leading from the proposed diamond interchange to Vakiri village.	• Ensure that the rehabilitation of the secondary road leading to Vakiri village stays within the exiting ROW.	Project Cost	Contractor to Implement Mitigation	RD
	Impacts to habitat, flora, and fauna from quarrying activities.	• Licensed borrow pits and quarry sites will be selected avoiding protected and sensitive areas, nearby settlements, water sources, and in forest areas and fertile agriculture lands.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
	Cumulative impacts from the multiple development in the region.	• Consultation will be taken with IFI's, donors, and implementing units on other projects that are likely to contribute to cumulative impacts so as to reduce uncertainty and, where necessary, take appropriate action to minimize environmental harm.	Project Cost	RD	N/A
Flora / Habitats	Mortality of individuals / Loss of habitat	• The Contractor shall conduct a survey prior to construction to identify and quantify habitat types to ensure that impacts can be correctly quantified, and any replanting requirements to meet ADB's requirements for No Net Loss for Natural Habitat can be properly met. • A fauna survey will be carried during the habitat assessment with the aim of understanding fauna and fauna habitat values within the site to inform pre-construction planning and revise relevant mitigation measures if necessary. • The Contractor shall identify through a site survey the Georgian Red-listed tree species located within five meters of the site boundary. This survey will form part of the Contractor's Clearance, Revegetation, and	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
		Restoration Management Plan. Where walkover surveys pre-construction reveal that protected plant species in the area will be lost, the contractor will be responsible for replant any trees cut on a 1:10 basis. • Relocation of any specimens found during the surveys where practical will be provided with the help of biodiversity experts to ensure proper handling. This is especially important for species of conservation. The practice will provide the best possible chance of survival for wildlife. A plan and schedule must be developed by the Contractor prior to implementation of this task.			
Change of Land Use and Livelihoods	Land acquisition and livelihood loss to affected persons	• Before the commencement of the construction works of the Project, the RD must finalize and implement the Land Acquisition and Resettlement Plan (the LARP) designed in compliance with the ADB Safeguards Policy Statement 2009.	LARP Cost / Project Cost	RD to finalize the LARP and implement the Plan.	ADB to approve the LARP
	Barrier effect (impacts on mobility and access of locals to areas such as farmlands, aquaculture ponds, etc., across the Project road)	• Ensure designs retain habitat along the edge of the irrigation canal opposite of the planned highway to reduce impact on species, retain connectivity, and offer free movement.	Project Cost	Contractor to Implement Mitigation	RD
Services Demand	The disruption of services, including energy, to surrounding communities	• All telephone and electrical poles/wires and underground cables should be shifted before start of construction. • Necessary permission and payments should be made to relevant utility service agencies to allow quick shifting and restoration of utility services.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
	due to relocation of utilities.	• Local people must be informed through appropriate means about the time of shifting of utility structures and potential disruption of services if any.			
Grievance Redress	Complaints due to project implementation	• Prior to commencement of site works, the contractor will develop a grievance redress mechanism (GRM) or system that will allow for receiving/recording and immediate response to and resolution of construction-related complaints. The GRM shall be consistent with the GRM described in this IEE. • The Contractor will inform the communities along the alignment and other stakeholders affected by the Project about the GRM in place to handle complaints and concerns about the Project. • The Contractor will also install notice boards at the construction sites to publicize the name and telephone numbers of the representatives of the Contractor, and the RD.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
Health and Safety		• Final designs of the underpasses will need to accommodate for pedestrian and bicyclists use and must include features to ensure health and safety. This should include adequate width for users to pass each other comfortably, lighting, road signing, and markings to increase pedestrians' perceptions of security and comfort.	Project Cost	RD	N/A

1.b - Management Plan for Site Preparation, Construction and Worksite Closure (i.e., project closure) Phase

Table 90. Management Plan for Site Preparation, Construction and Worksite Closure (i.e., project closure) Phase

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
Site Preparation, Construction and Worksite Closure (i.e., project closure) Phase					
Air Quality	Localized emissions of dust resulting from the use of machinery and equipment and circulation of vehicles.	• Dust generating areas will be controlled by water spraying, particularly under dry weather conditions. • Stockpiles will be planned and sited to minimize the potential for dust generation by taking into account prevailing wind directions and the locations of sensitive receptors. • The drop height of potentially dust generating materials will be kept as low as possible. • Where practicable, stockpiles will be located away from sensitive receptors. • If crushing of construction materials is required, crushers will be located away from sensitive receptors. Keeping at least 300 m distance from residences windward to concrete production plants should be ensured. • An environmental impact permit for an asphalt plant (if planned to run own facility) will be obtained before operation. • On-site speed limits will be applied and enforced for trucks travelling on unpaved surfaces (20 km/h). • Trucks transporting spoil or other dusty materials off-site will be covered before leaving the sites. • Wheel washing facilities will be available and used so that trucks leaving the site do not spread dust onto neighboring roads. • Public roads used by site traffic will be swept regularly to prevent accumulation of dirt.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
		• Conveyor belts (e.g., at batching plants and rock crushing plants) shall be fitted with wind-boards, and conveyor transfer points and hopper discharge areas shall be enclosed to minimize dust emission.			
	Localized and long-term emissions of combustion gas resulting from the use of machinery and equipment and circulation of vehicles.	• Machines and construction plant items (e.g., trucks) that may be in intermittent use will be shut down or throttled down between work periods. • The burning of waste or vegetation on site is prohibited. • Special attention will be given in storage and handling of petrochemicals in order to avoid environmental hazards and risks. • Maintenance procedures will be implemented in order to keep equipment in good working condition to minimize exhaust emissions caused by poor performance. • Wherever possible, use electrically-powered equipment rather than gas or diesel-powered equipment. • Training will be provided for the operators of equipment and truck drivers regarding the air pollution potential of their activities.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
	Effects of road vehicle emissions on neighboring vineyards	• Vegetation barriers (i.e., trees and shrubs) will be strategically planted in all the areas of the proposed road where the 21 land parcels have been identified by the Consultancy's air modeling assessment as potentially exceeding thresholds for airborne NOx concentration and dust deposition (see IEE Table 54 and Table 55). • The following procedure for monitoring and mitigation of impacts on adjacent vineyards will be undertake prior to the operation phase: o Before the new road opens, measure baseline levels of nitrogen dioxide and dust deposition at illustrative locations. o Review the findings and update the baseline assessment of air quality impacts on vineyards presented in Section **7.2.2 - Air Quality** of the IEE.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
		○ Identify whether mitigation may potentially be required in light of improved data on baseline air quality.			
Noise	Noise and vibration emissions resulting from the use of machinery and equipment and vehicle circulation	• Work hours will be restricted between 07:00 to 20:00 hours within 500 m of the settlements. • Optimum travel speed during offsite travel will be established by the Contractor. • Install temporary noise barriers made of plywood or acoustical blankets around noisy operation where necessary to comply with project noise limits. • Use newer equipment with improved noise muffling and ensure that all equipment items have the manufacturers' recommended noise abatement measures, such as mufflers, engine covers, and engine vibration isolators intact and operational. Newer equipment will generally be quieter in operation than older equipment. All construction equipment should be inspected at periodic intervals to ensure proper maintenance and presence of noise control devices (e.g., mufflers and shrouding, etc.). • The number of equipment operating simultaneously will be reduced as far as practicable. • Orientate equipment known to emit noise strongly in one direction so that the noise is directed away from receptors as far as practicable. • Locate noisy plants as far away from receptors as practicable. • Avoid transportation of materials on- and off-site through existing community areas during nighttime hours. • Use material stockpiles and other structures, where practicable, to screen noise sensitive receptors from on-site construction activities.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
		• Record and respond to complaints according to the established grievance redress mechanism. • Keep nearby residences informed in advance about noisy activities during various construction phases. • Perform independent periodic noise and vibration monitoring to demonstrate compliance with Project noise and vibration limits. • When there is a possibility of human annoyance from construction activities, conduct such activity only during weekday daytime hours when the ambient background noise and vibration is higher and many residents are away from their homes at work. • Use drill and cast in place columns (CIDH) method for bridge columns instead of impact pilling near noise sensitive areas if it is practical. • Reduce force of the vibratory roller on the portion of the secondary road where there are houses along the road to avoid vibration impacts.			
Soil Quality	Land pollution due to wrong management of solid waste, as well as possible dripping of hydrocarbons from machinery and equipment, and wrong storage of oil and fuel.	• Temporary fuel tanks will be located at least 50 m away from any watercourse, drain, or channel leading to a water course. The tank will be placed in covered areas with berms or dikes installed to intercept spills, if any. Any spill will be immediately localized and cleaned up with absorbent materials. The bund will be able to accommodate 110% of the volume of the tank. • Onsite repairs /maintenance and fueling activities will be limited to the extent possible. • On-site vehicles and equipment shall be inspected regularly for leaks and all leaks shall be immediately repaired. Leaking vehicles/equipment will not be allowed on-site. • Secondary containment devices (drop cloths, drain pans) shall be used to catch leaks or spills while	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
		removing or changing oils from vehicles or equipment. For small spills, absorbent materials will be used. • Tire washing units will be equipped with drainage settling facilities. The washout pit will be cleaned immediately upon 75% filling. • No washing of vehicles etc. in the river will be allowed. • Usage of off-site vehicle wash racks or commercial washing facilities will be used whenever feasible. Bermed wash areas for cleaning activities will be established if on-site cleaning is required. • Contractor will implement a training program to familiarize staff with emergency procedures and practices related to contamination events. Operating personnel will be trained to visually inspect discharged water quality for oil and grease traces (that will be visible on the surface) periodically and take appropriate corrective actions.			
Soil Structure	Land erosion due to loss of vegetation coverage and changes in its structure	• Materials and waste will be stockpiled so as to avoid erosion (in stockpiles less than 2 m in height and with a slope gradient of less than 25%) and washing off into the river. Drainage trenches will be established to divert surface runoff from the site. • To avoid loss of the productive soil layer, all suitable topsoil and other material shall be saved and stockpiled separately for the future recultivation of the area. • Stockpiles of removed topsoil will be properly designed/shaped and managed. • Sand and aggregates will be stored in a hopper or bunker which shields the materials from winds. The bunker should enclose the stockpile on three sides. The walls should extend one meter above the height of the maximum quantity of raw material kept on site and extend two meters beyond the front of the stockpile. The	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
		hopper or bunker will be fitted with water sprays which keep the stored material damp at all times. • Store cement in sealed, dust-tight storage silos. All hatches, inspection points and duct work will be dust-tight. • Temporary detention ponds or containment to control silt runoff will be provided. • Construct intercepting ditches and drains to prevent runoff entering construction sites • Soil compaction may be reduced by strictly keeping to temporary road boundaries • Slopes of embankment will be protected from erosion by vegetation and slope drainage. The design considers selection of a reasonable embankment height, establishment of temporary berms, slope drains, temporary pipes, contour ditches, ditch checks, diversions, and sediment traps • Disturbed vegetation must be replanted immediately after the construction/disturbance stops • Appropriately set up temporary construction camps (if determined needed) and storage areas to minimize the land area required and impact on soil erosion.			
Relief	Modification of geological formations - Quarries	• The Contractor will carry out operation of quarries and borrow pits, as well as extraction of gravel from river terraces (if utilized), in strict accordance with the conditions of a license issued by the Ministry of Economic Development (MoED) and cleared by the Ministry of Environment Protection and Agriculture (MoEPA); and • The Contractor will be responsible to develop, agree and strictly adhere to quarry/borrow pit operation and re-cultivation plan (if the Contractor owns or establishes a new quarry site).	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
		• Borrow areas for materials, other than dredged sand fill, shall not be located in productive land, forested areas and near water courses such as rivers, streams, etc.			
Water Quality	Surface water contamination from accidentally spilled fuel/oil and road surface runoff	• The RD will ensure that maintenance of all water drainage structures is included in the Road Maintenance Contractor's SOW, in addition to being financed and monitored accordingly.	Project Cost	RD	N/A
	Pollution of nearby water bodies due to poor storage and management of construction materials	• Monthly water quality analysis in the canal using the same parameters tested for the baseline in accordance with international best practice. • Discharge of any untreated water into surface water bodies will be strictly prohibited. • Discharges into the irrigation canal will be prohibited. Discharge of cement/concrete contaminated water will be prohibited unless settled and neutralized first to avoid pollution from water with high alkalinity, which can be toxic to aquatic life. • To prevent runoff contamination, paving will be performed only in dry weather. • In disturbed soil areas, compacted straw (straw bales), silt fence, fibber rolls, gravel bags, or other approved sediment control must be ensured. At a minimum, all bare soil (whether it's an abutment slope or a stockpile) must be protected before it rains. • Drainage systems and erosion control and silt removal facilities will be regularly inspected and maintained to ensure proper and efficient operation at all times. • Vegetation will be preserved where feasible, in particular in the areas near river banks to avoid	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
		erosion/sedimentation. Areas will be promptly revegetated, where practicable and appropriate. • The construction camp (if needed), permanent or temporary, will not be located within 500 m of any river, or irrigation channel. • Wastewater Management Plan (see IEE Annex 9, Section **9.a.i - Wastewater Management Plan**) and proper sewage collection and disposal system will be available to prevent pollution of watercourses (if discharge in surface water is planned). • Storm water drainage and wastewater will be treated in accordance to the applicable World Bank/IFC guidelines. • The Contractor will take all necessary measures to ensure effluent and runoff is not discharged to the irrigation channel.			
	Impact to surface water contamination from inappropriate waste management	• Construction materials and wastes will be properly stored to minimize the potential damage or contamination of the materials. • A construction materials inventory management system will be implemented to minimize over-supply of the construction materials, which may lead to disposal of the surplus materials at the end of the construction period. • Hazardous and non-hazardous waste will be segregated and appropriate containers for the type of waste type will be provided. • Waste will be stored systematically to allow inspection between containers to monitor leaks or spills. • Waste will be disposed of systematically by licensed contractors.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
		• Storm water drainage and wastewater will be treated in accordance to the applicable World Bank/IFC guidelines.			
	Impacts to surface water due to contamination from accidental releases of hazardous substances	• Implementation of the specific mitigation measures outlined under Contamination of Soils above.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
	Water pollution from bridge/ pipe / culvert construction	• Silt fences, sediment barriers, or other devices to prevent migration of silt during construction within the river will be provided. • Ensure no waste materials are dumped in the river, including re-enforced concrete debris. • Generators will be placed more than 20 m from rivers/canals/channels. • No concrete waste from concrete mixers will be dumped in to water bodies. • Areas where concrete mixers can wash out leftover concrete without polluting the environment will be provided. This may be in the form of a lined settling pond. Drivers will be informed of these locations and the requirements to use these settling ponds on a routine basis by the Engineer. • Areas where concrete mixers can wash out leftover concrete without polluting the environment will be provided. This may be in the form of a lined settling pond. Drivers will be informed of these locations and the requirements to use these settling ponds on a routine basis by the Engineer.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
		• Dried waste from the settling ponds can be used as backfill for culverts, etc. (as long as not contaminated).			
Vegetative Coverage	Loss of vegetation coverage in specific areas of the project	• Delimitation of areas to be cleared will be made before the beginning of the construction activities in order to limit as much as possible the surface of vegetation to be cleared. • Boundaries of ROW and operation area will be strictly kept to - to avoid impact on the adjacent vegetation; Strict keeping to traffic routes during the construction will be ensured to avoid impact on vegetation. • The planned clearance area for the construction works shall be clearly identified and marked to avoid accidental clearing. • Fencing of critical root zones of the trees at the boundary with the project area or on the way will be carried out. • Project will utilize or upgrade existing roads where possible to minimize unnecessary clearing requirements. • Training of the staff in environmental and safety issues, including protection of vegetation outside the boundaries of the Project corridor. • Care will be taken to avoid introduction of new invasive species to, and spread of existing invasive species within, the Project area through: washing of vehicles, equipment and supplies before entry to the Project area; monitoring for invasive species; and control/eradication of invasive species where found. • Implement Clearance, Revegetation, and Restoration Management Plan (see IEE Annex 9, Section **9.k - Clearance, Revegetation, and Restoration Management Plan**). Dispersion of fine dust and aerosol will be limited to the narrowest area possible through	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
		protective revegetation activities on both sides of the road. • All efforts will be made to minimize removal of mature/significant trees and maintain connectivity between areas of forest habitats.			
Vegetative Coverage Terrestrial Habitat	Planting of vegetation on the site after rehabilitating disturbed areas	• Disturbed sites will be recultivated after completion of works. • The Clearance, Revegetation, and Restoration Management Plan (see IEE Annex 9, Section **9.k - Clearance, Revegetation, and Restoration Management Plan**) prepared prior to construction will be followed. • No net loss of natural habitat will be ensured based on the site survey conducted during Pre-Construction Stage. • Any reseeding or replanting of selected areas to be restored will use locally collected seed mixes and saplings. • A local source of indigenous saplings suitable for replanting programs will be identified in advance to facilitate restoration.	Contractor Cost	Contractor to Implement Mitigation	Supervision Contractor to Monitor Success Rate (RD to determine success rate criteria)
	Tree cutting	• Plant maintenance will be carried out for at least two years. • The Contractor shall be responsible for replanting of any trees cut in these areas on a 1:3 basis using species native to the area.	Contractor Cost	Contractor and RD to Implement Mitigation	RD, Engineer
	Modification, fragmentation, and degradation of habitat	• Air, water, soil, and noise impact mitigation measures will be implemented. • Waste management – regular clean-up of the areas, management of waste according to the type and category.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
		• Refueling of all plant, vehicles, and machinery will not be allowed within 50 m of any watercourse, drain or channel leading to a water course. • Construction materials and chemicals will be appropriately secured during flood season to avoid accidental release to the natural environment. • Oil, chemical and solid waste will be stored, and handled and disposed of by appropriately licensed waste management contractors. • Construction camp waste areas will be properly managed, so animals are not attracted that could be injured or ingest inappropriate food.			
Terrestrial Habitat	Introduction of invasive alien species	• Care will be taken to avoid introduction of new invasive species to, and spread of existing invasive species within, the Project area through: washing of vehicles, equipment and supplies before entry to the Project area; monitoring for invasive species; and control/eradication of invasive species where found.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
	Fauna mortality	• Speed limits to maximum of 20 km/hr for construction vehicles will be enforced to minimize potential for fauna strike. • Commitment will be made to raise awareness of values of natural habitat areas to construction work force and arrangements will be made for restriction of poaching and forest product collection. • Hunting wild animals will be strictly prohibited to apply for all staff. • Where possible vegetation will be removed outside the core breeding season from spring to early summer to allow species to find alternative breeding sites or to disperse after breeding. • Excavations left open at night will be covered.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
		• Excavations will need to include slopes or boards to ensure species can self-rescue should they fall in. • Leaving water filled excavations will be avoided.			
Terrestrial Fauna Distribution	Displacement of species due to noise, presence of machinery and equipment and presence of staff.	• Adherence to no horn policy will be enforced. • 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. • Works will not be lit except in exceptional circumstances or required for safety reasons. • If lights are to be installed on the road or bridges for the operation phase, ensure that lower wattage lamps are used in street-lights which direct light downwards to reduce glare.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
Landscape Quality	Cumulative impacts from the multiple development in the region.	• Consultation will be taken with IFI's, donors, and implementing units on other projects that are likely to contribute to cumulative impacts so as to reduce uncertainty and, where necessary, take appropriate action to minimize environmental harm.	Project Cost	Contractor to Implement Mitigation	RD, Engineer
	Change to existing landscape and character	• Implementation of mitigation measures defined for soil, vegetation, and waste management. • Visual impact of construction works will be mitigated by keeping to the boundaries of the worksites and traffic routes; preservation of vegetation; cleanup and good management of construction sites and camps; timely removal of waste from the area; material stock control (to avoid accumulation of surplus material on the site) • An approved recultivation plan will be implemented. • After completion of works, the worksite will be cleaned up; surplus materials, temporary structures, and machinery will be removed. • Site compounds within the landform will be carefully placed.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
		• Existing woodland, land features, and other key elements will be retained and protected where possible within the proposed development corridor. • Commitment to high quality design, materials, and specification for the road.			
Change of Land Use and Livelihoods	Land acquisition and livelihood loss to affected persons	• Impacts of physical and economic displacement will be addressed through the resettlement plans that have been designed in compliance with the ADB Safeguards Policy Statement 2009. • Written agreements with local landowners for temporary use of the property will be required and sites must be restored to level acceptable to the owner within a predetermined time period.	Project Cost	RD to Implement the Plan / Corrective Action Plan	ADB to Approve the LARP / Corrective Action Plan
Jobs	Impacts on employment and economy	• An Employment and Procurement Procedure (see IEE Annex 9, Section **9.f - Employment and Procurement Procedure**) should be established. Development of the plan should involve consultation with relevant stakeholders, including government authorities and local villagers. • Opportunities to establish a skills training program with an aim of training interested local villagers to contribute to the Project should be reviewed. • Local villagers should be informed of job opportunities in a timely manner. • Local businesses should be informed of contracting opportunities in a timely manner.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
Services Demand	Impacts on community infrastructure and services	• Traffic advisory signs (to minimize traffic build-up) will be posted in coordination with local authorities. • Accidentally damaged private property and/or infrastructure should be promptly restored. • The community will be kept informed about the schedule of works which could cause temporary restriction of	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
		services and the potential duration of the 'impact' in advance.			
Community Health and Safety	Impacts on social cohesion	• Construction camps (if established) will be located away from communities in order to avoid social conflict in competition for resources and basic amenities such as water supply. • Local residents should be given priority in hiring of construction workers. • Employment of women will be encouraged. • Goods and services will be sourced from local commercial enterprises to the extent possible.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
	Risks to community health and safety due to increased traffic; the transport, storage, and use and/or disposal of materials (e.g., fuel and chemicals); and access to structural elements or components of the project by members of the community.	• Air, water, soil, waste, and noise impact mitigation measures will be implemented. • The Contractor shall provide appropriate safety barriers with hazard warning signs attached around all exposed openings and excavations. • Noise, vibration, and emission impact mitigation measures will be implemented. • Signs advising road users that construction is in progress will be provided, specifically at the points where the new road connects with the S-5. • Flag persons will be employed to control traffic when construction equipment is entering or leaving the work area. • Strictly impose speed limits on construction vehicles along residential areas and where other sensitive receptors such as schools, hospitals, and other populated areas are located.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
Occupational Health and Safety	The exposure of workers to various physical	• Measures will be implemented to reduce the likelihood and consequence of the potential hazards. This shall include (but not limited to) the following hazards:	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
	hazards that may result to minor, disabling, catastrophic, or fatal injuries.	○ Falling from height; ○ Falling into water; ○ Entanglement with machinery; ○ Tripping over permanent obstacles or temporary obstructions; ○ Slipping on greasy walkways; ○ Falling objects; ○ Contact with dangerous substances; ○ Electric shock; ○ Variable weather conditions; ○ Lifting excessive weights; and ○ Traffic operations. • Conduct orientation for construction workers regarding health and safety measures, emergency response in case of accidents, fire, etc., and prevention of HIV/AIDS and other related diseases. • Provisions will be incorporated into all sub-contracts to ensure the compliance with the SEMP at all tiers of the sub-contracting. • Competent and adequately resourced Subcontractors will be used where construction activities are to be sub-contracted. • All persons working on site will be provided information about risks on Site and arrangements will be made for workers to discuss health and safety with the Contractor. • The areas where risk of injuries from falling objects exist will be marked with rope or flagging to minimize risks and injuries. • Flag persons will be employed to control traffic when construction equipment is entering or leaving the work area.			

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
		• Road signs will be provided in accordance with approved traffic management plan (See IEE Annex 9, Section **9.c - Traffic Management Plan**). • The Contractor will prepare and implement an Occupational and Community Health and Safety Management Plan (see IEE **Annex 11. Occupational and Community Health and Safety Plan Template**) prior to commencing work. This plan will include provisions on clean water, sewage and wastewater, solid waste, liquid chemical waste, personal protection, emergency preparedness and response, records management, safety communication, and training and awareness. • All workers will be properly informed, consulted and trained on health and safety issues. • Personal Protective Equipment (PPE) shall be worn at all times on the Site. This shall include appropriate safety shoes, safety eyewear, and hard hats. Non-slip or studded boots will be worn to minimize the risk of slips. • Before starting work all the appropriate safety equipment and the first-aid kits will be assembled and checked as being in working order. • All lifting equipment and cranes will be tested and inspected regularly. • All scaffolding will be erected and inspected, and the appropriate records maintained by the Contractor. • When there is a risk of drowning, lifebelts shall be provided and it shall be ensured that personnel wear adequate buoyancy equipment or harness and safety lines, and that rescue personnel are present when work is proceeding. • All safety harnesses, life-lines, reviving apparatus and any other equipment provided for use in, or in			

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
		connection with emergencies will be properly maintained and thoroughly examined at least once a month, and after every occasion on which it has been used. • All accidents and near misses will be reported and statistics will be collected to be used to identify trends and requirements for further training or 'safety stand-downs' where incident numbers are growing.			
Cultural Heritage	Risks to built heritage, objects, and sites that have archaeological, historical, religious, or other cultural value and significance.	• The chance find procedure (see IEE **Annex 8. Chance Find Procedure**) for managing cultural heritage will be implemented if any cultural heritage is discovered during construction.	Contractor Cost	Contractor and RD to implement mitigation	RD, Engineer
Grievance Redress	Complaints due to project implementation	• The Contractor will be responsible for nomination of Community Liaison Officer (CLO) and implementation of grievance procedure. • Continuous monitoring and review of complaints received from neighboring communities around the Project activity areas as per the grievance redress mechanism. • Workers will not be restricted from joining or forming workers organizations or from bargaining collectively, and the contractor will not discriminate or retaliate against workers who form or join collectives or bargain collectively. • Working relationships and conditions of work are also to be managed and monitored in implementing the Project.	Contractor Cost	Contractor and RD to implement mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
Waste	Pollution of land, water, or air from poor waste Management	• Construction and work sites will be equipped with sanitary latrines that do not pollute surface waters and are connected to septic tanks, or waste water treatment facilities. • The Contractor will classify waste streams (hazardous, non-hazardous, or a waste that requires a full assessment to determine classification – so-called 'mirror entry' waste) and manage them according to international best practice and Georgian law. • The Contractor will conclude an agreement with a municipality and solid non-hazardous and inert waste will be removed to a GoG licensed waste dump. • Domestic and Inert Waste o Provide garbage bins and facilities within the Project site for temporary storage of domestic solid waste and construction waste. o Waste storage containers shall be covered, tip-proof, weatherproof and scavenger proof. o Ensure that wastes are not haphazardly dumped within the project site and adjacent areas. • Hazardous waste o On the site allocated for temporary, short term keeping of hazardous wastes ensure compliance with the following safety measures: ▪ Use containers suitable for each type of waste; ▪ Prohibit use of damaged containers. Check integrity of containers regularly. ▪ Mark containers adequately; ▪ Provide secondary containment; ▪ Do not mix various waste streams. o Hire authorized contractor for hazardous waste removal and Keep agreements with hazardous waste management companies active.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
		○ Keep copies of waste manifests on site. Keep a record of waste on-site and waste removed. ○ In case of large-scale spills of hazardous liquids, follow the Spill Management Plan (see IEE Annex 9, **9.j - Spill Management Plan**). ○ Ensure implementation of ACW Management plan (see IEE **Annex 13. Asbestos-Containing Waste Management Plan**) if asbestos-containing waste is identified in the boundaries of the Project corridor.			

1.c - Management Plan for Operation Phase

Table 91. Management Plan for Operation Phase

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
Operation Phase					
Air Quality	Localized emissions of combustion gas and dust resulting from the circulation of vehicles.	• Local communities should be motivated to maintain greenery in the project area, including protective revegetation on both sides of the road. • Regular maintenance of the road will be done to ensure good surface condition.	Included in Operation / Maintenance cost	Local Communities / Road Maintenance Contractor	RD
	Effects of road vehicle emissions on neighboring vineyards	• The following procedure for monitoring and mitigation of impacts on adjacent vineyards will be undertaken during the operation phase: ○ Once the new road is operational, measure baseline levels of nitrogen dioxide and dust deposition at the same locations measured during the Site Preparation, Construction and Worksite Closure Phase (see above). ○ Review the findings to confirm whether mitigation is required. ○ If monitoring data shows that mitigation is found to be advisable based on the testing results, the following mitigation measures (targeted to the areas of concern) will be implemented as appropriate: ▪ Planting of vegetation barriers at the closest boundary of the vineyards to the road ▪ Use of solid fencing as part of the elevated road construction, adjacent to the proposed road ▪ Systematic sweeping and watering of roads ▪ Ongoing monitoring to confirm effectiveness • Plant maintenance will be carried out for at least two years on vegetation planted as a mitigation measure.	Included in Operation / Maintenance cost	Local Communities / Road Maintenance Contractor	RD, ADB

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
Soil Quality	Pollution due to littering	• Awareness raising and education of community on waste management (no illegal dumping or littering) should be provided. • Regular maintenance and cleanup of the drainage system will be carried out to prevent impact on soil erosion or flooding.	Included in Operation / Maintenance cost	Local Communities / Road Maintenance Contractor	RD
Water Quality	Surface water contamination from accidentally spilled fuel/oil and road surface runoff.	• Implementation of mitigation measures set for pre-construction and construction stages of the project during the road maintenance works as appropriate. • Maintenance paving of the road sections and bridge decks will be performed only in dry weather to prevent runoff contamination. • 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. • Roadside strips and drainage structures will be regularly maintained and cleaned.	Included in Operation / Maintenance cost	Road Maintenance Contractor / RD	RD
Terrestrial and Aquatic Fauna Habitat	Degradation of habitat	• The presence of invasive species will be monitored. • Roadside waste collection and clean up (sweeping) of the road will be done regularly.	Included in Operation / Maintenance cost	Road Maintenance Contractor	RD
Landscape Quality	Modification of the original landscape from the presence of new infrastructure	• Roadside vegetation will be preserved/maintained to shield the visual change in the landscape related to the new infrastructure (in addition to providing other benefits). • Periodic inspections will be done to detect signs of slope instability and ensure revegetation where necessary.	Included in Operation / Maintenance cost	Road Maintenance Contractor	RD

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
Occupational Health and Safety	The exposure of workers to various physical hazards that may result to minor, disabling, catastrophic, or fatal injuries.	• Applicable occupational health and safety measures taken during the construction phase will continue to be followed.	Included in Operation / Maintenance cost	Road Maintenance Contractor	RD
Community Health and Safety	Road accidents resulting from higher travel speeds and increased traffic	• Road safety facilities have been incorporated in the Project design at both preparatory and detailed design phases. These include traffic separation medians, pedestrian sidewalks, and signs and pavement markings complying with international and Georgian standards. These will be put in place by the Contractors during construction and will be maintained by the Project owner during the Project's service life. • Monitoring and maintenance of road safety furniture will be done to sustain road safety facilities constructed under the project.	Included in Operation / Maintenance cost	Road Maintenance Contractor / RD / Local Government and traffic authorities	RD

1.d - Environmental Monitoring Plan

Table 92. Environmental and 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
Site Preparation, Construction, and Worksite Closure (i.e., project closure) Phases					
EMP contractual obligations	• Development of thematic management plans (specific guidance and direction included in **Annex 9. Thematic Management Plans** of the IEE).	• N/A	The RD will clear the plans.	• Thematic management pans should be cleared once before construction begins • Information from the plans should be included in regular reports to the RD and ADB	RD
Air quality	• SOx • NOx • PM	• Construction sites • Receptors such as dwellings near the alignment (e.g., the town of Tsnori and Vakiri Village)	Measurements of exhaust emissions	• Monthly at five locations • Unannounced inspections during construction works	RD, Engineer
Air quality – dust	Fugitive dust emissions	At construction sites	Visual monitoring	Twice monthly during construction	RD, Engineer
Effects of road vehicle emissions on neighboring vineyards	• Maximum Predicted 24-hour Mean Airborne NOx Concentration (the air quality guideline for 24 hour mean NO_2 levels is 75 $\mu g/m^{-3}$). • Maximum predicted 24-hour mean dust deposition rate (the air quality guideline for 24 hour mean not to exceed 200 $mg.m^{-2}.day^{-1}$).*	• Six representative locations in the vicinity of the new road	• NO_2 diffusion tube • Dust deposition gauge • To be monitored at six sampling sites (for both NO_2 and dust) at representative locations along the new road.	• One year prior to opening of the new road • 12 x 1 month surveys for NO_2 and dust deposition at each location	RD, Engineer

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
Noise	Hourly average noise levels Leq, dBA.	• At noise sensitive sites, such as houses • At locations where baseline noise was monitored	Mobile noise meter	• Monthly during construction at five locations • Upon complaint	RD, Engineer
Soil erosion	• Adequacy of soil erosion prevention measures; and Soil Erosion Management Plan (see IEE Annex 9, Section **9.b - Soil Erosion Management Plan**).	All active construction sites	Visual inspection	Weekly	RD, Engineer
Soil quality	• Adequacy of soil contamination prevention techniques • Adherence to Spill Response Plan (see IEE Annex 9, Section **9.j - Spill Management Plan**) • Texture, bulk density, pH, conductivity, cation exchange capacity, organic matter, Total N, P, K, and heavy metals	At all project sites including construction yards, approach roads, bridge end facilities	• Ensure no contaminated effluent is leaving from the filling area to agricultural lands. • Water quality sampling of all effluent prior to discharge	Every 3 months	RD, Engineer
Quarry material	Location of borrow pits according to EMP, Spoil Waste Management Plan; Soil Erosion Management Plan; Aggregate and Borrow Pits Management Plan, and Clearance, Revegetation, and Restoration Management Plan	At all sites where quarry materials are being sourced	• Visual inspection • Review of quarry Licenses and contract	Before construction begins and inspections of the quarry site(s) every three months	RD, Engineer

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
	(see IEE **Annex 9. Thematic Management Plans**)				
Surface water quality	(i) Testing of pH, SS, EC, Turbidity, Cl, HCO3, SO4, K, Ca, Mg, Na, total P, TPH, total N, Coliform bacteria (/100ml), BOD and COD (ii) Completion of detailed terms of reference on the maintenance requirements for storm drain inlets and channels to prevent pollution of the irrigation channel.	(i) Sampling at major river crossings and along the irrigation canal	(i) Water quality analysis using international best practice (ii) Visual inspection	(i) • Monthly at five locations • Unannounced inspections during works near watercourses (ii) During construction phase for completion prior to operation phase.	RD, Engineer
Hydrocarbon and chemical storage	Construction camps	• Worksite • Car Maintenance servicing area • Staging/lay down area • Campsite (if available)	• Inspections • Observations	• Monthly • Unannounced inspections during construction	RD, Engineer
Impact on planted areas	(i) Completion of Pre-Construction Stage site survey to identify and quantify habitat types. (ii) • Adequacy of Clearance, Revegetation, and Restoration Management Plan • Status of vegetation • Plantation survival rate	Planted vegetation areas	Visual inspection	(i) Prior to site preparation and construction phases (ii) • Monthly • Unannounced inspections during preparation, construction, and	RD, Engineer

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
				worksite closure phases	
Impacts on trees near the working area	• Adequacy of Clearance, Revegetation, and Restoration (see IEE Annex 9, Section **9.g - Occupational and Community Health and Safety Management Plan**) • That trees located close to the project area protected by fence	At sites where trees and forests are located along the construction site	Visual inspection	Monthly	RD, Engineer
Possible loss or damage to cultural resources	Presence of chance finds	Dependent on findings during construction	Visual inspection	Throughout construction works	RD, Engineer, and Ministry of Culture and Monument Protection
Local Roads	Existing roads	• Local roads are not damaged • Grievance and redress	• Visual inspection	Monthly	RD, Engineer
Traffic Safety and Management	• Haul and all affected roads as identified in the Traffic Management Plan (see IEE Annex 9, Section **9.c - Traffic Management Plan**) • Adequacy of Traffic Management Plan	As identified in the Management Plan	• Visual inspection	Daily	RD, Engineer
Occupational Health and Safety	• Adherence to the approved Occupational Health and Safety Plan (see IEE **Annex 11. Occupational and**	Worksite	• Inspection • Interviews • Comparisons with the Contractor's approved	• Weekly • Unannounced inspections during Construction • Upon complaint	RD, Engineer

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
	Community Health and Safety Plan Template) • Adherence to ACW Management plan, if developed (see IEE **Annex 13. Asbestos-Containing Waste Management Plan**). • Worker complaints and concerns and recorded incidents • Use of personal protective equipment (PPE) relevant to the task • Training records • Organization of traffic on the construction site • Keeping to the safety rules while working on height		Occupational Health and Safety Plan		
Drinking water and sanitation	Safe water and sanitation facilities are provided on the site	In construction yards and construction camps (if applicable)	• Visual inspection • Interviews	Weekly	RD, Engineer
Community Health and Safety	• Availability of information on GRM • Adequacy of construction site signage and fencing • Adequacy of temporary noise mitigation measures • Accidents involving public and workers • Emergencies and responses • Public complaints about issues such as	All active construction sites	• Visual inspection of all active construction sites • Informal interviews with nearby residents (within reason given the possible distances between sites)	Monthly	RD, Engineer

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 on employment and economy	• Employment of local workforce and women.	All active construction sites	The Contractor to record and provide figures regarding employment of local workforce and women to RD.	Semi-Annually	RD
Solid and Liquid Waste Management	• Adherence to Waste Code • Adherence to Waste Management Plan and Laydown Area and Construction Camp Management Plan (see IEE **Annex 9. Thematic Management Plans**). • That solid waste is disposed at designated site	Construction camps (if applicable) and construction sites	Visual inspection	Weekly	RD, Engineer
Adherence with EMP and loan covenants	• EMP /SEMP • Loan covenants	All active construction sites	• Visual inspection • Supervision	Semi-Annually	RD, ADB
Operation Phase					
Post-construction site inspection	Performance checked against the management plans submitted before construction for specific aspects (e.g., Clearance, Revegetation, and Restoration Management Plan and if relevant - Spoil Waste Management Plan, and Aggregate and Borrow Pits Management Plan) (see **Annex 11. Occupational and Community Health and Safety Plan Template**).	All former construction sites	Visual inspection	Twice: two weeks before completion of construction activities and once after completion	RD, ADB

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
Road safety	Proper signage and traffic control arrangements in place	Entire length of constructed section	Inspection	Recurrent	RD
Adequate operation and maintenance of drainage systems	Drainage infrastructure in good technical condition and cleaned regularly	Entire length of constructed	Inspection	Recurrent	RD
Regular maintenance and periodic replacement of greenery within the alignment corridor	Trees planned for compensation of removed plants and grass seeded for slope stabilization properly safeguarded, watered as needed, and replaced when necessary	Greened areas within the ROW	Inspection	Recurrent	RD
Effects of road vehicle emissions on neighboring vineyards	• Maximum Predicted 24-hour Mean Airborne NOx Concentration (the air quality guideline for 24 hour mean NO_2 levels is 75 µg/m^{-3}). • Maximum predicted 24-hour mean dust deposition rate (the air quality guideline for 24 hour mean not to exceed 200 mg.m^{-2}.day^{-1}).*	• Six representative locations in the vicinity of the new road	• NO_2 diffusion tube • Dust deposition gauge • To be monitored at six sampling sites (for both NO_2 and dust) at representative locations along the new road.	• One year once the new road is operational • 12 x 1 month surveys for NO_2 and dust deposition at each location	RD

*Note: * Recommended air quality guidelines were provided in the following study: East-West Highway (Bakutsikhe -Tsnori) Improvement Project, Georgia Assessment of air quality impacts on vineyards. ED 12424100 | Issue Number 2 | Date 13/05/2019. Ricardo Energy & Environment.*

Annex 2. Stakeholder Engagement Meeting Minutes

Minutes
of Public Consultation Meeting
on the Draft Environmental and Social Impact Assessment Report
for Bakurtsikhe-Tsnori Road Section

21.02.2018 Gurjaani Municipality

Chairman of meeting – Maya Vashakidze, Environmental Safeguard Consultant Roads Department of Georgia

Secretary of meeting – Rusudan Elizbarashvili Senior Specialist of the Environment Protection Division of the Roads Department of Georgia

Speakers: Maya Vashakidze
Attendees of the Meeting: See attachment 1

The goal of the public discussion was to inform the local communities about the purpose of the upcoming works, their timeline; temporary inconvenience expected from the construction works; and planned measures for mitigating the expected negative environmental impact.

Local stakeholders had possibility to ask questions and express their opinion during the public discussion, so that their comments could have been considered in the final version of the Environmental Management Plan.

Ms. Maya Vashakidze, Environmental Consultant and Rusudan Elizbarashvili Senior Specialist of the Environment Protection Division of the Roads Department of Georgia were representatives of the Roads Department of Georgia.

Ms. Maya Vashakidze informed attendees about the Environmental and Social Environment Impact Assessment report of construction works under Secondary and Local Roads project III. The ESIA was carried out based on the World Bank's safeguard policies: OP/BP 4.01 Environmental Impact Assessment and OP/BP 4.12 Involuntary Resettlement. The project is classified as environmental category "B", since it covers new construction, what may have significant and irreversible impacts on the natural and social environment. Pursuant to the national legislation, an environmental permit needs to be obtained.

Ms. Maya Vashakidze made a presentation of ESIA draft report. She covered the scope of planned works, their possible impact on the natural environment and human health. Also was overviewed mitigation measures proposed to reduce negative environmental impacts of the project in the construction and operation phases.

№	Question	Answer
1	When will the construction works of the road start?	The FSs' final document is under preparation. When the preparation of the study will be approved by the WB, the RD will announce tender for design-build project.
2	Will the local population be employed during the construction works?	The local population will be employed during the construction works. Works contractor will be hired on the competitive basis and will have a discretion to recruit work force upon own discretion. The construction Company's contract will envisage the prioritized employment of the locals and supervision Company and local authorities will take care that these conditions are met.
3	Will the cattle passages and access roads be constructed with the project support?	The construction company, which will be identified after tender will prepare detail design of the road section and the exact number of the cattle passages will be known afterword. But the construction company will work close with the local municipalities and population to identify their needs for access roads and cattle passes.
4	How can we be able to see the detailed design once it is developed	Our today's meeting is one of the meetings planned to conduct with all interested parties within the scope of the project. Once the Final version of Feasibility Study is available, the Resettlement Action Plan will be prepared. A meeting with the local population will be organized to discuss it with the affected people. Besides, the Resettlement Action Plan will be made available at local municipalities and the web site of the Roads Department of Georgia, where all of you will be able to see it.
5.	If the local roads are damaged during the construction works, will the Contractor repair them?	The Contractor will be responsible for prompt repairing of damaged local roads. RD will enforce adherence to this rule.
6.	Can you give an exact list of project-affected families and plots so that we should plan our activities accordingly, e.g. I wonder if it is meaningful to do any agricultural works for me.	As already mentioned, a detailed design is being developed at present. Only after this process is over, it will be possible to exactly identify the project-affected land plots. After the registration and inventory process is over, the affected persons' property and plantings will be inventoried by the given moment, and their loss will be compensated within the scope of the resettlement action plan.
7.	How much will you pay for 1 sq.m. of land?	While developing of the Resettlement Action Plan, a professional evaluator will be deployed for setting the value of land plots to be taken.

Representatives of Roads Department of Georgia:

Maya Vashakidze (signed)

Rusudan Elizbarashvili (signed)

საერთაშორისო მნიშვნელობის ბაკურციხე-წნორის საავტომობილო გზის ბუნებრივ და სოციალურ გარემოზე ზემოქმედების ანგარიშის საჯარო განხილვა

გუნდი

21 თებერვალი 2018

№	სახელი, გვარი	საკონტაქტო ინფორმაცია (მისამართი, ტელეფონი და სხვა)	ხელმოწერა
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	[illegible]	595-25-15-81	
	[illegible]	577-20-23-63	
	ნინო [illegible]	577157169	
	[illegible]	595576891	
	ალექსანდრე [illegible]	599-97-82-94	
	[illegible]	551-16-50-64	
	დავით [illegible]	592 952710	
	მერაბ [illegible]	599 97-38-32	
	[illegible]	598 51-14-60	

Photos of public consultation:

Minutes
of Public Consultation Meeting
on the Draft Environmental and Social Impact Assessment Report
for Bakurtsikhe-Tsnori Road Section

21.02.2018 Signagi Municipality

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Ms. Maya Vashakidze made a presentation of ESIA draft report. She covered the scope of planned works, their possible impact on the natural and social environment. Also was overviewed mitigation measures proposed to reduce negative environmental impacts of the project in the construction and operation phases.

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3	Will the cattle passages and access roads be constructed with the project support?	The construction company, which will be identified after tender will prepare detail design of the road section and the exact number of the cattle passages will be known afterword. But the construction company will work close with the local municipalities and population to identify their needs for access roads and cattle passes.
4	How can we be able to see the detailed design once it is developed	Our today's meeting is one of the meetings planned to conduct with all interested parties within the scope of the project. Once the Final version of Feasibility Study is available, the Resettlement Action Plan will be prepared. A meeting with the local population will be organized to discuss it with the affected people. Besides, the Resettlement Action Plan will be made available at local municipalities and the web site of the Roads Department of Georgia, where all of you will be able to see it.
5.	At present, there is a car access road to the land plots. Will this access road remain in place after the project is implemented?	The Contractor will be prepare the Detail Design. The number and locations of access roads will be determined during the development of the detail design.

Representatives of Roads Department of Georgia:

Maya Vashakidze (signed)

Rusudan Elizbarashvili (signed

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საერთაშორისო მნიშვნელობის ბაკურციხე-წნორის საავტომობილო გზის ბუნებრივ და სოციალურ გარემოზე ზემოქმედების ანგარიშის საჯარო განხილვა

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Photos of public consultation:

Annex 3. Interviews and Analysis from Preliminary Social Survey with Affected Communities and Roadside Businesses

Brief Analysis of Social Survey

748. The interviews were carried out on November-December 2017.

749. During the preliminary social survey 28 private and legal persons were interviewed, who has a business nearby the existing road. 2 persons out of 28 (7%) are legal entities and 26 (98%) are private individuals. The number of respondents is estimated to be 20% of business producers in Gurjaani and Sighnaghi municipalities. The surveyed legal entities have a gas station, furniture store and food stores. As for individual traders, 6 of them trade with meat, and the rest - their agricultural products and their food-stuff (pumpkin, garlic, fruits, and churchkhela and other). A detailed social survey will be conducted at the stage of elaboration of the Project Resettlement Action Plan.

750. 100% of interviewed persons are ethnically Georgian and live in adjacent villages. For 4 out of the interviewed 26 private traders (15%) this business is the only source of income. 20 of them (77%) additionally receive pensions, while the other 2 traders (8%) have other sources of income. As for the 2 legal entities, their business is the only source of income.

751. In relation to the land and assets purchases, the overall objective of the project is to assist the affected population (AP's) in order to ensure their living conditions at least on the current level of project implementation. It will be good practice if the outdoor traders will be able to sell their products not in an open spot but into specially allocated spaces in an organized manner. This measure will also be useful if the specially arranged facility for outdoor traders will be located between existing road and project road, because in this case the intensity of traffic will no longer cause the reduction of "clientele". Their products will be available for vehicles moving on the existing road, as well as for cars moving on the new road. In addition, it is necessary to take into account specific principles, such as:

- Implementation of road construction in maximal distance from residential areas to minimize the physical movement of people and selecting routes that require the acquisition of the minimum amount of productive agricultural lands owned by private and public ownership;
- Developing such design standards that will reduce the limitations of the land use of the adjacent territories;
- Development of fair and transparent procedures, in accordance with the matrix of the powers of the present Resettlement Policy Framework to compensate: in case of temporary loss of land/property during construction, in case of permanent acquisition of land and property and possible prohibition of land use at the adjoining site of the corridor;
- Purchase of land (or land use right) on the basis of a bilateral agreement, as for the state's right to use expropriation procedures for the necessary public need - this should only happen only after the exhaustion of all mediators with owners, only in extreme cases.
- Maximum restoration of the original condition of the land after completion of the construction, so that landholders/beneficiaries/leaseholders should be able to renew the activity they were engaged in before the start of the project;

- Fully informing the project affected people and societies on further land acquisition and compensation procedures; As well as informing them about the land rights and the mechanisms of appealing.
- Consideration of the complaints of the affected persons, decision-making and gratification should be done in accordance with the provisions of the Resettlement Policy Framework.
- All affected persons, regardless of the legal status of their property, shall have the appropriate compensation in order to be able to maintain subsistence funds and provide a better standard of living than he had before the project implementation. Persons who illegally own the land parcels are not granted compensation for loss of land, but they will receive compensation for loss of property that they have created with their own funds and also because of loss of income in such a way that to help them to maintain survival funds. The detailed measures to be taken are based on the survey and socio-economic research that will be carried out in the preparation of the Resettlement Action Plan.
- AP's will be informed of the Project Implementation Schedule and will be consulted on land acquisition and issues related to the loss and damage of assets.
- Loss of such assets such as fruit-bearing agricultural plants and trees, fences and booths and loss of income, including loss of harvest, will be minimized, and if such damage is inevitable, it will be compensated despite the legal status of property, according to the matrix of the authority given in the RPF document.
- The Resettlement Action Plan will be developed in accordance with the Resettlement Policy Framework, World Bank OP 4.12 and Georgian legislation on each section of the Project route and the plan will provide detailed compensation packages and project implementation schedule. Due the differences, as noted above, between OP 4.12 policy and the Georgian legislation regarding the expropriation methods, the land required for the project will be purchased with the Principles and Procedures under this RPF document.
- The market will be studied to determine the market price of the land, impacted building materials, agricultural crops and other necessary products. Estimated prices will be used as unit prices to determine the volume of compensation. The above-mentioned measure is needed in order to make it possible for the affected persons to buy a substitute land in accordance with the market prices.
- Loss of income and assets - remuneration with clear calculation without taxes, depreciation and other deductions.
- The final project of the Resettlement Action Plan will be submitted to the bank, which will approve it on the relevant sections before the commencement of construction works.
- Details of land acquisition procedure will be included in the Resettlement Action Plan. However, the following included aspects should be noted:
    - Consultation at the initial stage with informing Affected People's (AP) about the project and the impact of the project
    - Survey of AP's, geographical and socio-economic research
    - Determination of APs and identification of impact types/zones
    - Preparing compensation package and creating Resettlement Action Plan
    - Consultation with APs
    - Negotiation with APs and paying compensation
    - The process of alienation in case of futile negotiation.

Social Survey Results

752. The implementation of the project will have direct impact on the food facilities, petrol stations and individual traders located near the main road, whose work is seasonal and lasts for 3-4 months a year, when they sell products which they produce by themselves, and for

the remained months try to sell seasonal fruit and/or other products. During November, 30 individual traders were observed in the proximity section, 24 of those took part in the polls by their own will, while 4 refused any questions. The survey showed that the number of vendors are a little bit higher (about 2-3 times). They are mostly residents of adjacent villages and trade with their harvest and food-stuff (fruit, churchkhela, pumpkin, garlic, etc.).
Photo №1. Meetings with outdoor vendors

753. It should be mentioned that all business is active only from spring to autumn (May to October). Most of them are not operating during the winter time or operate at very limited scale. All shop owners mentioned that reduction transit movement will not affect their business, about 90% of customers are from the local neighborhood.

754. Effect of the traffic diversion on large shops will be low. According to the owners, the sales are not dependent on the traffic flow and/or the season.

755. Keeping the mentioned above in mind, fruit, and vegetable sellers as the most vulnerable to the change were interviewed.

756. All respondents except one refused to say approximate daily income.

757. Owners of those trade that are located in the middle of the villages are happy with the new project, because the movement of trucks and intensive traffic on the village road damage their homes and they mainly work for local population and passenger drivers rarely enjoy their services.
Photos №2. 3. 4 Meetings with the shop owners

Note: Most of private business owners refused to allow for photos to be taken of their business

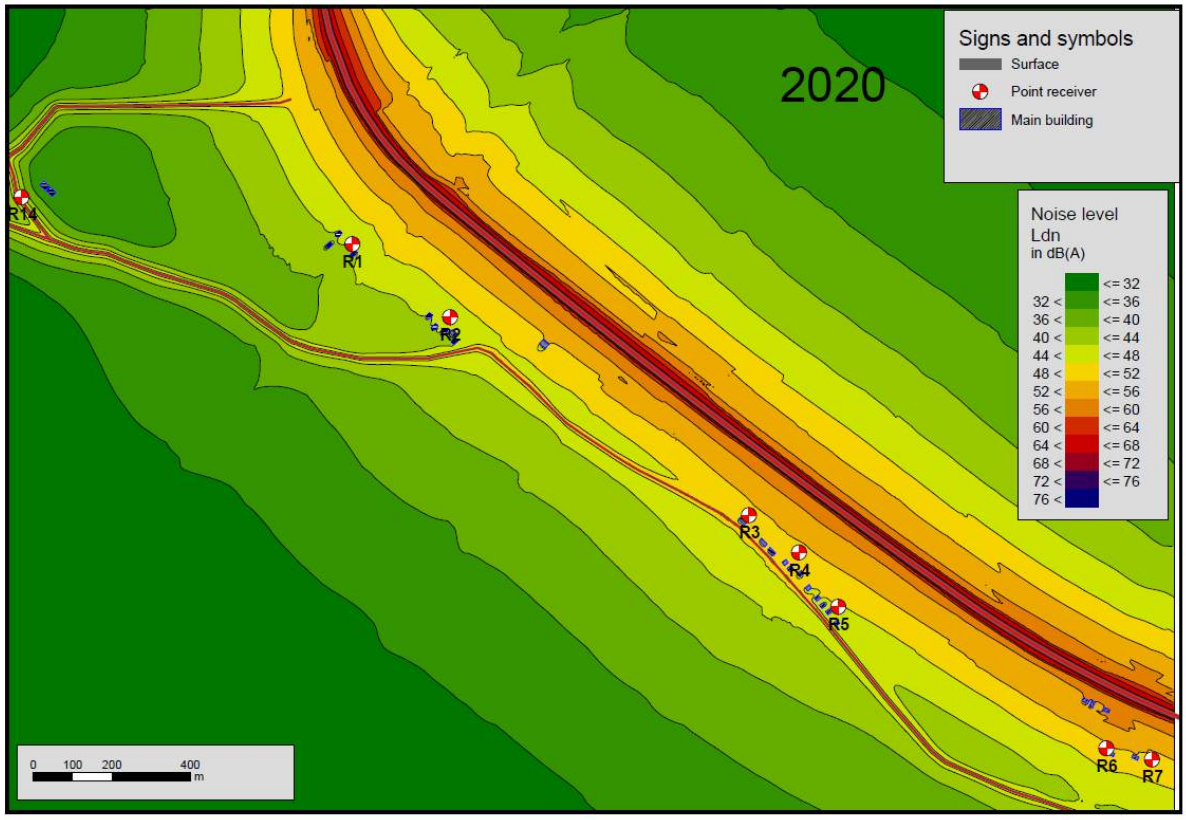
758. There are also such (mostly owners of bakeries) who are not interested in the new project. In their opinion, the new road does not have any sense for them and whatever business income they had before, it would remain all the same.

759. As for the opinion of the small business owners and workers of gas stations (furniture stores, household stores) - they think that their business will suffer by the reduction of traffic intensity on the existing road.

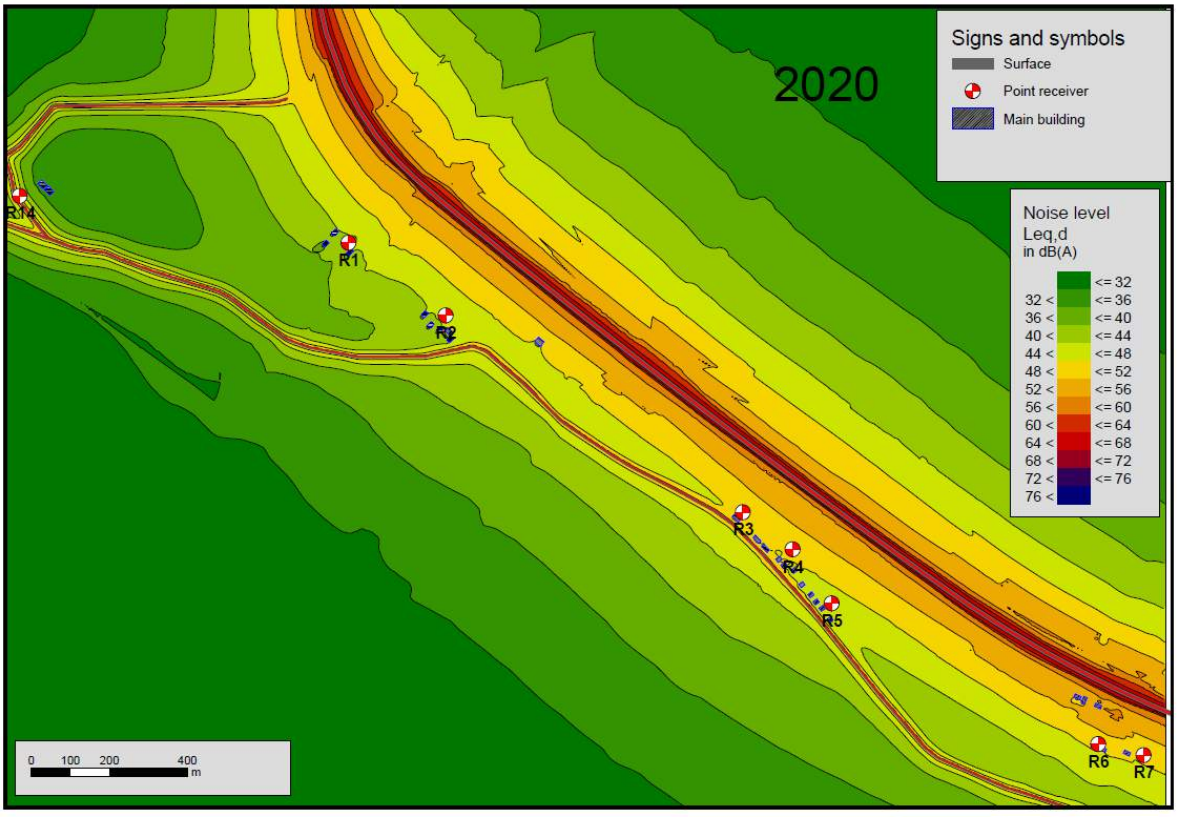
760. The main concern of the residents is lack of employment in particular for youth. The attitude toward the project is dual. They agree that the road is necessary, are happy that diversion of traffic will reduce the risk of car accidents and improve air and noise quality in the settlement, but fear that they will have to stop their business as the number of customers reduces. In their opinion they or their family members must have priority during temporary employment. Most of the respondents are skeptical that establishment of alternative businesses will be feasible is short term prospective. In their opinion this will be possible only in case of support from the state.

Annex 4. Noise Contour Maps

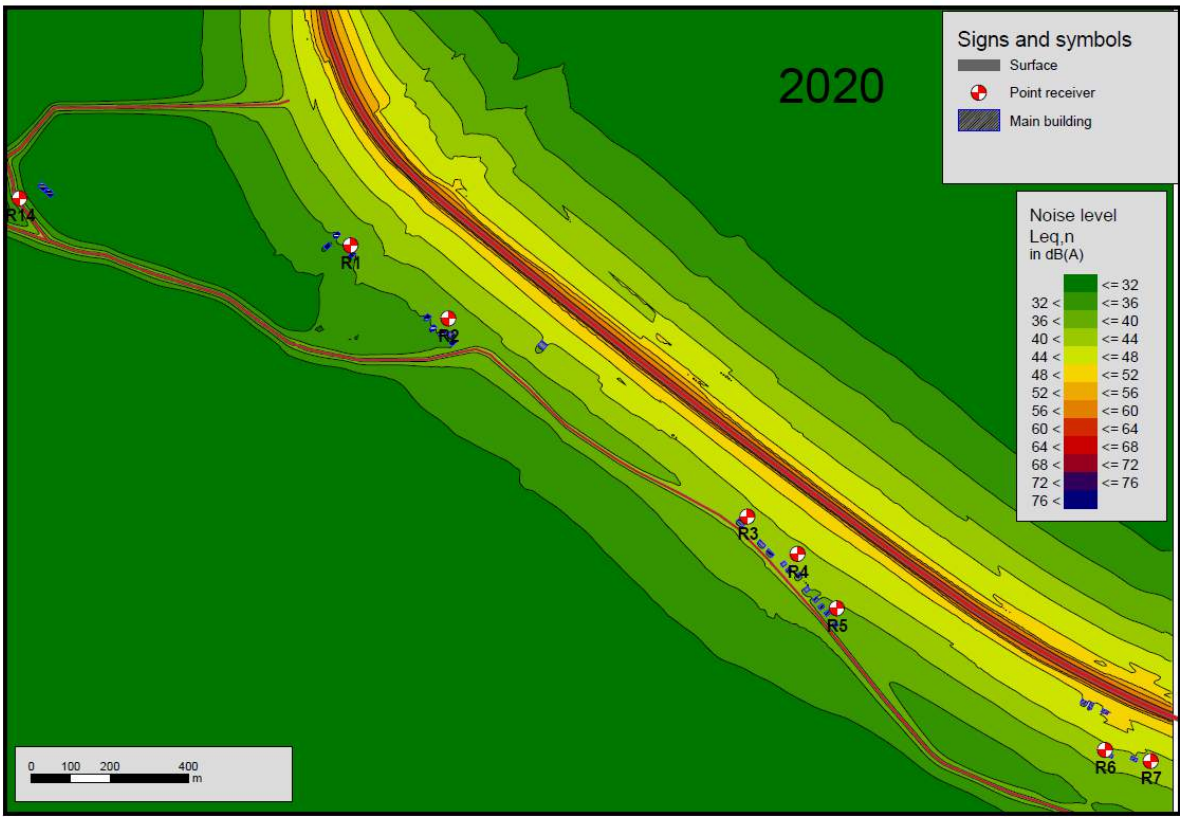
2020 R1 – R7 Ldn



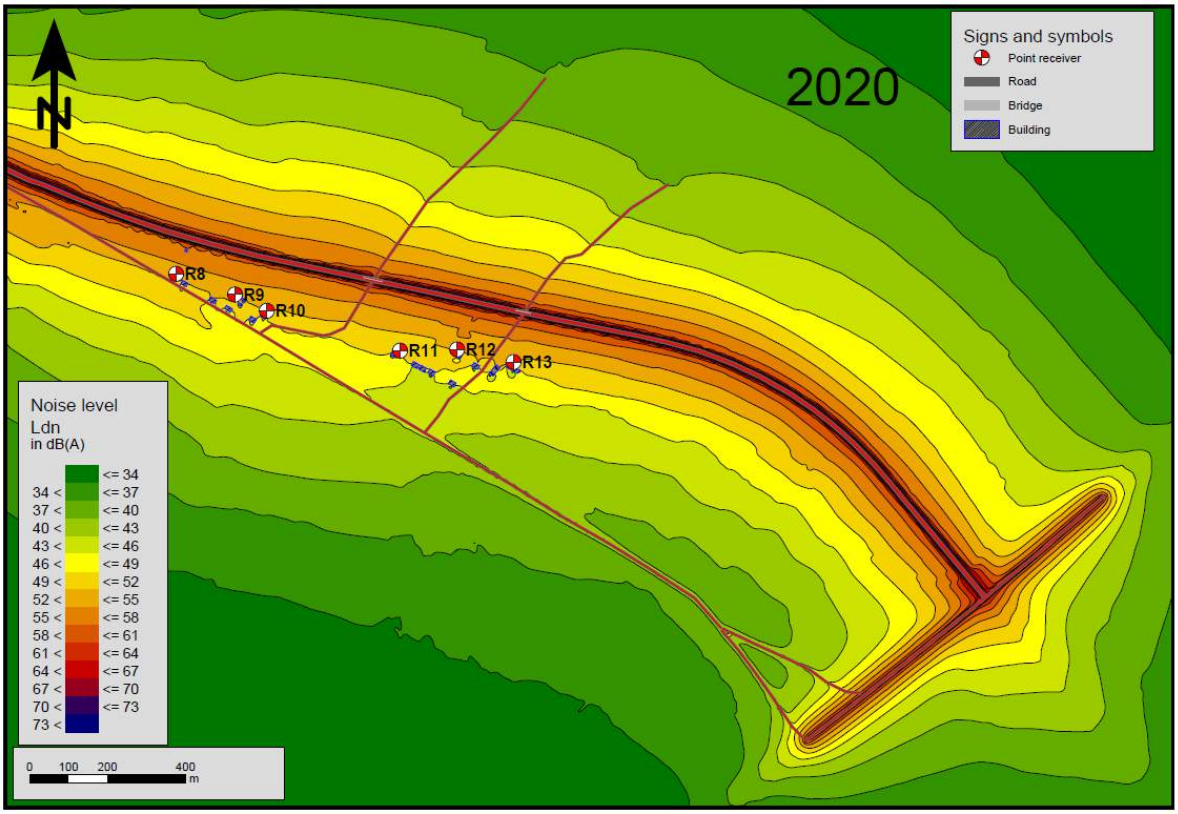
2020 R1 – R7 Ldn day



2020 R1 – R7 Ldn night



2020 R8 – R13 Ldn



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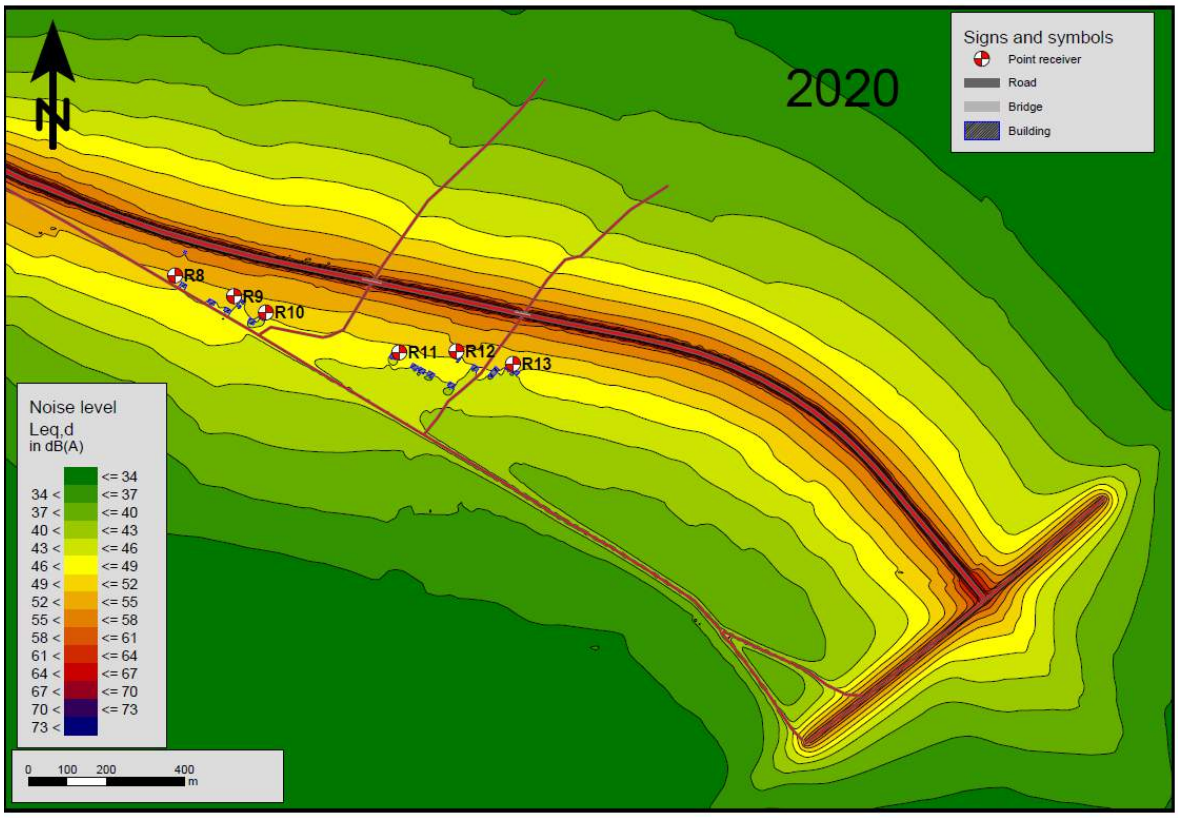

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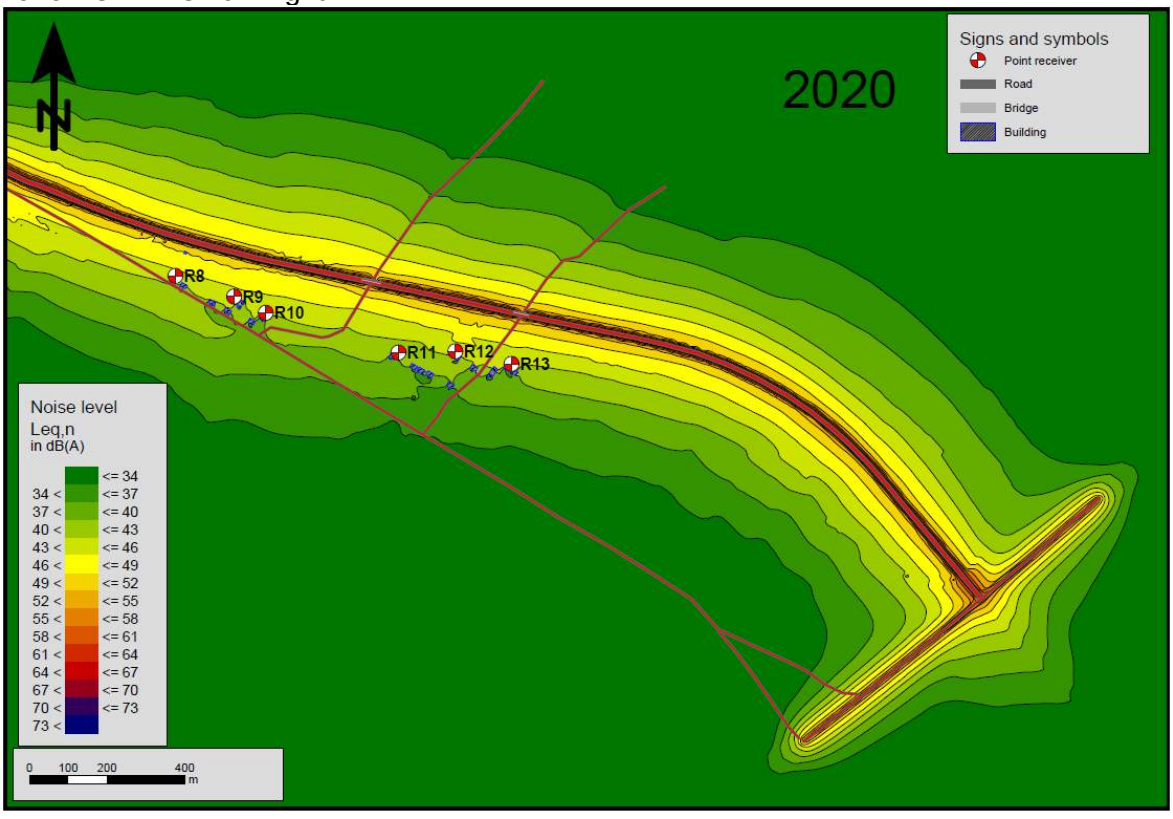
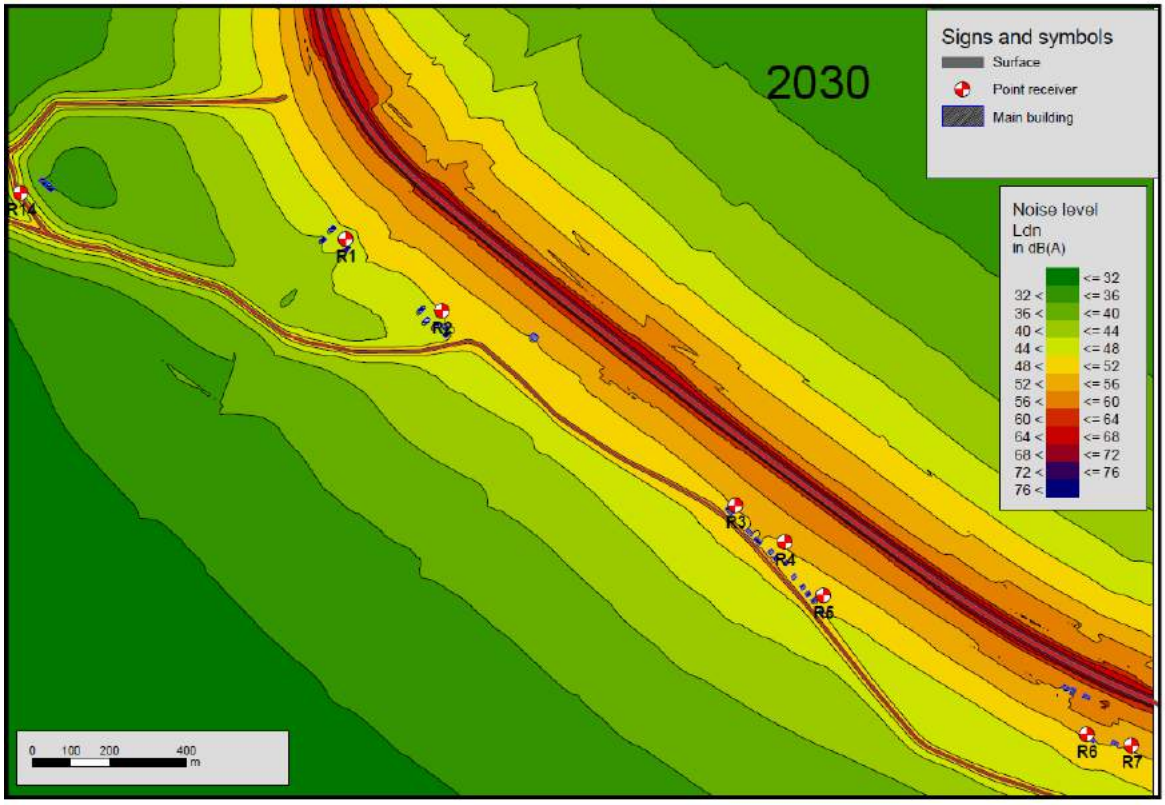


2030 R1 – R7 Ldn



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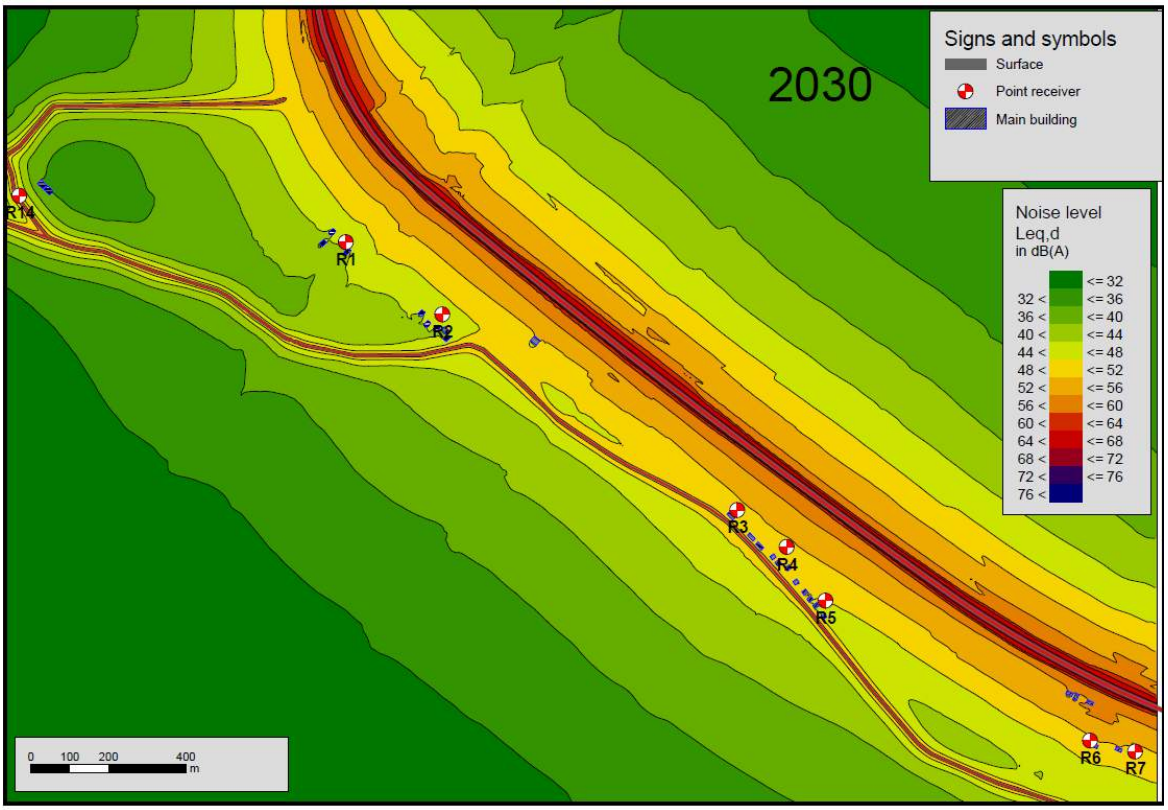

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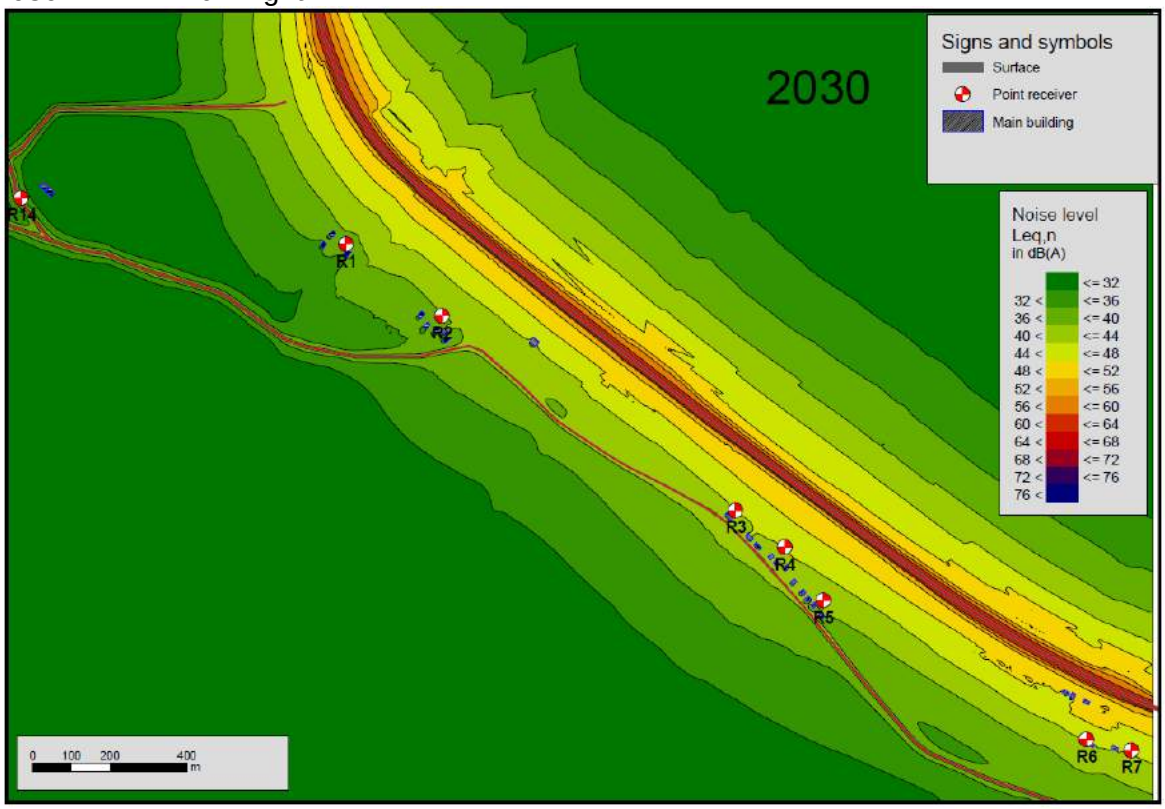

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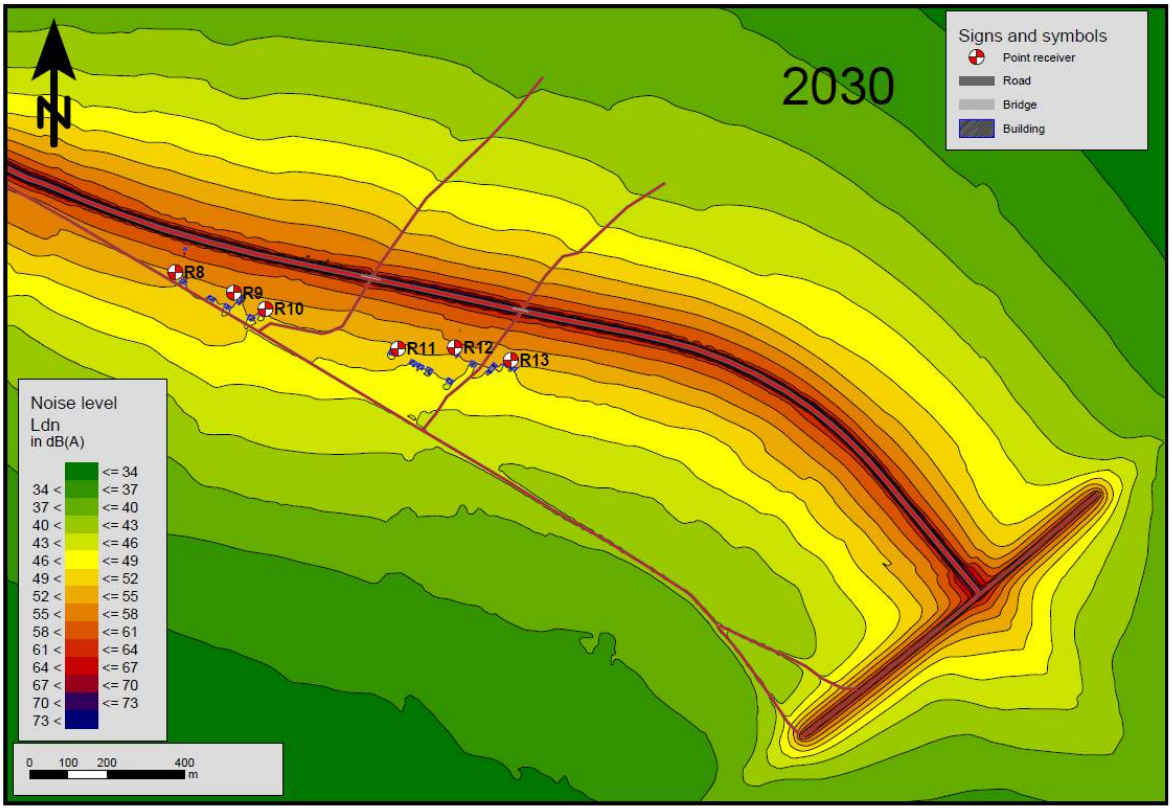

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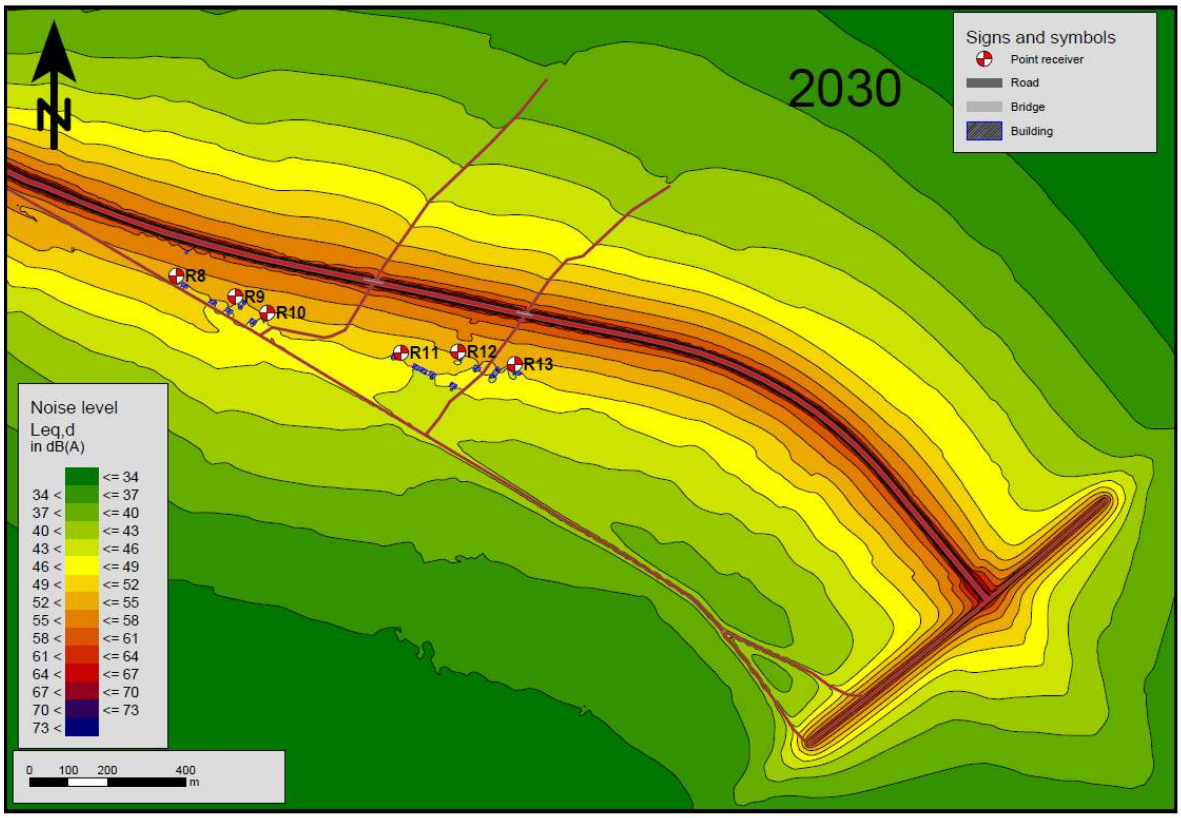

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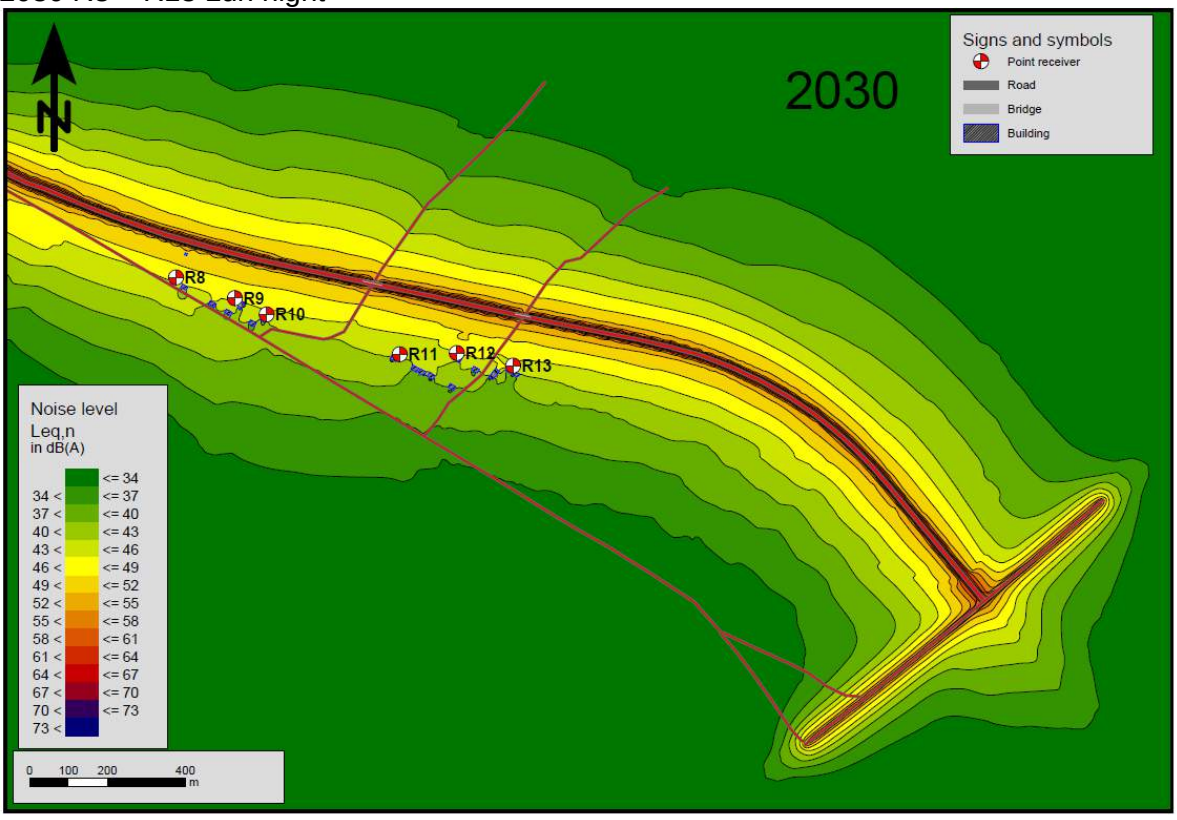
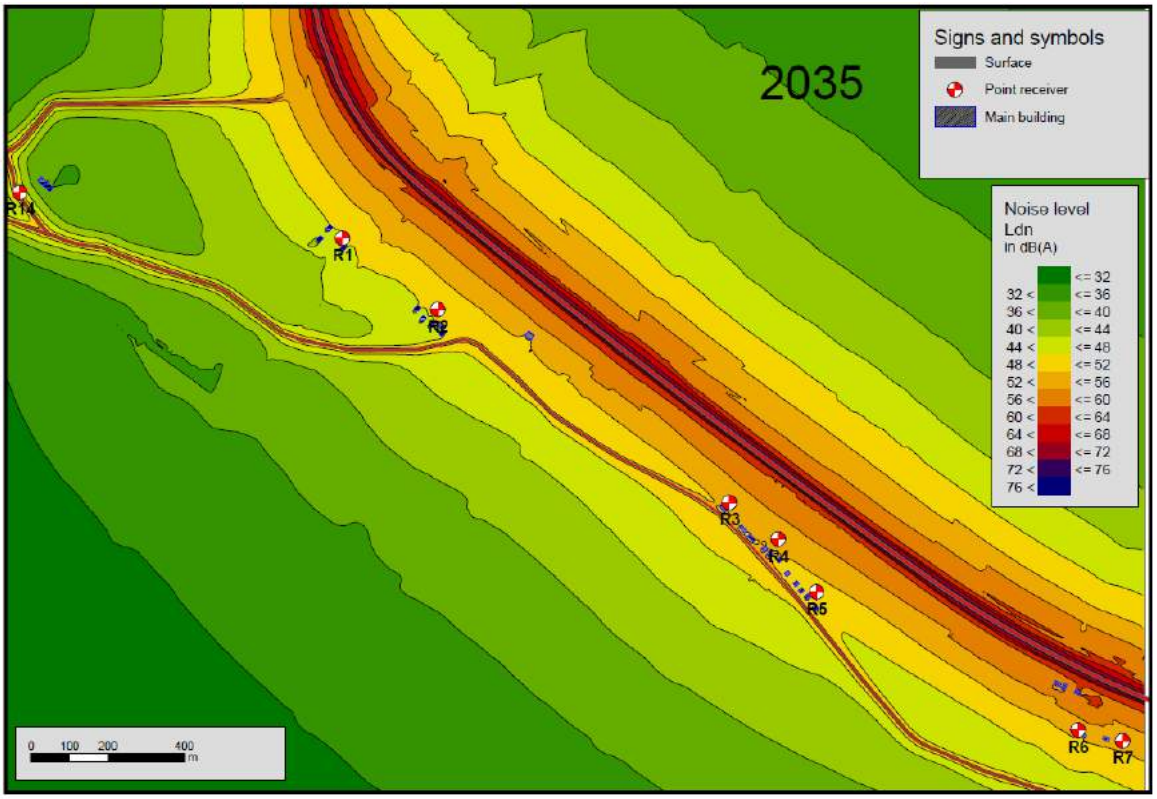


2035 R1 – R7 Ldn



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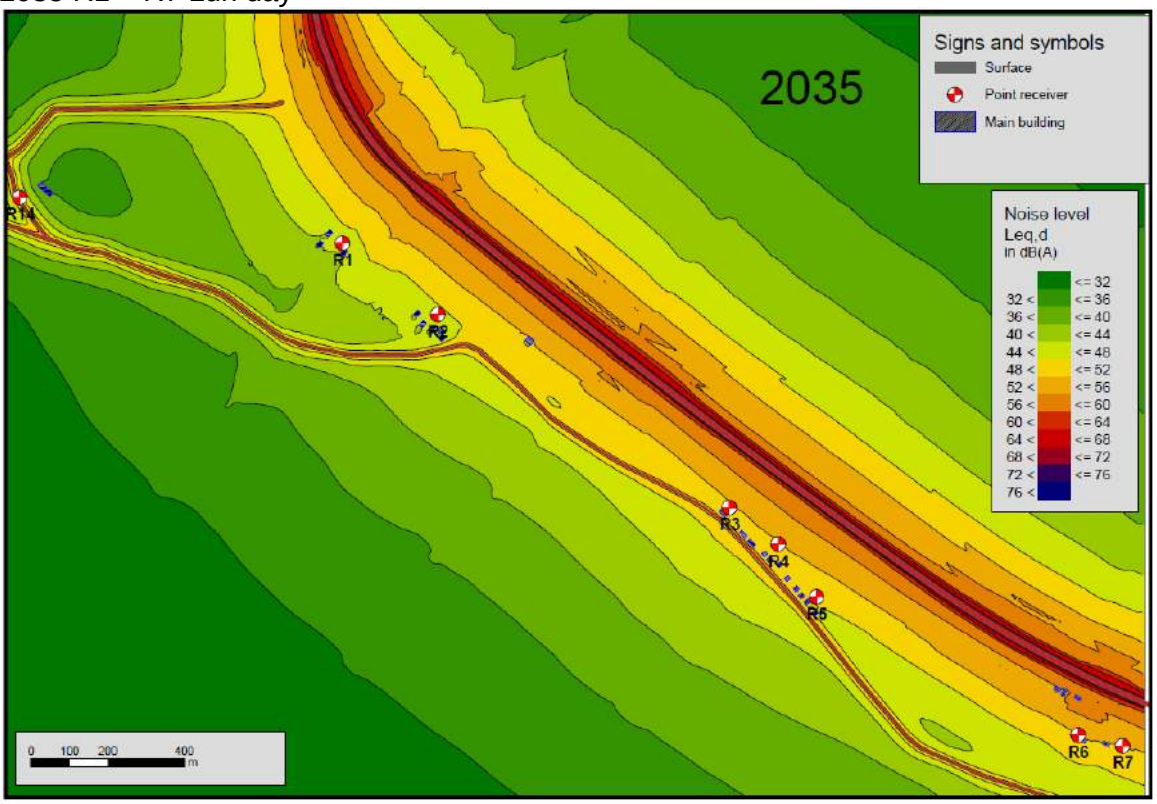

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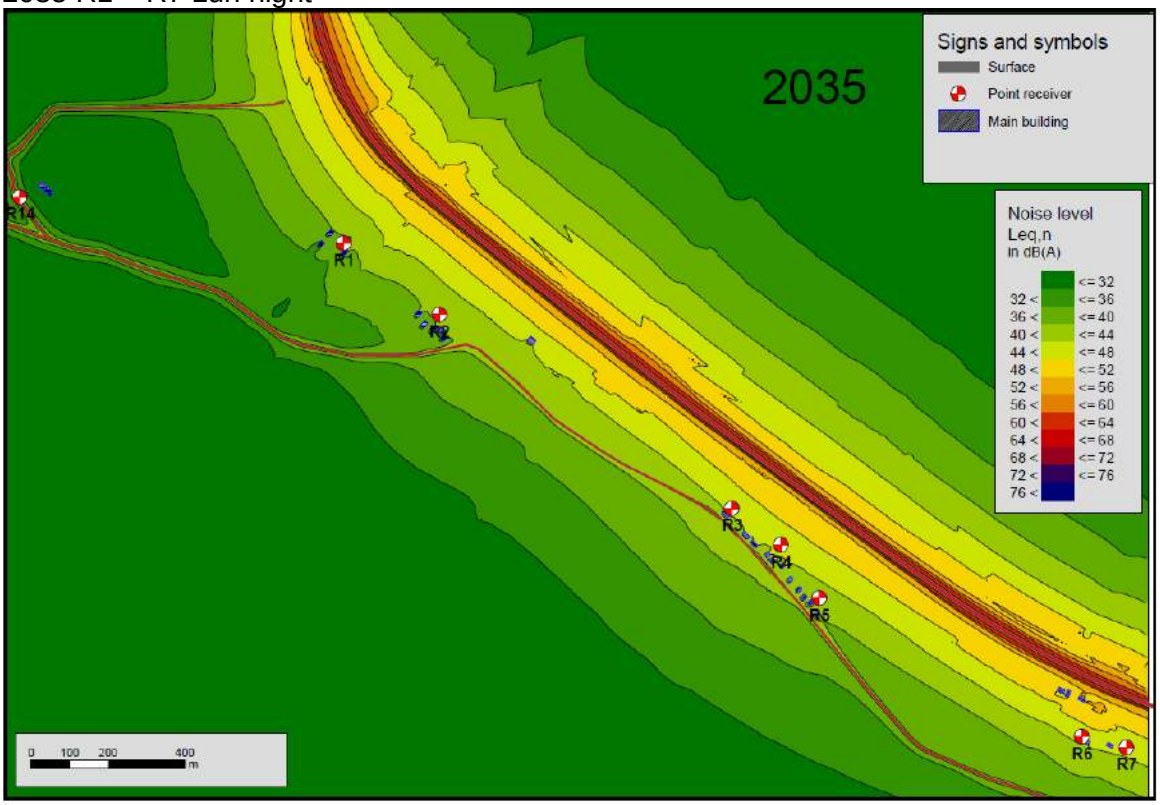

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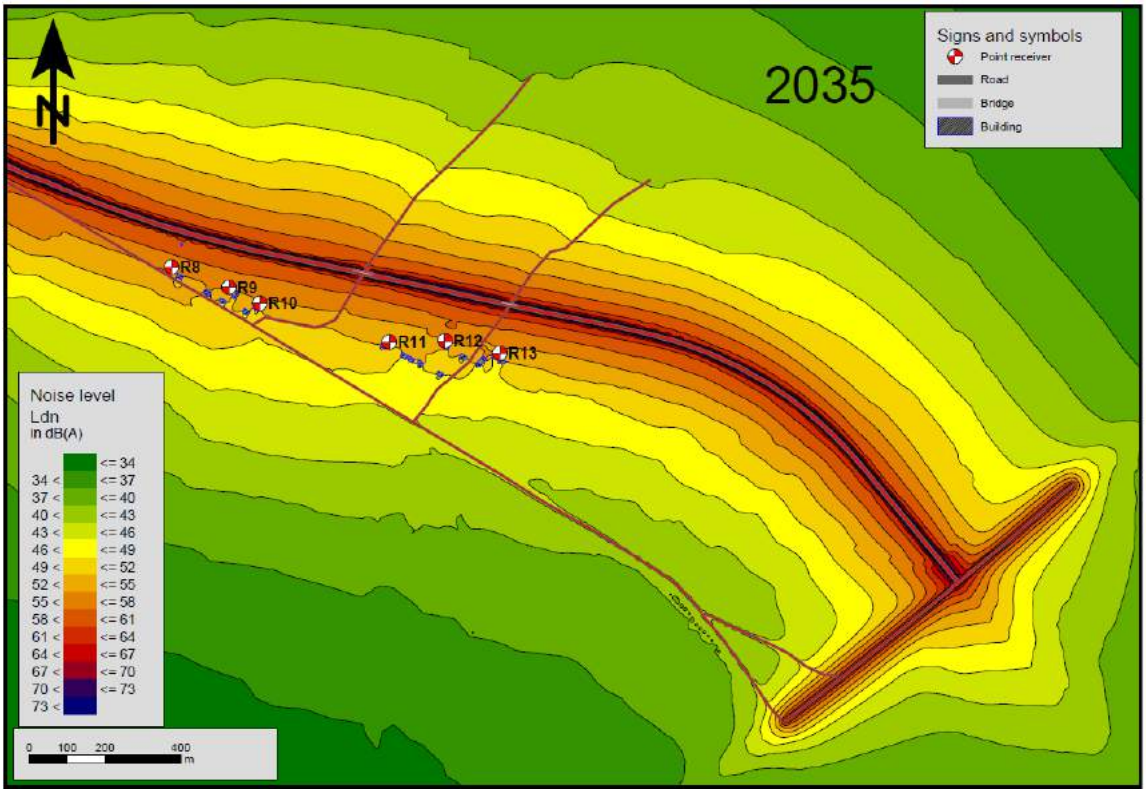

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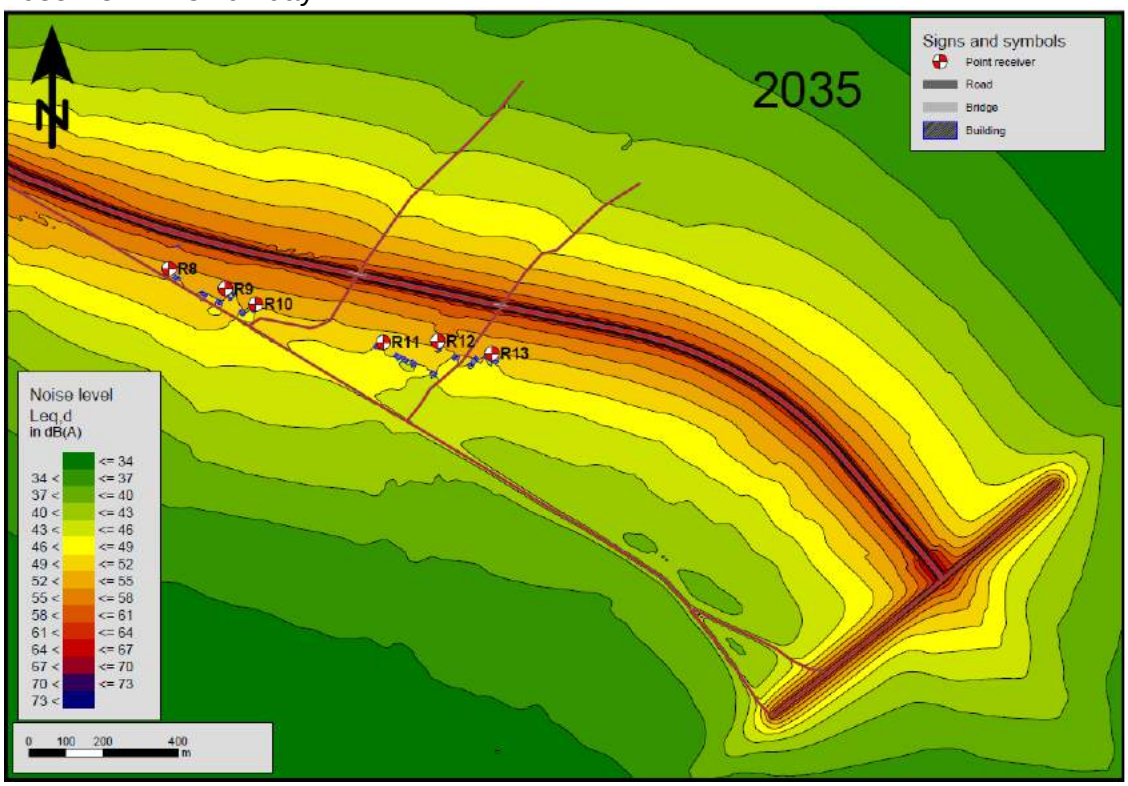

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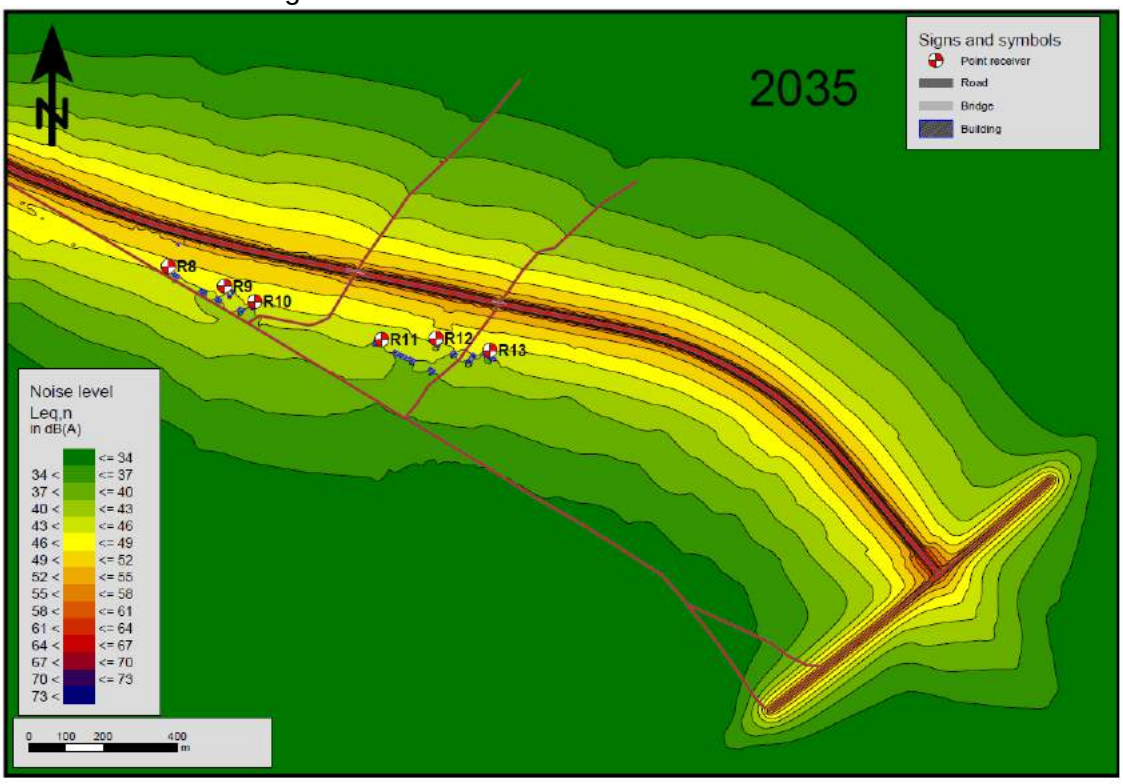
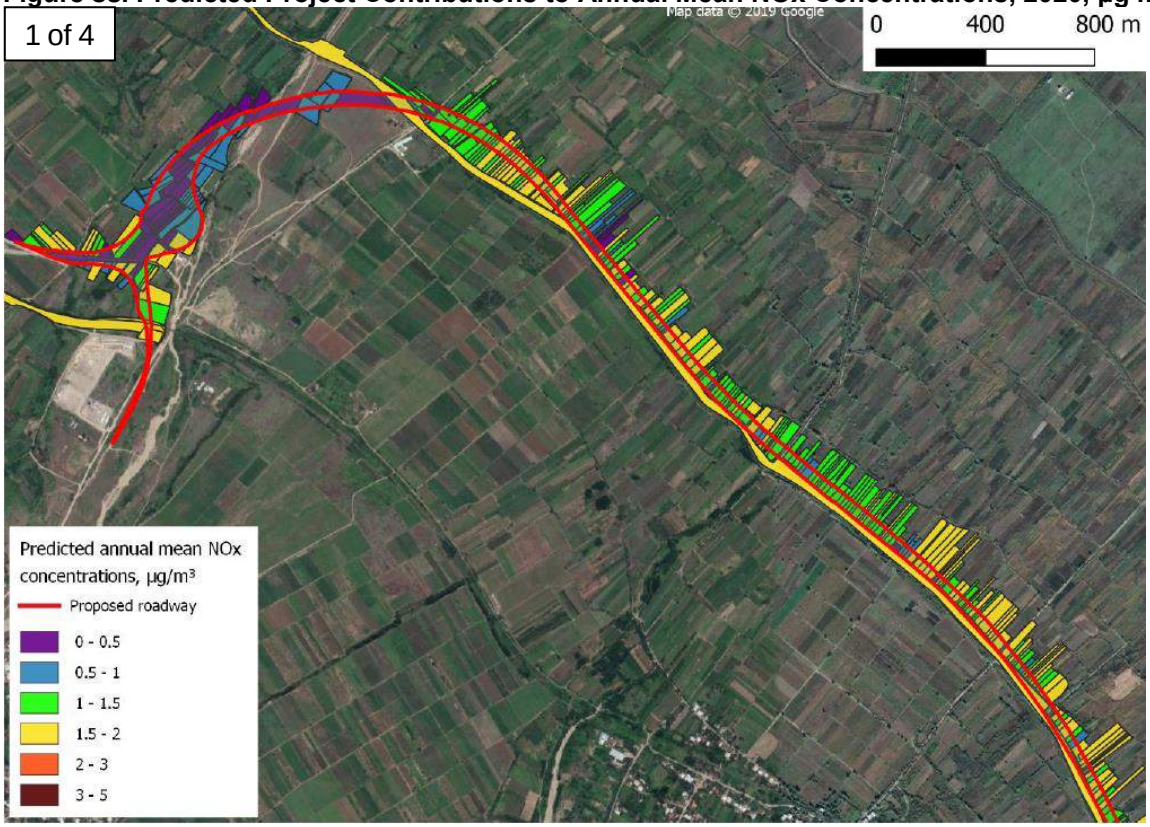
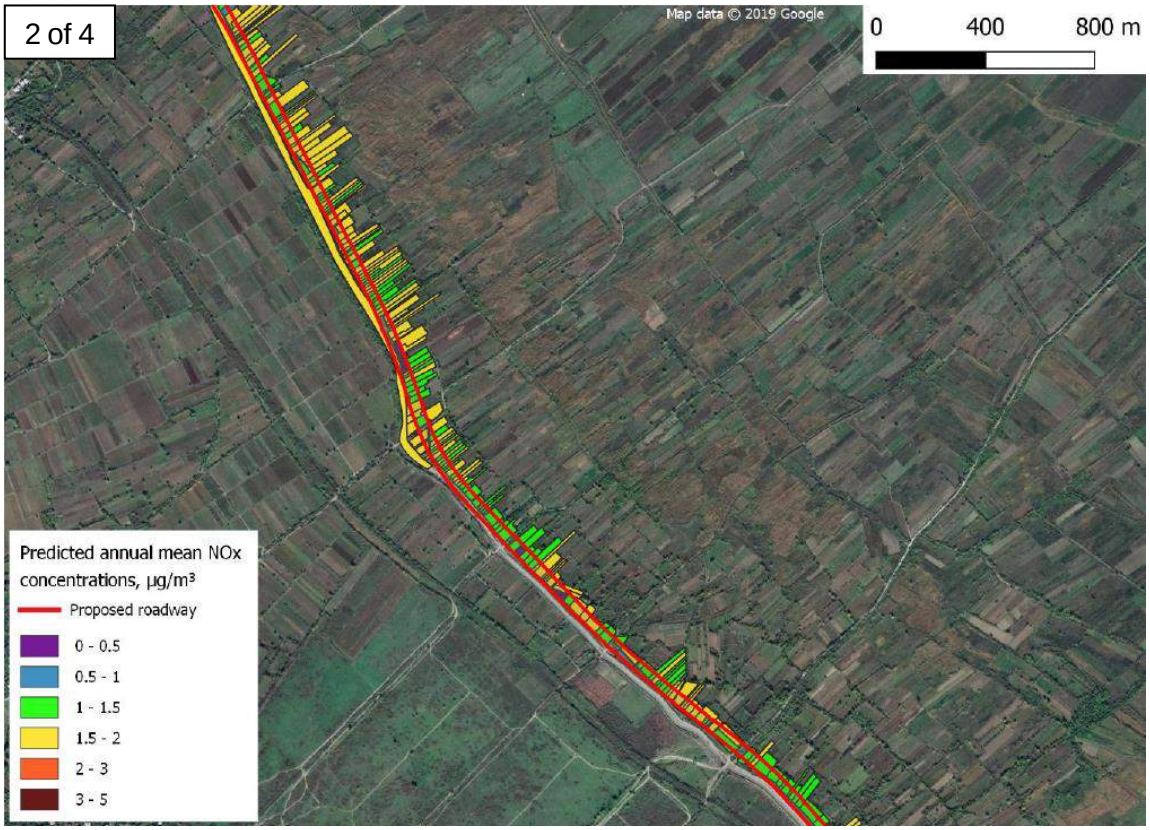
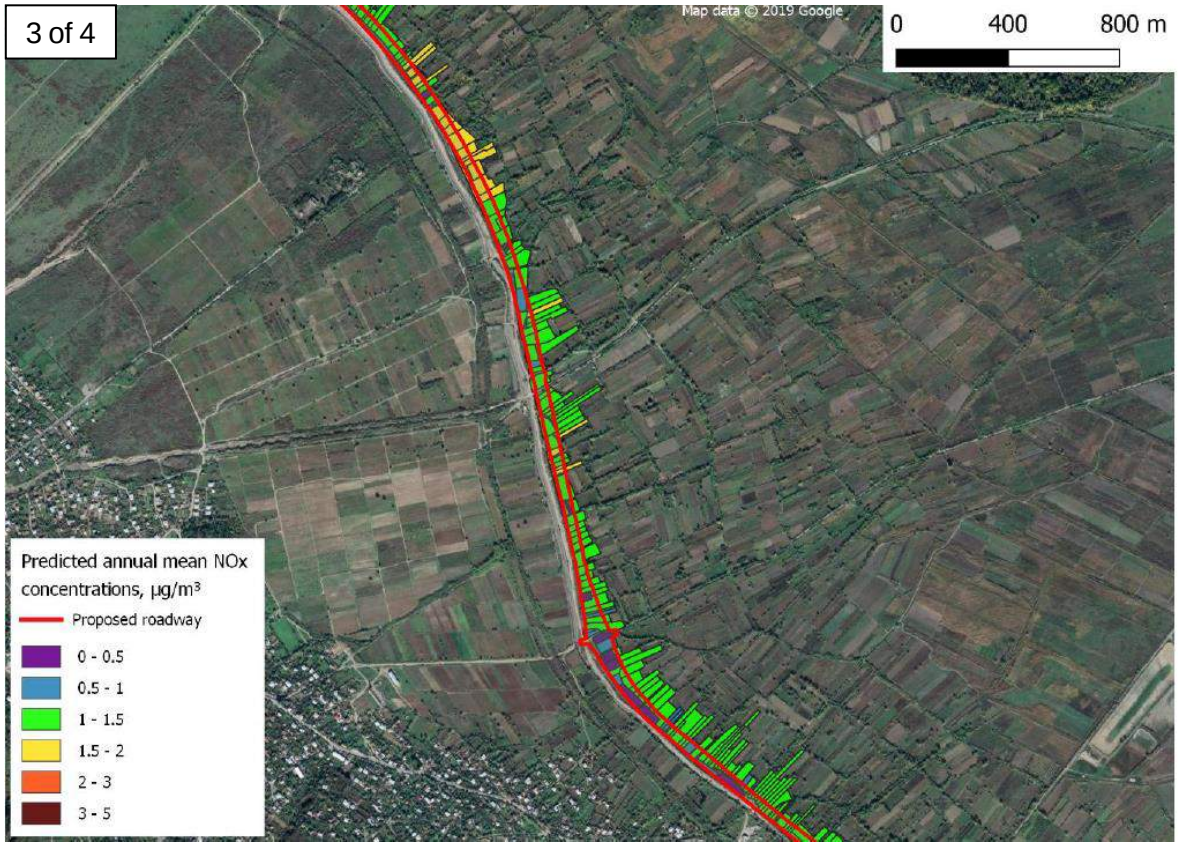


Annex 5. Modelled Pollutant Levels at Individual Land Parcels

Figure 38. Predicted Project Contributions to Annual Mean NOx Concentrations, 2020, µg m^{-3}






3 of 4
Map data © 2019 Google
0
400
800 m
Predicted annual mean NOx concentrations, µg/m³
Proposed roadway
0 - 0.5
0.5 - 1
1 - 1.5
1.5 - 2
2 - 3
3 - 5

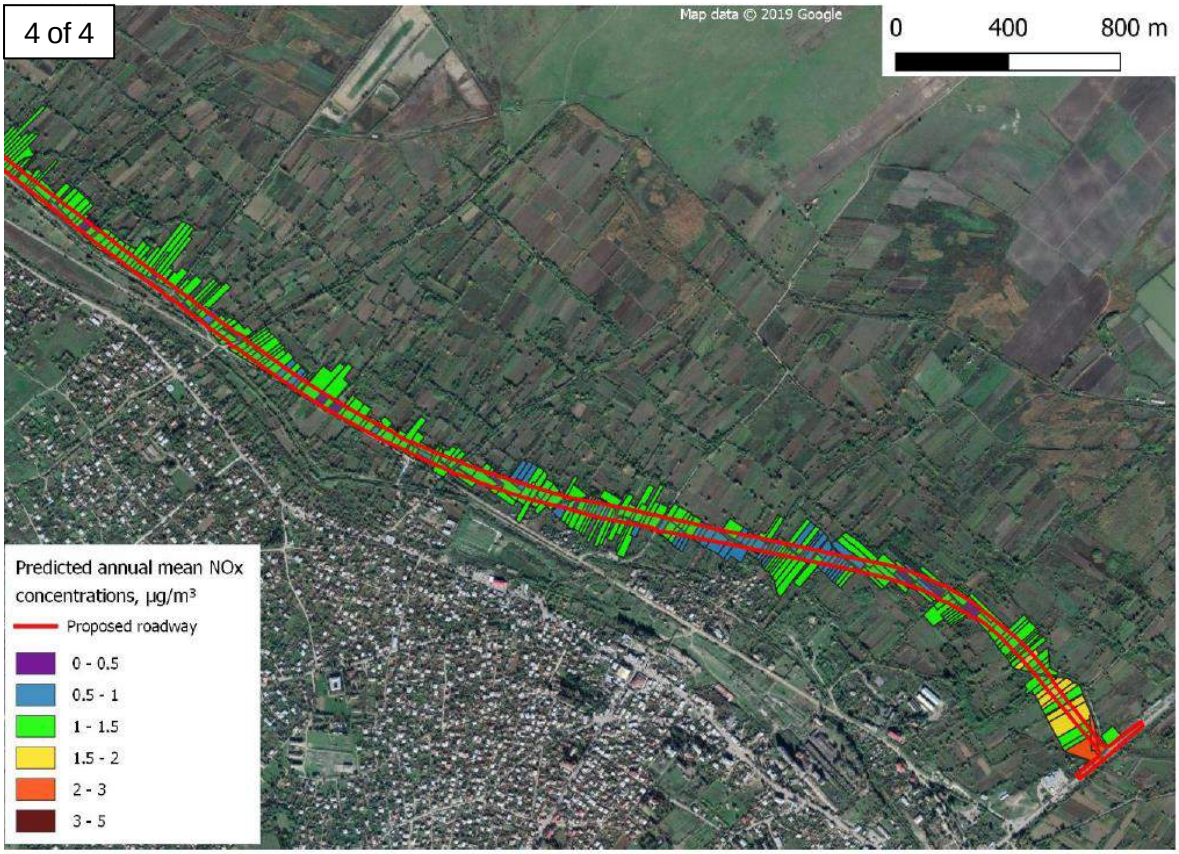
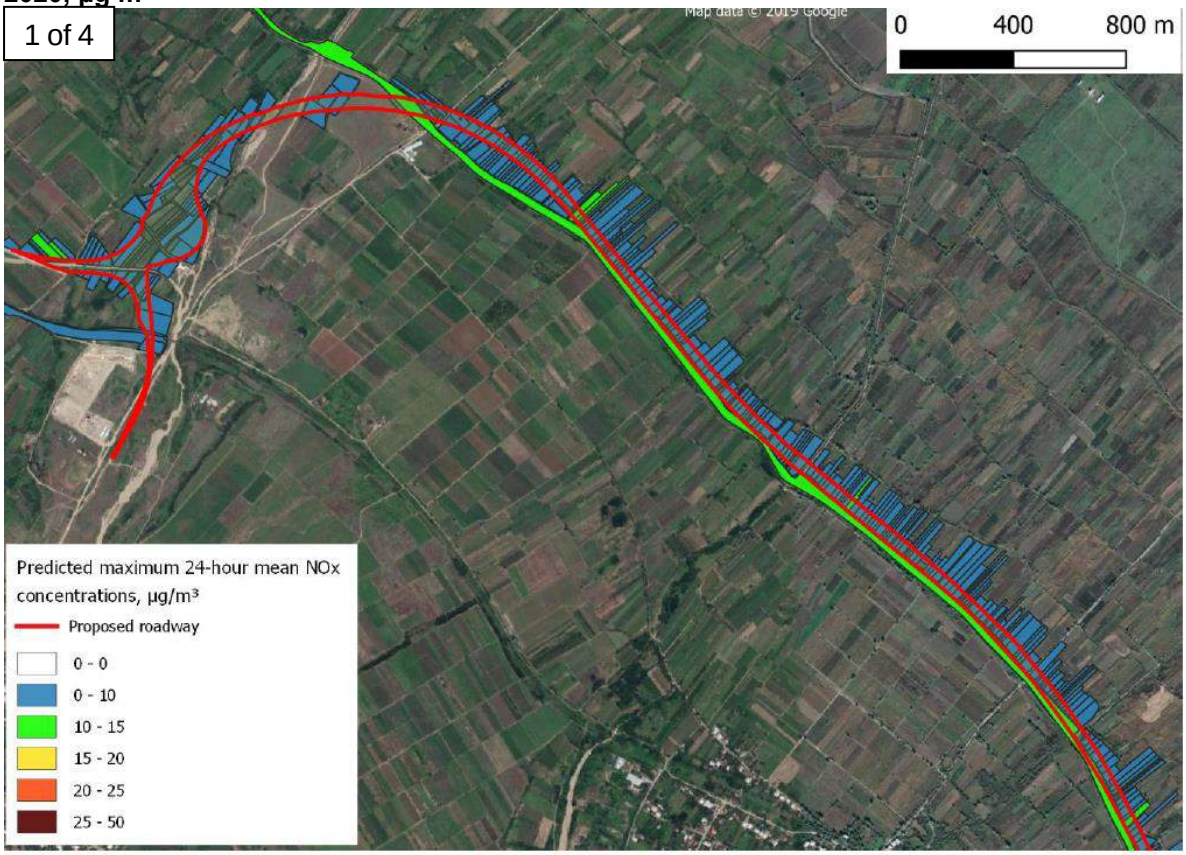
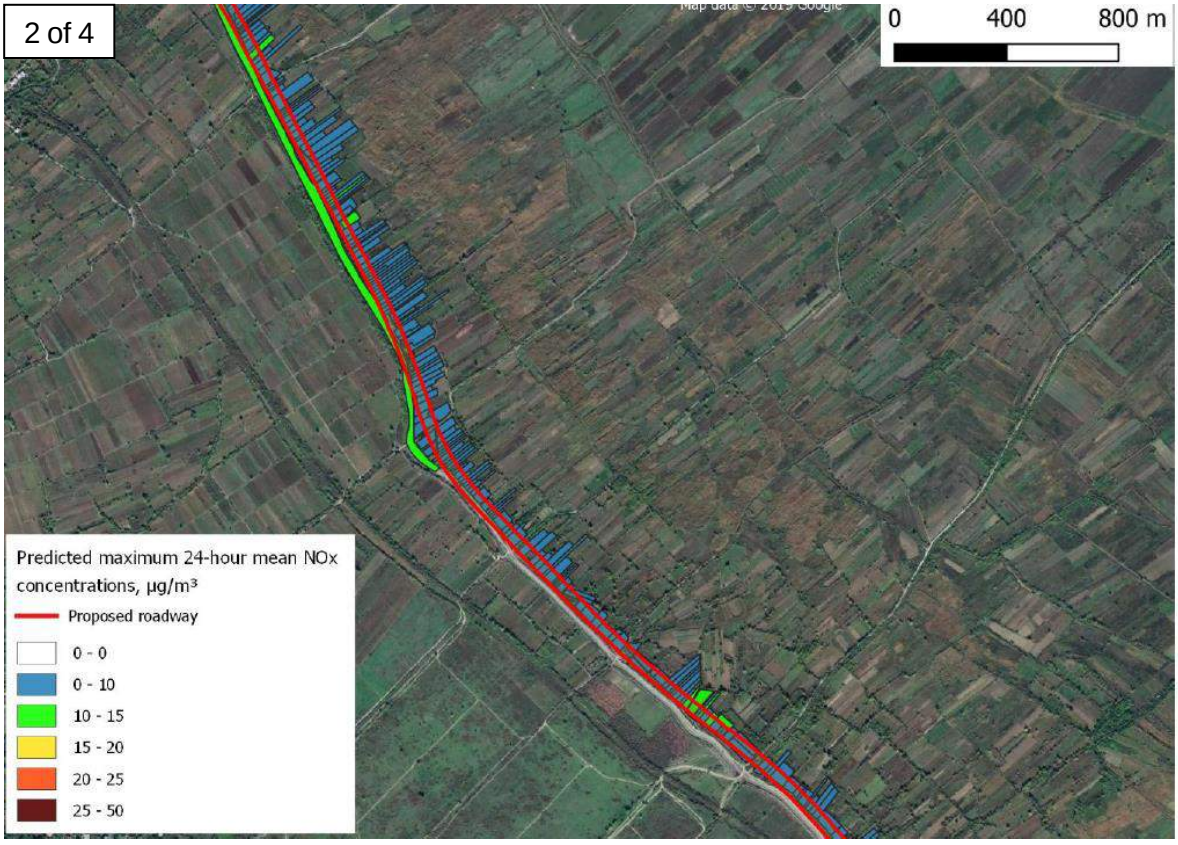
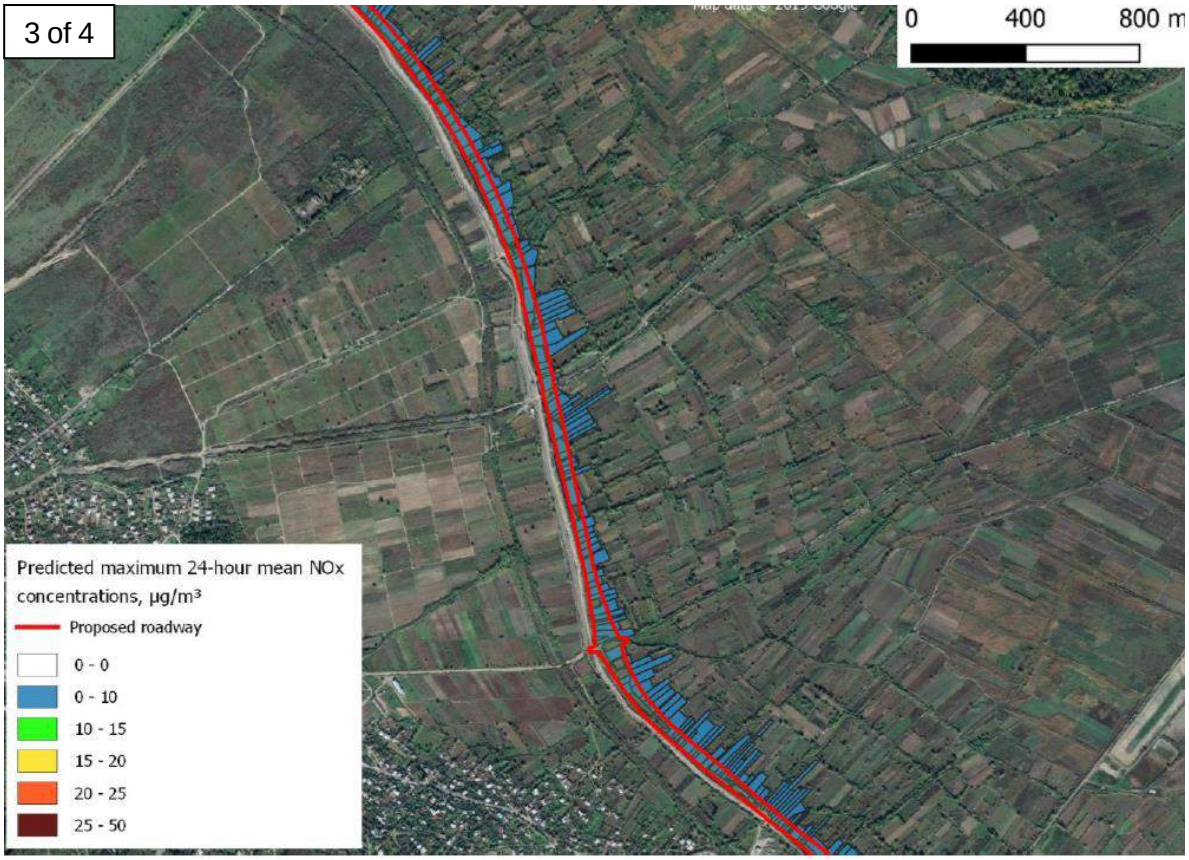

4 of 4
Map data © 2019 Google
0
400
800 m
Predicted annual mean NOx concentrations, µg/m³
Proposed roadway
0 - 0.5
0.5 - 1
1 - 1.5
1.5 - 2
2 - 3
3 - 5

Figure 39. Maximum Predicted Project Contributions to 24-hour Mean NOx Concentrations, 2020, µg m^{-3}






3 of 4
0
400
800 m
Predicted maximum 24-hour mean NOx concentrations, µg/m³
Proposed roadway
0 - 0
0 - 10
10 - 15
15 - 20
20 - 25
25 - 50

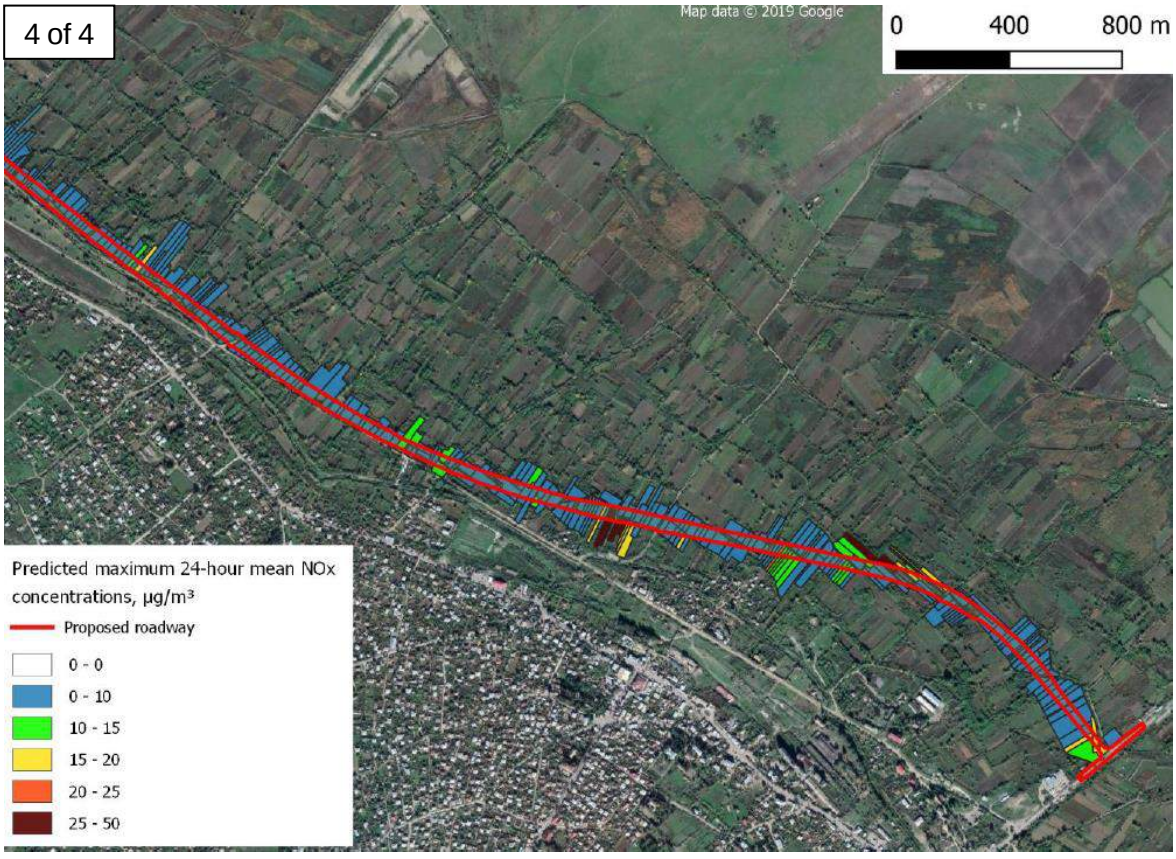
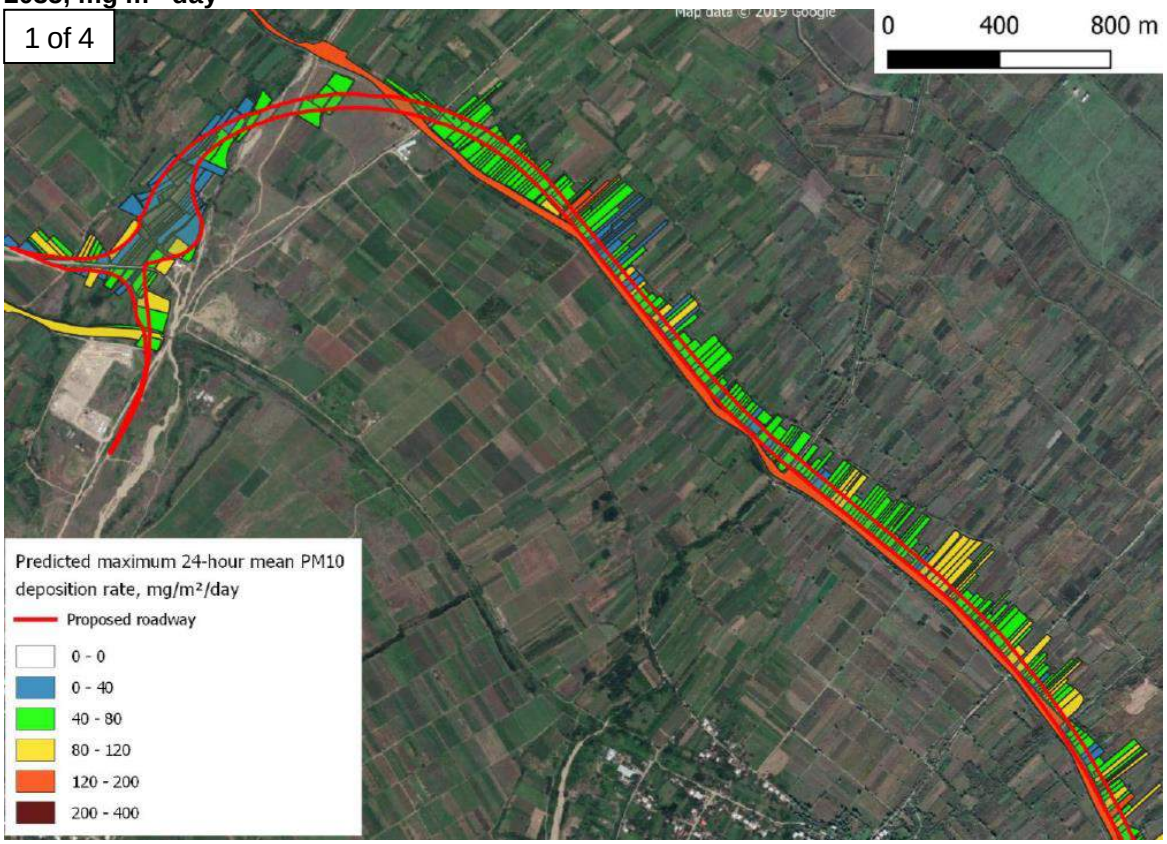
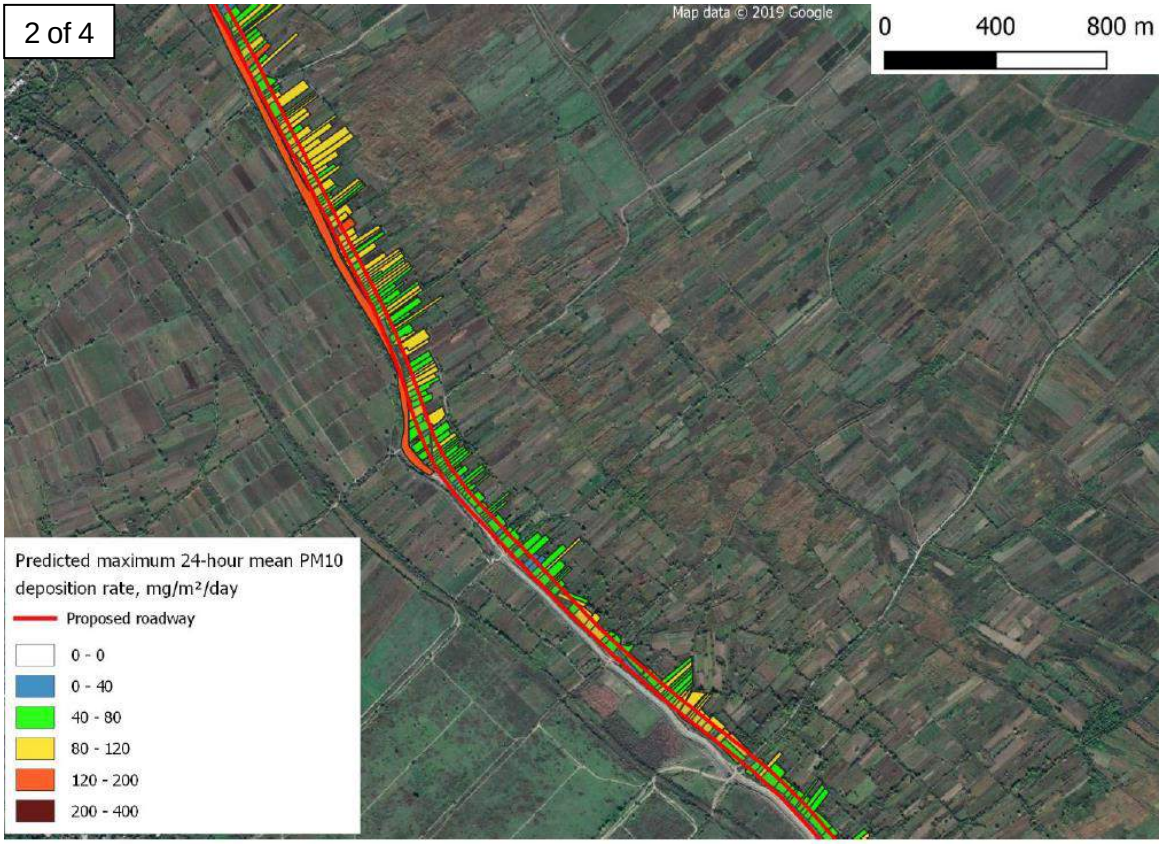
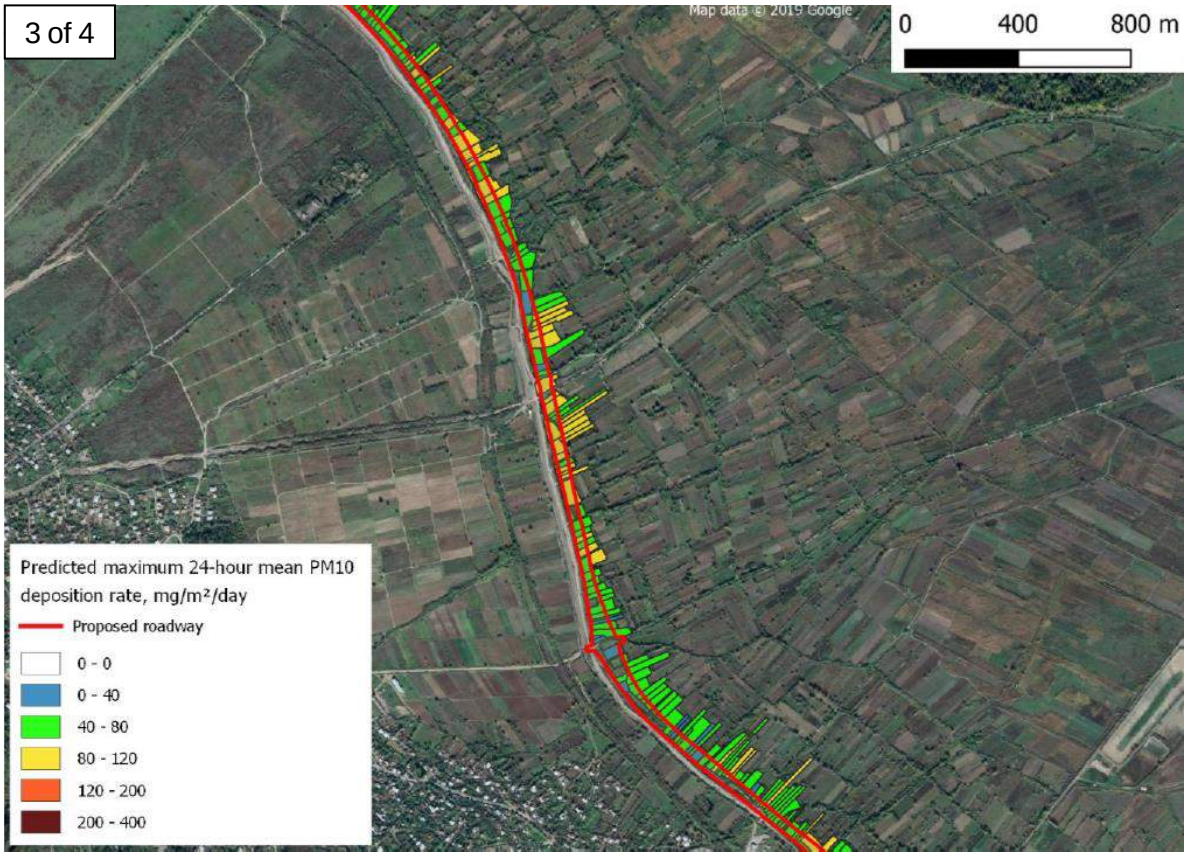
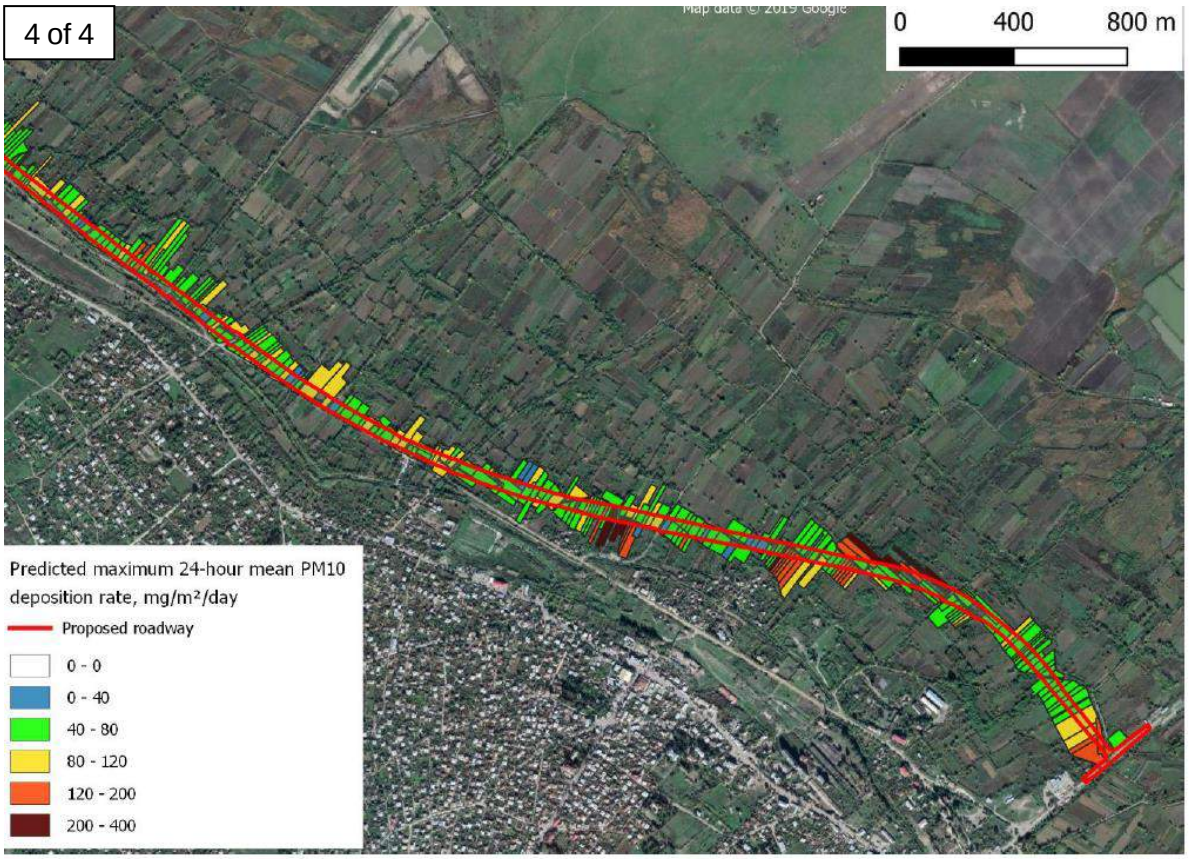

4 of 4
Map data © 2019 Google
0
400
800 m
Predicted maximum 24-hour mean NOx concentrations, µg/m³
Proposed roadway
0 - 0
0 - 10
10 - 15
15 - 20
20 - 25
25 - 50

Figure 40. Maximum Predicted Project Contributions to 24-hour Mean PM_{10} Deposition Rate, 2035, mg m^{-2} day^{-1}

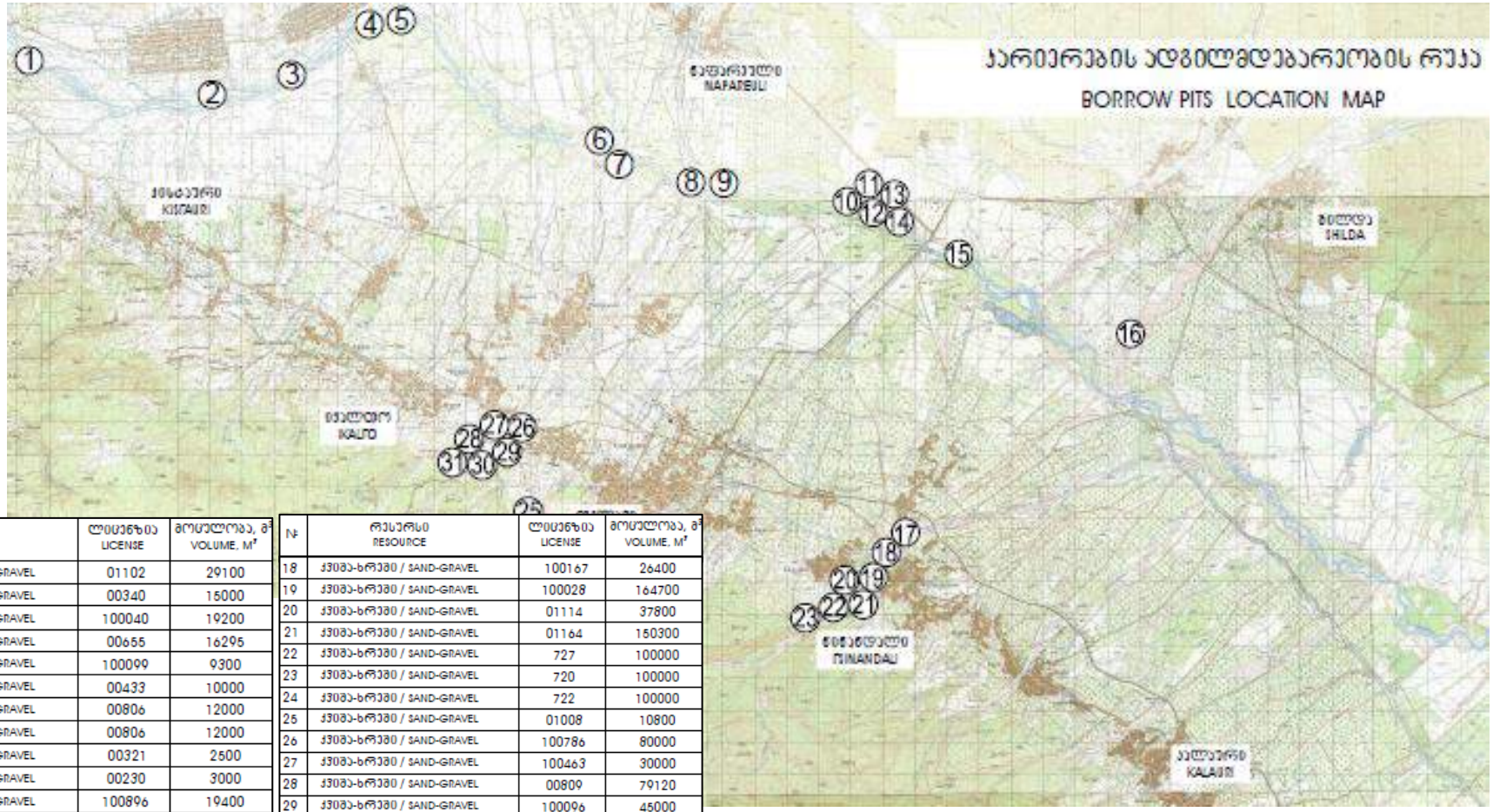





3 of 4
Map data © 2019 Google
0
400
800 m
Predicted maximum 24-hour mean PM10 deposition rate, mg/m²/day
Proposed roadway
0 - 0
0 - 40
40 - 80
80 - 120
120 - 200
200 - 400

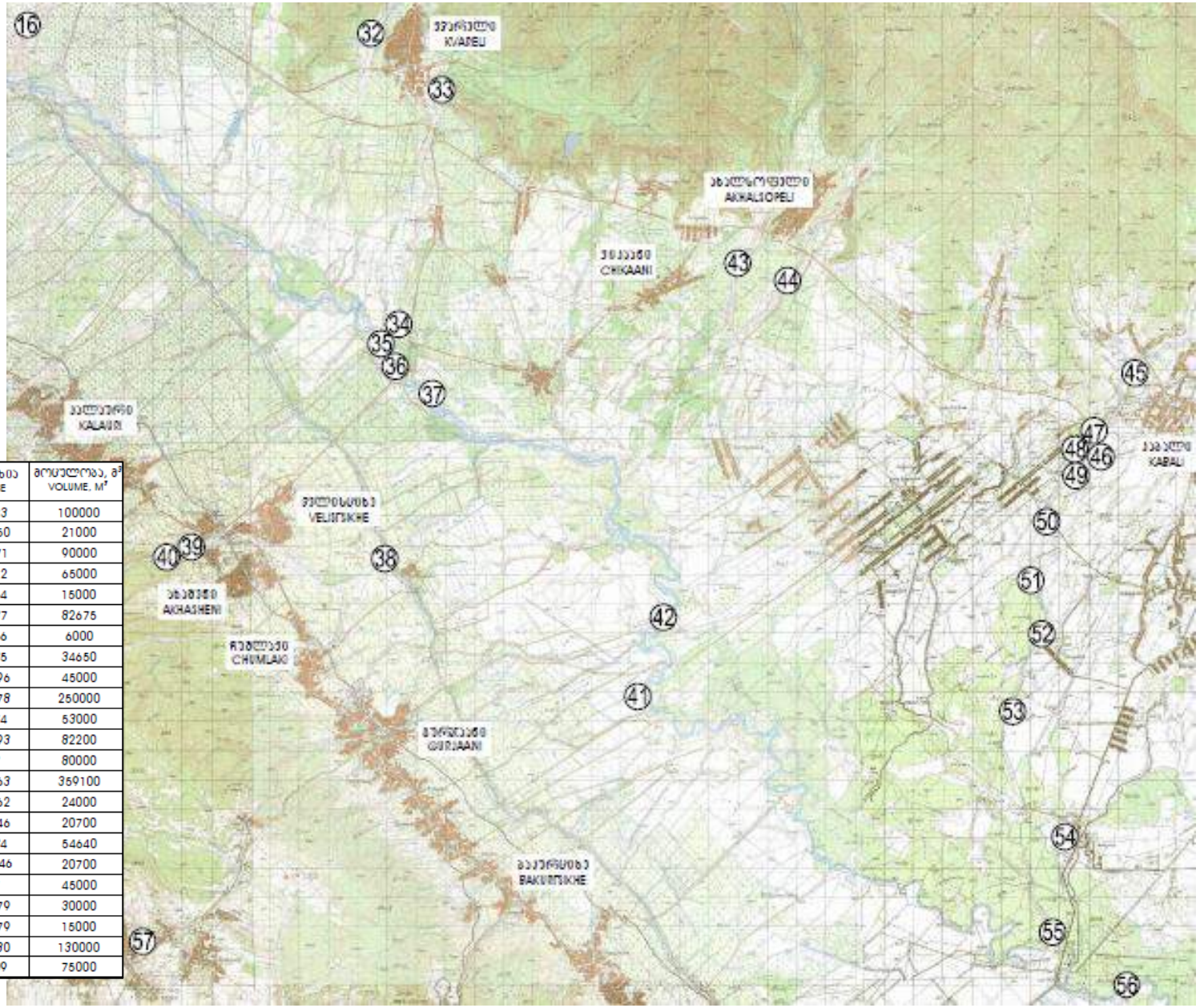

4 of 4
Map data © 2019 Google
0
400
800 m
Predicted maximum 24-hour mean PM10 deposition rate, mg/m²/day
Proposed roadway
0 - 0
0 - 40
40 - 80
80 - 120
120 - 200
200 - 400

Annex 6. Locations of Licensed Borrow Pits and Quarry Sites



№	რესურსი RESOURCE	ლიცენზია LICENSE	მოცულობა, მ³ VOLUME, M³
1	ქვიშა-ხრეში / SAND-GRAVEL	01102	29100
2	ქვიშა-ხრეში / SAND-GRAVEL	00340	15000
3	ქვიშა-ხრეში / SAND-GRAVEL	100040	19200
4	ქვიშა-ხრეში / SAND-GRAVEL	00655	16295
5	ქვიშა-ხრეში / SAND-GRAVEL	100099	9300
6	ქვიშა-ხრეში / SAND-GRAVEL	00433	10000
7	ქვიშა-ხრეში / SAND-GRAVEL	00806	12000
8	ქვიშა-ხრეში / SAND-GRAVEL	00806	12000
9	ქვიშა-ხრეში / SAND-GRAVEL	00321	2500
10	ქვიშა-ხრეში / SAND-GRAVEL	00230	3000
11	ქვიშა-ხრეში / SAND-GRAVEL	100896	19400
12	ქვიშა-ხრეში / SAND-GRAVEL	719	50000
13	ქვიშა-ხრეში / SAND-GRAVEL	721	100000
14	ქვიშა-ხრეში / SAND-GRAVEL	00731	25200
15	ქვიშა-ხრეში / SAND-GRAVEL	00761	12000
16	ქვიშა-ხრეში / SAND-GRAVEL	100543	11100
17	ქვიშა-ხრეში / SAND-GRAVEL	100784	58600

№	რესურსი RESOURCE	ლიცენზია LICENSE	მოცულობა, მ³ VOLUME, M³
18	ქვიშა-ხრეში / SAND-GRAVEL	100167	26400
19	ქვიშა-ხრეში / SAND-GRAVEL	100028	164700
20	ქვიშა-ხრეში / SAND-GRAVEL	01114	37800
21	ქვიშა-ხრეში / SAND-GRAVEL	01164	150300
22	ქვიშა-ხრეში / SAND-GRAVEL	727	100000
23	ქვიშა-ხრეში / SAND-GRAVEL	720	100000
24	ქვიშა-ხრეში / SAND-GRAVEL	722	100000
25	ქვიშა-ხრეში / SAND-GRAVEL	01008	10800
26	ქვიშა-ხრეში / SAND-GRAVEL	100786	80000
27	ქვიშა-ხრეში / SAND-GRAVEL	100463	30000
28	ქვიშა-ხრეში / SAND-GRAVEL	00809	79120
29	ქვიშა-ხრეში / SAND-GRAVEL	100096	45000
30	ქვიშა-ხრეში / SAND-GRAVEL	0000017	18000
31	ქვიშა-ხრეში / SAND-GRAVEL	100867	62655
32	ქვიშა-ხრეში / SAND-GRAVEL	586	300000
33	ქვიშა-ხრეში / SAND-GRAVEL	00939	24120
34	ქვიშა-ხრეში / SAND-GRAVEL	00766	171900
35	ქვიშა-ხრეში / SAND-GRAVEL	00908	147600



№	რესურსი RESOURCE	ლიცენზია LICENSE	მოცულობა, მ³ VOLUME, M³
36	ქვიშა-ხრეში / SAND-GRAVEL	01023	100000
37	ქვიშა-ხრეში / SAND-GRAVEL	100650	21000
38	ქვიშა-ხრეში / SAND-GRAVEL	00771	90000
39	ქვიშა-ხრეში / SAND-GRAVEL	00612	65000
40	ქვიშა-ხრეში / SAND-GRAVEL	00854	15000
41	ქვიშა-ხრეში / SAND-GRAVEL	00687	82675
42	ქვიშა-ხრეში / SAND-GRAVEL	01156	6000
43	ქვიშა-ხრეში / SAND-GRAVEL	00835	34650
44	ქვიშა-ხრეში / SAND-GRAVEL	100696	45000
45	ქვიშა-ხრეში / SAND-GRAVEL	100878	250000
46	ქვიშა-ხრეში / SAND-GRAVEL	00474	53000
47	ქვიშა-ხრეში / SAND-GRAVEL	100193	82200
48	ქვიშა-ხრეში / SAND-GRAVEL	708	80000
49	ქვიშა-ხრეში / SAND-GRAVEL	100963	359100
50	ქვიშა-ხრეში / SAND-GRAVEL	100962	24000
51	ქვიშა-ხრეში / SAND-GRAVEL	100946	20700
52	ქვიშა-ხრეში / SAND-GRAVEL	00584	54640
53	ქვიშა-ხრეში / SAND-GRAVEL	100946	20700
54	საკვები თიხა / CLAY	707	45000
55	ქვიშა-ხრეში / SAND-GRAVEL	100579	30000
56	ქვიშა-ხრეში / SAND-GRAVEL	100779	15000
57	საკვები თიხა / CLAY	100230	130000
58	გაჯი / GYPSUM	00609	75000

Annex 7. Soil Analysis Results

7.a - Field Investigation Results

761. With borehole BH-1, a thin surface layer consisting of topsoil or fill material cobbles medium to fine grained with clay filling and thin layers and lenses of clay and sand have been recorded. This material has been encountered to depth between 1.70 and 3.5 m below surface with layer thicknesses from 1.2 to 3.5 m. The granular cobble material is underlain by lean clay with cobble inclusions and thin layers and lenses of silty clay. Thickness of the clay layer is more than 3.2m at BH-2 and the cohesive material in BH-1 is underlain by cobbles to the final depth. In borehole BH-2 the cohesive material has been recorded to the final depth of the borehole. The borehole log of borehole BH-4 indicates below a layer of artificial fill material (technogenic soil) only lean clay to the final depth of the borehole. The lean clay has been described as having the same characteristic as the cohesive material in borehole BH1.

762. The borehole logs at the start of the alignment near Bakurtsikhe (Br-1 and BH Soil-1), show a thin surface layer of granular material described as cobbles with a thickness between 0.9 and 3.2 m. The cobbles are in both boreholes underlain by lean clay. In Br-1, below 4.10 m the lean clay is underlain by cobbles to final depth of the borehole at 15 m. Similar to BH-1 at the start of the alignment, the soil profile of Br-1 shows cobbles underlain by lean clay.

763. Borehole logs for Br-2, Soil-2, and Soil-3 between km 1 and km 5, show varying surface layers of topsoil, pavement material, and lean clay. In Br-2, the lean clay is between 8.1 and 11.9 m depth disrupted by a layer of cobbles.

764. Between approximately km 5 and km 10, cobbles with intermittent lean clay was encountered in boreholes BH-2 and Br-3.

765. Towards the end of the alignment, the ground is characterized by lean clay in boreholes BH-4 and BH Soil 4. The lean clay was described during drilling works as containing varying amounts of granular material

7.b - Laboratory Test Results

766. Results from the soil samples are as follows:

- **Technogenic soil** - The fine content (<0.063mm) of the tested technogenic soil samples was determined in the laboratory, in a range from 11.2% (Br-2) to 54% (B-2) with a sand content between 11 and 47% and about 34 to 41% gravel. With a Liquid limit from 35.7% to 36.8 and a Plasticity Index between 13.2 and 14.2, the fine material has been classified as clay with low plasticity and a very stiff consistency. Based on the grain size distribution and plasticity the technogenic soil material has been classified clayey sandy gravel (Br-2) and as gravelly sandy clay (B-2) with low plasticity. According the AASHTO soil classification system the technogenic soil falls into group A-2-6 and A-6. The rating of the fill material as subgrade is fair to poor
- **Cobbles, with silty clay filling** - The sand content of the tested samples of cobbles was determined in the laboratory, in a range from 17 to 20% with a fine (<0.063mm) content between 3 and 5.9% and about 5 to 16% stones greater 63mm. The borehole logs show varying ground conditions changing from lean clay as prevailing subgrade material to locally cobbles at the surface underlain by lean clay in varying depth. At this stage of investigation along the preferred alignment, the lean clay is considered the prevailing subgrade material. The cobble material is, based on the grain size distribution and plasticity classified as sandy gravel with stones and little

fines. According the AASHTO soil classification system the Cobbles falls into group A-2-4. The rating of the cohesive soil as subgrade is fair to good.

- **Lean clay, brown, very stiff, with fine to medium cobbles inclusions** - The fine content (<0.063mm) of the tested lean clay samples was determined in the laboratory, in a range from 31.6 to 60% with a sand content between 27 and 45% and around 13 to 23% gravel. The natural density of the lean clay was determined in a range between 83 and 87% of the maximum dry density (MDD). The brown lean clay material is, based on the plasticity, classified as sandy gravelly clay with low to medium plasticity and firm to stiff consistency.
- **Lean clay, reddish brown, stiff, with fine to medium cobbles inclusions** - The fine content (<0.063mm) of the tested lean clay samples was determined in the laboratory, in a range from 35.1 to 40.7 with a sand content between 44.3 to 50% and around 15% gravel. The cohesive subgrade material is, based on the plasticity, classified as sandy gravelly clay with medium plasticity and soft to firm consistency.
- **Lean clay, yellowish brown** - The fine content (<0.063mm) of the tested lean clay samples was determined in the laboratory at around 40% with a sand content 60%. The consistency of the yellowish-brown lean clay material has been determined as soft with medium plasticity based on laboratory test results.

Annex 8. Chance Find Procedure

Purpose of the chance find procedure

767. 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

768. 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

769. 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

770. 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:

- 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;
- Immediately notify a foreman. The foreman will then notify the Construction Manager and the Environment Officer (EO)/Environmental Manager (EM);
- Record details in Incident Report and take photos of the find;
- 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;
- 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;
- 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.
- 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).
- The onsite archaeologist provides the Heritage team with photos, other information as relevant for identification and assessment of the significance of heritage items.
- The Ministry must investigate the fact within 2 weeks from the date of notification and provide response in writing.
- 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;
- Construction works could resume only after permission is granted from the responsible authorities.
- In case no response received within the 2 weeks period mentioned above, this is considered as authorization to proceed with suspended construction works.

771. 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

772. 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_1.1Replicable heritage

773. Where tangible cultural heritage that is replicable66 and not critical is encountered, mitigation measures will be applied.

The mitigation hierarchy is as follows:

[66] 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.

- 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.

774. Nonreplicable cultural heritage[67] 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

775. Any removal of cultural heritage must be conducted using the best available technique advised by relevant authority and supervised by archaeologist.

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.

776. 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.
- Exhumate. 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

[67] 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.

Archaeological Research Centre under the Georgian National Museum
3, Rustaveli Avenue0105 Tbilisi, Georgia
Tel: +(995 32) 2998022; Fax: +(995 32) 2982133
E-Mail: info@museum.ge

Annex 9. Thematic Management Plans

777. Before the construction starts, the Contractor will prepare a number of thematic management plans and method statements consistent with the EMP for review and approval by the RD. Approval will be required prior to construction commencing. Contract documents shall explicitly indicate that construction cannot start until all documents are approved. The thematic management plans include the following:

9.a - Waste Management Plan

778. The Contractor will ensure that, for the relevant areas, waste is managed in accordance with local and national policies, as well as with international best practice.

779. An overarching Project-wide Waste Management Plan should be produced by the Contractor and used to ensure a consistent approach to managing waste at the construction sites, this is a requirement for the Project, but also a requirements under National Legislation. The Project-wide plan should provide a central location for all Project waste information to ensure that waste is effectively managed in accordance with the waste hierarchy, meeting regulatory control requirements, and reducing waste disposal costs.

780. The Project-wide plan should:

- make reference to statutory waste management requirements and obligations'
- record the Contractor's responsible person(s) for waste management;
- set out waste handling procedures;
- set out waste transportation procedures;
- set out waste disposal procedures;
- set out auditing and other oversight requirements;
- record the waste types generated by the entire Project;
- provide details of waste minimization actions;
- provide project-wide waste forecasts for each waste type; and
- contain a complete register of all approved waste carriers and receptor sites for the Project.

781. The Contractor is also required to produce a Wastewater Management Plan and a Spoil Disposal Management Plan. These plans can be treated as separate management plans or within the overall Waste Management Plan.

782. Asbestos-containing waste will need to be managed and disposed of safely and securing according to the management plan provided in **Annex 13. Asbestos-Containing Waste Management Plan**.

9.a.i - Wastewater Management Plan

783. The Wastewater Management Plan will need to identify:

- plans for provision of sanitary latrines and proper sewage collection and disposal system to prevent pollution of watercourses or groundwater;
- plans for the operation of the work camp (if any) indicating proposed arrangements for the collection and disposal of sewage consistent with applicable national regulations (e.g., provision of sanitary latrines, installation of proper sewage collection, and disposal systems designed to prevent pollution of land and watercourses;

- plans detailing how wastewater would be collected from all wastewater generating areas, as well as storage and disposal methods. If the Contractor intends to carry out any on-site wastewater treatment, this should also be included.

9.a.ii - Spoil Disposal Management Plan

784. The Spoil Disposal Management Plan will need to identify:

- the approach taken to excavated material and waste management taking into account the waste hierarchy;
- procedures for identifying contaminated soil;
- the dedicated area for the handling and storage of excavated materials;
- where the practicable opportunities for the use of material with recycled content during construction will be adopted;
- the types of excavated material and waste removed from site, its description and estimated quantities of waste generated;
- the authorized waste carrier details;
- plan for waste segregation to maximize opportunities for reusing and recycling;
- the types of training that will be provided to all site workers on waste management and recycling procedures;
- disposal routes and permitting requirements; and
- details of the site that the waste and/or material will be and was taken to.

785. A soil disposal assessment template is provided as an annex in this IEE and should be utilized to confirm that the site selected is appropriate and the level of assessment is sufficient to meet ADB safeguards requirements (see **Annex 12. Soil Disposal Assessment Template**).

9.b - Soil Erosion Management Plan

786. The Soil Erosion Management Plan addresses the management and mitigation of significant impacts relating to soil erosion on the site for the proposed Project. The aims of the Management Plan are to provide:

- a general framework for erosion management, which enables Contractors to identify areas where erosion can be accelerated from their actions; and
- an outline of general methods to monitor, manage, and rehabilitate erosion to ensure that all erosion caused by this development is addressed.

787. This Management Plan serves as a guideline to be applied by all Contractors on the Project. The plan is an evolving guideline, however, that needs to be updated or adapted as conditions change within the Project area, and successes and failures of procedures are identified. The objectives of the ESMP are to:

- identify the risk from soil erosion across the Project site and in relation to the areas and water assets; and
- identify and set prescriptive management actions to protect key assets in identified high risk areas.

9.c - Traffic Management Plan

788. A site-specific Traffic Management Plan will be produced, coordinated, and then implemented by the Contractor. The Management Plan will be prepared in consultation with

traffic authorities and the emergency services. The Plan will need to be approved by the RD in consultation with the relevant local authorities. The Plans will need to include:

- site boundaries and the main access/egress points for the worksites;
- temporary and permanent closures and diversions of roads or highways (including program and/or phasing);
- the strategy for traffic management such as the use of parking measures and/or site operatives to manage how construction vehicles will enter and exit the sites;
- local routes to be used by trucks, cranes, and abnormal loads generated by construction activity including, where required, the timings of use of such routes, truck holding areas, truck route signing strategy, means of monitoring truck use, and any routes prohibited from use;
- a schedule and program of the planned traffic management schemes and measures required to undertake the works;
- measures (including notification to suppliers) to address potential risk to residents and activities on local roads adjacent to the construction site. These will include where appropriate restrictions on delivery hours where practical, and strict enforcement of speed limits; and
- procedures for carrying out regular full safety audits on all highway works and temporary diversion routes.

9.d - Method Statement for Temporary Roads

789. The purpose of this document is to describe plans for the use of temporary roads (also referred to as access/haul roads), including designs for construction of new temporary roads (if applicable). The statement shall be prepared with contribution from and in consultation with relevant traffic authorities and should cover measures to maintain the temporary roads (i.e., erosion protection, dust prevention, reinstatement, etc.)

9.e - Aggregate and Borrow Pits Management Plan

790. The Aggregate and Borrow Pits Management Plan will describe work activities, technology, potential environmental impacts, and mitigation measures for aggregate/borrow pits (if operated by the Contractor) and extraction sites. Contractors will ensure that:

- after use, borrow pit areas will be graded to ensure drainage and visual uniformity;
- borrow pit restoration will follow the completion of works in full compliance with all applicable standards and specifications; and
- topsoil from borrow pits will be saved and used during restoration were possible.

791. The plan should provide information on the following:

- the location and extent of extraction areas, current land use, and assessment of the character and key features of the surrounding area;
- a reclamation strategy and plan;
- a summary of compliance and copies of licenses obtained in accordance with national and local laws; and
- a plan showing the proposed main haul routes to and from the site.

9.f - Employment and Procurement Procedure

792. During the construction phase of the Project, temporary and permanent workforce will be employed by the Contractor, subcontractors, and other contractors. Contractors to

comply with all applicable labor laws and core labor standards, including the Core Labor Standards of the ADB.[68]

793. The prime Contractor will have a fundamental role in the process of managing the supply chain and implementing mitigation measures. The Contractor will implement its own Employment and Procurement Procedure, providing details on management methods and mitigation measures in line with this IEE. The plan should include the following:

- provisions prohibiting employment of child laborers and forced labor;
- provisions encouraging employment of women;
- provisions on equal pay for equal work of equal value regardless of gender, ethnicity, or caste
- provisions on dissemination of information on sexually transmitted diseases, including HIV/AIDS, to employees and local communities surrounding the Project sites
- grievance mechanism that ensures concerns are addressed promptly using an understandable and transparent process that provides timely feedback to those concerned, without any retribution;
- a general framework which allows the Contractor to track the number of local firms, workers, and women that are/have been employed; and
- the types of training that will /have been provided to all site workers.

9.g - Occupational and Community Health and Safety Management Plan

794. For management of occupational health and safety (OHS), the Contractor will prepare a Occupational and Community Health and Safety Management Plan for the construction workers based on the EMP and in line with Georgian legislation, including the Labour Code and Law of Georgia on Labor Safety. A template is provided as an Annex to this IEE which should be utilized as a guide (see **Annex 11. Occupational and Community Health and Safety Plan Template**). It will be submitted to the RD for review. The detailed management plan will include the following provisions:

- *Clean Water.* Provide a clean and sufficient supply of fresh water, for construction and for camps (if established), offices, and workshops.
- *Sewage and Wastewater.* Provide an adequate number of latrines and other sanitary arrangements at the site and work areas and ensure that they are cleaned and maintained in a hygienic state.
- *Solid waste.* Provide garbage receptacles at construction site and camps, which will be periodically cleared.
- *Liquid Chemical Waste.* Provide receptacles in suitably bunded areas for the storage of liquid chemical waste prior to disposal. Include clear warnings with health risks.
- *Personal Protection.* Provide personal protection equipment (PPE), such as safety boots, helmets, gloves, protective clothing, goggles, and ear protection, in accordance with relevant health and safety regulations, for workers.
- *Emergency Preparedness and Response.* An Emergency Response Plan (prepared separately) to take actions on accidents and emergencies, including public health emergencies associated with hazardous material spills and similar events will be prepared. Emergency phone contacts with the nearest hospitals will be established. The Contractor will ensure that qualified first-aid can be provided at all times.

[68] Core labor standards are addressed through ADB's Safeguard Policy Statement (2009) (https://www.adb.org/documents/safeguard-policy-statement), Social Protection Strategy (2001) (https://www.adb.org/documents/social-protection-strategy), and Core Labor Standards Handbook (2006) (https://www.adb.org/documents/core-labor-standards-handbook).

Appropriately equipped first-aid stations should be easily accessible throughout the Project site.

- *Records Management.* A Records Management System that will store and maintain easily retrievable records protected against loss or damage should be established. It will include documenting and reporting occupational accidents, diseases, and incidents. The records will be reviewed during compliance monitoring and audits.
- *Safety Communication.* Ensure that safety, rescue, and health matters are given a high degree of publicity to all persons regularly or occasionally at active construction sites. Posters in Georgian and any other language appropriate for the Contractors drawing attention to relevant health regulations will be made or obtained from the appropriate sources and will be displayed prominently at the site.
- *Training, Awareness, and Competence.* Train all construction workers in basic sanitation and health care issues, general health and safety matters, and on the specific hazards of their work. Implement HIV/AIDS and other communicable diseases awareness and prevention program to target the local community and construction workers.

9.h - Emergency Response Plan

795. The Emergency Response Plan will contain the following as a minimum:

- guidance on the storage and use of hazardous materials with the aim of preventing and containing spills and releases;
- guidelines on the degrees of containment which take account of the nature of the materials and the sensitivity of the environment;
- procedures and appropriate information required in the event of any incident such as a spillage or release of a potentially hazardous material; and
- systems for notifying appropriate emergency services, the RD and other relevant authorities, and the Contractor's personnel.

9.i - Air Quality Plan

796. Plan that outlines measures that will be taken to limit emissions emanating from construction related operations. Such measures may include, but are not limited to:

- spraying/paving of internal haul roads;
- spraying of stockpile and plant areas during dry and windy conditions;
- siting of plant and machinery away from sensitive receptors;
- provision of landscaping around the perimeter of the site, or around the dust emitting activity;
- dust suppression on plant and machinery;
- seeding and landscaping of berms and other open areas not directly affected by extraction operations;
- reduction of emissions from site vehicles;
- continual plant operator training, and management of driver behavior;
- measures to ensure road cleanliness; and
- monitoring and recording of dust-generating activities.

9.j - Spill Management Plan

797. The Contractor’s Spill Management Plan will document the specific requirements, protocols, responsibilities, and materials necessary to implement an emergency spill response following an incident.

798. The Management Plan will contain:

- an assessment of the type of materials to be used and the risk of contamination;
- guidance on the storage and use of hazardous materials, with the aim of preventing and containing spills and releases;
- guidelines on pollution prevention for watercourses (e.g., the irrigation canal);
- procedures to be adopted in the event of a pollution incident, to contain and limit any adverse effects;
- systems for notifying appropriate emergency services, authorities, and the Contractor's personnel; and
- standby equipment and materials.

9.k - Clearance, Revegetation, and Restoration Management Plan

799. The Contractor shall submit a site clearing method for all areas where the Contractor is required to, or intends to, clear vegetation, either within the ROW or at the other designated construction areas outside the proposed road and bridge footprint. The Management Plan will include:

- Clearance Plan
    - a clear indication of land reference;
    - search and rescue procedures for relocation of any priority and protected flora specimens;
    - details of relocation of any flora specimens found during the surveys (e.g., Georgian Red-listed tree species and species of conservation importance such as Colchis Water-Chestnut (*Trapa colchica*) and Spring snowflake (*Leucojum vernum*));
    - which areas will be cleared;
    - how these areas will be cleared; and
    - how the cleared materials will be stored or disposed of.

- Revegetation Plan
    - topsoil, mulch, fertilizer and soil stabilizer requirements and application;
    - landscaping and revegetation methods for each area, including locations and timing;
    - procurement requirements and list of species of plants to be procured;
    - vegetation establishment and maintenance requirements (irrigation, fertilization, etc.) for all revegetated areas; and
    - the use of any herbicides, pesticides, and other poisonous substances, if required.

- Restoration Plan
    - plan for site cleanup rehabilitated so that these can be returned as close as possible to their previous uses, including the removal of all waste materials, machinery and any contaminated soil; and
    - plan for handover, sale, or removal of all plant vehicles and machinery to ensure that no unserviceable items are left on the construction site.

800. The Contractor should appoint a suitably experienced landscaping contractor/horticulturist to compile the revegetation rehabilitation plan.

9.l - Noise Management Plan

801. The Noise Management Plan should outline measures that will be taken to limit noise emanating from the Project construction and related activities. Descriptions of the following measures should be included:

- the use of temporary noise barriers around noisier activities/machinery;
- siting of plant and machinery away from sensitive receptors;
- construction of berms or other noise barriers between the site and receptors;
- noise dampening apparatus on plant and machinery;
- limitations on working hours;
- regular maintenance of all plant and machinery;
- appropriate surfacing/grading of internal haul roads;
- regular monitoring of noise levels;
- use of plant and machinery that is suited to its application; and
- continual plant operator training, and management of driver behavior.

9.m - Biodiversity Management Plan

802. The Biodiversity Management Plan covers all construction activities and is applicable to all Contractors and Subcontractors. While the Management Plan will act as a 'framework' to determine what the Contractors will be expected to produce, Contractors are required to ensure that all the requirements are adopted within their own management plans.

803. The Management Plan should:

- outline actions and measures necessary for the effective management of biodiversity along the route;
- cover identified impacts upon biodiversity;
- detail specific control measures to be implemented by the Contractors (and Subcontractors), to achieve this;
- incorporate the requirements of the IEE findings, international standards, Georgian legislation, and Project-specific construction permits; and
- establish a framework for external collaboration and data dissemination for the benefit of the greater ecosystem.

804. To ensure the attainment of identified biodiversity objectives and outcomes, the following key principles should be adhered to:

- targets should be 'SMART' i.e., specific, measurable, attainable, relevant, and time-bound
- the long-term sustainability of the biodiversity management should be ensured through appropriate partnerships, resourcing, and engagement of stakeholders
- the Management Plan should be aligned with the site's rehabilitation plan and environmental management system

9.n - Laydown Area and Construction Camp Management Plan

805. The Laydown Area and Construction Camp Management Plan should propose preventive/mitigation measures for environmental impacts of laydown areas and the construction camp, i.e., offices, accommodation facilities, testing facilities/laboratories, batching areas, storage and stockpiling areas, workshops, vehicle washing areas and all other areas/facilities required for the undertaking of activities required for completion of the

Project. The Management Plan should contain procedures for establishing and operating laydown areas and work camps in order to safeguard nearby communities and environment resources.

806. The Management Plan should comprise the following details:

- details of the sites selected;
- site preparation;
- arrangements/ facilities within the laydown area and camp;
- mitigation measures that will be undertaken as per the EMP;
- re-development plan; and
    - list of structures to be demolished and list of the cleanup activities that needs to be undertaken
    - proposed use of the land after demobilizing
    - presence of facilities that could be put in use by the land owner if it is a leased out private land or community in case of a public property
- working drawings and certifications.
    - electrical plan showing the electrical network planned for the site
    - location of plants, generators, master switch boards, etc.
    - plumbing drawing showing the network of water supply lines, sewerage line, and drainage line
    - copy of certificates / permissions obtained from regulatory authorities / local governing body / community etc. as applicable
    - copy of agreement entered with the owner of the site if it is a leased-out land

9.o - Asphalt, Rock Crushing, and Concrete Batching Plant Management Plans

807. The Management Plans should include, but not be limited to, providing method statements and information on the following:

- Asphalt Plant Management Plan
    - Description of the layout and management of asphalt plant, including management of bitumen (if planned to run own facility)

- Rock Crushing and Concrete Batching Plant Management Plans
    - description of the layout and management of crushing and concrete batching plants, including waste water discharge, dust management, etc.
    - Method Statement detailing cement storage, concrete batching areas and methods, method of transport of cement and concrete, storage and disposal of used cement bags, and spill contingencies for each concrete batching operation.

9.p - Bridge Construction Method Statements

808. Bridge Construction Method Statements will describe the proposed methodology for bridge construction and the proposed measures for the avoidance of surface water pollution and impact on aquatic habitat and fauna. The method statements should include the following:

- construction conditions (i.e., the restrictions concerning bridge erection), including when in-river construction is permitted;
- procedures and methods; and

  - materials and equipment mobilization
  - bridge erection
- other measures that will be undertaken to address adverse environmental impacts such as erosion of river embankment and siltation of watercourses that may result from such activities.

Annex 10. Specific Environmental Management (SEMP) Plan

	Content of SSEMP	
	Chapter	***Brief Description of each chapter***
1.	***INTRODUCTION & OVERVIEW OF THE SEMP***	*Brief description of the project; ADB environmental category; When IEE/EIA have been prepared; The main objective of the plan; By whom the SEMP is prepared (construction contractor should be mentioned in this chapter).*
2.	***DEFINITION OF BOUNDARIES INTRODUCTION & OVERVIEW OF THE SEMP***	*Brief description of project site location; Provide here project site map with construction site boundaries;* *The decision on how to divide a project can be made based on the following criteria:* *1. If the construction activities are different* *2. If there are variations in the environments (such as a transition from agricultural land to forest or from rural to residential areas).* *Justification is also needed why this project has been divided in one or more areas for which a single or more SEMP preparation is needed.*
3.	***Access Road(s)***	*Description of access roads to site should be provided with maps. It also should be mentioned that prior to the construction activities initiation, contractor should conduct the access road's pre-construction survey to assess and record its condition.*
4.	***SENSITIVE RECEPTORS AND ENVIRONMENTAL VALUES***	*Once the boundaries of a site to be covered by a SEMP have been defined, the sensitive receptors surrounding the site and the environmental values of the area need to be confirmed and accordingly described in this chapter.*
5.	***CONSTRUCTION ACTIVITIES***	*In this chapter various phases of work for each site should be described. Different phases of work will include different activities and thus different environmental management requirements.* *For example, construction of a reservoir could have the following schedule of works:* - *Site Clearance, Topsoil Stripping* - *Site Establishment, Excavation and Materials Transportation* - *Demolition of Reservoirs* - *Concrete Pouring Activities* - *Backfilling and Compaction* - *Reinstatement*
6.	***RISK ASSESSMENT***	*The Risk Assessment Matrix should be included in this chapter. The last column of Risk Assessment Matrix includes brief description of environmental management measures (mitigation measures).*
7.	***ENVIRONMENTAL MANAGEMENT MEASURES***	*Environmental Mitigation measures and their implementation should be described in this chapter in more details than in Risk Assessment Matrix.*
8.	***SITE PLAN***	*The environmental management requirements need to be included in a site plan. This is the final, but vital stage in the preparation of SEMP. A site plan must*

		cover the extent of the construction activity and should contain: - *Indication of North, and scale;* - *Existing and planned supporting infrastructure (e.g. access roads, water supplies, electricity supplies, etc)* - *Location of planned work* - *Contours* - *Drainage systems* - *Locations of sensitive receptors*
9.	***ENVIRONMENTAL MONITORING PLAN***	*Including all of the required monitoring as per the Project EMP.*

Annex 11. Occupational and Community Health and Safety Plan Template

1. INTRODUCTION
1.1 Brief Description of the Project

2. HEALTH AND SAFETY POLICY
2.1 COMPANY POLICY STATEMENT
2.2 CERTIFICATIONS

3 HEALTH AND SAFETY RESPONSIBILITIES
3.1 Management Responsibilities
3.2 Health and Safety Officer Responsibilities
3.3 Supervisor Responsibilities
3.4 Worker Responsibilities
3.5 Subcontractor Responsibilities
3.6 Visitors

4. HEALTH AND SAFETY TRAINING AND INFORMATION
4.1 Planned Trainings
4.2 New Worker Orientation
4.3 Policy Violation
4.4 Health and Safety Policy Acknowledgement form
4.5 WHMIS- Workplace Hazardous Materials Information Systems

5. INSPECTIONS, HAZARD REPORTING AND INVESTIGATION PROCEDURE
5.1 Workplace Inspections and Hazard Reporting
5.2 Accident Investigation and Reporting

6. WORKPLACE SAFETY AND WELFARE
6.1 Workplace Safety - General
6.2 Site Security
6.3 Traffic and Pedestrian Arrangement
6.4 Housekeeping
6.5 Storage Areas
6.6 Waste Areas
6.7 Spill Control
6.8 Passageways
6.9 Lighting
6.10 Access to Worksites
6.11 Stacking of Materials
6.12 Maintenance of Stairs, Steps and Landings:
6.13 Fire Fighting General Rules
6.14 Emergency Responce
6.15 Welfare and Toilet Facilities
6.16 Toilet Facilities
6.17 Washing Facilities
6.18 Rest Areas

7. VEHICLE / EQUIPMENT AND TOOLS SAFETY
7.1. Maintenance of Vehicles and Equipment Procedure
7.2 Key Points of Equipment Maintenance
7.3 Work Shop and Field Mechanics

1. INTRODUCTION

1.1 BRIEF DESCRIPTION OF THE PROJECT

Figure 1: SITE MAP

Figure 2: Project Camp Layout

2. HEALTH AND SAFETY POLICY

2.1 COMPANY POLICY STATEMENT

2.2 CERTIFICATIONS

3 HEALTH AND SAFETY RESPONSIBILITIES

3.1 Management Responsibilities

Contractor's Project Management must perform or adhere to the following:

- Provide and maintain constructional plant, equipment and systems of work that are lighted, safe and without risks to health;
- Execute suitable arrangements for ensuring safety and absence of risks to health in connection with the use, handling, storage, transport and disposal of articles and sub stances;
- Provide protective clothing and equipment, first aid stations with such personnel and equipment as are necessary and such information, instruction, training and supervision as are necessary to ensure the health and safety at work of all persons employed on the Works all in accordance with the Laws of Georgia.
- Hire lawfully aged employees (According to Georgian Labor Code no one to be employed under 18);
- Ensure that the Health and Safety Policy has been communicated to all staff,
- Enforce health and safety violations with progressive discipline;
- Take every reasonable precaution for the protection of a worker;
- Establish, maintain, and review at least annually a Health and Safety Plan, and document revisions to the plan arising from the annual review;
- Ensure that workers are properly trained and instructed in safe work practices.
- Establish and maintain Safety Trainings Records;
- Report accident sand injuries to the Engineer and Employee as required by the Contract.
- Provide workers with health and safety information;
- Inspect projects and meet regularly with supervisors to monitor the Health & Safety Program and take corrective action where required;
- Consider accident prevention and safety performance when evaluating Supervisors and Workers.

A review of the management responsibilities will be done on an annual basis. This evaluation will measure each health & safety responsibility.

All management need to understand that they are accountable for health and safety performance. By including health and safety in performance evaluation systems, the Contractor demonstrates the importance of health and safety.

3.2 Health and Safety Officer Responsibilities

- Arrange all Organizational procedures according to the Contract Terms, Health and Safety Plan and Georgian Regulations, Standards and Norms.
- Prepare Supplemented H&S Plans.
- Provide all necessary trainings, information, records and coordination relating Health and Safety issues.
- Conduct H&S Site inductions for new employees, subcontractors and visitors.
- Arrange communication between Management and Workforce.
- Conduct Daily H&S Inspections of the Project Site, Office, Camp and Plants.
- Provide Weekly, Monthly and Quarterly H&S Reporting.
- Assist the Project Management in H&S issues.
- Coordinate and Control Hazard Identification and Risk Assessment Program.

- Arrange all H&S Postings at workplaces and more attended places of employees.
- Cooperate with Supervisors and Workers to comply with their H&S obligations.
- Accident Investigation and Near Miss analyses.
- Prepare Site Emergency Plan.
- Ensure compliance with the Company HSE Policy by all outside suppliers, service providers and contractors.

3.3 Supervisor Responsibilities

"Supervisor" means a person who has charge of a workplace or authority over a worker; A Supervisor must also be a competent person.
"Competent person" means a person who,

1. is qualified because of his knowledge, training and experience to organize the work and its performance,
2. is familiar with the provisions of the Act and the Regulations that apply to the work
3. has knowledge of any potential or actual danger to health or safety in the workplace;

Supervisor (s) must perform or adhere to the followings:

- Be responsible for on-site accident prevention;
- Review safe work procedures for the site;
- Take every reasonable precaution for the protection of the worker;
- Monitor the health and safety performance of subcontractors;
- Report accidents and injuries to management as required by this plan and regulations by using the forms provided with this manual;
- Investigate accidents and take actions to prevent reoccurrence;
- Ensure that the Health and Safety Plan is followed at the work level;
- Enforce disciplinary actions for violations of the Health and Safety Plan;
- Ensure that protective equipment provided, accessible, used and maintained properly by workers, and that workers understand the reasons for its use;
- Instruct personnel in proper work practices and update instructions as needed;
- Check work practices and work areas for hazards and take corrective action where required;
- Consult and co-operate with the Health and Safety Officer;
- Acquaint new workers with hazards and safe work procedures.

3.4 Worker Responsibilities

"Worker" means a person who performs work for the Project.

- Comply with Health and Safety Plan and all relevant regulations, including legal duties of workers.
- Take every reasonable precaution necessary to prevent accidents;
- Use safety equipment, devices and clothing as required;
- Work in accordance with the Health and Safety Plan and Procedures;
- Work in a manner that will not endanger anyone;
- Refrain from using any dangerous equipment or machinery without authorization;
- Report unsafe situations immediately to their supervisor;
- Report injury or illness immediately to their supervisor;
- Help new employees recognize job hazards and follow proper procedures;

- Be aware that workers are subject to disciplinary action where either Company safety rules or government regulations are violated.

3.5 Subcontractor Responsibilities

- The purpose of this policy is to establish minimum guidelines for Sub-Contractors in order to help provide and maintain a safe work environment for all employees.
- All Sub-Contractors are responsible for complying with the requirements of H&S Plan, other Health and Environmental Plans, Procedures, Instructions and Georgian Regulations, Norms and Standards.
- All Sub-Contractors must prove that his employees are trained and competent to implement their work.

3.6 Visitors

To ensure the safety of all visitors the following responsibilities must be communicated. All employees are required to enforce this policy.

Each visitor must read the visitor responsibilities and sign in at reception. It is the responsibility of the company contact to remain with the visitor at all times.

Visitors must:

- Sign in and sign out in the log.
- Remain with their designated host.
- Wear the appropriate personal protective equipment when touring the Site.
- Not touch any company equipment or product.
- Remain out of restricted areas.
- Follow all posted signs and rules.
- In the event on an emergency follow the Emergency instructions and remain in the gathering area until given further instruction.

4. HEALTH AND SAFETY TRAINING AND INFORMATION

Company believes that training is crucial to establishing and maintaining the high safety standards expected in performing all job functions. We are committed to ensuring that all employees are adequately trained to perform their job functions safely. Workers must participate in their training and follow the instructions that they are given.

4.1 Planned Trainings

- Site Health and Safety Induction
- Overview of the Health and Safety Plan and the applicable Regulations.
- Hazard Identification and Risk Assessment
- WHMIS Information.
- Safe use of Tools and Equipment
- Confined space
- Specific Supervisor Training.
- Lockout/Tagout
- New Worker Orientation.
- Safe work procedures for road building operations.
- Use of Personal Protective Equipment.
- Traffic Control
- First Aid and Medical Care
- 5 Minute Safety Talks

4.2 New Worker Orientation

Inexperienced workers are generally involved in more accidents than veteran workers. Health and safety education should start with orientation as soon as a worker joins the organization or is given new duties.

A record of the orientation will be placed in the employee's personnel file.

New worker orientation shall include the following:

- Explanation and review of the Health and Safety Policy and Plan by H&S Officer;
- Introduction to the co-workers and explanation of all job functions at the workplace by Supervisor;
- Introduction to the Health and Safety Representative, where applicable;
- Orientation of the workplace and/or jobsite with attention to the site specific hazards;
- Identification of the location of the first aid kit or first aid station, fire extinguishers, telephone and washrooms;
- Explanation of the proper use of the personal protection equipment applicable to the particular work being performed;
- A reminder that the worker has the right to refuse to perform hazardous work and that a hazardous conditions should be reported immediately to the supervisor;
- Explanation of emergency procedures;
- Partnering of the new worker with a more experienced worker, where possible.

4.3 Policy Violation

Policy Violation procedure has the following steps*:*

1. Step one: Supervisor gives a verbal warning and provides corrective action to worker. Worker must acknowledge receiving verbal warning by signing the Discipline Acknowledgement form. The form will be placed on the worker file, and removed after 12 months.

2. Step two: Worker receives a written warning using the Written Discipline form. This will outline the issue, corrective and timeframes for compliance. The worker must sign the form in the presence of their supervisor and a Health and Safety Officer. The form will be placed on the worker file for a period of 24 months.
3. Step three: Should the worker not abide with the corrective action, then suspension or termination will occur.

The severity of the violation will determine the step that is applied to the worker. For example, inappropriate use of an excavator will result in immediate termination.

4.4 Health and Safety Policy Acknowledgement form

All employees of our company are subject to:

- Take every reasonable precaution to ensure the safety of himself and his fellow-workers.
- Wear the proper personal protective equipment (PPE) and use the protective devices as provided by the company (example hardhats, vest, safety goggles and any other special equipment required to do your job, the employee is responsible for the own safety shoes).
- Not use or be under the influence of alcohol or mind altering drugs while on the jobsites.
- Must take every preventive measure when operating machinery and/or equipment to ensure the safety of the employee and co- workers.
- Report any unsafe work practices or unsafe site conditions as well as any accidents or injury immediately to your foreman or supervisor and obtain treatment as necessary.

I agree to abide by and work in accordance with the Health and Safety Plan and Procedures, Management's safety directions and Safety policy.

Employee's Signature: _____

Date:

4.5 WHMIS- Workplace Hazardous Materials Information Systems

Workplace Hazardous Materials Information Systems (WHMIS) is a materials labeling system which addresses the workers "Right to Know".

WHMIS training shall include:

- Education in the content, purpose and significance of information on label sand Material Safety Data Sheets (MSDS).
- Education in the use of types of identification.
- Training in the procedures for the safe storage, handling, use and disposal of controlled products.
- Training in emergency procedures involving controlled products.
- Training in procedures to follow when fugitive emissions are present.
- The joint health and safety committee or the health and safety representative will be consulted during the development, implementation and review of the job specific WHMIS training program.

- The Company will ensure, as far as reasonably practical, that this WHMIS training program results in the worker being able to apply the information as needed to protect health and safety.

The Company shall also be responsible to ensure that:

- All materials have supplier labels.
- Workplace labels are provided.
- Material Safety Data Sheet (MSDSs) is readily available in the workplace.
- A current MSDS is obtained on or before the date of the first shipment of every controlled product.
- The MSDSs are kept updated.

The Worker shall be responsible to:

- Learn the information on controlled products which the Contractor is required to provide.
- Follow the instructions provided and the information in the MSDS.
- Both the Company and Workers are responsible to ensure that no product that requires a Material Safety Data Sheet is permitted on the jobsite or in the workplace unless an MSDS accompanies it.

5. INSPECTIONS, HAZARD REPORTING AND INVESTIGATION PROCEDURE

5.1 Workplace Inspections and Hazard Reporting

Workplace health and safety inspections are vital to maintaining a safe workplace and identifying existing or potential hazards in order that appropriate corrective action can be taken.

An assessment should be made by the Health and Safety Officer in conjunction with the supervisor of the frequency of inspections required based on the potential hazards and dangers at the workplace or project. These inspections must be conducted on a monthly basis, a minimum. Workplace specific checklists should be developed by supervisors and used for regularly-scheduled inspections. Completed reports should be forwarded to management promptly.

It is important to observe both conditions and procedures during the inspection. If a hazard poses an immediate threat, take immediate action to eliminate the hazard.

A follow-up of all reports and action taken to eliminate hazards must be completed in a timely manner. Subsequent workplace inspection will review the items from previous inspections to ensure that remedial action has resolved the concern.

5.2 Accident Investigation and Reporting

PURPOSE

To identify all immediate and basic causes of the incident and make the necessary recommendations to prevent the injury/incident from recurring.

SCOPE

Review once a year reports of the following injury/incident types to determine any investigative needs:

- First aid
- Accidents
- Incidents
- Near miss

Definitions:

First Aid:

- Includes but is not limited to: cleaning minor cuts, scrapes or scratches; treating a minor burn, applying bandage sand/or dressings, cold compress, cold pack, splint, changing a bandage or a dressing after a follow-up observation visit and any follow-up for observation purposes only

HealthCare:

- An injury that results in attention received from a recognized health care provider but that does not result in time away from scheduled work nor a wage loss.

Near Miss:

- An event that under different circumstances could have resulted in physical harm to an individual or damage to the environment, equipment, property and/or material.

The following categories of injury/incidents may produce a loss to people, equipment, material and environment. Immediate investigation of the following is required:

Fatality:
- An injury that results in the loss of life

Lost time:
- A work-related injury that results in the injured employee missing scheduled time from work resulting in a wage loss.

Property Damage:
- An event where contact is made between two objects resulting in alteration to one or both of the objects.

Occupational Illness:
- A condition that results from exposure in a workplace to a physical, chemical or biological agent to the extent that normal physiological mechanisms are affected and the health of the worker is impaired.

Environmental Release:
- An accidental discharge of a physical, biological or chemical substance into the workplace and/or community.

Fire/Explosion:
- An event where undesired combustion occurs.

PROCEDURE:

In the event of a workplace accident/incident, ensure the following:

- Arrange for prompt medical treatment for the injured worker(s)
- Secure and do not disturb the accident scene until proper people are notified
- Call Health and Safety Officer and Security Supervisor immediately
- Notify supervisor
- Investigate accident/incident
- Notify the Engineer
- Decline any comment to media and refer them to Senior Management

In case of First Aid Treatment only:

- Provide first aid if trained
- Record what first aid was given and materials taken out of first aid kit
- Treatment recorded
- In the event he/she does seek outside medical treatment they must notify the supervisor
- Investigate accident, as a preventative measure to ensure that future occurrences do not occur

In case of near misses:

- All near misses to be reported to supervisor
- Near misses must be investigated, as a means of prevention. Corrective action to be taken and communicated to all employees to prevent future occurrences resulting in accidents

In case of Medical Aid/HealthCare:

- Provide first aid where possible
- Arrange transportation to medical center
- Where possible a Functional Abilities Form should be given to the worker to take to their treating agency in the event it becomes a lost time incident.
- Investigate the accident scene to determine what caused the accident and have a form completed
- Ensure that preventative measures are put in place to avoid future occurrences
- Take witness statement regarding accident/incident
- Notify the Engineer

Fire/explosion:

- Call Health and Safety Officer or Security Supervisor immediately
- Inform Supervisor and all workers around
- Notify the Engineer and Emergency Services

Property/equipment damage:

- Inform supervisor immediately
- Inform Senior Management
- Document the details of the damaged goods and complete an investigation report
- If necessary, photographs can be taken of the damage equipment/property
- Ensure that damaged equipment/property is fixed promptly
- If motor vehicle accident, stop at scene, obtain first aid if required
- Contact Police officials if necessary
- Advise supervisor/management of accident location
- Obtain details of third-party name and driver's license numbers, vehicle plate number and description of the vehicle and damage
- If necessary, obtain names and addresses of eyewitness to the accident
- Notify the Engineer

Chemical/environment releases:

- Notify the Engineer and emergency services immediately.
- Comply with Spill Response Procedure

COMMUNICATION

The results and the injury/incidents will be communicated to the employees in a number of ways:

- Minutes of the health & safety committee meetings
- Supervisors holding safety talks with employees
- Through postings on safety bulletin boards
- Testimonial by the involved employees.

INVESTIGATOR RESPONSIBILITIES:

Collect Information:

- Interview workers involved,
- Interview witnesses
- Interview outside experts if applicable i.e. suppliers, equipment designersetc.
- Insure the interviews are conducted as soon as reasonably possible.

- The interviews should be conducted in a quiet place, one on one.
- The interview must be documented.

Scene assessment

- Make observations, on site assessment of the scene (site, equipment, material).
- Use photographs/sketches/drawings etc.

Identify Contributing Factors

- Factors to consider are People, Equipment, Material, Environment and Process.

Write Report:

- Use the injury investigation report form to identify contributing factors through a review of items such as maintenance records, plant layout, training records, time of day, length of service in this-work area, etc. Considerations given to lack of safety equipment and/or the need for safety equipment.
- The standard investigation reporting system (form) must capture all the requirements contained in the investigation procedure.
- Copies of the investigation report are sent to the appropriate people.

Recommendations for corrective action:

- Responsibilities must be assigned
- Recommendations are documented on a standard form.
- The recommendations must focus on corrective actions(s) to all the contributing factors identified.

6. WORKPLACE SAFETY AND WELFARE

Offices, Workshops, Dormitories, Kitchen, Concrete Plant, Asphalt Plant, Road Construction Sites, Borrow Pits, Bridge Construction

6.1 Workplace Safety - General

- Fence the site against unauthorized entry
- Take measures to prevent objects from falling from height
- Provide and keep safe egress and access to each place of work located at site
- Put up appropriate signs including traffic routes, authorized personnel only etc.
- Keep the site tidy, well lit and well laid out
- Provide sufficient welfare and first aid facilities
- Provide adequate fire precautions such as fire extinguishers, escape routes
- Ensure that existing power lines (buried or overhead) are identified and associated safe systems of work in place
- Take necessary precautions to ensure that electrical systems are well maintained in a safe condition
- Ensure that vehicles and people are kept apart, with traffic routes maintained in a safe condition
- Minimize and eliminate risk of manual handling by the use of mechanical equipment, or arrange material to be supplied in manageable sizes and weights to reduce the risk of back injury
- Take all measures to reduce exposure to noise and vibration
- Ensure that holes are protected, with clear marking and fixed covers to prevent falls

6.2 Site Security

- Erect suitable barricades, fencing, and hoarding
- Proper signage and lighting in suitable places when passers-by or entry by public is likely
- Footpaths kept clean and free from debris
- Site access controlled
- Traffic control procedures in place

6.3 Traffic and Pedestrian Arrangement

- Improved design and layout of the workplace to minimize transport accidents
- Signs to be used as a secondary measure where risks cannot be eliminated
- Avoiding the need for reversing by better layout design
- Segregating pedestrian and vehicle traffic routes if feasible
- Posting adequate warnings in conspicuous places
- Ensuring suitable pedestrian crossing points on vehicle routes
- Introducing a one-way traffic system, if possible, to reduce the risk of head-on collision
- Checking to see if vehicle traffic routes are suitable for the types and flow of vehicles that use them
- Keeping all floor and road surfaces in good condition
- Removing obstructions or otherwise, making sure they are clearly visible
- Avoiding sharp bends in road layouts
- Providing suitable fixed mirrors at blind corners
- Suitable direction, speed limit and priority signs
- Suitable physical speed restrictions such as speed bumps
- Edges of loading bays, pits etc. must be clearly marked and fitted with either a temporary or permanent barrier

6.4 Housekeeping

- Nothing should be left lying around the site unnecessarily. When equipment is in use it should be sited so as to minimize health, safety, and environmental risks. For example, it should not create a trip hazard and plant should not be located over site drains.
- Materials and equipment should be stored away from doorways and gangways. In particular, it will not be allowed to block fire exits.
- Once work is finished for the day all portable tools and equipment should be put away tidily. Where appropriate tools must be cleaned. However, used oil will not be used for cleaning.
- Kitchen, canteen and living areas must be kept clean and tidy.
- Where possible avoid vehicles tacking mud from the construction site onto the highway.

6.5 Storage Areas

- Storage areas must be kept tidy with materials properly labeled.
- Drums and containers must be kept upright, in good condition and with lids and bungs in place.
- Hazardous material storage locations should be on hard standing and must have a bund or drip tray. Secondary containment must be sufficient to contain 110% of the contents stored.
- Bunds and drip trays will be emptied on a regular basis. If contaminated the contents should be disposed of as hazardous waste. If the bund contains oil or fuel storage contaminated water will have a sheen on the top. If the bund contains chemical storage it may be more difficult to tell if the contents are contaminated. If in any doubt the contents must be disposed of as hazardous waste. Contaminated bund water must never be poured down the drain.
- When not in use materials must be returned to their storage location. If hazardous materials are required at their point of use for a period of time they must be kept in a drip tray.
- Drip trays must be used under stationary or parked plant.

6.6 Waste Areas

- All wastes must be segregated and stored correctly in designated areas.
- All wastes must be correctly labeled.
- Burning or burying waste on site is strictly prohibited.

6.7 Spill Control

- Nozzles or funnels must always be used for decanting and refueling.
- Plant and machinery will be inspected for leaks.
- When used spill cleanup material must be restocked.
- All spills must be reported to the Construction Superintendent.

6.8 Passageways

- Unobstructed and clearly defined
- Provide adequate lighting
- Ensure clear sightline at breaks and corners

6.9 Lighting

- Adequate and free from glare
- Lighting clean and efficient
- No flickering
- Maintain steady lights
- Provide and maintain all emergency lighting systems

6.10 Access to Worksites

- Keep all walkways and stairways clear of debris and other materials such as used boxes, wooden scrap, loose gravel, oil leakage, tools and supplies to prevent tripping and slipping
- Put them in a bin or debris area to prevent fire and tripping hazards
- Provide adequate lighting to prevent accidents

6.11 Stacking of Materials

- Ensure the proper heights and correct stacking
- Allow sufficient space for moving stock
- Store materials in racks/bins
- Keep shelves free of rubbish
- Keep floors around stacks and racks clear
- Check drums and ensure pallets in good repair
- Heavier items stored low and without danger of falling objects
- Avoid sharp edges and provide safe means of accessing high shelves

6.12 Maintenance of Stairs, Steps and Landings:

- Replace or remove worn-out or broken steps
- Keep handrails and fencings in good repair
- Keep clear of all obstructions
- Maintain adequate lighting
- Provide and maintain emergency lighting
- Ensure non-slip treatment/treads in good condition
- Keep clear of debris and spills

6.13 Fire Fighting General Rules:

- Prepare Fire Fighting Procedure (See H&S Procedures)
- Ensure all extinguishers and firefighting equipment serviced and marked
- Provide adequate fire alarm and communication system
- Restrict smoking/naked flame
- Avoid storage of excess quantities of flammable substances at worksites
- Establish storage procedures for flammable substances
- Provide fire extinguishers near all diesel tanks, generators, welding, oxy-acetylene cutting or other sources of ignition
- Keep fire extinguishers easy to locate and reach in case of an emergency
- Never store flammable or combustible materials in common areas, stairways or exits
- Avoid spraying of paint, solvents, or other types of flammable substances in areas with poor ventilation to avoid build-up of fumes and vapors leading to explosions or fires
- Store gasoline and other flammable liquids in a safety can in a ventilated place or an approved storage facility
- Ensure that leaks or spills of flammable or combustible materials are cleaned up promptly

6.14 Emergency Response:

- Prepare Emergency Response Plan (supplemented Plan)
- Employ and train emergency personnel
- Ensure emergency procedures are documented and issued
- Display emergency telephone numbers
- Conduct regular fire alarm checks
- Perform periodic testing and trial evacuations

6.15 Welfare and Toilet Facilities

Matters to be considered when planning the welfare and toilet facilities include:

- The work to be carried out and the health risks associated with it
- The duration and spread of the site locations
- The number of people working at different locations
- The distance from rest places and welfare facilities

6.16 Toilet Facilities

Fixed Installation:

- at the site base, usually near the site office,
- at different satellite locations, especially when the coverage of worksite is wide and far from the base
- Portable Installation on the Worksite

6.17 Washing Facilities

- Hand basins or bowls
- Water tap with buckets or receptacles
- Shower or eye-bath where necessary

6.18 Rest Areas

- Fixed installation:
- at the site base location
- at different satellite locations
- Temporary installations on the worksite

7. VEHICLE / EQUIPMENT AND TOOLS SAFETY

7.1. Maintenance of Vehicles and Equipment Procedure

Standards

All vehicles, machinery and equipment are serviced with respect to:

- Manufactures recommendations
- Industrial standards
- Legislated requirements
- Contractor's best practices

To ensure the safe operating condition of all equipment, our daily/seasonal pre-inspection and our preventive practice is based on the highest protocol.

Schedule

All equipment will be inspected to the manufacture's recommendations, industrial standards and legislated requirements.

- Pre-use inspection-daily
- Pre-use inspection, complete mechanical, at season beginning
- Schedule preventative inspection/maintenance

Preventative Maintenance Schedule

All maintenance on all vehicles, machinery and equipment to be done yearly and as required.

Standard Recording System

The system uses Daily Inspection Book for recording the inspections and listing required maintenance. The book records the following:

- List of items to be inspected for each significant piece of equipment
- Inspectors name and signature
- The date of the inspection
- Description of required work to be performed, if required
- Reporting of any suspected problems for correction
- General recommendations for correction of any deficiencies recorded

All out of service equipment, machinery or vehicles has designated area assigned so employees cannot put equipment, machinery accidentally back into service.

Qualified Person

All inspections and specifically, repairs and service can only be performed by qualified, competent persons. They are either qualified by an outside source or by our own competency program.

The Supervisor is responsible to help identify any equipment deficiencies or items requiring maintenance or preventative maintenance and activate the prescribed corrective action or required preventative maintenance.

All Employees are responsible to report any defects, deficiencies or hazards pertaining to the workplace and or equipment.

Operator pre–use inspections of equipment

The inspection will be performed by the competent operator that will be using the equipment at the beginning of the day or the first time the operator is going to use the equipment each day.

Mobile Equipment:

- Operator observes the equipment in place to ensure that the surrounding environment is safe and the equipment is in a safe location and on stable ground to be inspected.
- The operator retrieves the inspection book/form and proceeds with the pre-use inspection for the day and/or first time use that day.
- Any issue identified on the checklist that is deficient, will be checked off and comments added. The equipment is taken out of service and tagged until a qualified person has looked at the identified deficiency and corrected it.
- Once corrected, the operator will once again inspect the equipment immediately before use.
- Should the operator leave the equipment for any reason and it is out of sight and control of the operator for any length of time during the same day, the operator will perform a walk around and cursory inspection of the equipment before continuing its use.

The following information will be included on the inspection forms:

- Name and identification of equipment inspected
- Inspectors name/or initials
- Date of inspection
- Listing of the components to be inspected with minimum standard expected
- Description of the hazard(comments section)
- Recommendations for corrective action(comments section and given to the mechanic)
- Action taken(the repair report from the mechanic or their organization)

Non-Mobile Powered Equipment:

- Operator observes the equipment in place to en sure that the surrounding environment is safe and the equipment is in a safe location and on stable ground to be inspected.
- The operator will inspect the power equipment in compliance to the manufacturer’s recommendations and in conformance to procedure.
- Any piece of equipment found deficient will be taken out of service and corrected it.
- Once corrected, the operator will once again inspect the equipment immediately before use.
- Should the operator leave the equipment for any reason and is out of sight and control of the operator for any length of time during the same day, the operator will perform cursory inspection of the equipment before continuing its use.

Corrective Action
Any piece of equipment, whether Mobile Powered Equipment or hand operated power equipment, that is found to have deficiencies or in a sub-standard condition, will immediately tagged and/or locked out of service as per procedure.

The equipment will only be brought back into service after corrective action by a competent repair service and an inspection by a competent person.

The equipment being returned for use will and must be accompanied with a repair document from service provider with a description of the corrective action, a date and a signature of a competent provider.

Follow Up
Once the corrective action or repair has been made on the equipment and there is documentation on the repair/corrective action with an authorized signature, the equipment will be inspected to ensure the integrity of the repair/corrective action. This inspection will include testing of the function of the equipment.

7.2 Key Points of Equipment Maintenance

MANAGER/SUPERVISOR	**WORKER**
Ensure that all vehicles and equipment are maintained in safe and good working order	Obtain training to operate vehicle or equipment in a competent and safe manner
Have a competent worker inspect and repair vehicles and equipment	Other
Ensure a copy of the operating manual for vehicles or equipment is available	
Assign qualified worker to operate the equipment/vehicles	
Provide a cab or a screen when the driver or operator is exposed to overhead hazard	
Provide and maintain a log for all vehicles and equipment	
Install handrails, footholds that would facilitate mounting and dismounting	
Ensure Roll Over Protection are installed	
ON SITE PREPARATION	
Provide a copy of operating manual for all vehicles and equipment on site	Review maintenance and safety procedures with supervisor
Review maintenance and safety procedures with all operators and drivers	Perform inspection of equipment and vehicles prior to the start of each project
	Other
DURING CONSTRUCTION	
Ensure that daily inspection and maintenance is done	Every morning
Repair all reported and detected defects	Circle check equipment and vehicle for leaks
Periodically inspect logbooks	Check for crack, bent, loose or missing components
Other	Check operation of: windshield wipers/washers, seatbelts, horn beacon, turn signals, brake lights, four-way flashers, all gauges, reverse alarm
	Check tire pressure, loose or missing wheel nuts
	Adjust mirrors, clean windshields
	Other
OFFICE STAFF OR SUPERVISOR	**WORKERS**

MANAGER/SUPERVISOR	WORKER
During construction (Continued)	During construction (Continued) After starting the engine, check air brake pressure
	For aerial devices:Check basket leveling for proper tension Inspect buckets for damage Check for cracks around welds, hinge pins and boltsInspect cables for fraying or flattening of cables Check for loose material inside the boom Check hydraulic system and all control levers of boom
	For hydraulic equipment: Check low pressure devices to ensure they work properly Check all outrigger and holding valves to ensure that they are working If repair, adjustment or replacement was done to the vehicle, check to make sure the part is operational Check all levers to make sure that they are working properly
ANY TIME DURING THE DAY	
	If low pressure warning device comes on at any time, STOP IMMEDIATELY IN THE SAFEST AVAILABLE PLACE and correct loss of pressure before proceeding.
Ensure that buckets and hydraulic devices are properly parked and blocked	Report any defects to supervisor and stop using equipment or vehicle
Provide blocking for dismantling, altering or repairing equipment	Never leave buckets or any hydraulic devices unsupported
Ensure that workers do not use fork-lift truck, frontend loader or similar machines as workplace platform	Use blocking when dismantling, altering or repairing equipment

7.3 Work Shop and Field Mechanics

MANAGER/SUPERVISOR	WORKERS, DRIVERS, OPERATORS, MECHANICS
In General	In General
Ensure that workers are properly licensed and competent to do the job	Ensure proper training and familiarity with equipment
Ensure good working order of all tools, especially cranes, booms, lifting devices and power tools	Follow all recommendations in operating, service and maintenance manual. Always refer to the manual when in doubt
Ensure availability of manual of all equipment being repaired	Ensure clean work area and keep it free of spilled oil, grease and slipping hazards
Schedule regular inspection and maintenance of equipment and machinery at least as recommended by the manufacturer	Refrain from smoking at all times when working near fuel, batteries and ether
Provide means of proper storage and secure material inside all shop vehicles	Do not wear jewellery or loose fitting clothes
Ensure clean work area	Position equipment/machine on hard/level surface

MANAGER/SUPERVISOR	**WORKERS, DRIVERS, OPERATORS, MECHANICS**
Determine required PPE	Disengage power and stop engines before servicing
Ensure adequate ventilation and lighting	Support equipment with blocks or stands; never work on machine if only supported by life jacks or hoist
Provide necessary equipment to complete job safely	Lower all equipment attachments to ground, if not, secure it by proper blocking
Provide replacement parts recommended by manufacturer	Relieve all pressure in air, oil, and water systems before disconnecting
	Allow systems to cool down before repairing
	Engage all safety locks before working on equipment
	Post "Do Not Operate" signs at operator's station and disconnect battery to prevent inadvertent start up
	Use proper tools to complete the job safely
	Read and understand warning plates and decals
	Use appropriate PPE
	Change oily clothing as needed
Shop Operation	**Shop Operation**
Provide adequate floor space for work anticipated	Ensure adequate ventilation at all times
Designate special areas for duties such as welding, cleaning and painting	Maintain shop in a clean and orderly manner by cleaning up as you go
Provide separate rooms for the delivery and storage of parts, equipment and tools	Ensure clear pathway to fire extinguishers and emergency exits
Provide proper lunch and wash-up areas	Keep cleaning solvents away from sparks, flame and ignition sources
Provide adequate heating	
Ensure adequate ventilation at all times	
Ensure good housekeeping practice in keeping the shop free of fire hazards, oil, and debris	
Field Repairs	**Field Repairs**
Ensure that traffic control devices are available	Secure all material from spilling in the service vehicle
Ensure that each service vehicle is in good working order	Ensure that the first aid kit and fire extinguisher are in working order
Equip each vehicle with a fire extinguisher and first aid kit	Obey road signs at all times
Perform periodic inspection of service vehicles	Remove equipment or machine from traffic and construction activities or isolate the equipment so that it will not be accidentally moved during repair
	Ensure that the equipment or machine is secured before commencing work

7.4 Safe Operating Procedures for The Heavy Equipment:

- Backhoe
- Dozers
- Loaders
- Road Graders
- Skid steers

- Trucks

7.4.1 Backhoes

- Know the working range of the machine.
- Be sure attachment or load doesn't catch on obstructions when lifting or swinging.
- When lifting a load, do not lift, swing or stop unnecessarily fast.
- Be sure everyone is in the clear before swinging or moving in any direction. NEVER swing or position attachment or load over personnel or vehicle cabs.
- Never allow personnel to walk or work under any part of the machine or load while the machine is operating.
- Never allow anyone to ride the attachment or the load. This is an extremely dangerous practice.
- Do not load a truck unless the driver is in a safe place. Then, load the truck from the rear or side.
- Use a signal person. The signal person must be in direct communication with the operator, and the operator must pay close attention to the signals.
- Never exceed the lifting capacity of the machine. Stay within the lifting limits shown on the Load Rating Chart. Remember - you may be able to lift the load in close, at ground level, but as the load radius and elevation change, the lifting capacity of the excavator may decrease.
- Keep the machine well back from the edge of an excavation. Avoid undercutting the machine. If necessary, provide adequate shoring to prevent the machine from falling into the excavation.
- Level off the work area if possible.
- Avoid swinging or extending the bucket farther than necessary in a downhill direction. This will reduce the stability of the machine.
- Avoid working with the tracks across the slope, as this reduces stability and increases the tendency for the machine to slide.
- Always be sure that slings or chains used to lift the load are of adequate strength and that they are in good condition.
- Watch your boom clearance at all times.
- Turn off the engine and allow the machine to cool before working on the machine. Most fluids on the excavator are hot enough to cause severe burns at normal operating temperatures.

NEVER leave the machine without first lowering the bucket, stopping the engine, setting the parking brake, and placing the shift in park. Dismount the machine carefully. Do not jump out of the machine.

7.4.2 Dozers

- Operate the controls only with the engine running.
- Do not allow riders on the machine unless additional seat, seat belt, and rollover protection are provided.
- The operator must satisfy himself that no one will be endangered before moving the machine.
- Report any needed repairs noted during operation.
- Carry implements close to the ground, approximately 40cm (15 in) above ground level.
- Stay a safe distance from the edge of cliffs, overhangs, and slide areas.
- If the machine begins to sideslip on a grade, immediately dispose of the load and turn the machine downhill.
- Be careful to avoid the condition which could lead to tipping when working on hills, banks, or slopes, and when crossing ditches, ridges, or other obstructions.

- Work up and down slopes, rather than sideways, whenever possible.
- Keep the machine under control and do not work it over its capacity.
- Be sure hitch points and the towing device are adequate.
- Connect trailing equipment to a drawbar or hitch only.
- Never straddle a cable, wire rope, or similar device nor allow others to do so.
- Personnel are prohibited to be between the machine and trailing equipment when maneuvering to connect them. Block the tongue or hitch of trailing equipment to align it with the drawbar or hitch.
- This is a one-person machine, NO RIDERS ALLOWED.
- Know the pinch points and wrap points on the loader.
- Operate at a speed consistent with working conditions, visibility, and terrain.
- Ensure loader has an adequate rear counterweight
- When crossing exposed railroad tracks, ditches, ridges, or curbs reduce speed and cross at an angle.
- Carry loaded buckets as close to the ground as possible. The further a loaded bucket is from the ground the more unstable the loader becomes.
- Use extreme caution when operating a loader on a side slope. Slow down and carry the bucket, loaded or empty, as close to the ground as possible.
- Stay in gear when traveling downhill - this will help control speed.
- Never move a load above the heads of other workers.
- When back filling, use extreme caution. The weight of the material plus the weight of the machine could cause the new construction to collapse.
- Keep work area level; avoid developing ruts by occasionally back dragging the bucket to smooth the surface.

NEVER leave the machine without first lowering the bucket, stopping the engine, setting the parking brake, and placing the shift in park. Dismount the machine carefully. Do not jump out of the machine.

7.4.3 Road Grader

- Do not permit riders in or on the grader. Grader is a one-person piece of equipment.
- Do not dismount from the grader with the engine running - lower all attachments and stop engine first.
- Before backing up, use extra care to ensure persons and vehicles are clear of the grader.
- Know and use hand signals required for particular jobs and know who has the responsibility for signaling.
- Select a gear that will prevent excessive speed when going downhill. Do not coast downhill.
- Note and avoid all hazards and obstructions such as overhangs, ledges, slide areas, electrical lines, underground cables, water mains, or gas lines.
- Watch for bystanders and never allow anyone to be under or to reach into the grader and its attachments while operating.
- Check the local traffic laws for correct traveling requirements. If necessary, pull over and allow traffic to pass.
- When working near traffic areas or at night, use extra care. Use precautions, such as flares or reflectors, cones, red flags or red lights, barricades, flashing lights, and flagmen.
- Do not operate the grader in areas where volatile gases, dust, and combustibles may be present.
- Ensure the grader is properly equipped for grading in dry or forested areas.
- Avoid lubrication or mechanical adjustments with the grader in motion or the engine operating.
- Keep your head, body, limbs, feet, and hands away from all moving parts.

- Use extreme care when working with hydraulic systems. Relieve the hydraulic system pressure before performing any service.
- Match speed of the vehicle to job conditions.
- Be careful when operating with the wheels at right angle to a slope.
- When hooking up trailing equipment, keep all personnel away.
- Know your stopping distance at any given speed.
- Use caution when crossing side hills, ridges, ditches, and other obstructions.
- Keep close to inside bank when working on a side hill road or cut. Extend the blade to material near outer edge.
- Use extreme care to avoid tipping when working on hills, banks, or slopes.
- Cross obstacles at an angle and at slow speed. Be alert for sudden movement of machine when going over center of obstacle.
- Operate the vehicle only on level surface when cutting high banks.

NEVER leave the machine without first lowering the bucket, stopping the engine, setting the parking brake, and placing the shift in park. Dismount the machine carefully. Do not jump out of the machine.

7.4.4 Skid Steers

- Check to see that counterweights as recommended by the manufacturer are in place.

NOTE: This is very important as improperly balanced skid-steer loaders are easily upset.

- Clean steps, pedals, and floor of any slippery substances
- Clear the driving compartment for loose items that might interfere with the controls.
- Check the work area for hazards such as holes, soft spots, and obstructions. Check overhead for utility lines, doorway clearances, or other obstructions.
- Mount the machine wearing clean, dry shoes using the grab bars or handrails provided.
- Adjust the seat, fasten the seat belt, set the brake, and place transmission in park or neutral before cranking the engine.
- Visually check for the presence of others in the area and warn them away. Be especially alert for children.
- If the machine is garaged, leave the door or some windows open for ventilating the exhaust. CARBON MONOXIDE KILLS!
- Start the engine and check all controls to see that they are functioning properly.
- Check horn and backup alarm to see that they are working.
- Operate with caution on uneven surfaces. Avoid steep slopes completely.
- Carry the load as low as possible. Avoid sharp turns and slopes with a raised load.
- Travel straight up or down, with the heavy end of the machine pointed uphill.
- Operate with extreme caution near areas with sharp drop-offs.
- NEVER leave the machine without first lowering the bucket, stopping the engine, setting the parking brake, and placing the shift in park or neutral. Dismount the machine carefully. Do not jump out of the loader.
- If stopping for any length of time, lock the ignition and remove the key.

7.4.5 Trucks

- Truck drivers will be properly and thoroughly trained before attempting to do any work with or on any type of truck.
- Our motor vehicle policy, prohibit the operation of commercial motor vehicles by individuals who do not have the proper training and license. Do not attempt to operate any dump truck unless you have the proper license and training.

- Always use the steps and grab irons and face the vehicle when getting in or out of the truck.
- Place the gearshift into neutral and set the parking brake before starting the engine.
- Allow the engine to reach operating temperature and the air pressure to build to operating pressure before placing the truck into motion.
- Carefully check the area around the truck before placing it into motion. Objects or people that are very close to the truck may not be visible from the driver's seat.
- Always make sure that your seatbelt is properly fastened before driving the truck.
- Allow adequate stopping distance between the truck and the vehicles in front of it.
- Check the area around the truck for obstructions (tree limbs, overhead wires, etc.) before raising the dump box. Make sure that the spreader chains aren't set if you intend to dump in a pile.
- Always try to be on a level surface when you raise the dump box. As the box raises the truck's center of gravity goes up and the truck becomes less stable and more apt to tip over. If you must dump on a slope place the truck so that it faces straight up, or down the slope. Do not try to raise the box with the truck parked parallel with the slope. Remember that a dump truck is much more apt to tip over (or run into overhead obstructions) when spreading material then it is when dumping in a pile.
- NEVER work under a raised box (not even "for just a little bit") unless the box is adequately supported by a prop rod or cribbing. Do not rely on the truck's hydraulic system to hold the box up while you work under it.

NEVER leave the machine without first stopping the engine, setting the parking brake and placing the shift in park. Dismount the machine carefully. Do not jump out of the machine.

7.5 Vehicle Management Procedure

7.5.1 Construction Vehicle Management

Contractor will manage construction vehicle movements to ensure that all traffic associated with the works can safely travel on the road network to and from the construction site, safely enter and exit the site access points, maneuver to and from traffic streams and turn at work areas, depots, stockpile sites and quarries. Contractor will plan all construction vehicle movements with the aim to minimize the risk to other road users and keep the traffic generated by the project to minimum.

Contractor will monitor the use of local roads by construction heavy vehicle traffic in consultation with Local Traffic Police to minimize and/or restrict use of local roads by heavy vehicle traffic as far as reasonable and practicable.

The types of construction vehicle movements may include: deliveries of materials, supplies, plant or equipment to site; transportation of over dimension loads;
Haulage of materials on and off site associated with earthworks operations; deliveries of soil, gravel, asphalt, concrete and bitumen from batching plants to pavers; and regular trips by construction personnel in work trucks.

7.5.2 Heavy Equipment Operation (General)

All vehicles must have:

- A service brake system, an emergency brake system, and a parking brake system
- Working headlights, tail lights, and brake lights
- An audible warning device (horn)
- Intact windshield with working windshield wipers
- Ensure that all operators have been trained on the equipment they will use

- Check vehicles at the beginning of each shift to ensure that the parts, equipment, and accessories are in safe operating condition. Repair or replace any defective parts or equipment prior to use
- Do not operate vehicle in reverse with an obstructed rear view unless it has a reverse signal alarm capable of being heard above ambient noise levels or a signal observer indicates that it is safe to move
- Vehicles loaded from the top (e.g., dump trucks) must have cab shields or canopies to protect the operator while loading
- Ensure that vehicles used to transport workers have seats, with operable seat belts, firmly secured and adequate for the number of workers to be carried
- Equipment should have roll-over protection and protection from falling debris hazards as needed
- Prior to permitting construction equipment or vehicles onto an access roadway or grade, verify that the roadway or grade is constructed and maintained to safely accommodate the equipment and vehicles involved
- Do not modify the equipment's capacity or safety features without the manufacturer's written approval
- Where possible, do not allow debris collection work or other operations involving heavy equipment under overhead lines

7.5.3 Material Falling from Vehicles

- Do not overload vehicles
- Ensure that loads are balanced and are fully contained within the vehicle. Trim loads, where necessary, to ensure loads do not extend beyond the sides or top of the vehicle
- Cover with tarpaulin and secure loads before moving the vehicle

7.5.4 Driver Responsibilities

All drivers employed on the project, whether direct employees or subcontractors, have a responsibility to drive safely and in accordance with the Georgian Traffic Rules and any other safe driving instructions issued on the project.

Drivers must exercise care at all times and work in accordance with Vehicle Movement Plans (VMPs).

7.5.5 Hazardous Movements

When planning construction vehicle movements, the following hazardous movements will require particular consideration:

- Entering and exiting work sites to and from adjacent travel lanes;
- U-turn movements across travel lanes and at median crossover points between dual carriageways;
- Reversing maneuvers within the work area and in the adjacent travel lane; travelling through the work area between construction personnel and hazards; and the stopping of construction vehicles within adjacent travel lanes.

Contractor will apply controls and measures to mitigate the risk of these hazardous movements including the restriction of specific movements (e.g., turning bans);

- The provision of temporary traffic controls;
- The installation of deceleration, acceleration and turning lanes outside of the through lanes;

- Educating drivers;
- The installation of warning devices on vehicles;
- The implementation and compliance with project Vehicle Management Plans.

7.5.6 Planning Vehicle Movements

It is essential that satisfactory arrangements are planned and implemented for vehicles associated with the construction works. This mainly involves entering and leaving the traffic stream at work areas, accesses and side roads, or turning around.

Locations for turning across lanes carrying traffic and for entry and exit to and from work areas for vehicles associated with the work will be restricted to well defined points selected after considering relevant factors including:

Sight distance;

- Vertical grades horizontal grades
- Traffic volumes of through traffic;
- Approach speeds of through traffic;
- Areas clear of traffic lanes for accelerating and decelerating.

When planning construction vehicle movements Contractor will comply with all relevant environmental approvals;

- Minimize the number of vehicle movements by balancing earthworks and recycling excavated materials;
- Conduct a risk assessment to identify specific hazards and to facilitate the application mitigation measures;
- Promote safe driving principles;
- Develop on-road haulage routes that not only provide an efficient operation but minimizes the impact on the road network and local community;
- Analyze, assess and mitigate the impacts of the traffic generated by the construction works;
- Set-up depots, stock piles and batching plants at locations that minimize travel distances and impacts;
- Limit haulage operations to the construction corridor as much as feasible;
- Limit the number of access points and haul road crossings;
- Evaluate the need for temporary traffic control; implement appropriate environmental controls; provide an efficient and well maintained vehicle fleet;
- Determine the most appropriate hours of operation that will minimize the impact on the road network and local communities.

7.5.7 On-Site Construction Vehicle Movements

Construction vehicle movements on the construction site need to be carefully planned to address the various hazards and conflict points that occur within the work area and where a number of work areas interface with each other including the presence of workers on foot adjacent to working plant, mixing light vehicles with heavy vehicles, rough surfaces, poor sight distance and alignments, deep excavations and steep embankments.

To address these risks Contractor will ensure that:

- Regular toolbox meetings are held to discuss on-site vehicles movements;
- All plant are fitted with the appropriate safety features;
- All plant are regularly inspected for road-worthiness and are deemed ‘fit-for-purpose’;

- All access tracks are clearly defined and sign posted;
- Pedestrian tracks and crossing points are provided where necessary and clearly sign posted;
- Large plants, such as scrapers are separated from small plant items where possible;
- Workers do not operate within exclusion zones of moving plant;
- Exclusion zones at work areas and around plant are clearly delineated and where possible, physical separation is provided;
- Spotters and traffic controllers are positioned to assist and warn workers who are operating in close proximity to access roads and moving plant;
- Appropriate temporary traffic controls are installed where required;
- Consideration is given to the installation of reduced on-site speed limits;
- Site escorts are considered at locations where high-risk activities are being undertaken.

7.5.8 Road Network Construction Vehicle Movements

Contractor will plan all vehicle movements to minimize the impact on the road network. However, where on-road haulage operations are required Contractor will:

- Conduct traffic analysis to determine the number of vehicle movements and assess the potential impact on the road network;
- Develop a route that maximizes the use of the arterial roads and minimizes the use of local roads;
- Consult with Traffic Police during the development of haulage plans;
- Where possible, avoid movements during peak periods; develop a detailed VMP and toolbox all drivers; and ensure that the fleet are regularly maintained.

7.5.9 Construction Access Points

The most hazardous movement for construction vehicles occurs when the vehicle is entering or exiting the construction site to and from the adjacent travel lane. When planning construction access points Contractor will:

- Consider the use of existing local road junctions to access construction work areas where feasible;
- keep the number of access points to a minimum;
- Ensure that the new construction access points do not adversely impact on any existing
- Intersections, traffic facilities or traffic generating developments;
- Ensure that all access points comply with the Road Design guide standards in relation to sight distance, turning paths appropriate for the vehicle usage, intersection layouts, lane widths, acceleration and deceleration lanes and right turn bays to protect the right turn movement;
- Ensure the junction configuration has sufficient capacity to accommodate the traffic generated by the construction site;
- Ensure that security fences and gates at access points are indented to enable vehicles to park clear of the adjacent travel lanes;
- Ensure that access points are constructed of a suitable all weather surface that prevents debris from being tracked onto the adjacent travel lanes;
- ensure that all access points are clearly visible to approaching traffic and signposted accordingly;
- Consider the use of temporary traffic control to facilitate short-term major haulage operations and the movement of over-dimension vehicles where required.
- Each site access will show the exact entry and exit points for works vehicles and the associated signage.

7.6 Tools Safety Procedure

7.6.1 General Requirements

A. Broken, defective, burned, or mushroomed tools should not be used. They should be reported and turned in for replacement.

B. The proper tool and equipment should be selected and used for each task. For example, a wrench should not be used as a hammer or a screwdriver as a chisel.

C. Leaving tools on scaffolds, ladders, or any overhead working surfaces is hazardous because they may fall. Racks, bins, hooks, or other suitable storage space must be provided to permit convenient arrangement of tools.

D. Striking two hardened steel surfaces together is hazardous because pieces of metal may break off; i.e., two hammers, or a hammer and hardened steel shafts should not be struck together.

E. The practice of throwing tools from one location to another, from one employee to another, or dropping them to lower levels should be prohibited. When it is necessary to pass tools or material under the above conditions, suitable containers and/or ropes must be used.

F. Wooden tool handles must be sound, smooth, and in good condition and securely fastened to the tool.

G. Sharp-edged or pointed tools should never be carried in employee's pockets.

H. Only non-sparking tools shall be used in locations where sources of ignition may cause a fire or explosion.

I. Tools requiring heat treating should be tempered, formed, dressed, and sharpened by workmen experienced in these operations.

J. Tools designed to accommodate guards must be equipped with such guards when in use.

K. All rotating, reciprocating or moving parts of equipment (belts, gears, shafts, flywheels, etc.) must be guarded to prevent contact by employees using such equipment.

L. All hand-held power tools (e.g., circular saws, chain saws, and percussion tools) without a positive accessory holding means must be equipped with a constant pressure switch that will shut off the power when pressure is released.

M. Besides safety hazards, the use of power tools sometimes creates potential health hazards as well. The use of jackhammer and chiseling equipment often results in silica and nuisance dust exposures that can sometimes be controlled by wetting the work surfaces. Many times, however, the use of dust/mist respirators is required to prevent overexposures.

N. In addition to dust hazards, the hand vibration inherent in the use of some power tools may result in a restriction of blood flow to the hands and fingers, causing numbness or tingling. If workers consistently experience these symptoms after

the use of power tools, they should contact their supervisor so that steps may be taken to prevent further harm to the nerves and blood vessels in their hands. The use of a different tool, changes to the offending tool to reduce vibrations, and/or the use of special gloves may be recommended to deal with the vibration problems.

8. SAFE SYSTEMS OF WORK

8.1 Risk Assessment Procedure

1 Introduction

1.1 Purpose

It is a requirement of the Permit to Work procedure that a Risk Assessment is carried out before a permit is issued to carry out work on any site.
The purpose of this procedure is to describe only the Risk Assessment process in support of the Permit to Work System.

2 Responsibilities

2.1 Area Authority- Supervisor

Area Authorities are responsible for:

- Determining the extent of Risk Assessment required to support any Permit to Work application
- Organizing and participating in the Risk Assessment process.

2.2 Performing Authority – Foremen

Performing Authorities are responsible for taking part in the Risk Assessment process and disseminating the output from the Risk Assessment process to the personnel who will be doing the work.

3 Risk Assessment Categories

3.1 Risk Assessment Levels

Three escalating levels of Risk Assessment can be used depending upon the complexity and inherent risks of the task. Tasks may be classified as:

- tasks carried out without a Permit to Work
- tasks classified as moderately low risk
- tasks and activities requiring a formal Risk Assessment.

All Risk Assessments require input from those who will be doing the work. In addition, most formal Risk Assessments will require the input of expertise from outside the normal site team.

3.2 Tasks Carried Out Without a Permit to Work

Routine jobs frequently do not require a Permit to Work.
For this type of work, assessment through a periodic review of training needs is appropriate. In this way, the risk is minimized by ensuring that all personnel are trained and competent to undertake the tasks that they are required to do.

3.3 Moderately Low Risk Tasks

Tasks of a moderately low risk are carried out under permit control. The process of issuing the Permit to Work requires the identification of hazards and mitigating measures through the use of a simple Risk Assessment.
The Permit to Work form provides the prompt list and structured approach for this type of Risk Assessment.
As a general guide this level of Risk Assessment is appropriate to tasks which do not require authorization of the permit by the Supervisor.

Note: Discussing the job with the workforce involved is an important part of this process.

3.4 Formal Risk Assessment

Tasks require a formal Risk Assessment:

- the Permit to Work process indicates that authorisation is required by the Supervisor
- the risks to people, the environment or property may not be adequately controlled by the normal safeguards because:

  ⇒ those safeguards cannot be used

  or...

  ⇒ the task is of an unusual nature or is new to the operation

- the task involves an interface between two operations.

A formal Risk Assessment must **always** be undertaken for any job which requires:

- entry into a confined space
- heavy lifts (more than 50 T)
- lifts over power lines or process plant

A formal Risk Assessment is carried out against a check list (see *Appendix A Risk Assessment Check Lists*) and usually involves specialist / expert input.
The risks identified during a formal Risk Assessment are weighted.

3.5 All Risk Assessments

All Risk Assessments require a practical input from the people who will be doing and controlling the job. Only the formal Risk Assessment may require external input.

4 Formal Risk Assessment Team

The objective of a formal Risk Assessment is to use local knowledge and specialist knowledge in a structured way in order to achieve a practicable reduction in the risk involved in an activity to an acceptable level.

The Risk Assessment team should include:

- the Area Authorities for the areas in which the task will be carried out
- the Performing Authority
- the person who will undertake the task
- a specialist from inside and external to the operation as required
- an HSE specialist who is responsible for ensuring that the Risk Assessment is carried out in accordance with this procedure and for recording the results.

5 The Stages of Formal Risk Assessment

- Define the Task to be Assessed

The Risk Assessment team must first ensure that they fully understand the task and its implications. The overall task may need breaking into steps to facilitate carrying out the Risk Assessment.

- Identify the Hazards

A visit to the work site will usually be necessary in order to assess the layout of the area, site conditions and adjacent plant and activities. The check lists in *Appendix A* are designed to assist in this process.

Note: These checklists are supplied as a guide for reference purposes only. They should not be considered as being comprehensive.

5.3 Evaluate the Risk

Once familiar with the task to be carried out, the team should list all the significant hazards. This should be done in a group discussion, using the check list for formal Risk Assessments as a prompt. The main input at this stage should come from the knowledge and experience of the team.
The team should also consider the possibility of the interaction of different hazards, including those related to:

- Location
- Critical Activities
- Simultaneous Activities.

i) **Location -** Attention should focus on the proximity to other plant or equipment, e.g., Fuel tanks, ventilation systems, drains, ignition sources.
ii) **Critical Activities -** Critical activities include isolation, confined space entry, work at height, hot work, heavy lifting, use of power tools, temporary power and air supplies, radiography.
iii) **Simultaneous Activities -** Simultaneous activities should be investigated both within the task itself and with other unrelated activities taking place nearby.
iv) **Formal Risk Assessment Check Sheet -** The list of established hazards is entered onto the Formal Risk Assessment Check Sheet (see *Figure 3*). Any safeguards which are already in place are then entered in the second column of the table.

Note: Hazards are given a weighting **taking into account the safeguards already in place** based on the potential severity of the "effects" of hazard should things go wrong and the likelihood (probability) of the hazard occurring.

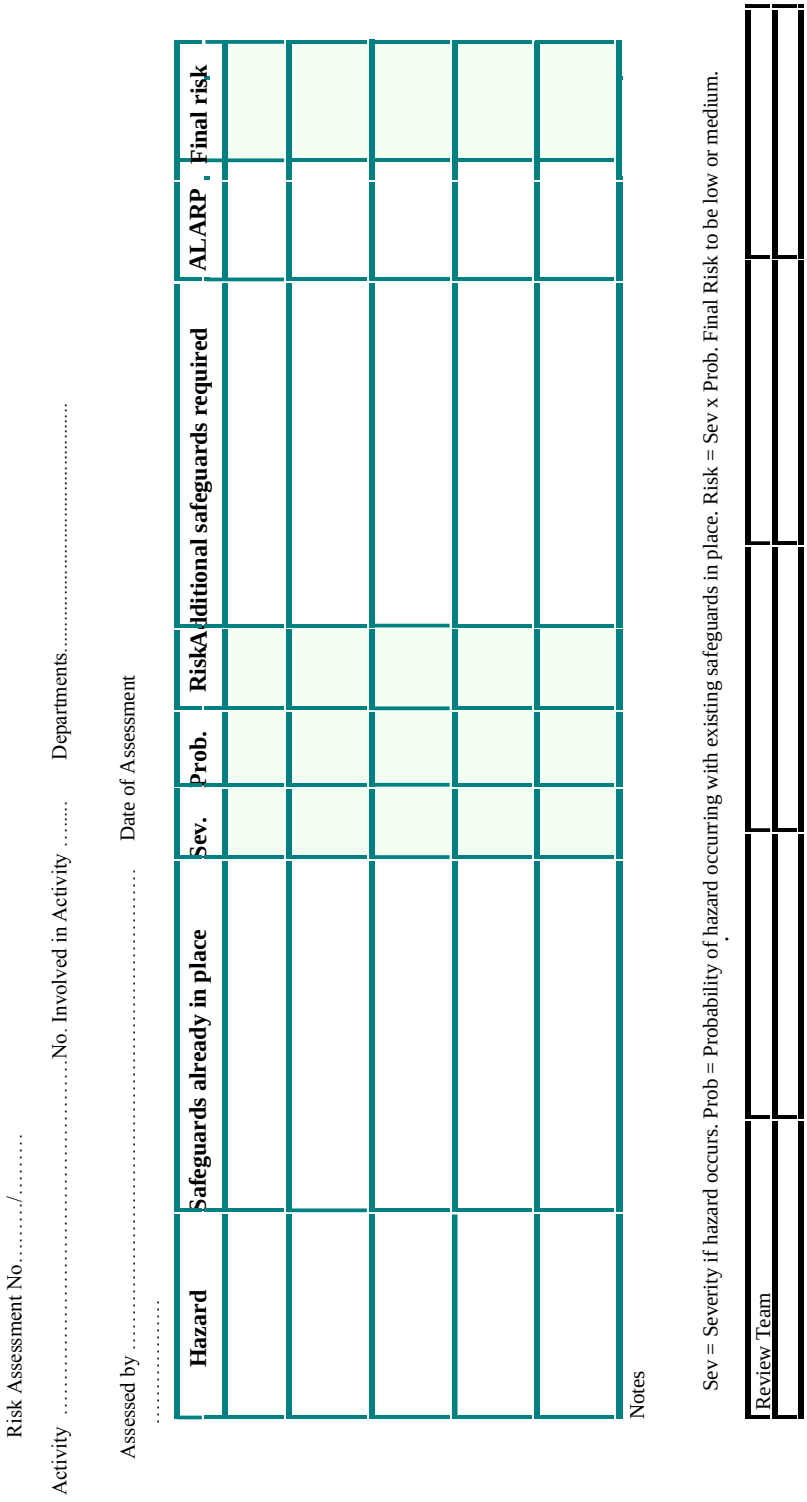


Figure 3 Formal Risk Assessment Check Sheet

v) **Risk Matrix -** Having identified the risks, the Risk Matrix (see *Figure 4*) is then used to estimate severity of the hazardous effect and probability as high, medium or low. The risk ratings are then entered on the Risk Assessment check sheet.

Figure 4 Risk Matrix

Level	Likelihood	Description
A	Almost certain	Is expected to occur during the project, 90% or > probability

B	Likely	Will probably occur during the project, ~50% probability
C	Moderate	Might occur at sometime during the project, ~10% probability
D	Unlikely	Could occur at some time during the project, ~1% probability
E	Rare	Only occur in exceptional circumstances, < 1% probability

Level	Consequence	Description
1	Insignificant	Insignificant Breach of Environmental Statutes
2	Minor	Minor Breach of Environmental Statutes
3	Moderate	Moderate Breach of Environmental Statutes
4	Major	Major Breach of Environmental Statutes
5	Severe	Shutdown of Project Due to Environmental Breach

Likelihood	**Consequences**				
	1 Insignificant	2 Minor	3 Moderate	4 Major	5 Severe
A (Almost Certain)	Medium	Significant	High	High	Extreme
B (Likely)	Medium	Medium	Significant	High	Extreme
C (Moderate)	Low	Medium	Significant	High	High
D (Unlikely)	Low	Low	Medium	Significant	High
E (Rare)	Low	Low	Low	Medium	Significant

5.4 Determine the Additional Safeguards Required

The team must next work through the list of identified hazards and determine the safeguards needed to reduce the risks to an acceptable level. Risk levels are determined as being either low, medium, or high.

Risks determined as “low” at this stage need not be considered further. Transfer the risk rating to the right hand column of the check sheet.

Additional safeguards must be considered for all risks not determined as “low”. The greater the risk, the greater the number and quality of the safeguards which should be in place.

Note: Controls and safeguards which prevent the hazard being realized should be used in preference to controls which reduce the effect of a hazard.

Typical controls and safeguards that may be used include, but are not limited to:

- **Physical:** disconnect a power supply
- **Procedural:** test for toxic or flammable atmosphere; control of adjacent work

- **Human:** use of specialist personnel; special briefing of workers
- **Time:** planning to avoid simultaneous adjacent work; limiting work to daylight hours
- **Contingency:** additional ESD (Engineering Safety Devices) provision; special PPE; provision of rescue equipment.

The measures to be adopted should be recorded in the “Additional Safeguards” column of the check sheet.

5.6 Re-evaluate the Risks for Acceptability

The team must then re-evaluate the risk for all those hazards for which extra safeguards have been determined. The new risk level (high, medium or low) should be determined and the team should consider whether the risk is now as low as reasonably practicable.

If the risk is not as low as reasonably practicable, the review team must decide what further safeguards need to be put in place. The ALARP status and final risk are entered into the right hand columns of the check sheet.

If at this stage any hazard has a high risk against it in the Final Risk column of the check sheet, the task in its present form must be abandoned.

The team must finally decide on the acceptability of the overall remaining risk for the task. Individual hazards with a medium risk may be acceptable provided the overall risk of the task is considered low. If the team decides that even with the safeguards in place, there are too many hazards which still have a medium risk, this must be recorded and the task in its present form must be abandoned.

The team must finally sign off the check sheet in the review team boxes.

6 Management of Risk

6.1 Approval

On completion of the Risk Assessment, the Risk Assessment Check Sheet must be attached to the permit application for the job. It must be reviewed and signed by the Supervisor before he approves the associated Permit(s) to Work.
Should the Supervisor feel that the task presents risks beyond his level of accountability, he must refer to his Manager for guidance, and if necessary request a more sophisticated analysis of the risks and mitigation than can be provided by the method described in this procedure.

6.2 Implementing Safeguards

The safeguards specified by the team must be implemented by the Supervisor before the permit is issued.
The Supervisor must ensure that any training requirements or special pre-task briefings are completed before work commences.

7 Recording the Risk Assessment

Where a task is likely to be repeated, a record of the Risk Assessment should, at the permit issuer’s discretion, be retained for future reference. In any event Risk Assessments which include hazards to the health of those undertaking the task must be attached to the permit(s) for the job and retained for 12 months.

Appendix A Formal Risk Assessment - Checklists

Note: These checklists are for guidance only. They should not be regarded as comprehensive in nature and do not replace sound judgment in the recognition of all hazards associated with any task undergoing assessment.

Several check lists are provided below AS A STARTING POINT FOR FORMAL RISK ASSESSMENTS. The team should choose the list which it feels is the best starting point for the assessment to be carried out.
The Incident Causation Check List or the General Check List can be used for guidance on all tasks, in combination with a more specific checklist if appropriate.

Hazard Checklist - General

Falling from height	Noise
Manual Handling	Vibration
Lifting operations	Pressure
Falling object	Biological agents
Noise	Welding/cutting
Lighting	Power tools
Fume/dust	Hand tools
Minimise potential for ignition	Work on safety systems
Collision	Transport by sea/air
Hand tools	Storage
Machinery	Water jetting
Asphyxiation	Grit blasting
Cold/Heat	Loss of containment from nearby system
Mental Stress	Loss of containment from system being worked on
Ionising Radiation	Ignition
Chemical hazard	Fire
Inert gas	Explosion
Flammable gas	Structural damage
Flammable liquid	Personal injury
Electricity	Barriers/access restrictions
Static Electricity	Weather

Hazard Checklist - Confined Space Entry

Residual gases/vapours
Sludge which may give rise to vapours/gases when disturbed
LSA scale
Adequacy of ventilation
Need for air movers during entry.
Communication difficulties within the Confined Space or with the standby man
Standby man communication with the CCR
Ingress of gases/vapours from other nearby activities or systems
Use of mechanical tools/power tools/electrical equipment
Slip hazards within the Confined Space or at the point of entry
Ionising radiation; nucleonic instrumentation
Danger of falling into Confined Space boots or sumps
Noise, general
Noise when using power tools
Visibility within the Confined Space
Adequacy of lighting within the Confined Space
Temperature effects
Oxygen enrichment
Oxygen deficiency
Frequency of gas testing
Location of rescue kits
Competency of standby man
Disposal of Confined Space cleanings

Appendix B - Definitions

List of Definitions

Confined Space Entry:	where there is inadequate ventilation to dispel injurious or flammable fumes, vapor or gas or to provide sufficient oxygen. Also includes areas where access / egress is restricted.
Hazard:	the potential for human injury or loss of life, damage to the environment or to material assets or a combination of these.
Hazardous Consequence:	the result when a hazard is realized.
Inhibition:	the isolation of the executive action of a protective system. Where practicable, this should not prevent the operation of the visual / audible warning system.
Isolation:	• Process Isolation involves the closing and locking of valves. This may include depressurizing, flushing, and purging, e.g. single valve isolations. • A Positive Isolation involves the disconnection of plant, equipment and systems from sources of motive power, liquids and gases. • Electrical Isolation - The secure, disconnection and separation of a circuit, or item of equipment, from every

	source of electrical energy. This may involve electrical, instrument and communication isolations. • Long Term Isolation - An isolation that remains in place after permit cancellation and recorded as “Long Term”.
Isolation Certificate Board:	a board used to display the status of Isolation Certificates, Isolation Certificate Continuation Sheets and Boundary Isolation Certificates, maintained by the Area Authority.
Isolation Certificate Register:	a register maintained in the control room identifying the status of all Isolation Certificates by the Control Room Operator-referenced to individual permits.
Likelihood:	the chance of occurrence of an event. Likelihood can be expressed as a probability, frequency, class, rank etc.
Permit:	an authorizing document approved by management, specifying the required precautions and conditions under which potentially hazardous or interacting activities can take place
Permit Display Board:	a board used to display the status of active and suspended permits.
Permit Register:	a register maintained in the control room identifying the status of all permits.
Risk:	a combination of the likelihood of a hazardous event and the severity of the possible consequences of that hazardous event.
Risk Assessment:	the overall process of risk analysis and risk evaluation.
Risk Evaluation:	the process to support management decisions as to acceptability or risk reduction requirements by comparing the estimated risk against relevant criteria.
Safeguards:	steps taken to reduce either the likelihood or consequences, or both of a particular risk.

8.2 Excavation and Backfilling Procedure

1 Introduction

1.1 Document Purpose

This document sets out the precautions and conditions considered necessary for the safety of all excavation works.

1.2 Document Scope

This document refers to:

- Method of excavation
- Excavation and protection of third-party pipelines and services
- Excavation of oil contaminated soils
- Backfilling guidelines.

2 Responsibilities

2.1 Site Supervisor

- The Site Supervisor is responsible for the safety of all personnel on site and the safe execution of all work carried out on the site
- The implementation of, and compliance with, this Safe System of Work on site
- Ensuring that only suitably trained and qualified personnel are employed on site and for using only those contractors who employ suitably competent and experienced personnel
- Ensuring that a risk assessment is carried out for the work site by a competent person
- Reviewing all Risk Assessments carried out on site
- Maintenance of site records including those for Risk Assessments, equipment inspections and training.

2.2 Area Authority

Area Authorities are responsible for:

- Compliance with this Safe System of Work within their area of authority
- The safety of personnel and the safe execution of activities within their area
- Ensuring daily equipment checks are completed on equipment within their area and that equipment is maintained in good working order.

2.3 Machinery Operator

Machinery operators are responsible for:

- The safe and responsible operation of machinery under their control
- Immediately reporting to their supervisor if they believe the equipment they are using is in a dangerous or unsafe condition
- Ensuring that the machinery or equipment they use has all the safety devices and guards in place and that all guards are properly fitted.

2.4 Banksmen

Banksmen are responsible for:

- Preventing access to working areas under their control by unauthorized personnel
- Providing safe guidance and assisting in the safe operation of machinery under their direction.

2.5 All Personnel

All personnel are responsible for:

- Carrying out their duties in a safe and responsible manner
- For halting any work where they feel that conditions are unsafe and for bringing this to the attention of their immediate supervisor.

2.6 ENVIRONMENTAL MANAGER

ENVIRONMENTAL MANAGER is responsible for:

- Providing advice and assistance to the Site Supervisor on environmental matters as and when required
- Providing Information regarding natural, archaeological and other important features within and adjacent to the excavation site.

Note: Photographs of important features should also be provided if required.

3 Access Routes

Access routes to proposed sites shall be properly surveyed and reconnoitred. In particular, for all access routes:

- Risk assessments shall be made, and actions documented, for all crossing points and other points of difficulty recognized on the route
- Method statements shall be produced for negotiating all crossing points and other points of difficulty
- The route shall be clearly marked.

4 Route Identification and preparation

4.1 Locating and Marking Existing Pipelines

Note: At locations where there is hydrocarbon or a suspected leak a gas survey must be carried out before pipeline location activities begin.

Prior to the commencement of any excavation a site survey shall be carried out in order to:

- Locate, identify and mark any existing pipelines and foreign services and utilities and any cathodic protection system components, using pipe locating equipment and hand excavated trial holes
- Peg out the pipeline routing
- Define and log the point of excavation.

4.2 Pipeline Crossing Points

Requirements

Construction traffic and other plant shall cross the pipeline only by:

- Public roads
- Previously agreed and clearly marked crossing lanes or bridges.

Construction
All crossing lanes shall be fenced on both sides over a width to be specified and agreed by the Pipeline Patrolman as far as is reasonably practicable as dictated by local conditions and acts of vandalism. These fences shall be returned along the edge of the wayleave strip for a distance of 6 m away from the crossing.
Where it is necessary at crossing points to install a temporary bridge to protect the pipeline. Such a bridge will consist of the laying of steel plates of adequate thickness with hard core laid in, or an approved sleeper raft, or a combination of these methods. The design and construction of such bridges and crossings shall be by a competent person or approved civil engineering subcontractor where it is deemed necessary.

Markings
Any temporary crossing or bridge must be clearly marked by appropriate notices and flags, and additionally with lights at dusk, at night or in foggy conditions.

5 Site Safety

5.1 Access and Security

Guards and Barricades
Open excavations in a plant or near public areas must be

- attended by a watchman

or…

- protected by a barricade and mark with a warning sign.

All other open excavations should be attended by a watchman, marked or barricaded. If there is a recognized chance of people or cattle falling into the excavation, a decision may be taken regarding the use of a night watchman.

Note: If a night watchman is used, he shall be equipped with appropriate communications and shelter for use in case of prowling animals, sickness or other emergency. Vehicle for night watchman to be provided as far as is reasonably practicable.

Fencing, Gates and Safety Notices
Erection of stock fencing, gates and bunting safety notices, etc., shall be undertaken over access ways and worksites.

5.2 Vehicle Traffic

Vehicular traffic should not operate within 1 m of a trench or excavation. Vibration created by traffic may cause cave-ins.

5.3 Personnel

Protective Equipment (PPE)
With temperatures experienced in Georgia use of Inherently Fire Resistant or Flame Retardant Coveralls during summer where personnel are working all day outside could be unbearable. An alternative to IFR/FR coveralls for the low flash risk applications is 100% cotton. Personnel involved in specific work activities should wear Flame Retardant coveralls.
During all activities on site all personnel shall wear minimum PPE (helmet, safety boots/shoes, fire coveralls, and eye protection).
Personnel involved in specific work activities shall wear additional PPE to suit the requirements of the work as agreed/detailed at the pre-work toolbox talk.

Excavator Operators
Only experienced operators shall operate the excavating equipment.

Banksmen
Trained and qualified banksmen shall attend all operations involving excavating equipment and movement of heavy plant to prevent personnel entering the field of work and to ensure safe working of the equipment.

5.4 Equipment

Type and Location
All equipment shall be checked and registered on the appropriate checklists and registered in accordance with the site operating procedures. All operatives' certificates shall be checked and logged prior to works commencing.

Warning: Machinery vibration may cause cave-in. No running plant shall be located within 1 m of an excavation.

Equipment Inspection
Equipment shall be inspected daily and maintained as necessary to ensure that it is in good working order. This includes the inspection of brakes, pivot pins, hydraulic cylinders, hoses, snap rings, main attaching bolts, etc.

Adjustments and Repairs

- **Do not** lubricate or make mechanical adjustments to the unit while the unit is in motion or the engine is running.
- **Do not** repair or tighten hydraulic hoses or fittings when the:
  - system in under pressure
  - engine is running

or…

  - equipment hydraulic cylinders are under a load.

Refueling
A method statement covering spill containment and management of personnel injury risks shall be prepared for all refueling operations
In all cases, equipment shall be shut down prior to being refueled.

Lighting
All lighting shall be either explosion proof or located outside Zone 2.

5.5 The Use of Mechanical Equipment Near Overhead Power Lines

Introduction
All personnel working near overhead power lines with a machine or mechanical equipment shall be made aware of:

- the dangers associated with power lines
- the precautions they should follow to deal with those dangers
- what to do if they make contact with a power line.

Warning: Physical contact with high-voltage overhead power lines is likely to be fatal or cause severe and irreversible maiming.
It is impossible to say whether an overhead cable is a power line or a telephone line from observation alone. The only sure method is to make contact with the line owner.

Safe Vertical Working Clearance
The minimum safe working distance between mechanical excavation equipment and live overhead power lines will vary according to:

- type of power line (for example, insulated or uninsulated)
- voltage carried by the power line
- ground and weather conditions.

To establish and maintain safe **vertical** working distances between mechanical equipment and overhead power lines the following practice shall always apply:

1. Establish and record the maximum vertical reach of all machines on site.
2. Identify the routes of all overhead lines on or near the land to be excavated and clearly mark these routes on site plans.

3. For each overhead power line, identify the line owner.
4. From the line owner find out:
    a. if the line can be conveniently made DEAD
    b. the line type (for example, insulated or uninsulated)
    c. the voltage carried
    d. minimum safe working clearance for mechanical machinery operating near the power line.
5. If the line cannot conveniently be made DEAD then the established minimum safe operating clearance shall be adhered to at all times.

Reducing the Risk from Overhead Power Lines
Risks associated with working close to overhead power lines can be reduced by:

- Taking care not to damage poles and stays
- Fitting shorter radio aerials or repositioning existing ones on high machines so they cannot cause danger
- Carrying long items (for example, pipes or ladders) horizontally and not storing pipes or other materials and equipment near or under power lines and their supports
- Designating safe areas for high-risk activities; for example, tipping trailers
- Using barriers and goalposts: by erecting goalposts and barriers, machines which have to pass beneath lines can be limited to a safe height – an option especially suited to gateways and tracks.

If Contact is made With an Overhead Power Line

- Never touch an overhead line – even if it has been brought down by machinery or has fallen through other means.
- Never assume that lines are dead.
- When a machine is in contact with an overhead line, electrocution is possible if anyone touches both the machine and the ground. Stay in the machine and lower any raised parts that are in contact or drive the machines out of the lines if you can.
- If you need to get out to summon help or because of fire, jump out as far as you can without touching any wires or the machine – keep upright and away from the machine.
- Get the line owners to disconnect the power supply. Even if the line appears dead, do not touch it – automatic switching may reconnect the power.

5.6 Working Hours

Excavation work shall only be carried out during daylight hours where practicable. If the task overruns dayshift then the area will be barriered off and illuminated using approved out side site lighting. Preferably this should be a mobile tower, diesel driven arc light if available. These are additional requirements in addition to the site being fenced off.

5.7 Fires

Storage of material for lighting of fires in the vicinity of above ground installations associated with it **is not** permitted.

6 Pre-excavation requirements and Procedure

6.1 Excavation activity should preferably be undertaken in the summer as far as is reasonably practicable, in order to minimise both ground disturbance and soil compaction.

6.2 Landowners

Ensure that access has been granted by the landowner, that a pre-entry survey with photographs has been done and that compensation, access route and area protection have also been agreed.
Landowners and neighbours in close proximity to the proposed excavation must be informed that work is about to begin and that the inspection is of a routine nature.

Note: This requirement may be negated under an emergency situation.

6.3 Third Party Services

Owners of third-party services shall be contacted before the excavation of their services begins. A No Objection Certificate shall be obtained when applicable.

6.4 Excavation Boundaries

The extent of required excavation shall be clearly marked out prior to commencement of the work.

6.5 Excavation design requirements

Access
Whenever personnel will be in an excavation, ramps, stairways or ladders should be kept within 7.6m of workers for all excavations over 1.2m deep.

Windsocks
Wherever the presence of hydrocarbons is reasonably suspected, for example in all Red Zones, windsocks or flags must be positioned on both sides of the excavation in order to determine wind direction.

Planning for Water Accumulation
Works shall be suspended / re-scheduled during periods of severe/inclement weather. A portable diesel driven dewatering pump with a suitable length of hose shall be in attendance to drain the excavation if required.
When someone will be working in an excavation where water may accumulate, consideration **should** be given to:

- Special support or shield systems
- Water removal equipment, and
- Emergency rescue procedures.

Confined Spaces
If the depth of excavation is 1.2m or greater, it shall be treated as a confined space. Risk Assessment should stipulate if all confined space entry requirements are to be met. Gas testing must be carried out prior to entry. Where hazardous atmospheric conditions may exist or develop in an excavation/confined space, controls such as proper respiratory protection (BA sets, respirators), ventilation, availability of trained and competent Rescue Teams and Emergency Rescue equipment must be provided.

7 Excavation Procedures

7.1 Excavation Inspections

Where personnel are required to work in excavations of 1.2m or deeper a safety inspection by a competent person must be carried out on each shift as follows:

- before work is started
- after rainstorms
- after other occurrences which may increase the hazard of cave-ins.

All high-risk excavations as defined by the Risk Assessment must be attended by a geo-technical engineer/person trained in soil analysis.

7.2 Toolbox Talks

A toolbox talk shall be carried out prior to works commencing with all parties involved in the works. Talks shall be carried out during the works when the initial shift handover takes place and when new works come on site.

Note: Toolbox talks shall be recorded.

7.3 Operating restrictions

The following are operating restrictions for excavating equipment.

- Tracked vehicles **should be used in preference** to wheeled equipment on the side of the excavation to minimise soil compaction.
- Equipment **must** be operated within its rated capacity.
- Personnel **must** stay clear of excavating equipment while in operation.

Examples of unsafe areas include: under or beside the bucket of a backhoe, near hydraulic rams of a bulldozer, etc.

- A seat belt **must** be installed on equipment manufactured with a ROPS.
- Do **not** use equipment if the ROPS has been removed.

Note: "Pure" ditching machines (those without blades or backhoe attachments) are excluded from ROPS requirements.

Operators
Equipment operators must:

- be trained in the use of the equipment
- be properly seated when operating equipment controls
- wear seat belts if the equipment is in operation and furnished from the manufacturer with a Roll Over Protective Structure (ROPS)
  Note: Seat belts **should not** be worn if the equipment is not fitted with a ROPS.
- use care at all times to maintain equipment stability
- always drive at safe speeds for the conditions encountered (for example, on rough ground, slopes, crossing ditches, turning, etc)
- always use steps and handles provided when mounting or dismounting equipment.

Equipment operators must not:

- start the engine unless seated in the driver's seat

- allow other personnel to ride on the equipment unless it is designated for more than one occupant
- get off the equipment while it is in motion, except in an emergency.

Parking and Moving Equipment
The table below describes the operator requirements for specific excavating equipment.

Activity	Precautions
Parking excavating equipment	• Park the unit on the level ground if possible and… • Lower the boom to a relaxed position
Parking a backhoe on an incline	• Lower the bucket so that the cutting lip contacts the ground • Apply the parking brake and… • Securely chock the wheels.
Loading equipment on a trailer	• Use the crawl gear.
Storing or transporting a ditcher on a trailer	• Use trainer ramps • Lower the boom • Place the transmission in gear and… • Fasten the ditcher securely to the trailer.

Using Backhoes
The following precautions apply whenever a backhoe is used during excavation:

- Personnel **must not** be in an excavation within the full reach of the backhoe while it is excavating
- The boom must be raised and centered before engaging or disengaging the transport.
- Avoid using the full reach or swinging a loaded bucket to the downhill side.
  Note: This will prevent upsets when operating in a slope.
- Attach towlines at a point below the rear axle.
  Note: Attaching above this level increases the risk of rollover.

Waste Management
Waste Management Plan to be referred to.

Power Lines
Before operating equipment, all utility lines and overhead power lines must be located and identified.

7.4 Excavated Materials
Excavated material shall be placed at least 1m away from the edge of the excavation and shall be stockpiled within the Right of Way area.

Topsoil
The stripped topsoil shall be stored for re-use away from the side of the excavation and separate from the sub-soil.
The height of stored soils should be limited to 3 m in order to reduce erosion problems and prevent the development of anaerobic conditions within the stockpile. Weed growth may need to be controlled by spraying with approved herbicides.
Warning: **Do not** pile topsoil under overhead power lines.

Subsoil
The stripped sub-soil shall be stored for re-use away from the side of the excavation and separate from the topsoil.

Warning: **Do not** pile subsoil under overhead power lines.

Contaminated Soil

Note: Any excavation where contaminated ground is encountered shall have a Hazard Risk Assessment completed. This Risk Assessment shall take into consideration the duration that the excavation is expected to be open.

8 Backfilling Procedures

8.1 Preparation

Backfill Materials
No perishable materials such as vegetable growth, timber bush, etc are to be filled into the trench.

Backfilling Guidelines
Backfilling operations in well-compacted layers should be carried out in such a manner as to prevent heavy loads passing over the pipeline. Allowance should be made for sufficient overfilling or mounding of the filled trench to compensate for subsequent settlement.
The following guidelines apply to backfilling operations:

Note: If a compactor is used, area gas monitoring shall be conducted throughout the compacting activity

1. All water shall be removed from the trench before backfilling commences.
2. The bottom of the trench shall be padded as far as is reasonably practicable with a minimum of 150mm of suitable granular material, i.e., building sand.

Note: The removal of any fine materials from riverbanks and / or riverbeds is strictly prohibited.

3. The original topsoil is to be replaced in the top of the trench with the same depth as that on the working width.
4. All surplus excavated materials, rock, welding rods, waste and all unwanted material shall be removed from the site of the works and the site left in a tidy condition.
5. On completion of backfilling all fields, verges, tracks, paths, garage drives and access roads should be permanently reinstated to a condition equivalent to that before the commencement of the work.
6. Any damage to field drains etc. must be repaired and local farmer/land owner be invited to inspect the repair(s) prior to backfill.

9 Site Reinstatement

Reinstatement of the site shall be implemented in accordance with the Contract Specifications.

9.1 Drainage

Any field drains that have been damaged should be repaired or replaced. Drainage patterns should be returned to their original state by using the same permeable materials that were excavated. Topsoil reinstatement should take place in dry conditions to prevent permeability and drainage characteristics from being altered through compaction.

9.2 Topography

In addition, excavated soils should be redistributed across the entire right-of-way to restore the natural topography. Any areas outside the trench area that have been compacted by moving vehicles should be loosened using deep-tine cultivators. The responsible department in order to ensure that restoration is satisfactory or to ensure that monitoring should continue should carry out a final inspection.

9.3 Fire Fighting Procedure

1 Introduction

1.1 Document Purpose

This Safe System of Work provides the information necessary for ensuring the safety of personnel, buildings, installations, and plant with regard to fire prevention, detection and protection.

1.2 Document Scope

The contents of this Safe System of Work apply to all personnel employed on this project.
This Safe System of Work does not remove the responsibility for compliance with local legislation and statutory requirements, which shall be complied with at all times.

2 Responsibilities

2.1 AREA AUTHORITY - SITE SUPERVISOR
Within their particular areas, Area Authorities are responsible for ensuring:

- compliance with this safe System of Work
- that fire prevention and housekeeping standards are maintained at all times
- that all fire fighting equipment is in date and fully functional
- that all activities are carried out in a safe and responsible manner with regard to fire risks, and that Risk Assessments are carried out wherever necessary.

2.2 All Personnel

All personnel, including contractors, are responsible for the prevention and detection of fire. In particular, all personnel are responsible for:

- immediately informing their supervisor of any situation that they consider to be a potential fire risk
- conducting themselves and their work in a fire-safe manner
- ensuring that they are aware of and fully understand the actions they must take in the event of a fire alarm
- ensuring that they are fully aware of the actions they must take on discovering a fire.

3 Fire Prevention

Prevention is the first line of defence against fire. All reasonably practicable measures shall be taken to reduce the fire risks to as low as reasonably practicable.

3.1 Housekeeping and Procedures

Properly established and applied housekeeping procedures are required in order to reduce both the risk of fire and the ultimate consequences should a fire occur.

Work Areas and Walkways
No materials, flammable or otherwise, should be allowed to accumulate in the workplace or in walkways, where they can present direct fire hazards or obstruct attempts to deal with a fire.

- Work areas and walkways should be kept free of any unnecessary flammable materials, including:
    - flammable materials or agents no longer required for the activity
    - combustible waste (for example, wood shavings, flammable dust)
    - packaging materials, particularly plastics and polyester foam waste which, when ignited, can give off large amounts of dense, black smoke and toxic fumes.
- All spills involving flammable liquids shall be cleaned up immediately. Where necessary, suitable cleaning materials should be provided and used.
- Flammable liquids should be dispensed over a drip tray, the contents of which should be disposed of at frequent regular intervals (for example, on completion of dispensing activities)
- Where necessary, working areas should be kept free of flammable dust accumulation by regular cleaning, and vacuuming spillages as they occur.

Waste Materials

- Suitable containers must be provided for waste materials. These containers must be clearly labelled with regard to their use and contents.
- Oily or paint soaked rags, waste, or clothing shall be placed in closed, metal containers that shall be emptied frequently, ensuring safe disposal of their contents.
- Contaminated waste materials should be disposed of safely in accordance with the Environmental Management Plan. If necessary, waste disposal experts should be used.

Working Practices

- Keep containers closed when not in use. If possible, use safety containers with self-closing lids.
- Only dispense flammable liquids in a safe place where there is good ventilation and no source of ignition.
- Take extra care when dealing with, or working close to, engine fuels, solvents and thinners. Nearly all refined liquid petroleum products will emit a flammable vapour and may convert naturally to a gaseous state at or below temperatures found in a normal working environment
- Do not use flammable liquids for cleaning machinery or machine parts.
- Suitable signs should be posted in areas where ignition sources or flammable materials are likely to be in use
- Identified fire risks should be dealt with immediately

3.2 Risk Assessments

All Activities
Risk Assessments shall assess the potential for a fire and its possible consequences. In particular, Risk Assessments should address the:

- existence of planned and accidental ignition sources
- proximity of combustible materials to the work area or storage area
- possible consequences of fire and the possibility of the fire spreading to adjacent areas

- provision of suitable and adequate fire fighting equipment and personnel
- requirement for contingency plans in the event of a fire or spillage
- competency of personnel involved in the work and of those who may be required to deal with the initial outbreak of a fire.

Hot Work
Hot Work, spark potential or naked flame, shall only take place under the control of a Permit to Work that is supported by a formal Risk Assessment.
See also *3.4 Hazardous Areas*.

3.3 Hazardous Areas

Area Classification
Areas are classified as hazardous or non-hazardous using recognised standards. The process of identification of hazardous areas is a multi-discipline task performed by Process and Safety Engineers in the development of a hazardous area classification.
The areas may be classified as:

Zone 0: in which a flammable atmosphere is continuously present or present for long periods.
Zone 1: in which a flammable atmosphere is likely to occur in normal operation.
Zone 2: in which a flammable atmosphere is not likely to occur in normal operation, and if it does it will exist for only a short time.
Non-Hazardous: in which an area is not one of Zone 0, 1 and 2.

Plant and Equipment in Hazardous Areas
Equipment and plant used in Zones 0, 1, and 2 must be explosion proof and electrical devices must be intrinsically safe.
Any source of unplanned ignition, including mobile phones, matches and cigarette lighters **shall not** be taken into these areas.

Motor Vehicles and Internal Combustion Engines
Special precautions are required for the use of motor vehicles and internal combustion engines. In particular:

- motor vehicles and internal combustion engines shall not be allowed in Zones 0 and 1
- motor vehicles and internal combustion engines shall only be allowed into Zone 2 under a Hot Work (Spark Potential) Permit.

Hot Work in Hazardous Areas
All hot work, in a hazardous area or otherwise, shall only be carried out under the control of a Hot Work permit, either spark potential or naked flame. The issue of a Hot Work permit is dependent upon the results of a formal Risk Assessment that shall fully address the fire risks involved and the Hazardous Zone classification.

3.4 Handling and Storage of Flammable Substances
Handling

- Site Managers and Area Supervisors shall be aware of hazardous and flammable materials that are used or stored within their areas of responsibility and shall have contingency plans in place for dealing with spills and fires involving these materials
- Personnel handling flammable materials shall be suitably qualified and trained in the use and properties associated with those materials

- Personnel handling or dealing with flammable substances shall be equipped with suitable personal protective equipment, including but not necessarily limited to face protection, hand protection and fire-proof overalls
- Suitable fire fighting equipment shall be made available in areas where flammable substances are handled.

vi) Storage

- Site Managers and Area Authorities shall be aware of all flammable materials stored within their areas of authority
- Flammable substances shall not be stored near to sources (potential or real) of flame, high heat or near other combustible materials
- Flammable substances shall be stored in secure storage areas or facilities
- Storage areas for flammable liquids and gases shall be well ventilated in order to promote rapid dispersal of vapors given off from leaks, spills or unplanned releases
- Storage areas for flammable substances shall have signs and notices clearly posted warning personnel that flammable substances are present
- Where necessary, storage areas shall be equipped with adequate containment facilities, for example trays or bunding, to prevent spills from spreading to other areas
- Containers used for flammable materials shall be clearly and accurately labelled with regard to their contents
- Glass containers shall not be used for storing flammable liquids.

3.5 Fire Protection of Buildings and Plant

As a minimum, building work shall comply with local authority requirements.
New and altered buildings / installations and work sites shall be formally assessed and adequate provision made for:

- fire detection
- fire fighting equipment (fixed and portable)
- personnel escape routes.

Note: Any buildings, installations, or sites undergoing structural alterations or a change of use must be reassessed for the above points.

4 Fire Detection

4.1 Fixed Fire Detection Systems

Description and Types

Heat detectors (electro-pneumatic; electronic; heat sensing wire; quartzoid bulbs)
Smoke detectors (photo-electric cell, ionisation detectors, continuous air sampling)
Flame detectors (infra-red detectors, ultra violet detectors)

Location and Use

As a minimum, fixed fire detection systems shall be located and used in accordance with the manufacturer's recommendations and in accordance with local legislation.
Detection systems shall not be modified in any way without undergoing a thorough Risk Assessment. All modifications shall be recorded and held on site.

Operation

Fire detection systems shall include an automatic alarm system that:

- alerts personnel to an outbreak of fire
- provides indication of where the fire is.
- activates a fire suppression system (for example, sprinkler system).

If for any reason these facilities must be overridden:

- personnel must be informed (for example by public announcement)
- smoking shall not take place in the affected area
- any hot work in the affected area shall only be allowed under the control of a Permit to Work and only when alternative arrangements for fire detection and protection have been arranged (for example, the use of fire watchers).

Inspection and Maintenance
Fire detection systems should be inspected and maintained by a competent person and in accordance with the manufacturer's instructions and recommendations. The Site Manager shall ensure that a suitable inspection and maintenance programme is in place for fixed detection systems.

Inspection results and any repairs carried out to a fixed fire detection system must be recorded and held on site for future reference.

4.2 Manual Fire Detection

Site Specific Procedures
Personnel shall be made aware of site-specific fire and emergency procedures during their initial safety induction. The induction should cover:

- action to take in the event of a fire
- escape routes and muster points
- manual alarm point locations
- extinguisher locations

In addition, fire and muster instructions shall be posted at strategic locations around the site.

Note: At all times, personnel are responsible for making themselves aware of the fire and emergency procedures relevant to their location.

Person Discovering Fire
Personnel discovering a fire should:

1. Raise the alarm the alarm by shouting "FIRE FIRE FIRE".
2. If the fire is small and easily extinguishable and a suitable extinguisher is available, attempt to put out the fire without endangering themselves or others

or…

if the fire is not easily extinguishable or the initial attempt to extinguish the fire fails, evacuate the area closing any doors en route.

3. Follow the fire and emergency procedures specific to the site / installation.

4.3 Personnel Response to Fire Alarm

Upon hearing the fire alarm, personnel should:

1. Switch off / make safe the equipment they are using and leave the area / building by the nearest safe exit, closing doors and windows behind them
2. Proceed in accordance with local fire and emergency procedures.

Note: Personnel should not delay from evacuating to collect their personal belongings.

5 Fire Protection

5.1 Fixed Fire fighting Equipment

Description and Types

The most common types of fixed fire fighting systems are:

- Sprinklers
- High Velocity Water Spray (Automatic and Manual)
- Medium Velocity Water Spray (Automatic and Manual)
- High Expansion Foam Flooding Systems (Fixed and Portable)
- CO_2 Fire Suppression Systems (may be used in unmanned areas).

Location and Operation
As a minimum, fixed fire fighting systems shall be located and used in accordance with the manufacturer's recommendations and in accordance with local legislation.
Fixed fire fighting systems shall not be modified in any way without undergoing a thorough Risk Assessment. All modifications shall be recorded and held on site.

Inspection and Maintenance

As a minimum, fixed fire fighting systems should be inspected and maintained by a competent person and in accordance with the manufacturer's instructions and recommendations and local legislation. The Site Manager shall ensure that a suitable inspection and maintenance programme is in place for fixed fire fighting systems.

Inspection results and any repairs carried out to a fixed fire fighting system must be recorded and held on site for future reference.

5.2 Portable Fire fighting Equipment

Description and Types

- **Water:** Water filled extinguishes are suitable for use on fires involving paper, wood, and rubbish.
  Warning: Water extinguishers must not be used on electrical fires where there is a possibility of the water coming into contact with electrical sources.
- **Foam:** Foam filed fire extinguishers may be used successfully on fires involving paper, wood and general rubbish. However, foam fire extinguishers are primarily designed for use on oil fires.
  Warning: Foam extinguishers must not be used on electrical fires where there is a possibility of the foam coming into contact with electrical sources.
- **Dry Powder:** Dry powder filled extinguishers may be used on fires involving rubbish and oil and may also be used on electrical fires. However, the use of dry powder on electrical equipment usually makes that equipment unusable.
- **Carbon Dioxide (CO2):** CO2 extinguishers are intended for use on electrical fires only. If used on fires involving rubbish and debris, the pressure from the extinguisher is likely to disturb the seat of the fire and spread burning material. For the same reason they are not suitable for oil based fires.

Location
Portable fire fighting equipment must be placed in accordance with local fire regulations, national fire protection guidelines and any other requirements.

The location of all portable fire fighting equipment should be shown on safety plans placed at strategic locations around the site / installation.

Operation and Use - Recharging
All extinguishers must be recharged immediately after each use. Chemicals must never be mixed, as the resulting chemical reactions may damage the extinguisher.
Recharging must only be done by trained personnel.

Inspection and Maintenance
All maintenance of portable fire fighting equipment must be carried out by a competent person and in accordance with the manufacturer's recommendations and local legislation.
The following inspections represent the minimum requirements of any inspection programme:

- All extinguisher units must be in the designated location and clearly visible. Signs or painted red backgrounds may be used to identify extinguisher locations.
- All extinguishers must be visually checked every month to ensure operational reliability (for example, seals are in place, nozzles and hoses are free from damage and the units can be accessed easily).
- Annual inspections must be performed as per manufacturer's specifications and applicable regulations.
- Inspection results shall be documented for each extinguisher unit and retained on file at the local site.

6 Training and Drills

6.1 Training Programme
All personnel are required to be knowledgeable on the common causes and types of fire and must be familiar with the use of fire fighting equipment. This is achieved by the use of a comprehensive training programme that includes:

- established training courses for all personnel
- regular on-site drills and practices.

6.2 Training Records
Training records for all personnel shall be held on site.

6.3 Practice Drills
Practice drills shall be held at regular intervals according to an established programme. The drills shall be used to practice and improve personnel skills and knowledge in fire fighting techniques and also to highlight any shortcomings in established fire fighting procedures.

Appendix A - Definitions

List of Definitions

Fire Protection:	All measures used to minimize injury and loss through fire, including procedures, design, selection, installation and maintenance.
Fire Prevention:	Procedures used to minimize or prevent fire.
Fire Detection Systems:	Equipment designed to detect fire and raise the alarm.
Fire Suppression Systems:	Systems designed to suppress or extinguish fires through automatic or manual activation.
Emergency Procedures:	Planned measures designed to minimize the risk of injury in an emergency situation.
Combustible:	The property of any material or substance that will readily burn.
Flammable:	The property of a substance that ignites easily, burns intensely and has a rapid flame-spread.
Flash Point:	The lowest temperature at which a flammable or combustible liquid gives off vapors to form an ignitable mixture with air.
Ignition Temperature:	The lowest temperature at which a mixture of vapor and air will ignite without a spark or flame. The term also applies to the temperature of a hot surface that can ignite flammable vapors.
Flammable or Explosive Range:	The range between the smallest and largest amounts of vapor in a given quantity of air that will explode or burn. The amount is usually given in percentages and are based on normal atmospheric temperatures and pressures.
Water Solubility:	The capability of a flammable or combustible liquid to be soluble in water.
Spontaneous Combustion:	Ignition due to the rapid oxidation of a substance that generates enough heat for ignition to occur.

Appendix B – Checklist for Fire Safety Management

Note: This checklist in this appendix is provided as an *aide memoir* only, and is not intended for use as an approved test certificate or an official document:

Checklist for Fire Safety Management

- Ensure that written fire safety and emergency evacuation instructions are provided, properly displayed and regularly updated.
- Ensure that all means of escape from buildings, installations and work areas are properly indicated and readily accessible.
- Ensure that adequate fire fighting equipment is provided, correctly located and indicated.
- Make all personnel aware of the location of escape routes, fire alarms and fire fighting equipment.
- Arrange training in the use of fire fighting equipment.
- Keep readily combustible materials and flammable liquids to a minimum consistent with reasonable requirements and ensure that relevant statutory requirements, codes and client standards are observed, particularly during cutting and welding operations.
- Ensure that good housekeeping is practised, for example, the removal of unwanted rubbish and packing materials from the work area.
- Ensure that an annual fire safety audit of all premises is carried out.

- Refer to the HSE Adviser in the event of queries.

8.4 Work at Height Safety Procedure

1 Introduction

1.1 Document Purpose

This Safe System of Work provides the guidelines and precautions that must be adhered to in order to reduce the risks involved with personnel working at heights to as low as reasonably practicable.

1.2 Document Scope

The contents of this Safe System of Work apply wherever personnel are required to work at heights of 2m or above on this Project.
This document should be used in conjunction with Safe Systems of Work Procedure Scaffolding.

1.3 Requirement to Work at Height

The guidelines in this document only reduce the risks involved with working at height to a point where they are as low as reasonably practicable. They do not remove the risks entirely. For this reason, wherever possible, every effort shall be made to minimize the need for personnel to work at elevated positions.

In addition, all personnel have an obligation to halt any activity that they believe to be unsafe.

2 Responsibilities

2.1 PROJECT MANAGER
The Site Manger / OIM is responsible for:

- ensuring the requirements of this Safe System of Work are fully implemented and followed on the site / installation
- appointing competent person(s) to inspect and certify fall arrest equipment and associated systems, scaffolds, etc., as safe to use.

2.2 Supervisors

Supervisors of personnel working at height are responsible for following and implementing the guidelines and precautions included in this safe System of Work and shall ensure that all personnel under their supervision comply with the same.

2.3 Competent Person

The competent person shall be suitably trained, experienced and qualified to carry out the inspections and examinations, etc., as detailed in this Safe System of Work.

3 Working Platforms

The preferred system for working at heights requires the use of fixed platforms with guardrails or handrails fitted, and approved for use by a competent person, for personnel working at raised elevations. Fixed platforms may include:

- Aerial lifts (boom, scissor and snorkel types) used in accordance with manufacturers recommendations.
- Industrial trucks that are fitted with specifically designed personnel work platforms
- Scaffolding that has been erected to meet all requirements (refer to *Scaffolding Procedure*)
- Man lifts, specifically designed and used in accordance with requirements.

4 Fall Arrest Equipment

4.1 Use of Fall Arrest Equipment

Where work at height must take place without a fixed working platform, fall arrest equipment shall be used at all times.

Fall arrest equipment shall:

- be capable of limiting a fall to two meters or less
- be capable of supporting a static load of 5000lb (2275kg) per person
- be fitted to a proper anchor point (preferably overhead)
- include a full body harness with double latch self-locking snap hooks at each location
- use only synthetic fiber lanyards
- include a shock absorber

Harnesses, inertial reels, lanyards and lifelines, shall not be used for purposes other than protection of personnel.

4.2 Maintenance of Fall Arrest Equipment

All fall arrest equipment and systems shall be visually inspected at regular intervals and tested in accordance with the manufacturer's recommendations. Any equipment that is damaged or has been activated shall be removed from service immediately.
Any harness, lanyard or lifeline that has been subject to in service loading shall be removed from service.

Safety harnesses, inertial reels, lanyards and lifelines shall be inspected before each use and by a competent person. Any damaged items shall be removed from service immediately.
Any used fall arrest equipment must be cleaned regularly.

5 Movement and Working At Height

5.1 Access

Use only the safe means of access provided. Do not climb bracing or frames that are not specifically designed for climbing.

Note: All personnel are responsible, where necessary for insisting that proper and safe means of access are provided.

5.2 Movement

While working at height, personnel shall take care to move and climb safely. In particular, when on ladders:

- face the rungs as you climb up or down.

- use both hands on the ladder and maintain 'three point' contact (keep one hand firmly on frame or ladder at all times)
- do not try to carry materials while you climb
- ensure footing and balance before releasing hand grips
- do not work on slippery rungs.

5.3 Working on Roofs

Shallow Sloped Roofs
Work on roofs with slopes less than or equal to 4 in 12 (vertical to horizontal), with unprotected sides and edges 2m or more above lower levels, shall require fall protection measures that may include:

- guard rail systems
- personnel fall arrest systems
- combination of warning line system and guardrail system, or safety monitoring system.

Steep Sloped Roofs
Work on roofs with slopes greater than 4 in 12, with unprotected sides and edges 2m or more above lower levels, shall require fall protection in the form of guard rail systems with toe boards, safety net systems or personal fall arrest systems.

5.4 Working on Scaffolding

All scaffolding must have:

- guard rails on all open sides: top rail 42 inches above the work platform surface, middle rail 21 inches above the work surface.
- toe boards on all sides
- side screens on sides adjacent to passageways or thoroughfares
- scaffold boards in good condition and extending not less than six inches, nor more than 12 inches, beyond their end supporters (unless otherwise secured from being dislodged)
- an access ladder secured to the scaffold with minimum required clearances between ladder rungs and away from obstacles that interfere with safe use of the ladder.

Note: Loose articles and materials must be kept to an absolute minimum on scaffolding platforms. All necessary precautions must be taken to prevent objects from falling from scaffolds, e.g., by use of toe boards.

5.5 Safe Use of Ladders

Ladders may be used as a short-term alternative to scaffolding or as means of access to scaffolding, providing the points listed in this section are considered.

Note: Ladders are potentially dangerous. The must common type of accident occurs through a ladder slipping.

- Always place a ladder on a firm base, set the angle near to 75°
- Make sure the ladder projects well above the level at which the user stands.
- Ensure sufficient overlap between stages of extension ladders.
- Do not load ladder beyond maximum intended load.

- Barricade traffic areas in vicinity of ladder use, and lock, barricade, or guard doorways in which a ladder is placed.
- Keep area around the top and bottom of ladder clear.
- Use only non-conductive side rails around live electrical equipment.
- Do not use top or top step for standing/stepping.
- Do not stand on cross bracing.
- Always face the ladder when ascending or descending.
- Always maintain 3 points of contact with the ladder (2 feet/1 hand or 2 hands/1 foot should be in contact with ladder at all times).
- Carry tools in pouches around waist; use a rope to raise or lower large items such as toolboxes or materials.
- Do not overextend sideways. Use the belt buckle rule: keep your belt buckle positioned between the side rails at all times, which will maintain your center of gravity.
- Never allow more than one worker on the ladder at a time.
- Do not erect ladders on sloping surface leaning to one side or at a steep an angle.
- Do not erect ladders for use as a plank or bridge.

Training
All personnel required to perform elevated work shall be fully trained in appropriate, safe work practices, including the wearing and care of associated safety equipment and the safe use of all elevated work equipment.

8.5 Scaffolding Safety Procedure

Introduction

1.1 Document Purpose

This document contains the guidelines necessary for the safe:

- construction, use, dismantling and control of scaffolding
- use of ladders.

1.2 Scaffolding Definition

Scaffolding is a temporary structure on which persons work and which provides support for the materials used in construction, maintenance, repair or demolition work. It can also be used to obtain access to certain areas of equipment.

Where work cannot safely be carried out from ground level or from part of a building or other permanent structure, there must be provided either scaffolding or, where appropriate, ladders or other means of support.

Note: The erection, dismantling and alteration of scaffolding must be carried out by competent workmen under competent supervision

2 Responsibilities

2.1 Project Manager

The Project Manager is responsible for:

- ensuring the requirements of this standard are implemented on their facilities

- appointing a competent person to inspect and certify scaffolds as safe to use.

3 Scaffolding Design requirements

3.1 Materials

All Materials
Before use, a competent person must inspect all scaffolding and material used in construction in order to ensure:

- it is in good condition and is serviceable
  Note: Damaged or deteriorated equipment **shall not** be used
- It is in compliance with this Procedure.

Wood Planks
Wood plank should be inspected to see that it is:

- graded for scaffold use
  Note: Wood planks used for scaffolding must be specifically graded for scaffold use by a nationally recognized grading agency.
- is sound and in good condition
- straight grained, free from saw cuts, splits and holes.
- In the case of 38mm thick, are banded at either end or nail plates fitted

3.2 Construction

National Requirements
The scaffold assembly must be designed to comply with local state and İnternational Safety requirements, whichever is the higher.
Scaffolds required with a loading capacity greater than 2.5kn/m2 must always be subject to qualified scaffold designer input / approval.

Load Calculations
Frame spacing and mud sill size can only be determined after the total loads to be imposed on the scaffold and the strength of the supporting soil or structure are calculated and considered. A qualified person prior to the scaffold structure being built must do this analysis.

Note: Manufacturers load carrying information shall be used for design calculations

Construction, Dismantling and Alteration
Competent workmen under competent supervision must carry out the erection, dismantling and alteration of scaffolding.

Plumb and level scaffold until connections can be made with ease. Do not force members to fit. Be sure scaffold stays level and plumb as erection progresses.

During dismantling of scaffolding, poles and fittings shall not be dropped to the ground but always carefully lowered. Poles shall be stacked flat and fittings collected into bags or containers.

Support and Bracing

Scaffolding must be securely supported or suspended, and where necessary braced to ensure stability. Unless constructed as freestanding independent scaffolding, it must be rigidly connected with the building or structure (not to pipe work).

Ties, guys, bracing and/or outriggers may be needed to assure a safe stable scaffold assembly. Determine the need for stability bracing.

If in doubt – ask.

The requirement for stability bracing is dependent upon:

- the height of the scaffold in relation to the minimum base width

Note: Freestanding Scaffolds with a height in excess of 4 times internally or 3.5 times externally, the minimum base width dimension must always be secured to a rigid structure or seek alternative means of support.

Internally = no wind loading
Externally = relatively sheltered locations / minor wind loading

- wind loads
- the use of brackets or cantilevered platforms
- imposed scaffold loads.

Ties:

- The bottom tie must be placed no higher than four (4) times the minimum base width and every four (4) meters vertically thereafter. Ties should be placed as close to the top of the scaffold as possible and, in no case, more than three (3) times the minimum base width of the scaffold from the top.
- Vertical ties should be placed at the ends of scaffold runs and at no more than 4meters horizontal intervals in between.
- Ties should be installed as the erection progresses and not removed until the scaffold is dismantled to that height.
- Ties should be constructed to 6.25kn (slipload) unsheeted & 12.5kn sheeted

Guys:

- Each leg of a freestanding tower must be guyed at the intervals outlined above or otherwise restrained to prevent tipping or overturning.

Note: Circular scaffolds erected completely around or within a structure may be restrained from tipping by the use of "stand off" bracing members.

Planks

- Work platforms must be fully planked either with scaffold graded solid sawn or laminated plank, in good sound condition, or with fabricated platforms in good condition.
- Each plank must overlap the support by a minimum of 1.5 x thickness or be cleated / securely tied for example, 3-meter planks on 2.8 meter spans must be cleated/securely tied.
- Plank must not extend beyond the support by more than 4.5 x thickness Such overhangs should be separated from the work platform by guard-railing so that they cannot be walked on.
- Spans of full thickness, 50mm by 250mm scaffold grade planks, should never exceed 2.6m. Loads on plank should be evenly distributed and not exceed the allowable loads for the type of plank being used.
- Spans of normal thickness (38mm) boards should never exceed 1.5m.
- Planks and/or platforms should always be secured to scaffolding to prevent uplift or displacement due to high winds or other job conditions.

Guardrails and Toe Boards

- The scaffolds shall be supplied with the toe boards and guardrails when the height of planks location is 1,3 m and over.
- The height of the top guardrails shall be between 910mm & 1150mm and distance between the posts of guardrails should not exceed 2.7 meters.
- Guardrails must be used on all open sides and ends of scaffold platforms. Both top and mid-rails are required. Local codes specify the minimum heights where guardrails are required, however, use at lower heights if falls can cause injury.

Transoms

A transom is a length of scaffold tubular used as a cross-member to support planking on working lifts & provide lateral structural support on non-working lifts. Particular care and attention shall be paid to the use of transoms. In particular:

- transoms should overhang the support points by at least 150mm
- transoms hangers shall be used with bolts fastened to support transoms on frames
- transoms spans greater than 2.7m (very light duty), 2.4m (light duty) or 2.1m (general purpose) require knee bracing and lateral support
- transoms used as side or end brackets need special bracing.

Note: Transoms **must not** be used for the storage of materials.

Scaffold Access

Access must be provided to all work platforms. If it is not available from the structure, access ladders, frames with built-in ladders, or stairways must be provided. When frames with built-in ladders are used, cleated plank or fabricated plank must be used at platform levels to minimize or eliminate platform overhang. Access ladders must extend at least 1 metre above platforms.

Bridging Scaffold

Bridging between towers should not be done with plank or stages unless the overturning moments have been compensated for & suitable guardrails, ties etc are fitted.

Mud Sills and Screw Jacks

Mud sills must be of adequate size to distribute the loads on the scaffolding to the soil or supporting structure. Sills should be level and in full contact with the supporting surface.
Base plates or screw jacks with base plates must be in firm contact with both the sills and the legs of the scaffolding. Compensate for uneven ground with screw jacks with base plates. DO NOT USE unstable objects such as blocks, loose bricks, etc.

Dismantling Scaffold

3.3 Rolling Scaffolds

The tower height must not exceed 3.5 times internally or 3 times externally the minimum base dimension. Outrigger frames or outrigger units on both sides of the tower may be used to increase base width dimension when necessary.

All casters must be secured to frame legs or screw jacks with a nut and bolt or other secure means. Total weight of tower + men, materials & tools etc should not exceed the capacity of the casters.

Screw jacks must not be extended more than 300mm above caster base. Tower must be kept level and plumb at all times.

Horizontal/diagonal (plan) bracing must be used at the bottom and top of tower and at least every alternate lift. Fabricated planks with hooks may replace the top diagonal brace.

- All frames must be fully cross-braced.
- Only prefabricated plank or cleated / tied planks should be used.
- Casters must be locked at all times the scaffold is not being moved.

4 Inspections and Scafftags

4.1 Site Inspection (Pre-Construction)

The job site should be inspected to determine ground conditions or strength of supporting structure, and for proximity of electric power lines, overhead obstructions, wind conditions, the need for overhead protection or weather protection coverings. Special care is needed when scaffolding is to be erected on fill or other soft ground or on frozen ground. These conditions must be evaluated and suitably provided for.

4.2 Site Inspection (Post-Construction)

A competent person shall inspect scaffolding:

- before it is first used and then at least once every week
- following any alteration
- if it has been exposed to weather conditions likely to affect its strength or stability.

Details of inspections must be recorded.

4.3 Scafftags

“Scafftags” shall be used on all scaffold structures, whether complete or part complete/dismantled to indicate whether or not the scaffolding is safe to use.
Scafftags must be positioned prominently at access points to scaffold structures.
When scaffolding is incomplete (whether partly erected or dismantled) or considered to be unsafe for any reason, the green scafftag must be pulled to display the red (Do Not Use) tag. In addition, access to the scaffold shall be barriered off as soon as practicable.
Scaffolding Use

5.1 Inspection

Inspect the scaffold assembly before each use. In particular, check:

- the Scafftag – Pay particular attention to the load rating
- that the scaffold is assembled correctly:
- that it is level and plumb
- base plates are in firm contact with sills
- bracing is in place and connected
- platforms are fully planked with guardrails in place
- safe access is provided
- that the scaffold is properly tied and/or guyed
- there are no overhead obstructions or electric lines within 4 meters of the scaffold assembly.

5.2 Access

Use only the safe means of access provided. Do not climb bracing or frames not specifically designed for climbing. If access is not provided, insist that it be provided.

5.3 Working Safely

Personnel Movement on Scaffold
While working on scaffold, personnel shall take care to climb safely. The following work practices shall apply:

- Climb safely. In particular, when on ladders:
- face the rungs as you climb up or down.
- use both hands on the ladder and maintain 'three point' contact (keep one hand firmly on frame or ladder at all times)
- do not try to carry materials while you climb
- ensure footing and balance before releasing hand grips
- do not work on slippery rungs.
- do not overload platforms with materials
- **Never** add sheeting to a scaffold structure without consulting a qualified person.
- do not extend working heights by using planking guardrails or by use of boxes or ladders on scaffold platforms
- Do not remove any component of a completed scaffold assembly. Alterations shall only be carried out by suitably qualified / authorized personnel under the supervision of a qualified person.

Note: Any removed component should be immediately replaced.

Dropped Objects
Loose articles and materials must be kept to an absolute minimum on scaffolding platforms. All necessary precautions must be taken to prevent objects from falling from scaffolds, e.g. by use of toe boards.

Cantilevered Platforms
Materials should never be placed on cantilevered platforms unless the assembly has been designed to support material loads. (These types of platforms cause overturning and uplift forces, which must be compensated for. All frames should be fastened together to prevent uplift an overturning moment compensated for with counterweights or adequate ties).

Hoisting and Lifting
Scaffold should not be used as material hoist towers or for mounting derricks unless the assembly is designed for that purpose.

- Rolling Scaffolding

- Do not ride manually propelled rolling scaffold. No personnel should be on the tower while it is being moved.
- Lock all casters before getting on the tower.
- Work only within the platform area: do not try to extend overhead work area by reaching out over guard railing.
- Do not bridge between two rolling towers with plank or stages.
- Secure all materials before moving scaffolds.
- Be sure floor surface is clear of obstructions or holes before moving scaffold.

- Be sure there are no overhead obstructions or electric power lines in the path of rolling scaffold.
- Rolling towers must only be used on level surfaces.
- Move rolling towers by pushing at the base level only. Do not pull from the top.

5.5 "Quick Erect" Aluminum Scaffolding

The use of "quick erect" aluminum scaffold systems can be used subject to local controls such as restricting use to non-hazardous areas and appropriate storage.

6 Ladders

Ladders may be used as a short-term alternative to scaffolding or as means of access to scaffolding, providing the points listed in this section are considered.

Note: Ladders are potentially dangerous. The must common type of accident occurs through a ladder slipping.

6.1 Transporting and Moving Ladders

Unless space restrictions dictate otherwise, always carry ladders parallel to the ground.
Do not move, shift, or extend a ladder while the ladder is occupied.

Note: **Do not** walk a ladder

Tie ladders down securely when transporting.

6.2 Maintenance

Ladders shall be inspected and maintained by a competent person. The record of inspections shall be registered not be longer than six months.
Maintain ladders free of oil, grease, and other hazards.

Do not use any ladder with structural defects; properly tag the ladder with a "Do Not Use" notice
and withdraw the ladder from service.

6.3 Preparation

Inspect ladder prior to EVERY use.
Before using a ladder, ensure that it is the correct item of equipment for the job in hand and that it is in good condition

Warning: Aluminum ladders **must not** be used in hazardous areas due to the danger of sparks when the ladder impacts steel).
Use ladders only for the purpose for which they were designed (refer to manufacturer's labelling and recommendations).

6.4 Safe Use of ladders

- Always place a ladder on a firm base, set the angle near to 75°.
- Make sure the ladder projects well above the level at which the user stands.
- Ensure sufficient overlap between stages of extension ladders.
- Secure the ladder in place wherever reasonably practicable.

- A standby person should remain at the base of the ladder whenever the ladder is in use.
- Do not load ladder beyond maximum intended load.
- Barricade traffic areas in vicinity of ladder use, and lock, barricade, or guard doorways in which a ladder is placed.
- Keep area around the top and bottom of ladder clear.
- Use only non-conductive side rails around live electrical equipment.
- Do not use top or top step for standing/stepping.
- Do not stand on cross bracing.
- Always face the ladder when ascending or descending.
- Always maintain 3 points of contact with the ladder (2 feet/1 hand or 2 hands/1 foot should be in contact with ladder at all times).
- Carry tools in pouches around waist; use a rope to raise or lower large items such as tool boxes or materials.
- Do not overextend sideways. Use the belt buckle rule: keep your belt buckle positioned between the side rails at all times, which will maintain your centre of gravity.
- Never allow more than one worker on the ladder at a time.
- Do not erect ladders on sloping surface ,leaning to one side or at to steep an angle.
- Do not erect ladders for use as a plank or bridge.

8.6 Confined Space Entry Procedure

1 Introduction

Note: A Hazard Assessment must be completed before any entry into a confined space (See *Risk Assessment Procedure*).

The Hazard Assessment should identify the:

- sequence of work to be performed in the confined space
- specific hazards known or anticipated
- control measures to be implemented to eliminate or reduce each of the hazards to an acceptable level.

No entry shall be permitted until the Hazard Assessment has been reviewed and discussed by all persons engaged in the activity.

Personnel who enter a confined space must be informed of all known or potential hazards associated with the confined space to be entered.

1.1 Purpose

The purpose of this procedure is to:

- identify and define confined spaces
- describe the proper procedures and preparations to protect the health and safety of all personnel who must work in confined spaces.

1.2 Scope

This mandatory procedure applies to road construction project of XXXX

1.3 Confined Space - Definition

Properties of a Confined Space
A **"confined space"** is any enclosed or partially enclosed space which:

- is large enough for any person to bodily enter it and perform assigned work
- has limited or restricted means of entry or exit
- has unfavourable natural ventilation
- is not designed for continuous occupancy.

Note: Confined spaces often present, or have the potential to present, hazards related to atmospheric conditions (e.g., toxic, flammable, asphyxiating), engulfment, or entrapment.

Confined Space Examples
The general definition of a confined space shows that many types of space may be considered confined and therefore hazardous, including:

- tanks
- vessels
- ducts
- sewers
- pits
- flues

Other Confined Space Examples
The definition also includes any space in which dangerous levels of contaminants can accumulate and ventilation is restricted, which can include:

- excavations (normally deeper than 1.2m)
- the space above floating roofs on floating roof tanks
- open topped tanks
- closed or unventilated rooms
- sumps and culverts
- any other poorly ventilated area.

1.4 Confined Space - Hazards

The hazards associated with entering and working in confined spaces are capable of causing bodily injury, illness, and death to the worker. Hazards commonly encountered in confined spaces include:

- toxic substances in hazardous concentrations, e.g., hydrogen sulphide (H2S), benzene and hydrocarbon gases
- flammable gases, vapours and liquids with potential for fire or explosion; above 10% of the lower explosive limit (LEL) or above 0% LEL if hotwork is required
- gas, vapour or fumes produced by operations carried out in the confined space, e.g., welding and cutting, brush and spray painting, and the use of adhesives and solvents
- lack / insufficient oxygen supply, causing asphyxiation (oxygen content below 19.5 % by volume is considered oxygen deficient atmosphere)
- oxygen enriched atmospheres (oxygen content above 23% by volume)
- electric shock or ignition of flammable gases from portable lights, tools, or associated electrical equipment

- injury from mechanical equipment such as mixers, conveyors, etc., inadvertently activated
- direct contact with corrosives or irritants
- contaminants entering from other areas through ducts, piping, etc
- ignition from static electricity
- sources of ionizing radiation (e.g., level gauges, naturally occurring radioactive materials)
- general safety hazards, including communication problems and physical hazards. For example:
  - falling objects, inadequate visibility, excessive temperature / noise / vibration, etc
  - possible collapse of excavations.

2 Training and Responsibilities

2.1 Training

Employees who will be involved in the entry must be fully conversant with the Emergency Action Plan and be trained in:

- hazard recognition
- Safe Systems of Work - permit to work procedures, isolation procedures, purging and/or ventilation procedures
- the use of gas detectors
- the use of safety equipment such as breathing apparatus (BA set), respirator, retrieval harness and lines
- the use of communication equipment
- self rescue.

2.2 Responsibilities

Note: For all confined space work, the responsibility for safety, during the entire operation, rests with the Performing Authority, Rescue Team personnel and Authorized Entrants. These personnel must ensure that adequate steps have been taken to eliminate or control the hazards present.

Area Authority

The Area Authorities are responsible for:

- identifying all confined spaces existing within their areas of responsibility
- identifying and labeling Entry Certificate Controlled Confined Spaces
- providing training in confined space entry
- reviewing entry operations to ensure personnel are protected from confined space hazards
- canceling or suspending the Confined Space Entry Certificate when the job is complete or when unacceptable conditions arise.

Performing Authority
The Performing Authority shall:

- know and recognise hazards that may be faced during entry
- authorise entry and allow entry to begin (provided that the requirements of this procedure have been met)

- ensure that responsibilities are safely and effectively transferred
- ensure that personnel entering a confined space have all necessary personal protective equipment
- ensure that rescue services are available and that the means for summoning those services are operable
- ensure acceptable entry conditions are maintained and that they remain consistent with the terms of the Confined Space Entry Certificate.

Authorized Entrants
The authorized entrants shall:

- follow established safety standards and practices
- know and recognize the hazards that may be faced during entry including signs or symptoms, and consequences of the exposure
- make proper use of equipment and protective devices
- maintain communication with the attendant to enable the attendant to monitor the entrant's status as well as to alert the entrant to exit the confined space if there is a hazard noted
- alert the attendant if a prohibited condition exists or when symptoms of exposure appear
- exit from the space as soon as possible when:
  - ordered by the attendant
  - the entrant recognizes the warning signs or symptoms of exposure
  - a prohibited condition exists.

Confined Space Attendant
The attendant must be properly trained to carry out his duties. He must remain outside the confined space, **in a safe atmosphere**, at all times during a confined entry operation and perform the assigned duties under this procedure. He must also:

- maintain an accurate count of all persons in the space by:
  - using a tally board on which the name, entry and exit times for all personnel entering or leaving the confined space shall be recorded
  - airlines and / or safety lines are marked so that each individual inside the tank is clearly identified in the event of a problem
- be aware of the hazards that may be faced during entry, including the mode, signs or symptoms, and consequences of any exposure
- monitor conditions and activities inside and outside the space to determine if it is safe for entrants
- remain outside the confined space during entry operations until relieved by another attendant
- maintain effective and continuous communication with authorized entrants during entry
- order authorized entrants to evacuate the confined space immediately if:
  - a condition is observed that is not allowed
  - behavioral effects of hazard exposure are detected
  - a situation occurs outside the confined space that could endanger the entrants
  - an uncontrolled hazard is detected inside the confined space
  - the attendant must leave the work station
- summon rescue and other emergency services in emergencies.
- take necessary actions when unauthorized persons approach or enter a confined space while entry is underway.

3 Rescue Team

3.1 The Rescue Team

The Rescue Team should respond immediately to rescue calls from the Attendant or any other person recognizing a need for rescue from the confined space.
The Rescue Team must be trained to perform the assigned rescue functions. In particular, members must be trained in the proper use of personal protective and rescue equipment, including breathing apparatus. Also, at least one Rescue Team member shall be certified in first aid and in cardiopulmonary resuscitation (CPR).
Note: New personnel **shall not** be assigned to the confined space entry tasks, unless under training and accompanied by a competent person who is familiar with the hazards of confined space entry.

3.2 The Rescue Plan

The rescue plan should be formulated to include as a minimum:

- an assessment of the hazards associated with the confined space
- the required gas testing/monitoring equipment
- the personnel required to perform the rescue
- all precautions to be taken while in the confined space
- the required personnel protective equipment
- the required rescue equipment
- the required tools and any other special equipment.

A means of communication shall be provided and a system of signals agreed and understood by all personnel involved. These communication arrangements shall be maintained throughout the duration of the entry.

In all cases of confined space entry, a trained attendant shall be posted outside the entry/exit in order to handle emergencies. Circumstances may require an assistant to the attendant or more than one attendant posted at different access/entry points. The attendant(s) must be aware of their responsibilities and be trained as rescue team members.

4 Personal Protective Equipment

4.1 Personal Protection

Appropriate personal protection, e.g., head, foot, hand, eye, ear, face, body and respiratory protection, must be worn when entering an Entry Certificate Controlled Confined Space.
A life line attached to a full body harness must be used by all entrants during entry into a confined space.

4.2 Respiratory Protection

Dependent upon the type and concentration of contaminants, respiratory protection may range from a simple cartridge respirator to air-supplied respiratory equipment.
When the level of airborne contaminants is beyond the filtration capability of a respirator or where there is an oxygen deficiency, then breathing apparatus must be used.

Breathing Air Standards
The need to ensure a continued provision of good quality breathing air relies on regular changing of air filters and maintenance of dryers, supported by periodical analysis of the breathing air supply.

Note: Breathing air shall conform to *BS 4275, "Recommendations for the Selection, Use and Maintenance of Respiratory Protective Equipment".*

Air Line Mask
Air line breathing apparatus shall be approved and conform to *EN 139*. The full face mask enables the wearer to work for a long periods in harmful atmospheres, whilst breathing air is supplied by either portable air compressors fitted with reservoir air tanks, or a battery of compressed air bottles.
Connections to the air line mask hose are made via instantaneous bayonet spring couplings. These couplings must be kept in good condition and **must not** be used for any purpose other than supplying air to breathing apparatus.

Using Portable Air Compressors
Where no compressed air bottle supply is available, portable air compressors having a reservoir air tank may be used. In such cases:

- the compressor air intake(s) of the compressor must be upwind of any known source of contamination to ensure clear air being fed to the user (a wind sock indicating wind direction should be flown in the vicinity of the intake to the compressor)
- the system of air supply employed should incorporate a receiver of sufficient capacity to enable persons to escape from an irrespirable atmosphere in the event of a failure of the prime mover supplying the air
- the air must be passed through suitable filters to remove excess moisture and oil mist.

Note: To ensure that an adequate supply of air is available and being received by the wearers, a suitably competent person must be appointed who is responsible for checking the pressure in the air receiver, and for ensuring the filters are functioning properly.

Self Contained Compressed Air Breathing Apparatus (SCCABA)
SCCABA shall conform to *EN 137 "Self Contained Compressed Breathing Apparatus"*. These sets are provided where a portable supply of air is required for a short period of time.
The air for this apparatus is supplied under pressure either from compressed air cylinders carried by the wearer or from trolley sets.

4.3 Escape Breathing Apparatus

Any person entering a Confined Space using an airline Breathing Apparatus or a SCCABA set shall be provided with an Escape Breathing Apparatus set with a bottle capable of supplying an emergency air supply for approximately 10 minutes. This set shall also conform to *EN 137* "*Self Contained Compressed Breathing Apparatus".*

All persons required to use breathing apparatus must receive initial training and refresher training at intervals not exceeding six months. The training shall be recorded.

5 Confined Space Entry Precautions

These precautions shall be applied on each occasion of confined space entry.

5.1 Confined Space Entry Certificate

A Confined Space Entry Certificate must be completed before an approval can be given to enter an Entry Certificate Controlled Confined Space.

A copy of the certificate should be kept at the job site for the duration of the job. If the circumstances cause an interruption in the work or a change in the rescue arrangements for which the Confined Space Entry Certificate was approved, a new Confined Space Entry Certificate must be completed.

5.2 Pre-entry Briefing

Before the entry, the Performing Authority must brief entrants, attendants and supervisors on their responsibilities and the hazards and controls for safe entry.

5.3 Isolation

The confined space must be positively isolated from All Energy sources and flooding.

5.4 Cleaning
Before entering the interior of any vessel or tank, depending on the nature of its content, it must be emptied of residual material by being drained, pumped out, washed, and made clean by hot or cold water flushing, steaming, chemical neutralisation, inert gas or air purge.

Use of Chemical Cleaners
If chemical cleaners are to be used then the MSDS for the chemical should be consulted and a risk assessment conducted in accordance with procedure *Chemicals Risk Management* prior to use.
When introducing a chemical into a confined space, the compatibility of that chemical with the contents of the confined space must be checked. If any doubts exist regarding the compatibility of a chemical, the HEALTH AND SAFETY Department shall be consulted.
Sludge and spent cleaning fluids must be contained and disposed of in a safe and environmentally acceptable manner.

Bonding and Grounding
To reduce the possibility of static electricity build up, proper bonding and grounding procedures must be followed.

Welding
Before any welding, cutting and grinding may be carried out in a confined space, the space shall be proved completely gas free, and free of all flammable residuals.

5.5 Ventilation

Clean-out Doors
Where confined spaces are provided with clean out doors, these doors shall be opened after purging, and the confined space thoroughly ventilated.

Use of Ventilation Equipment
Ventilation shall preferably be accomplished using a positive method of mechanical ventilation that is arranged to:

- introduce sufficient fresh air and remove contaminants from all pockets or corners of the confined space
- avoid re-circulating contaminated air.

Even after the confined space is cleaned and ventilated, the mechanical ventilation equipment must be kept operating to provide secondary protection:

- in case of accidental introduction of harmful substances
- to remove contamination or heat that may be produced by the work (e.g., welding and cutting, painting, coating).

The atmosphere must continue to be gas tested and monitored for hazardous atmospheres while personnel are inside the confined space.

Ventilation Air Source
The ventilation air used will be from either:

- an electrical blower

or...

- an air driven blower.

The air intakes for these devices shall be located where no contaminants may enter the stream.

Disposal of Confined Space Atmosphere
Outlets for power driven blowers, pneumatic air eductors, or air/steam eductors used to draw vapors out of a confined space must be directed to a safe place far from possible sources of ignition.

5.6 Atmospheric Testing

Confined space atmospheres must be tested by qualified personnel (i.e., an Authorized Gas Tester Level 1) before entry is allowed. Tests shall be conducted for:

- oxygen deficiency or excess
- flammable gases and vapors
- toxic vapors and gases.

Test Requirements
Testing must be carried out in accordance with the following requirements:

- Ventilation equipment must be shut off before the tests commence.
- The atmosphere must be tested at the bottom, top, and the middle of all confined spaces.
- The atmosphere inside must be continuously monitored while work is being conducted in the confined space.
- If the confined space is left for any reason, the atmosphere shall be re-tested before re-entry may be permitted.

Testing from Within a Confined Space
Where practicable, the gas test shall be carried out from outside the confined space, e.g., using extension probes. If it is not possible to perform sufficient testing from the outside of the confined space then upon initial entry to a confined space to conduct any testing, self-contained or air-supplied breathing apparatus must be worn.

Note: If breathing apparatus has to be worn, the Authorized Gas Tester shall, if practicable, also wear a harness and a life line.

Test Equipment
Testing instruments must be calibrated and operationally checked before and after use in accordance with manufacturer specifications.

Test Record
The atmospheric tests and operational checks shall be recorded on the entry certificate.

5.7 Lighting and Portable Tools

Temporary Lighting
The following precautions shall be observed when using temporary lighting:

- Where the confined space has not been declared gas free, air driven flameproof lights or certified battery powered torches must be used.
- Confined spaces, which have been certified gas free but where flammable residues could remain, may be illuminated as above; or by extra low voltage (25V ac) portable lighting equipment.
- Where the confined space has been cleaned of all flammable residues and certified gas free, or is a confined space by virtue of restricted access alone and there has never been the possibility of it containing a flammable atmosphere, standard low voltage industrial lighting may be used.
- The supply cables to the transformers, for extra low voltage portable lights, must always be supported above ground and the transformers never taken inside the Confined Space.

Tools
If the atmosphere inside the confined space is classified as flammable/combustible no electrical tools must be used by the entrants. Air-driven tools only may be used. No tools with the potential to produce sparks, e.g., grinders or needle guns must be used.

6 JOB COMPLETION

The Entry Certificate must be canceled upon completion of the entry and after all entrants have exited.

At the end of a job, a thorough check must be made by performing authority to ensure that no personnel, tools or equipment have been left behind.

Appendix A - Definitions

List of Definitions

Acceptable Entry Conditions	Conditions that must exist in a Confined Space to ensure that employees can safely enter and perform work.
Attendant	An individual stationed outside the confined space who monitors the authorized entrant(s) and performs attendant's duties defined in this procedure.
Authorized Entrant	An employee who is authorized and trained to enter a confined space.
Authorized Gas Tester	An individual designated by the area authority to undertake gas test in confined spaces.
Breathing Apparatus (BA set)	A device which ensures that the wearer has a continuously available supply of uncontaminated air through a face mask, helmet or mouthpiece.
Entry	The action by which a person passes through an opening into a Confined Space.

Engulfment	The surrounding and effective capture of a person by a liquid or finely divided (flowable) solid substance that can be aspirated to cause death by filling or plugging the respiratory system or that can exert enough force on the body to cause death by strangulation, constriction or crushing.
Entry Certificate	A document to allow and control entry into an entry certificate controlled confined space.
Entry Certificate Controlled Confined Space	A confined space that has one or more of the following characteristics: 1. Contains or has a potential to contain a hazardous atmosphere. 2. Contains a material that has the potential to engulf an entrant. 3. Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly-converging walls or by a floor that slopes downward and tapers to a smaller cross-section. 4. Contains any other recognized serious safety or health hazard. Spaces in which dangerous contaminants can accumulate and ventilation is restricted, e.g. excavations (normally deeper than 1.2 m or 4 feet) the space above floating roof tanks, open-topped tanks and other poorly ventilated areas are also considered as Entry Certificate Controlled Confined Spaces.
Hazardous Atmosphere	An atmosphere that may expose authorized entrant(s) to the risk of death, impairment of ability to self-rescue, injury or acute illness.
Ionizing Radiation	Gamma rays, X-rays or corpuscular radiation, such as alpha and beta, which are capable of producing ions either directly or indirectly.
Naturally Occurring Radioactive Material	Radioactive material produced in conjunction with oil and gas as deposits within process equipment.
Performing Authority (Entry Supervisor)	A designated supervisor appointed by area authority to accept the Confined Space Entry Certificate and subsequently be in charge of the confined space entry work. This person is responsible for ensuring that all precautionary measures stipulated on the Confined Space Entry Certificate and accompanying documentation are followed.
Rescue Team	The personnel designated to rescue entrants from confined space.

8.7 Permit to Work Procedure

1. Introduction

1.1 Purpose

This procedure describes the Permit to Work system which is used to provide the controls necessary in achieving the safe performance of a specified range of potentially hazardous tasks.

Note: All personnel should be aware that the Permit to Work system is not an absolute safeguard in itself. It is the responsibility of each individual to be alert to hazardous situations that may arise during the operation.

1.2 Scope

The control of tasks on sites without High Risk Potential , e.g., supply bases and offices, will generally be satisfied by the use of an Application to Perform Work and an associated procedure. However, Permits to Work and supporting procedures shall be used where assessment of the risks indicates that they are necessary.

2 Responsibilities

Note: Within the activities controlled by the Permit to Work and Isolations procedures, a person may have more than one role, e.g., the Performing Authority and Isolator may be the same individual provided that all relevant training and competence requirements are completed.

2.1 Site Manager
The Site Manger is responsible for:

- the safety of all personnel on the site and for the safe execution of all work carried out on the site
- the implementation of the Permit to Work procedure in accordance with this procedure and its supporting procedures (and any local rules) at the site
- ensuring that the Permit to Work system is subject to active assurance, acting upon all recommendations and proposing system improvements
- ensuring that the personnel appointed under this procedure are competent to carry out the task for which they are authorized
- communicating the responsibilities of key participants within the Permit to Work and Isolations procedures, to those personnel under his direction
- reviewing the risk assessments and ensuring that they have been carried out for all permits that they are required to authorize prior to issue

Note: Site Managers shall request a higher level of risk assessment should they consider that risks have not been fully addressed

- approval and revalidation all Hot Work (Naked Flame), Hot Work(Spark Potential) and Cold Work(Special Task) Permits and Confined Space Entry Certificates in Hazardous Zones (see Hazardous Zones- Risk Assessment Procedure)
- auditing compliance with this procedure.
-

2.2 Area Authority - Supervisor

The Area Authority is responsible for:

- the safety of personnel and the safe execution of all activities undertaken within his area of authority
- processing all Applications to Perform Work and all applications for Permits to work
- the operation of the Permit to Work System and its supporting procedures in his area
- determining the extent of risk assessment required to support any permit application and for organizing and participating in the risk assessment process

- facilitating the identification of the hazards and precautions to be taken before, during and after all tasks covered by all Permits to Work and Supplementary Certificates
- identifying the impact of tasks and precautions on other areas and informing the Affected Area Authority of the proposed activities (this includes specifying the precautions which may be necessary as a result of activities in another area and ensuring that these are disseminated to all affected personnel)
- providing accurate and up to date cross-referencing between Permits and Supplementary Certificates including those in other areas
- ensuring that work site inspections are undertaken before, during and after the performance of each task (some of the inspection may be delegated to an appropriately competent person)
- the issue of Permits etc., to Performing Authorities in his area and subsequent re-validation (subject to approval by the Site Managerin appropriate cases)
- ensuring that adequate hand over takes place at shift change, crew change or other change-out of Area Authorities, Performing Authorities and Isolating Authorities
- maintaining a display board of all Permits and Certificates in use in his area of authority, together with a separate display board for Isolation Confirmation Certificates under which a Sanctioned Test is being performed and for long-term Isolation Confirmation Certificates.

2.3 Affected Area Authority

An Affected Area Authority is an Area Authority whose area of responsibility will be affected by work being undertaken principally in another area and under the control of another Area Authority.
The Affected Area Authority is required to be aware of, and in agreement with, work activities taking place which have a potential impact on his area of responsibility and control.

2.4 Performing Authority

The Performing Authority is the person who requires the work to be done (or who will do the work) and is the senior person in charge of the work controlled by a permit.

Note: The same person **shall not** have the role of both Area Authority and Performing Authority for the same Permit to Work.

The Performing Authority is responsible for

- safety at the work site
- taking part in the risk assessment process and disseminating the resulting output to the personnel who will be doing the work.
- ensuring that only those activities included in the Specification of Work detailed on the Permit to Work are undertaken
- immediately informing the Area Authority of any event which might impact on the safe performance of a task or on the associated precautions
- ensuring that adequate handover takes place at shift change, crew change or other change-out of Performing Authority
- ensuring that the work team have been withdrawn and the work site is left in a safe and clean condition on completion (or suspension) of the task.

2.5 Authorized Gas Tester

After appropriate training, the Authorized Gas Tester is authorized to test for the presence of flammable gas or vapor for Permit to Work compliance.

2.6 Authorized Electrical Persons and Senior Authorized Electrical Persons

Authorized Electrical Persons and Senior Authorized Electrical Persons are authorized for specific types of electrical / instrument work and are responsible for defining and carrying out electrical isolations in co-ordination with the Area Authority.
All Authorized Electrical Persons shall be competent to the level of Electrical Technician or Instrument Technician and authorized for work on low voltage systems.
The Senior Authorized Electrical Person shall be competent to the level of Electrical Supervisor and authorized for work on high voltage systems. The voltage (low or high) for which the person is authorized shall be stated on the authorization certificate.

2.7 Process Isolators

Process Isolators are responsible for:

- the specification, application, removal and recording of process isolations (process / mechanical Isolations) in accordance with the Area Authority's request on the Isolation Confirmation Certificate
- immediately informing the Area Authority of any event which might impact on the security of the isolations.

2.8 The Control Room Operator

The Control Room Operator shall:

- inhibit and re-instate sections of the Detection or Protection systems according to requests made by the Area Authority on the Permit to Work
- immediately inform the Area Authority of any event which might impact on the safe performance of a task or on the associated precautions
- maintain up to date written or computer-based registers of Permits and Supplementary Certificates, together with cross-references, unless local rules assign this responsibility to someone else
- maintain a display board of all Permits and Certificates in use **over the whole site**, together with a separate display board for Isolation Confirmation Certificates under which a Sanctioned Test is being performed and for long-term Isolation Confirmation Certificates.

2.9 Fire Watchers

Personnel appointed as Fire Watchers shall monitor work areas and the precautionary measures taken in those areas, when specified by the Area Authority on the Permit to Work, and shall undertake response activities as required.

2.10 The HEALTH AND SAFETY OFFİCER

The HEALTH AND SAFETY OFFİCER is responsible for:

- providing Permit to Work system design, including master documentation
- providing an advisory service on request
- arranging independent audits

- collating information on operating experience, from all sources, and initiating periodic system reviews aimed at further improvement.

3 TYPES OF PERMIT to Work

3.1 Permit to Work Categories

In the Permit to Work System tasks are allocated to one of the following categories:

- Hot Work (Naked Flame)
- Hot Work (Spark Potential)
- Cold Work (Special Task)
- Cold Work (Other Task)
- Formal Procedure
- No Permit Required.

Details of Permit colors, re-validation, maximum lives and senior signatories are shown in *Table 1*.

	Hot Work (Naked Flame)	**Hot Work** (Spark Pot.)	**Cold Work** (Special Task)	**Cold Work** (Other Task)	**Formal Procedure**	**No Permit Required**
Color	Red	Green	Yellow	Blue	White	N/A
Re-validation	At shift change of Performing Authority or 12 hours				Implicit at each shift change of Area Authority or Performing Authority	
Max Life	24 hours	72 hours	72 hours	7 day	Review Annually	N/A
Senior signatory	Site Manager	Site Manager	Site Manager	Area Authority	Area Authority	Area Authority

Table 1 Permit to Work Validation Details

3.2 Application to Perform Work

An Application to Perform Work form is used in the case of a formal procedure or where no Permit to Work is required. Its completion by the Area Authority provides a written record that personnel performing the task have been authorized to do so without a Permit to Work.

3.3 Supplementary Certificates

Five supplementary certificates are provided for use where specialist activities have to be performed before a Permit to Work can be safely issued:

- Isolation Confirmation Certificate
- Confined Space Entry Certificate
- Plant Contamination Certificate
- Clearance for Excavation
- Clearance to Move Heavy Equipment.

Provision is made for cross referencing the Permits and their associated certificates. The relationships between the Permits, the certificates and other components of the system are shown in *Figure 5*.

3.4 Hot Work (Naked Flame) Permit (RED)

This permit is used for tasks involving the use of a naked flame or ignition source, including:

- welding / flame cutting
- electrical induction pre-heating / stress relieving
- use of heat shrink blowers
- grinding.

Note 1: A Hot Work (Naked Flame) Permit is not required for operations involving ignited gas flares or permanently mounted plant using an enclosed flame (boilers, inert gas generators, etc.).

Note 2: It is Company policy to avoid hot work in hazardous areas wherever practicable. It is the role of engineers planning the work to minimize the need for hot work and provide cost effective alternatives by careful consideration during the design and planning phase.

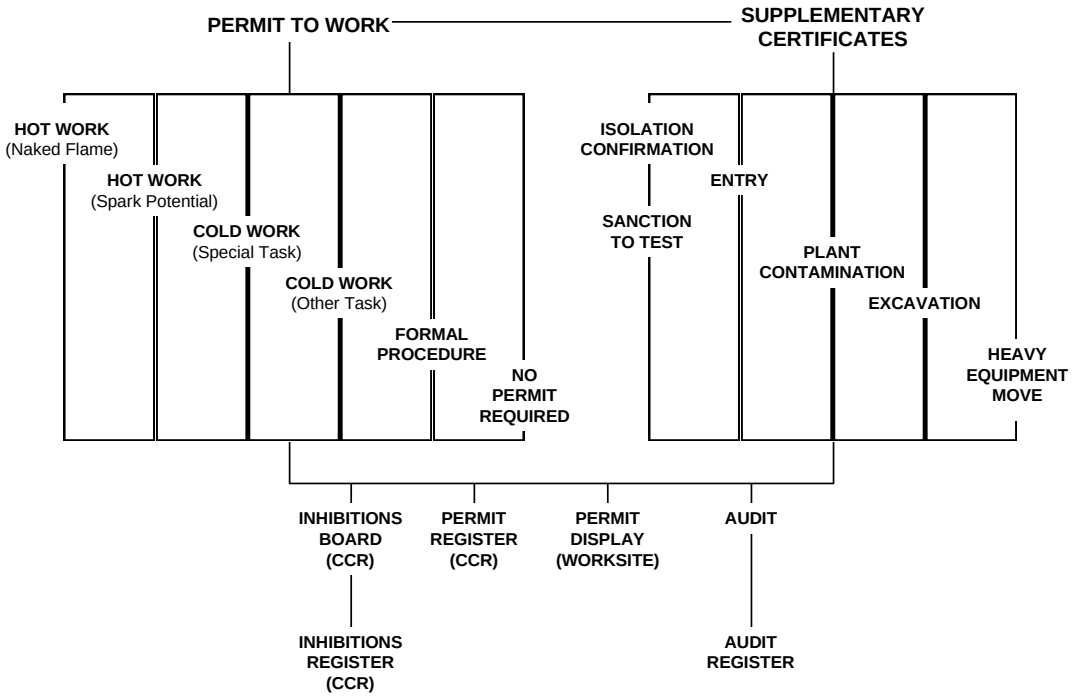


Figure 5 Relationship Between Permit to Work and Supporting Certification

3.5 Hot Work (Spark Potential) Permit (GREEN)

This permit shall be used if the task might produce or expose a possible source of ignition. For example:

- use of electrical / electronic equipment which has not been certified as suitable for use in flammable atmospheres
- opening live junction boxes
- use of air or hydraulic powered metal cutting, chipping or caulking tools
- use of electrical soldering irons
- use of explosives and perforating guns, including Slapper-Activated Firing Equipment
- use of powered steel wire brushes

- dry grit / shot blasting

3.6 Cold Work (Special Task) Permit (YELLOW)

This permit shall be used for a task which does not involve hot work but has a high-risk potential. For example:

- actual or possible breaking of containment of systems under pressure or systems which contain substances which are flammable, toxic or corrosive
- any work affecting the integrity or availability of safety or emergency systems e.g., fire pumps, fire mains, shutdown systems, fire and gas detection
- pressure testing of plant and equipment

3.7 Cold Work (Other Task) Permit (BLUE)

This permit shall be used for tasks which do not fall into the preceding categories of Permit to Work but still require to be covered by a permit. For example:

- brush painting in Confined Space
- general maintenance
- erection and dismantling of scaffolds
- work on isolated electrical equipment

3.8 Formal Procedures and Standing Orders

Formal Procedures
Certain low risk residual tasks of a routine and continuous nature may be performed under a written formal procedure rather than a Permit to Work. The formal procedure shall identify the full scope of the task together with the hazards and precautions and shall be authorized by the Site Manager.

Tasks performed under a formal procedure shall only be performed by suitably competent personnel.

Formal procedures shall only be used where any isolations fall within the scope of Personal Isolations (see *Section 4.1 Isolation Confirmation Certificate*) and they shall be reviewed at least annually. Examples include:

- fire and gas detector head checks and repairs
- public address system checks and repairs
- telephone system checks and repairs
- planned maintenance.

Standing Orders
Standing Orders, issued under the authority of the Site Manager, may be used to cover hot work tasks in workshops. Such orders shall specify the workshop concerned, the authorised use of only permanent facilities, the hazards involved and the precautions to be taken.

3.9 No Permit Required

The Area Authority may allow certain specific, routine, non-hazardous tasks to be performed in his area without the issue of a permit or a formal procedure provided that the tasks do not impact on another area.

The Area Authority shall satisfy himself that the risks are as low as reasonably practicable and that the tasks are performed by suitably competent personnel.
Many of the tasks that do not require a permit or the use of a formal procedure are themselves the subject of written procedures that have been risk assessed when originally produced. Such routines include:

- routine crane operations using fixed cranes, excluding heavy lifts and maintenance
- general cold work in workshops
- routine work in offices, and domestic activities.
- visual inspections, excluding Confined Spaces.

4 Supplementary Certificates

4.1 Isolation Confirmation Certificate

The Isolation Confirmation Certificate supports the Permit to Work by providing the means of:

- recording the isolations which are required before the task detailed on the associated Permit to Work can proceed
- confirming isolations have been made so that the task can proceed (subject to authorization of other certificates e.g., Confined Space Entry)
- authorization and recording of de-isolations and isolations which may be required to test equipment under a sanction to test
- authorization and recording of de-isolation on completion of the task detailed on the associated Permit to Work.

Note: The Isolation Confirmation Certificate must be completed before the relevant Permit to Work can be authorized.
Under certain circumstances, e.g., for short duration low risk tasks, the Area Authority may authorize isolation by the Performing Authority (Personal Isolation/De-isolation). However, an Isolation Confirmation Certificate shall always be raised and details entered in the Isolation Certificate Register. The Isolation Certificate shall be displayed on the isolation certificate board in the control room.
For full details of the Isolation Confirmation Certificate see *Isolation Process Safety procedure*.

4.2 Confined Space Entry Certificate

A Confined Space Entry Certificate shall be raised when it is necessary for personnel to enter confined spaces as defined in *Confined Space Entry procedure*.
This certificate provides the means of:

- declaring that the confined space is isolated so that the Authorized Gas Tester can enter, subject to any special conditions
- authorizing entry by the Authorized Gas Tester
- recording the gas test and re-test results
- declaring the confined space safe for entry under a Permit to Work
- specifying whether or not Breathing Apparatus is required
- written communication between the Authorized Gas Tester and Area Authority.

4.3 Plant Contamination Certificate

A Plant Contamination Certificate shall be used to cover the handling or transport of equipment which is, or has been, contaminated.

The certificate provides the means of:

- declaring that a contaminated piece of equipment has been cleaned, specifying the method(s) used
- defining the substances with which a piece of equipment is contaminated if it has not been cleaned
- specifying the precautions to be taken when handling a piece of contaminated equipment.

The certificate shall be securely attached to the equipment and a copy included with the manifest if the equipment is to be transported from the installation / site.

4.4 Clearance for Excavation Certificate

A Clearance for Excavation Certificate shall be used where any excavation or stake driving is planned, on any site.

The certificate provides the means of:

- applying for permission to excavate as specified
- recording the consent of those engineers responsible for the technical integrity of any underground equipment or services, subject to any specified precautions
- recording the consent of the Area Authority, subject to the issue of a Permit to Work
- acceptance by the Performing Authority, and his undertaking to observe the required precautions and to obtain the necessary Permit to Work before starting excavation.

4.5 Clearance to Move Heavy Equipment

A Clearance to Move Heavy Equipment Certificate shall be used when it is planned to move heavy equipment.

The certificate provides the means of:

- applying for permission to move the heavy equipment as specified
- specifying the precautions to be taken to avoid damage to underground, overhead, surface and surface mounted services and facilities
- recording the consent of the Area Authority subject to the issue of a Permit to Work
- acceptance by the Performing Authority, and his undertaking to observe the required precautions and to obtain the necessary Permit to Work before starting the move.

5 The Permit to Work Process

The sequence of compiling a typical Permit to Work form is summarized in the table below.

Section	Action by	Action to be Taken
1	Performing Authority	• Provides sufficient information for subsequent personnel to assess the task. Estimates duration and signs the section.
2	Area Authority	• Identifies the hazards in the task, work area and adjacent or associated work.

3	Area Authority	• Lists precautions he will take to control hazards identified in Section 2. • Notes any inhibits required. • Consults with Affected Area Authorities who sign this section.
4	Area Authority	• Specifies the protective clothing to be worn and equipment to be carried.
5	Area Authority	• Lists the precautions to be taken by the Performing Authority.
6	Area Authority	• Lists the Supplementary Certificates raised in connection with the Permit.
7	Site Manager	• Examines and signs to approve the Permit. • Satisfies himself that a Formal Risk Assessment is/is not required.
8	Gas Tester	• Gas tests equipment/work area where required. Logs and signs the results
9	Area Authority/Delegate & Performing Authority	• Formal hand over to Performing Authority, after specified work site inspection.
	Control Room Operator	• Permit entered into the Central Control Room Register and Permit numbered. Inhibits instituted.
10	Performing Authority	• Statement of completion or non-completion of task and work site inspection with Area Authority/Delegate.
	Area Authority/ Delegate	• Acceptance by Area Authority of state of completion and work site inspection. • Declares that systems can be returned to normal operation.
11	Control Room Operator	• Completes Central Control Room Register. Cancels Inhibits.

Table 2 Permit to Work Process

6 AUDIT

Each Contractor project shall:

- undertake self-regulatory audits of the operation of the Permit to Work System at each site
- maintain an Audit Register
- have in place a system for tracking recommendations through to close-out.

Use of a Standard Audit Checklist is recommended, to allow comparison with external audit results.

Appendix A - Definitions

List of Definitions

Confined Space Entry:	where there is inadequate ventilation to dispel injurious or flammable fumes, vapor or gas or to provide sufficient oxygen. Also includes areas where access / egress is restricted.
Hazard:	the potential for human injury or loss of life, damage to the environment or to material assets or a combination of these.
Hazardous Consequence:	the result when a hazard is realized.

Inhibition:	the isolation of the executive action of a protective system. Where practicable, this should not prevent the operation of the visual / audible warning system
Isolation:	• Process Isolation involves the closing and locking of valves. This may include depressurizing, flushing and purging, e.g. single valve isolations. • A Positive Isolation involves the disconnection of plant, equipment and systems from sources of motive power, liquids and gases. • Electrical Isolation - The secure, disconnection and separation of a circuit, or item of equipment, from every source of electrical energy. This may involve electrical, instrument and communication isolations. • Long Term Isolation - An isolation that remains in place after permit cancellation, and recorded as “Long Term”.
Isolation Certificate Board:	a board used to display the status of Isolation Certificates, Isolation Certificate Continuation Sheets and Boundary Isolation Certificates, maintained by the Area Authority.
Isolation Certificate Register:	a register maintained in the control room identifying the status of all Isolation Certificates by the Control Room Operator-referenced to individual permits.
Likelihood:	the chance of occurrence of an event. Likelihood can be expressed as a probability, frequency, class, rank etc.
Permit:	an authorizing document approved by management, specifying the required precautions and conditions under which potentially hazardous or interacting activities can take place
Permit Display Board:	a board used to display the status of active and suspended permits.
Permit Register:	a register maintained in the control room identifying the status of all permits.
Risk	a combination of the likelihood of a hazardous event and the severity of the possible consequences of that hazardous event.
Risk Assessment:	the overall process of risk analysis and risk evaluation.
Risk Evaluation:	the process to support management decisions as to acceptability or risk reduction requirements by comparing the estimated risk against relevant criteria.
Safeguards:	steps taken to reduce either the likelihood or consequences, or both of a particular risk.

8.8 Welding and Cutting Safety Procedure

1 Introduction

1.1 Document Purpose

This document provides the information necessary to ensure that welding, burning and associated activities are carried out in a safe and efficient manner, without harm to personnel or damage to equipment and the environment.

1.2 Document Scope

The activities covered by this document include the:

- storage and maintenance of welding and burning equipment
- preparations and precautions to prevent fire and explosion (including the safe storage and handling of equipment)
- preparations and precautions to be taken during specific welding and burning activities, e.g., welding in confined spaces, welding on tanks, etc.

1.3 Associated Procedures

Depending upon the nature and circumstances of the activity, this procedure should be used in conjunction with:

- *Permit to Work*
- *Confined Space Entry*.

Note: Welding, burning, grinding or any other operation that generates heat or sparks, e.g., abrasive cutting, shall be carried out under the control of the Permit to Work System.
The conditions laid down on the permit to Work will be adhered to at all times.

2 Responsibilities

2.1 Site Manager

Site Managers have overall responsibility for the safe use of welding and burning equipment on their sites and shall:

- use only welding and burning contractors who employ suitably competent and experienced personnel
- advise all welding and burning contractors with regard to flammable materials and hazardous conditions
- establish approved areas for burning and welding
- establish approval procedures for burning and welding.

2.2 Area Authority - Supervisor

The Area Authority is responsible for the safe execution of burning and welding within his area of authority and shall:

- inspect the work site before welding or burning is permitted and at least once per day during the work
- ensure that welding and burning equipment is maintained in satisfactory operating condition and in good repair
- ensure that welding and burning activities are carried out under the appropriate supervision.

2.3 Performing Authority

The Performing Authority is responsible for:

- the safe use of the burning or welding equipment

- determining the nature and quantity of combustible materials and hazardous areas present at the work site
- obtaining a Permit to Work from the Area Authority
- ensuring that fire protection and extinguishing equipment are properly located at the site
- ensuring fire watches are available at the site when required
- making a final check of the work site 30 minutes after the completion of burning or welding operations
- ensuring that combustibles are safe from ignition by:
- moving the work to a location free from dangerous combustibles

or...

- having the combustibles moved to a safe location

or...

- having the combustibles properly shielded against ignition
- ensuring wherever possible that any operation that might expose combustibles to the risk of ignition is not scheduled during burning or welding activities.

2.4 Welder

The Cutter and / or Welder shall:

- have approval by the Performing Authority before starting to cut or weld
- cut or weld only where conditions are safe
- stop working if conditions change from those under which the Permit to Work was granted
- after finishing work, ensure nothing is burning or smoldering near the work site.

2.5 Fire Watcher

A fire watch shall be maintained for at least 30 minutes after the completion of burning or welding operations, in order to detect and extinguish smoldering fires.

Fire Watchers shall:

- have fire extinguishing equipment readily available and be trained in its use (including practice on test fires)
- be familiar with the facilities and procedures for sounding an alarm in the event of a fire
- watch for fires in all exposed areas, and shall:
- try to extinguish them (only when obviously within the capacity of the equipment available)

and...

- sound the alarm immediately.

3 Gas Welding and Burning Equipment

3.1 Identification of Cylinders

Cylinder Markings
All cylinders shall be permanently and legibly labeled or stamped with the following:

- trade symbol of manufacturer
- serial number

- calculated quantity (tare) of empty mass
- manufacturing date (month, year)
- next inspection/test date, adjacent to the previous one (month, year)
- service pressure (psi/bar)
- test pressure (psi/bar)
- capacity (cubic feet/litres).

All markings shall be stamped on the shoulder of cylinders near valves.

Note: **Do not** remove or change any numbers or marks stamped on cylinders.

Cylinder Colour Coding
Compressed gas cylinders are painted in accordance with the National Color Coding System to properly identify their contents. The required color codes are listed in *Table 3*.

Note: Where the cylinders cannot be identified in accordance with this colour coding standard, they shall not be used, and shall be returned to the supplier.

Gas	Bottle Colour	Label Text	Label Colour
Propane	Red	PROPANE	White
Acetylene	White	ACETYLENE	Red
Butane	Red	BUTANE	White
Air	Black	COMPRESSED AIR	White
Oxygen	Blue	OXYGEN	Black
Carbon dioxide	Black	CARBON DIOXIDE	Yellow

Reference: *Regulation of "Structure (working principles) and Safe Operation of Pressure Vessels" – Moscow 1976*
Table 3 Compressed Gas Cylinder Identification

3.2 Cylinder Storage

All Cylinders
All cylinders **shall be stored** in a cool, well ventilated area preferably in the open air. They should be chained or otherwise secured and valve caps should be kept in place when cylinders are not in use.

Cylinders **should not be stored** in enclosed spaces such as workshops, accommodation.
All cylinders **shall be stored away from**:

- the direct rays of the sun or from radiant heat, e.g., flares
- locations where the temperature may exceed 45°C (113°F)
- locations exposed to adverse weather
  Note: Weather protection shall be provided if required
- possible sources of ignition
- flammable materials
- corrosive liquids
- any direct contact with soft or damp ground, or any other location where water can accumulate, thereby increasing exposure to the possible effects of corrosion.

Empty cylinders shall be marked with "EMPTY" or "MT", and stored separately from full cylinders.
Note: Regardless of whether or not cylinders have been marked, all cylinders shall be handled and treated as if they were full.

Oxygen Cylinders

Warning: Oils and greases are spontaneously combustible in the presence of oxygen. Oxygen cylinders and their fittings, including hoses, **must not** be stored or used where they can come into contact with oil or grease. This includes handling the equipment with oily hands, gloves or rags.

Oxygen cylinders must be stored apart from fuel gas cylinders by a minimum distance of 3 metres (10 feet). Separation by using cylinders of non-flammable gases is acceptable. This separation must be maintained.

The preferred practice is to store oxygen cylinders vertically, valve end up. However, it is acceptable to store oxygen cylinders horizontally provided that:

- the stacks shall not exceed a maximum height of three cylinders
- the largest cylinders must be at the bottom
- the row must be securely wedged.

Acetylene and Propane Cylinders

Warning: Acetylene cylinders **must not** be stored or used in a horizontal position. All acetylene cylinders, full or empty, shall be stored and used in the vertical, valve end up position.

Damaged Cylinders

Cylinders that may have been damaged in any way shall be returned to the supplier.
Leaking cylinders shall immediately be moved to a freely ventilated area away from any source of ignition or places where leaking gas will become tapped.

Cylinders Exposed to Fire

In the event of gas cylinders being involved in a fire, they must be kept cool with water spray, e.g., a fog nozzle, and where possible, removed to a safe area. Such cylinders must be returned to the manufacturer for checking prior to re-use.
In the case of acetylene cylinders that have been so exposed, prolonged cooling is necessary for several hours after the incident to prevent exothermic decomposition.

3.3 Cylinder Handling

Lifting

If cylinders are lifted by crane, a suitable cradle or similar device should be used. If a trolley is used as a cradle during lifting, care should be taken to ensure that its base is strong enough to take the weight of the cylinders.

Cylinders **shall not** be lifted using:

- the cylinder valves
- chain or wire rope slings (these can allow the cylinder to slip during lifting).

Movement of Cylinders on Site

Note: Cylinders **shall not** be dropped, dragged, rolled, or used as supports. In addition, the cylinder valves must be protected from damage at all times.

Cylinders should be transferred to, and moved within, the working area on trolleys specifically designed for that purpose, or in suitable containers providing stable and secure positioning of the cylinders.

All valves must be closed before a cylinder is moved and, if the correct trolley is not being used, regulators and hoses should be detached from the cylinders.

Electric Cables
Cylinders and gas hoses shall not be allowed to come into contact with current carrying wires. Therefore:

- special attention should be paid to the places where electro-welding and gas burning of metals are carried out simultaneously
- the distance from oxygen or fuel gas cylinders to electro-welding cables shall be not less than 1 m.

3.4 Cylinder Fittings

Acetylene Fittings

Warning: Wherever copper comes into direct contact with acetylene, the explosive compound Copper Acetylide may be formed.
Only approved alloys of less than 70% copper shall be used for acetylene fittings.
Where approved fittings are silver soldered, the solder should contain no more than 40% silver and 20% copper.

Regulators
Only automatic pressure regulators and pressure gauges as recommended by the gas cylinder supplier shall be fitted to oxygen and fuel gas cylinders. These pressure regulators provide the following safety features:

- provision of a filtered supply of gas at a constant delivery pressure
- safety diaphragms that burst before the bonnet is blown off
- pressure gauges with safety backs that deflect the venting gas.

Note: The adjustable screw on the regulator must always be released before the cylinder is opened.

Valves
To avoid leaks and possible dangerous gas build-up, valves and fittings shall be kept scrupulously clean, and care taken to ensure that no grit or foreign matter is allowed to remain on them.

Note: The use of any kind of packing in the valve joints is strictly forbidden. Packing, particularly lead or copper, can easily be forced into the orifice, causing a blockage.

Valve Keys
Only standard valve keys shall be used, and cylinder valves shall always be opened slowly by gently tapping the key.
Keys with long leverage should never be employed to force a valve shut.

Blowpipes
Only high pressure blowpipes may be used with high pressure equipment.
All blowpipes shall be dismantled and cleaned internally at regular intervals. During use, accumulated slag should be frequently removed from the blowpipe tip during operation. To avoid severe blockage, care should be taken to avoid dipping the blowpipe tip into molten metal.
Only the manufacturer's recommended tip clear should be used for cleaning or altering the blowpipe tip.

Note: Hard metal reamers shall not be used to clear the blowpipe tip.

Hoses
Unnecessarily long lengths of hose should be avoided. Oxygen and fuel gas hoses should be the same length.
Only good quality hoses fitted with check valves (to prevent gas flowing back from the blowpipe) are acceptable for use. Faulty or damaged hoses **must not** be used.
Hoses are supplied with connections suitable for standard regulators and blowpipes. If required, hose lengths should be joined by the use of crimped connecting fittings, not hose clips.
In order to identify and / or prevent possible blockage, hoses should be blown through with air before being connected to regulators and blowpipes.

Warning: Under no circumstances shall oxygen be used for ventilation or to blow through acetylene hoses. Explosions can occur when acetylene gas is present in air in any proportion between 2.5% and 80% by volume.

When in use, hoses should be protected from damage, and laid out in such a manner as to avoid being a tripping hazard.

Flashback Arrestors
Flashback arrestors, which quench flashback flames and cut off the gas flow automatically, must be incorporated in all oxygen lines and fuel gas lines.

Damaged / Faulty Cylinders and Fittings
Cylinders with faulty outlet valve connections, e.g., damaged threads, seized valve spindles, etc., must be returned immediately to stores with a note stating the cylinder number, the nature of the fault and whether the cylinder is charged.

Note: Under no circumstances may the user of the cylinder attempt any repair whatsoever.

Cylinders with leaking valves that cannot be shut off must be removed to a safe area away from any possible source of ignition and drainage, where they shall be allowed to vent off slowly until empty. Stores shall be advised of the fault.

Note: Propane and Butane are heavier than air and may accumulate in dips and hollows.

4 Electric Arc welding and burning Equipment

4.1 Welding Sets

All welding sets must be maintained in good condition and be of adequate capacity.
Where stationary transformers or generator sets are used, a suitable switch must be mounted adjacent to the equipment to provide isolation from the supply main.
Diesel driven welding sets shall not be used except with the formal agreement of the Site Manager for each occasion of use. If used, the sets must be approved for the area in which they are sited.

Note: The engine must not be refuelled whilst in operation.

In order to protect the trailing leads and the equipment, portable transformers or generator sets with trailing leads, must be provided with interlocked fused switch sockets and plugs.
Under no circumstances shall the welder:

- connect and disconnect the welding device from the electricity supply network when the connection is anything other than a plug and socket
- repair electro-welding machines (such repairs shall be carried out by a competent electrician only).

4.2 Cables and Connections

All cables, connectors and terminators must be maintained in good condition, and be of adequate capacity. To avoid long lengths of power cables the machine must be sited as close as possible to the workplace.

All supplies for welding equipment must be made of approved cables and connections and must be controlled from a circuit which includes protection sensitive to earth fault currents.
Welding leads and returns shall comprise flexible, tough rubber covered cables, using approved cable couplers where necessary. Leads shall be properly terminated, and cable couplers and terminations must be of adequate carrying capacity.

Welding leads must be inspected daily for any damage. In the case of worn or torn cable sheaths, or flattened or kinked cables, the affected part should be removed.

Welding return leads must always be used to prevent uncontrolled welding currents passing back from the work-site to the generator through the structure and/or plant items. This could give rise to sparks or cause damage to bearings in machines, etc. Particular attention should be paid to welding returns when welding on pedestal crane booms, so that currents cannot pass through main slew bearings.

Note: It is prohibited for the welder to commence or continue welding operations with faulty cables, starting devices or electrode holders.

4.3 Electrode Holders

Electrode holders shall be provided with a handle of tough, insulating non-ignitable material with a guard disc of similar material between the hand of the operator and the projecting line portion.
A fully insulated holder or hook should be provided for the live electrode holder when not in use. Laying live electrode holders on gloves, face screens or handing them up by the electric cable where it could come in contact with other equipment etc., is discouraged.

Warning: Electrode holders under voltage **must not** be left unattended.

4.4 Earthing and Bonding

For all AC welding transformers, the transformer low voltage winding must not be earthed but the transformer case must be effectively bonded to an earthing system adjacent to the equipment.
The DC welding output of all AC driven DC welding generators must not be grounded. The machine frame must be effectively bonded to ground.

For engine driven DC welding generators, no earth connection must be applied to the generator output terminals.

The work piece must be bonded to earth by means of a heavy section conductor having suitable clamped or bolted connections.

5 Welding and Burning - Hazards and Precautions

5.1 Personal Protection Equipment

Personnel engaged in, or working in close proximity to, welding, burning, chipping and grinding operations must use the appropriate protective clothing/equipment, e.g., goggles, face shields, welding helmets, welding screens, gloves, leather aprons, etc.
The necessity for protective clothing against sparks and pieces of hot metal, depends upon the position of the arc in reference to the welder's body.

For some classes of welding, e.g., where the welder is standing at a bench, the head screen and gauntlets may well provide sufficient protection.

A thick apron of leather or other suitable material may be needed if the welder is sitting at his work position, where molten metal may fall upon his thighs and legs.

If the arc is above the level of his shoulders or overhead, complete protection for the head, arms and upper part of the body is necessary.

Welding Helmets, Welding Shields and Flip-Front Goggles
The specifications for welding helmets, welding shields and flip-front goggles shall comply with:

- *EN 169 "Specification for filters for PPE used in welding"*
- *EN 175 "PPE for eye and face during welding*"
- *EN 166 "Eye protection".*

Wide Vision Welding Goggles
The lenses of wide-vision welding goggles shall conform to *BS 679* and their frames to *BS 1542*.

Coveralls
Flame retardant welders coveralls shall be approved to:

- *BSEN 470*
- *BSEN 531*.

Gauntlets

Note: For gauntlets used for electric arc welding, see *Additional Protection for Electric Arc Welding* below.

Gauntlets used for welding, brazing and burning shall conform to:

- *BSEN 407*
- *BSEN 388* (*Mechanical Risk*)
- *BSEN 420* (*General Requirements*).

Additional Protection for Electric Arc Welding
Gloves or gauntlets made of non-ignitable material are required for shielding the hands and arms from sparks and heat radiation of the welding arc. Leather gloves and gauntlets give no protection against electrical hazards. In particular, for electric arc welding, oiled or greased clothes and gloves shall not be worn.

As well as normal protective clothing, while performing electric arc-welding in hazardous conditions (welding of wet structures) electric welders shall use:

- dielectric gloves (*BSEN 388*)
- overshoes (*BSEN 345*)
- rubber mats.

5.2 Fumes and Gas Risk

Welding, burning, and brazing operations, etc., can produce toxic fumes and gases, the composition of which depends on welding temperature, arc intensity, electrode material and the gas mixture being used. Therefore, it must be ensured that:

- any organic coatings are removed prior to any welding and burning
- gases/fumes are removed either by natural ventilation or forced mechanical ventilation
- a suitable respiratory system should be available as a back up if the ventilation system is inadequate.
-

Warning: Respiratory protection must be worn where the welding or burning of cadmium alloys or a cadmium-coated material takes place.

5.3 Fire and Explosion Prevention

Note: Welders and helpers must always be alert to the danger of fire and explosion.

Restrictions on Welding and Cutting

Cutting or welding is only permitted in areas that are fire safe.
Welding or burning shall not take place in restricted areas without a Hot Work (Naked Flame) Permit. In addition, the conditions laid down on that permit must be strictly observed.

Approved Welding and Cutting Areas

Within the confines of an operating plant or building, the burning and welding work area shall be either:

- a specific area designed or approved for such work, i.e., a maintenance shop

or...

- a detached outside location of non-combustible or fire-resistive construction, essentially free of combustible and flammable contents, and suitably segregated from adjacent areas.

Where work cannot be moved practically, as in most construction work, the area shall be made fire safe by removing combustibles or protecting combustibles from ignition sources.

Area Preparation

Fully charged and operable fire extinguishers, appropriate for the type of possible fire, shall be available at the work area. Where hose lines are available, they shall be connected and ready for service.

Work must be screened to prevent sparks from flying outside the immediate welding area and all combustible material must be removed or covered with fire resistant material. Combustible materials such as paper clippings, wood shaving, or textile fibres on the floor shall be swept clean.
If welding is to be carried out on a metal wall, partition, ceiling, or roof, precautions shall be taken to prevent ignition of combustibles on the other side due to conduction or radiation. The preferred precaution is to relocate combustibles. However, where it is not possible for the combustibles to be relocated, a fire watch on the opposite side from the work shall be provided. Any drains in the area must be plugged, gullies cleaned and if possible water filled and finally covered with fire blanket.

Openings or cracks in walls, floors, or ducts within 11m of the site shall be tightly covered to prevent the passage of sparks to adjacent areas.

Conveyor systems that might carry sparks to distant combustibles shall be protected. Combustible floors shall be kept wet, covered with damp sand, or protected by fire-resistant shields.

Warning: **Do not** wet down floors where electric arc welding or burning equipment is to be used.

Removal of Slag
Slag shall not be cleaned from newly welded joints until it has had time to cool. Safety goggles must be used for slag removal.

Welding on Tanks and Vessels
Note: Before welding on tanks and vessels may take place, inspection by the Area Authority will be necessary to decide on the precautions to be taken.

All tanks, vessels and equipment on which welding, cutting, burning, brazing and soldering work is carried out, must be either free from flammable gases and vapours and cleaned of all traces of liquid, wax or solid hydrocarbons, or provision made for excluding oxygen, e.g., filled with nitrogen, high expansion foam or similar product.

The space between double plates or wear plates, where flammable material may be found, must be considered. Work on a main deck forming the root of an in-deck tank must be given special consideration.

Before cutting the bottom plates of any tank, test holes must be drilled and a gas test taken, to ensure that conditions are safe under the tank floor.
Unattended Welding Equipment

Blowpipes and hoses, if not in use, must not be left in vessels or enclosed spaces. If blowpipes and hoses cannot be removed from the space, the connections must be disconnected at the cylinders.

Note: Closing the cylinder valves is not classified as a disconnection.
Whenever equipment is to be left unattended, gas cylinder valves shall be shut, hoses de-pressurised and disconnected.

Electrical power supply for welding machines shall be switched off and disconnected. Any diesel driven welding sets shall be shut down.

Work Using Scaffolding
Gas cutting or welding operations involving the use of scaffolding is allowed only after taking measures to prevent the scaffold boards from ignition and molten metal falling on people below.

Maximum height of gas cutting point above lower located tier (meters)	0	2	5	7	10
Radius of sparks scattering (meters)	6	8	10	12	14

Fire Watchers

An active fire watch shall comprise at least one nominated person, whose sole duty consists of fire watching. This person shall be provided with suitable portable fire extinguishing equipment. In addition fire blankets and a pressurized fire hose may be provided depending on location/site conditions.

The fire watch shall ensure that the areas are left in a safe condition by inspecting the work area and any adjacent areas that may be affected 30 minutes after welding or burning work ceases.
Trained and competent personnel to act as fire watch shall be required by the Area Authority whenever burning or welding is performed in locations where:

- fire and gas detection systems have been inhibited to permit burning or welding to take place
- appreciable combustible material in building construction or contents is closer than 11 meters to the point of operation
- appreciable combustible materials are more than 11 meters away but are easily ignited by sparks
- wall or floor openings are within an 11 meter radius and give access to combustible material in adjacent areas, including concealed spaces in walls or floors
- combustible materials are adjacent to the opposite side of metal partitions, walls, ceiling, or roofs and are likely to be ignited by conduction or radiation.

5.4 Confined Spaces

All personnel involved in welding and burning operations in confined spaces must comply with the requirements of this procedure and the requirements defined in:

- Permit to Work
- Confined Space Entry.

In particular, when welding or burning in a confined space:

- **forced ventilation** shall be maintained in the space at all times
- **organic coatings** shall be removed prior to any welding and burning
- **gas cylinders** shall not be taken into the space at any time; they shall be sited outside the space with the hoses laid through suitable transits and protected from damage
- **welding transformers** shall not be placed inside the space; they shall be sited outside the space with the cables laid through suitable transits and protected from damage
- where work in confined spaces takes place over several days, welding hoses and equipment shall be removed from the space overnight in case of gas build-up due to leakage
- **lighting** inside the confined space during welding operations shall be provided by mobile light fixtures with a voltage of no more than 25V. Lights shall be fitted with wire protection cages

5.5 Welding and Burning on Small Containers

Before any hot work is carried out on any container that may have been used to store petroleum products or other flammable or combustible materials the following guidelines must be followed, and the Safety Adviser must certify the container free of gas and chemicals.

1. Drain the container of all contents.
2. Steam out the container thoroughly **or** submerge the container in boiling water for at least one hour.

   Note: Compressed air purging or washing out with hot / cold water may not sufficiently clean the vessel of flammable materials and therefore **shall not** be used as methods of preparation for repair purposes.
3. Blow through the container with compressed air until the container is dry.

During repairs, air (**not oxygen**) must be blown through the vessel to prevent the build-up of unburned gases.

8.9 Compressed Gas Cylinders

1 Introduction

1.1 Document Purpose

This procedure specifies the requirements necessary for the safe handling, use, storage, and transportation of compressed gas cylinders.

1.2 Document Scope

Where necessary, this procedure should be used in conjunction with procedure *Welding and Cutting* which provides advice specifically for the storage and use of compressed gas cylinders for welding and cutting activities.

2 Responsibilities

2.1 Site Manager

Site Managers have overall responsibility for the safe storage and use of compressed gas cylinders on their sites and shall ensure that:

- compressed gas cylinder inspection procedures for receipt, safe use and storage, are established and observed on site
- compressed gas cylinders are stored in accordance with these guidelines
- inspection, storage and use of compressed gas cylinders are carried out by suitably competent and qualified personnel.

2.2 Area Authority - Supervisor

Area Authorities are responsible for ensuring that the contents of these guidelines are observed within their areas of authority.

3 Receipt of Cylinders on site

3.1 Cylinder Inspection

Compressed gas cylinders shipped to any BP site shall be thoroughly inspected by qualified and competent personnel before being accepted. Cylinders shall be inspected for corrosion, dents, general distortion, scorch marks, or any defect.

Note: Defective cylinders shall be returned to the supplier/manufacturer.

Cylinders with faulty outlet valve connections, e.g., damaged threads, seized valve spindles, etc., must be returned immediately to stores with a note stating the cylinder number, the nature of the fault and whether the cylinder is charged.

Note: Under no circumstances may the user of the cylinder attempt any repair.

3.2 Cylinder Identification

Compressed gas cylinders are painted in accordance with the National Color Coding System to properly identify their contents. The required color codes are listed in *Table 4*.

Note (01): If cylinders cannot be identified in accordance with this colour coding standard, they shall not be accepted or used on site, but shall be returned to the supplier.

Note (02): This colour coding system does not apply to Diving Gases which are covered under separate standards and practices applicable to diving and subsea operations.

	Gas	Bottle Colour	Label Text	Label Colour	Stripe Colour
1	**Nitrogen**	Black	NITROGEN	Yellow	Brown
2	**Ammonia**	Yellow	AMMONIA	Black	-
3	**Propane**	Red	PROPANE	White	-
4	**Technical Argon**	Black	TECHNICAL ARGON	Dark blue	Dark blue
5	**Acetylene**	White	ACETYLENE	Red	-
6	**Associated gas**	Grey	ASSOCIATED GAS	Red	-
7	**Butane**	Red	BUTANE	White	-
8	**Hydrogen**	Dark green	HYDROGEN	Red	-
9	**Air**	Black	COMPRESSED AIR	White	-
10	**Helium**	Brown	HELIUM	White	-
11	**Oxygen**	Blue	OXYGEN	Black	-
12	**Medical Oxygen**	Blue	MEDICAL OXYGEN	Black	-
13	**Hydrogen Sulfide**	White	HYDROGEN SULPHIDE	Red	Red
14	**Sulphur Dioxide**	Black	SULPHUR DIOXIDE	White	Yellow
15	**Carbon dioxide**	Black	CARBON DIOXIDE	Yellow	-
16	**Chlorine**	Khaki	CHLORINE	-	Green

Reference: *Regulation of "Structure (working principles) and Safe Operation of Pressure Vessels" – Moscow 1976*

Table 4 Compressed Gas Cylinder Identification

3.3 Cylinder Markings

All cylinders shall be permanently and legibly labeled or stamped with the following:

- trade symbol of manufacturer
- serial number
- calculated quantity (tare) of empty mass
- manufacturing date (month, year)
- next inspection/test date, adjacent to the previous one (month, year)
- service pressure (psi/bar)
- test pressure (psi/bar)
- capacity (cubic feet/liters).
-

All markings shall be stamped on the shoulder of cylinders near valves.

Note: **Do not** remove or change any numbers or marks stamped on cylinders. Any cylinders that do not comply with this system shall not be accepted or used on site but shall be returned to the manufacturer/supplier.

4 Cylinder Storage

4.1 All Cylinders

All cylinders **shall be stored** in a cool, well ventilated area preferably in the open air and at least 3 meters (10 feet) from combustible materials.
Cylinders should be chained or otherwise secured, with valves shut and valve caps in place when cylinders are not in use.
Cylinders **should not be stored** in enclosed spaces such as workshops, accommodations.
All cylinders **shall be stored away from**:

- the direct rays of the sun or from radiant heat, e.g., flares
- locations where the temperature may exceed 45°C (113°F)
- locations exposed to adverse weather
  Note: Weather protection shall be provided if required
- possible sources of ignition
- flammable materials
- corrosive liquids
- any direct contact with soft or damp ground, or any other location where water can accumulate, thereby increasing exposure to the possible effects of corrosion.

Cylinders containing different gases must be stored separately and in accordance with established spacing requirements. Oxygen cylinders shall be separated from the cylinders containing flammable gas by at least 3 meters or by non-combustible barrier at least 2 meters high.

Empty cylinders shall be marked with “EMPTY” or “MT”, and stored separately from full cylinders.
Leaking cylinders or cylinders with leaking valves that cannot be shut off must be removed to a safe area away from any possible source of ignition and drainage, where they shall be allowed to vent off slowly until empty. Stores shall be advised of the fault.

Note: Propane and Butane are heavier than air and may therefore accumulate in dips and hollows.

Note: Regardless of whether or not cylinders have been marked, all cylinders shall be handled and treated as if they were full.

4.2 Oxygen Cylinders

Warning: Oils and greases are spontaneously combustible in the presence of oxygen.
Oxygen cylinders and their fittings, including hoses, **must not** be stored or used where they can come into contact with oil or grease. This includes handling the equipment with oily hands, gloves or rags.

Oxygen cylinders must be stored apart from fuel gas cylinders by a minimum distance of 3 meters (10 feet). Separation by using cylinders of non-flammable gases is acceptable. This separation must be maintained.

The preferred practice is to store oxygen cylinders vertically, valve end up. However, it is acceptable to store oxygen cylinders horizontally provided that:

- the stacks shall not exceed a maximum height of three cylinders
- the largest cylinders must be at the bottom
- the row must be securely wedged.

4.3 Acetylene and Propane Cylinders

Warning: Acetylene cylinders **must not** be stored or used in a horizontal position. All acetylene cylinders, full or empty, shall be stored and used in the vertical, valve end up position.

4.4 Damaged Cylinders

Cylinders that may have been damaged in any way shall be returned to the supplier.
Leaking cylinders shall immediately be moved to a freely ventilated area away from any source of ignition or places where leaking gas will become tapped.

5 Cylinders Exposed to Fire

In the event of gas cylinders being involved in a fire, they must be kept cool with water spray, e.g., a fog nozzle, and where possible, removed to a safe area. Such cylinders must be returned to the manufacturer for checking prior to re-use.
In the case of acetylene cylinders that have been so exposed, prolonged cooling is necessary for several hours after the incident to prevent exothermic decomposition.

6 Cylinder Handling

6.1 Transport

Fit suitable protective valve caps and covers before transporting.
Ensure cylinders are securely stowed to prevent moving. Cylinders should be stowed in the upright position unless instructions for transport specifically say otherwise.
Do not let gas cylinders project beyond the sides or end of a vehicle.

6.2 Lifting

If cylinders are lifted by crane, a suitable cradle or similar device should be used. If a trolley is used as a cradle during lifting, care should be taken to ensure that its base is strong enough to take the weight of the cylinders.
Cylinders **shall not** be lifted using:

- the cylinder valves
- chain or wire rope slings (these can allow the cylinder to slip during lifting)
- lifting magnets.

6.3 Movement of Cylinders on Site

Note: Cylinders **shall not** be dropped, dragged, rolled, or used as supports, and **must be** protected from damage at all times.

Cylinder Trolleys

Cylinders should be transferred to, and moved within, the working area on trolleys specifically designed for that purpose, or in suitable containers providing stable and secure positioning of the cylinders.

All valves must be closed before a cylinder is moved and, if the correct trolley is not being used, regulators and hoses should be detached from the cylinders.

Electric Cables

Cylinders and gas hoses shall not be allowed to come into contact with current carrying wires. Therefore:

- special attention should be paid to the places where electro-welding and gas burning of metals are carried out simultaneously
- the distance from oxygen or fuel gas cylinders to electro-welding cables shall be not less that 1 m.

When in use, hoses should be protected from damage, and laid out in such a manner as to avoid being a tripping hazard.

7 Cylinder Use

Many of the specific uses of gases will vary from gas to gas but there are several points that apply to all of them:

- Keep the cylinders away from operations that create sparks, heat, fire and electrical circuits.
- Don’t use oil or grease on cylinders or handle them with oily hands or gloves. Don’t let oxygen spray on an oily or greasy surface, or on your clothes.
- Use cylinders in ventilated areas only.
- Keep cylinders secured upright in cylinder racks.
- Open valves by hand, not with a wrench or other tool. If they cannot be opened by hand, notify the supplier/manufacturer.
- Do not tamper with safety devices.
- If a cylinder has a leaky valve or fitting which cannot be stopped by closing the valve, the cylinder must be taken outdoors away from sources of ignition. Tag the cylinder as in bad order and promptly notify the supplier. Do not try to fix a leaking cylinder or valve. Dented cylinders should never be used.
- Ensure that hosing/tubing for use in oxygen service is completely degreased and dust free before each use
- Always open valves slowly. If a valve cannot be opened by hand with the key or hand wheel provided, the cylinder shall be returned to the supplier/manufacturer. Do not force the valve open using wrenches or other hand tools.

8.10 Lifting Operations Safety Procedure

1 Introduction

1.1 Document Purpose

This document is prepared for Safe Lifting Operations of Contractor Construction Projects.

1.2 Document Scope

The equipment to which this document applies includes, but is not limited to:

- pedestal cranes
- mobile cranes
- overhead gantry cranes
- loose lifting gear (chain hoists, lever hoists, slings, shackles, pendants etc)
- wireline masts
- lifts for persons or goods
- abseiling equipment
- sling-sets attached to containers or pieces of equipment
- runway beams and padeyes to which lifting equipment is anchored or fixed

The contents of this document apply to the above equipment regardless of whether it is new, existing, second-hand or leased.

2 Responsibilities

2.1 PROJECT MANAGER

The SITE MANAGER shall be responsible and accountable for the application of this procedure on his work site. In particular the SITE MANAGER shall ensure:

- that no lifting equipment is used or allowed on site unless it is accompanied by all relevant certification and in date test certificates
- that proper records are maintained for all lifting equipment, including certification and examination and test reports.

2.2 Competent Person

The term **Competent Person** is used to identify a number of different roles. In practical terms the competency of a person may be confirmed by formal, vocational qualification or through first hand knowledge of planning or supervising the lifting operations or using the equipment. The Competent Person's responsibilities are described in each relevant section of this document.

2.3 Area Authority - Supervisor

The Area Authority shall be responsible for the application of this standard within his area of responsibility.

2.4 Personnel in Charge of Lifting Operations

Personnel in charge of lifting operations are responsible for ensuring:

- the immediate safety of all personnel involved in the lifting activity
- that all equipment used is suitable for the task and is within test date
- that the lifting operation has been risk assessed and planned

- that the activity is executed in accordance with the plan
- that lifting operations are halted if an unsafe situation occurs.

2.5 Subcontractors

Subcontractors providing lifting services for Contractor shall comply with the relevant sections of this procedure, according to their contractual conditions.

3 Positioning and Installation of Lifting Equipment

3.1 Permanent and Semi-permanent Lifting Equipment

All permanent and semi-permanent lifting equipment shall be designed, installed and positioned so that as far as reasonably practicable:

- the need to lift loads over people is minimized
- crushing is prevented at extreme operating positions; in particular, trapping points are prevented or access limited on travelling or slewing equipment
- loads are prevented from:
    - falling freely - through the fitting of suitable devices such as multiple ropes, safety gear or check valves
    - being unintentionally released during a loss of power to the lifting equipment or through the collision of equipment or their loads; for example, through the use of hooks with safety catches, motion limiting devices and safe systems of work
- loads moving along a fixed path (rails, runway beams, etc) are suitably protected to minimise the risk of the load or equipment striking a person

  Note: Drifting - runway beams should be level and tag lines used to control the movement of long or awkwardly shaped loads.
- personnel are prevented from falling down shafts or hoistways; for example, by the use of safety gates with interlocks

Overhead Gantry Cranes

Beneath the full travel of an overhead gantry crane, painted lines on the floor (where practicable) shall be used to delineate a path and indicate its width. This path shall be kept free of materials and stores. Warning notices shall be posted in prominent positions, especially at access points.
An audible and visual warning device should operate automatically when an over-head crane is tracking.

3.2 Mobile Lifting Equipment

Mobile lifting equipment shall be subject to the same precautions as those listed for permanent and semi-permanent lifting equipment above. However, it shall be the specific responsibility of the person in charge of the lifting operation to ensure that these precautions are properly addressed throughout the lifting operation.

Wheeled Cranes

- Hooks must be properly secured whilst cranes are in transit, and the jib kept in the shutdown position.
- An audible and visual warning device should operate automatically when the crane is reversing.

4 Strength and Stability of Lifting Equipment

The strength and stability of fixed / permanent lifting equipment, for example platform cranes, gantry cranes, etc., is mainly dependent upon the design, construction and initial installation. For temporary / mobile lifting equipment the strength and stability is dependent upon its installation, assembly and location.
However, the continuing strength and stability of all lifting equipment is dependent upon the purpose and method of use, and the application of a suitable system of regular examination, inspection and maintenance.

4.1 Design and Installation

All Lifting Equipment
During the design and installation stages for fixed lifting equipment it is necessary to:

- take account of the combination of forces which the equipment may be subjected to (including destabilizing forces), for example, load, wind, frequency of use, etc.
- ensure that the equipment is not susceptible to in-service failure modes (fracture, wear or fatigue), for example by choosing materials and components taking into account the combination of forces the equipment may be subjected to and by establishing an adequate maintenance and inspection routine
- where appropriate, lifting equipment shall be fitted with a Rated Capacity Indicator (previously known as a Safe Load Indicator)
- a table, showing the safe working load / radii limitations of the crane shall be fitted in every crane cab
- where the SWL changes with the operating radius of the equipment then a load-limiting device may need to be fitted to inhibit the equipment and provide visual and/or audible warnings
- build in an appropriate factor of safety against foreseeable failure modes
- provide rail mounted equipment with devices to prevent derailing
- lay rails so that they provide suitable support for rail mounted equipment.

Where there is a significant risk of overload, for example where lifting equipment may be used to offload a supply vessel onto a platform, the lifting equipment should be fitted with equipment which provides an audible and/or visual warning before an overload situation is reached.

Mobile Equipment

In addition to the factors listed for all lifting equipment, the initial strength and stability of mobile and semi-permanent lifting equipment is greatly dependent upon its positioning and its assembly.
In particular:

- mobile cranes shall only be used on flat and level ground
- when a wheeled crane with outriggers is used, the outriggers shall be extended and firmly jacked down upon a spread support before lifting operations commence
- the ground where spread supports are to be used shall be inspected by a Competent Person before deployment of the spread supports
- wheeled cranes shall only leave recognized roads under the authority of a Permit to Work

4.2 During Lifting

General Usage

During lifting operations:

- the lifting appliance shall not be loaded beyond the safe working load marked on it (except for the purpose of proof load testing by a Competent Person).
- the hoisting mechanism of a crane shall not be used for any purpose other than raising or lowering a load vertically.
- mobile cranes must not be used to transport loads, unless specifically designed for this purpose.

Load
The weight of all loads should be known and particular care must be taken when calculating the weight of any plant or equipment prior to lifting, especially when it may contain a liquid (for example, coiled tubing reels, heat exchangers, etc.).

The crane driver/operator must be advised of the weight of each load to be lifted and shall operate within the limits dictated by the **safe working load / radius tables** displayed within the crane cab. It is the responsibility of the crane driver/operator not to lift, or continue to lift, a load which causes the Rated Capacity Indicators (formerly Safe Load Indicators) to alarm. In particular, crane drivers/operators must not use the load/radius alarms as an indication of working within safe limits.

Note: On any change of boom length, the safe working load/radius limitations table must be changed to show clearly the new SWL radius limitations.

Wind Speed
Cranes shall not be operated in wind speeds in excess of manufacturer's recommended limitations or Georgian Legislation (whichever wind speed is the lesser). Sites and installations may impose lower limits as a result of operating experience.

The operating limitations shall be clearly displayed in the crane cab.

4.3 Lifetime of Equipment

Certification, Examination and Testing
All lifting equipment shall be properly certified at regular intervals in accordance with these guidelines and with any required legislation. In addition, all lifting equipment shall be subjected to regular examination and testing in accordance with *Paragraph 7 Certification, Examinations, and Inspections*.

Rated Capacity Indicators
Rated Capacity Indicators (formerly Safe Working Load Indicators), or any other alarms fitted to lifting appliances, shall not be disconnected or made unserviceable at any time whilst the equipment is in service. Wherever such warning devices have been disconnected or made unserviceable, the lifting equipment shall be taken out of service immediately and remain so until the devices are reinstated.

4.4 Other Equipment

Gin Poles and Derricks

- Gin poles must be constructed of steel, with attachments at the head for suspending the load and guying and be fitted with proper base plates.

- Guys for gin poles must be attached to "dead men", earth screws or substantial steel structures.
- Clearance for Excavation and the relevant Permit to Work must be obtained before driving stakes, etc. into the ground for gin poles.

4.5 Fork Lift Trucks

- Any fault affecting the safe operation of the fork lift truck prohibits its use until rectified.
- The fork lift truck must not be used to lift loads greater than the maximum Safe Working Load for which the equipment is rated. Only secure loads are allowed to be moved.

5 Lifting Equipment Markings

5.1 Safe Working Load

All Equipment
Where possible all lifting equipment should be hard stamped with the safe working load. Where it is not possible to hard stamp the safe working load directly onto the equipment the following alternatives are acceptable:

- hard stamp the safe working load on ferrules (for example, on wire slings)
- hard stamp the safe working load on a metal plate securely attached to equipment (for example, on chain hoists)
- paint the safe working load onto the equipment (for example, runway beams).

Note: Color coding of lifting equipment alone might not meet the requirements of the *Lifting Operations and Lifting Equipment Regulations 1998*.

Variable Safe Working Load
If the safe working load is dependent upon the configuration of the equipment then the safe working load for each configuration shall either be marked on the equipment or the information kept with the equipment where it is readily available to the operator, for example on load-radius charts in crane cabs.

5.2 Lifting Accessories and Separable Lifting Equipment Components

Any structural components of lifting equipment which can be separated from the equipment (boom section, slewring, etc.) shall be marked to indicate the equipment of which it is a part.
Where a number of accessories are brought together and not dismantled, for example a spreader beam with slings and shackles, the assembly should be marked to indicate its safety characteristics.
Lifting equipment and accessories should be marked with any relevant safety information such as the thickness of plates which may be lifted with a plate clamp.

5.3 Personnel Lifting Devices

General
Lifting equipment designed for lifting persons should be marked as such. The carrier should display the SWL and maximum number of persons which may be carried.

Winches

Where there is more than one winch, for example in a drilling derrick, it may be possible for a winch which has not been designated for man-riding to be used for lifting of persons. Where it is possible for this to occur, all winches shall be clearly marked as either suitable for lifting of persons or not.

6 Control of Lifting Operations

6.1 Personnel

Banksman
With the exception of overhead cranes that are designed to be operated from ground level, no lifting operation shall take place without an appointed and easily identifiable banksman. The banksman must be suitably trained and have adequate experience for his role.

Crane Driver / Operator
Cranes shall only be operated by properly trained and qualified personnel.

All crane drivers/operators must have good eyesight (corrected by spectacles if necessary) and good hearing. They must also have a sound working knowledge of safe slinging practices.

Contract crane drivers, in addition to the above, must hold a certificate of competence issued by their employer which shall be available for inspection.

Riggers and Slingers
All personnel who use rigging equipment must have completed a basic rigging/training course.

Operators of Industrial Power Trucks, Fork Lifts and Hydraulic Work Platforms

All drivers of industrial power trucks, fork lifts and operators of hydraulic work platforms must be properly trained in their use. Training should generally be in accordance with the United Kingdom Health and Safety Executive Code of Practice titled *The Basic Training of Operators of Counterbalanced and Reach Lift Trucks*.

Fork-lift drivers must undertake a course of training and testing generally in accordance with the approved code of practice and supplementary guidance: *Rider Operated Lift Trucks - Operator Training*. Drivers must provide evidence of having attended and successfully completed such a training course before driving any fork lift vehicle.

6.2 Risk Assessment and Planning
Risk Assessment

Non-routine lifting operations must undergo a risk assessment in accordance with Safe Systems of Work procedure *Risk Assessment*.

Routine lifting operations shall be reviewed on a regular basis to ensure that the original Risk Assessments remain valid.
For all lifting operations, the degree of risk identified during the Risk Assessment shall determine the level of supervision required for the operation and the required experience of the personnel involved. In particular, the Risk Assessment should account for:

- working under suspended loads
- attaching and detaching the load
- overloading
- overturning

- breakdown in communication during lifting (especially blind lifting)
- the environment and location
- proximity hazards
- lifting personnel with non-dedicated equipment
- pre-use checks by the operator
- deterioration in the condition of lifting accessories
- the experience, competence and training of available personnel.

Planning
Following a Risk Assessment, and the preparation of a standard instruction or procedure, the person using the equipment can normally plan routine lifts on an individual basis. In any event, the person planning the operation shall have adequate practical and theoretical knowledge and experience of planning lifting operations.

The degree of planning will vary depending upon the:

- type of lifting equipment
- complexity of the lifting operation
- degree of risk involved.

As a minimum, the plan shall address the risks identified and should identify all resources, procedures and responsibilities necessary to ensure a safe operation.

6.3 Control of Operations

Equipment Restrictions
- Crane activities shall stop (once the load has been made safe) in the event of a general alarm or emergency.
- No parts of the crane including the boom must be permitted to work within 9m (30 ft) of high voltage electrical lines on wooden poles or 15m (50 ft) on steel towers, unless the cables have been isolated electrically.
- Tracked cranes shall not travel within a width restricted area unless accompanied by a Banksman, whose duty it is to direct the Driver/Operator and other road users.

Personnel Restrictions
- Whilst the crane is in operation, the Crane Driver/Operator must not perform other work and must not leave his position at the controls until the load has been safely landed.
- Man-riding on loads, hooks or buckets intended for general cargo movement is not permitted.

> **Note:** It is strictly forbidden for anyone to ride on a fork lift truck as a passenger. Fork lifts are not to be used as elevated working platforms unless approved modifications have been carried out.

Load Restrictions
Pre-slung loads must not be accepted, unless the supplier/owner produces a current examination certificate for slinging arrangements, which will be monitored at supply base prior to shipping.

Operating Restrictions (Gantry Cranes and Crane Tracks)
Work which necessitates the presence of men closer than 6m (20 ft) to electrically driven overhead gantry cranes, or crane tracks, must not be started until the crane has been rendered inoperative by the removal of fuses or locking off of circuit breakers by an Authorized Electrical

Isolating Authority. In addition, if practicable, the crane power supply switch must be padlocked in the open position.

Where work is carried out on or near the wheel tracks of a crane and it is required that the crane remains in operation, it is necessary to ensure that the crane does not approach too close to the area of work. A minimum separation distance of 6m (20 ft) shall be maintained in these circumstances. Stop blocks shall be used to ensure that this separation is maintained.

7 Certification, Examinations and Inspections

7.1 Lifting Equipment Certification and Examination Records

All lifting equipment supplied and used on the Project must be in possession of all relevant up to date certification and a valid thorough examination record. The Site Manager shall ensure that all necessary certification and examination records have been provided before accepting the equipment on site.

The Site Manager shall also ensure that all lifting equipment that requires thorough examination is identified and recorded.

Note: Lifting equipment testing is not mandatory under Lifting Operations and Lifting Equipment Regulations 1998 but may still be required as part of an examination scheme prepared by a Competent Person.

7.2 Scheme of Examination

For all equipment which requires examination, a Competent Person must prepare a scheme of examination which identifies:

- parts to be examined
- resources required
- parts requiring testing
- test and examination frequency.

The examination must be able to detect defects or weaknesses that would have an adverse effect on safety. This may involve strip-down, load testing or NDT of equipment.
In general, a specialist service provider will be appointed to undertake the preparation of an equipment register and examination scheme.

Note: The examination should be carried out by a competent person who is impartial, although they need not necessarily be independent of the employer. In practice, however, the appointment of a specialist examination company would ensure impartiality. The body appointed to carry out examinations should be accredited by various types of bodies performing inspection.

7.3 Pre-Service Examinations and Inspections

A thorough examination must be carried out:

- before using lifting equipment on site for the first time, unless the equipment has not been used elsewhere before and is accompanied by the valid certificate not more than 12 months old
- if the safety of the lifting equipment is dependent upon installation or assembly conditions.

Inspections would include pre-operation visual checks and function tests and the equipment operator (particularly crane operators) are considered competent to perform such tasks.

7.4 In-Service Examination and Inspections
Frequency

All lifting equipment deteriorates in use and therefore a thorough examination must be carried out at specified intervals. The intervals between thorough examinations of lifting equipment and accessories are:

- every 6 months regardless of whether the equipment is used for lifting persons or otherwise
- every 12 months for fixed lifting equipment (runway beams, padeyes, etc).

These examination frequencies are more stringent than those specified in the Lifting Operations and Lifting Equipment Regulations.

Additional Examinations and Inspections
A thorough examination must be carried out following exceptional circumstances where the integrity of the equipment may have been jeopardized; for example, following an overload or changeout of a major load path item.

In addition to thorough examinations, inspections shall be carried out wherever user risks are identified. The inspections should include visual checks and function tests and shall only be carried out by a Competent Person.

Note: Equipment currently under a scheme of thorough examination need not be examined under this Practice until the next required under the existing scheme.

7.4 Examination Reports and Defects

Competent Person
The Competent Person carrying out the examination shall:

- immediately report any defects to the employer and equipment users if the defect could cause the equipment to become a danger to personnel
- complete an authenticated written report of examination and submit this within 28 days to the employer and equipment hirer (if applicable)
- forward a copy of the report to the relevant enforcing authority (the Safety Regulator of the country of origin of the equipment) if any equipment defects that could cause an imminent risk of serious personal injury.

PROJECT MANAGER
The SITE MANAGER shall:

- immediately withdraw the equipment from service if notified of a defect which poses an immediate threat to persons and not re-use it until the defect has been rectified
- if notified that a defect will become dangerous if not rectified within a specific period specified by the Competent Person:
    - withdraw the equipment form service if the necessary repairs are not completed within that period specified

  and…
    - not re-use the equipment until rectification is complete.

8 Records

8.1 Certificates of Conformity

Lifting equipment will be supplied with a certificate of conformity from the country from which it has been supplied and the employer must retain such records for so long as he uses the equipment.

8.2 Examination Reports

Pre-First Use
If lifting equipment has undergone a thorough examination prior to first use then a copy of this report must be kept until the employer ceases to use the lifting equipment.

Post-Installation/Assembly
Where a report of thorough examination has been issued following installation or assembly of lifting equipment a copy of this report must be retained until the equipment ceases to be used at that location.

8.3 Inspection Reports

Inspection reports must be retained until the next report is available.

8.4 Storage and Availability of Records

The SITE MANAGER shall ensure that the records are properly maintained and are in order.
Normally, reports are stored at the location where equipment is being used. However, if this is not possible they can be kept elsewhere provided they are easily accessible.
Records may be kept in hard copy form, stored electronically or on computer disc. Computer systems should be able to provide written copy when necessary.
Certification, examination and inspection records and reports shall be readily available to inspectors, inspection authorities and enforcement authorities upon request.

Appendix A – Definitions
List of Definitions

Competent Person:	A person with appropriate practical and theoretical knowledge and experience
Examination scheme:	A suitable scheme drawn up by a **competent person** for such **thorough examination** of lifting equipment at such intervals as may be appropriate in accordance with these guidelines.
Lifting accessory:	Work equipment for attaching loads to machinery for lifting (eg., pendant, sling, shackle, etc). **Note:** An accessory is also an item of lifting equipment as far as application of the UK *Lifting Operations and Lifting Equipment Regulations* are concerned.
Lifting equipment:	Work equipment used for **lifting** or **lowering** loads, including any **attachments** for anchoring, fixing or supporting it.
Load:	Whatever is lifted or lowered by the lifting equipment and accessories, including any carrier used to hold materials, persons or animals.
Thorough examination:	A thorough examination by a **competent person** including such testing as is appropriate for the purpose

9 METHOD STATEMENTS HEALTH AND SAFETY CONTROLS

9.1 Safe Work Method Statement Form

SAFE WORK METHOD STATEMENT

Hierarchy of Controls

Eliminate – 'Design out' the hazard when new materials, equipment and work systems are being purchased for the workplace;

Substitute - Substitute less hazardous materials, equipment or substances and use smaller sized containers;

Isolate – separate the workers from hazards using barriers, enclosing noisy equipment and providing exhaust or ventilation systems;

Engineering – use engineering controls to reduce the risks such as guards on equipment, hoists or other lifting and moving equipment;

Administrative – Minimize the risk by adopting safe working practices or providing appropriate training, instruction or information.

Personal Protective Equipment – Make sure that appropriate PPE is available and used correctly.

SWMS FOR SITE PREPARATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**PPE and Equipment**	**Monitoring Devices**
Equipment/ Facility Set-up	Slips, Trips, Falls	Clear walkways work areas of equipment, tools, vegetation, excavated material and debris	Body harnesses / lanyard (elevated platforms)	
		Mark, identify, or barricade other obstructions		
		Evaluate fall hazards above 2 m.; use fall protection equipment (harness/lanyard), standard guardrails or other fall protection systems when working on elevated platforms above 2 m		
		Use heavy duty industrial (type IA) ladders		
		Install and inspect scaffolds according to manufacturers requirements		
		Only trained operators are permitted to use aerial lifts		
		Tie-off all straight/extension ladders or manually hold by co-worker at base		
		Anchorage points for fall arrest systems must support at least 2 400 kg for each worker		
		Halt roof, exterior scaffold work in high winds, severe weather		
	Struck By/ Against Heavy Equipment	Wear reflective warning vests when exposed to vehicular traffic	Warning vests, Hard hat, Safety glasses, Steel toe work boots	
		Isolate equipment swing areas		
		Make eye contact with operators before approaching equipment		
		Understand and review hand signals		
	Burns	Wear proper work gloves, face shield/safety goggles, and leather apron to protect workers from skin burns when welding, cutting, and burning	Tinted face shield	
		Inspect burning/welding equipment, lines, valves, hoses before using equipment		
		Post fire watch for remote locations		
	Sharp Objects	Wear cut resistant work gloves when lacerations or other injury may be caused by sharp edges or objects	Leather gloves	
		Maintain all hand and power tools in a safe condition		
		Keep guards in place during use		
		De-energize or shut off utility lines at their source before work begins		
		Use double insulated or properly grounded electric power-operated tools		
		Maintain tools in a safe condition		
Hand tools and lifting devices		fire extinguishers)	Review JSA with all site personnel	

SWMS FOR SITE PREPARATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**PPE and Equipment**	**Monitoring Devices**
Clearing, Grubbing	Struck By/ Against Heavy Equipment	Wear reflective hi-vis vests worn when exposed to vehicular traffic	Hi-vis vests, Hard hat, safety glasses, Steel toe work boots	
		Isolate equipment swing areas		
		Make eye contact with operators before approaching equipment		
		Understand and review hand signals		
	Slips, Trips, Falls	Clear walkways work areas of equipment, tools, vegetation, excavated material and debris		
		Mark, identify, or barricade other obstructions		
		Maintain 3 point contact when ascending/descending ladders/ mounting/dismounting from heavy equipment		
		Halt exterior work in high winds, lightning, severe weather		
	Handling Heavy Objects	Observe proper lifting techniques		
		Obey sensible lifting limits (Refer to Manual handling procedure)		
		Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads		
	Eye Injuries	Wear face shield, goggles when operating powered clearing / grubbing equipment	Face shield, goggles	
	Sharp Objects	Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects	Leather gloves	
		Maintain all hand and power tools in a safe condition		
		Keep guards in place during use		
		Close doors, windows on heavy equipment to prevent injuries from tree branches and other vegetation		
	High Noise Levels	Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)	Ear plugs	Sound Level Meter
		Assess noise level with sound level meter if possibility exists that level may exceed 85 dBA		
	Insect / Snake Bites	Review injury potential and types of snakes with workers	Coveralls, duct tape bottom of coveralls to boots	
		Avoid insect nests areas, likely habitats of snakes outside work areas		
	Contact Dermatitis	Wear PPE to avoid skin contact with contaminated soil, plants, or other skin irritants	Tyvek coveralls, duct tape bottom of coveralls to boots or latex boot	
		Identify and review poisonous plants with workers		
		Apply protective cream/lotion to exposed skin to prevent poison oak or similar reactions		
		Wear eye, face, hand & hearing protection when operating power clearing equipment		
		Shut-off / idle power tools walking between work areas	Face shield,	

SWMS FOR SITE PREPARATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**PPE and Equipment**	**Monitoring Devices**
	Operations of power clearing tools (brush saws, weed wackers)	Store flammable liquids in well ventilated areas, away from work areas	goggles, leather gloves, ear plugs, Steel toe work boots, chaps	
		Shut off equipment during re-fueling		
		Allow equipment to cool before re-fueling		
		Use funnels to avoid fuel spillage		
		Prohibit smoking while operating clearing equipment		
		Provide ABC (or equivalent) fire extinguishers for all work areas		
	High/Low Ambient Temperature	Monitor for Heat/Cold stress	Insulated Clothing (ambient	Meteorological Equipment
		Provide fluids to prevent worker dehydration		
		Establish work/rest		
EQUIPMENT TO BE USED		**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**	
Brush saws, weed wackers, mowers		Inspect equipment and tools daily per manufacturers requirements	Proper use of equipment	
First-aid kit, insect repellant				
Fire extinguisher				
Personal protective equipment		Inspect all emergency equipment (i.e.: first aid kits, fire extinguishers)	Review JSA with all site personnel	
Hand tools				
	Underground/ Overhead Utilities	Identify all utilities around the site before work commences	Hard hat, safety glasses, steel toe work boots	
		Cease work immediately if unknown utility markers are uncovered		
		Use manual excavation within 1 meter of known utilities		
		Utility clearance shall conform with Excavation Safety Procedure		
		Construct diversion ditches or dikes to prevent surface water from entering excavation		
		Provide good drainage of area adjacent to excavation		
		Collect ground water/rain water from excavation and dispose of properly		
		Store excavated material at least 1 meter from the edge of the excavation; prevent excessive loading of the excavation face		
		Provide sufficient stairs, ladders, or ramps when workers enter excavations over 1,2 meter in depth		
		Place ladders no more than 7,5 meter apart laterally		
		Treat excavations over 1,2 meter deep as confined spaces		
		Complete confined space permit entry procedure		
		Monitor atmosphere for flammable/toxic vapors, and oxygen deficiency		
		Slope, bench, shore, or sheet excavations over 1,5 meter deep if worker entry is required		
		Assign a competent person to inspect, decide soil classification, proper sloping, the correct shoring, or sheeting		

10 COMMUNITY HEALTH AND SAFETY MANAGEMENT

10.1 Objectives

The objectives of this section of the plan are to:

- Continuously identify, evaluate and prioritize the risks and impacts of the Projects activities on the health, safety and security of local communities;

- Proactively prevent and avoid impacts to community health safety and security, and enhance any positive impacts related to community health, safety and security;
- Identify strategies that provide adequate health related information and prevention measures through which communities can manage their own health and safety in an optimum manner; and
- Implement security that protects employees, assets and business continuity in a manner that adheres to national legislation.

10.2 Purpose and Scope

The purpose of this section of the plan is to provide a clear set of actions and responsibilities for the control of impacts affecting the health and safety of the communities within the Project's area of influence.

The scope covers construction phase of the Project.

The plan includes measures to respond to the following potential impacts identified in the EIA:

- Changes to community health profile including exposure to disease, changes in availability and quality of water resources;
- Changes to livelihoods and income generating opportunities and subsequent effects on community access to social and physical infrastructure;
- Changes to community health and wellbeing including changes to social and cultural cohesion; and
- Changes to community safety profile related to traffic, emergency responses, unplanned events, crime and conflict.

Community health includes the concept of well-being, which looks beyond physical health or absence of disease, and incorporates a broader psycho- social concept of mental and social health. Wellbeing also considers the ability of an individual to realize their potential within society, work productively, build strong and positive relationships with others and contribute to their community. Factors such as self-esteem, coping mechanisms, resilience and stress response are important in determining an individual's wellbeing.

10.2 Management During Construction

Potential Impacts
The potential Impacts on the local community identified in the EIA include:

Safety - During the construction phase, the Project will be adding a mix of light, and heavy and slow-moving vehicles onto the road network. This will include vehicles transporting workers, trucks carrying heavy equipment between work areas and haul trucks moving spoil. The potential impacts of Project construction include the increased risk of collisions and road transport accidents (potentially resulting in injury, death, or fuel or cargo spillage) and subsequent harm to animals, local shepherds and communities (including contamination of soils and groundwater).

Potential areas where community safety could be affected during the construction phase are highlighted in the following figures.

Security - There is the potential that an improved road will bring greater crime due to improved accessibility to the area to people outside the valley. During the construction phase, this will include the presence of road construction workers, which could have a potential effect of increased crime in the Project area.

Management Actions
General

During construction this will include measures to:

- Avoid, minimize or compensate for the potential for community exposure to hazardous materials and substances during construction;
- Avoid, minimize or compensate for the potential for traffic related accidents;
- Avoid, minimize or compensate for the proposed Project's direct impacts on the local environment which may result in subsequent impacts to local income generating opportunities;
- Avoid, minimize or compensate for the potential for community exposure to communicable and other diseases;
- Avoid, minimize or compensate for a decline in the availability and / or quality of water resources available to local communities;
- Assist and collaborate with the local communities, local government, and other relevant partners, in their preparations to respond effectively to emergency situations; and
- Assess and manage risks and impacts posed by the Projects security arrangements to those within and outside the Project site.
- In achieving these objectives, the Contractor will consider the differentiated exposure of different local communities to impacts and the higher sensitivity of vulnerable groups.

Specific

Hazardous Materials – An emergency response plan, spill management plan and waste management plan have been provided as part of the Project to manage this issue. In addition, the following conditions will apply for the storage and use of hazardous materials (including bitumen):

- All hazardous materials will be stored (including within suitable sized bunds for liquids), handled and disposed of according to their Material Safety Data Sheet (MSDS).
- Copies of MSDS will be kept on site with all hazardous materials.
- A log of the type and volume of all hazardous wastes on site will be kept.
- A plan of site indicating where all hazardous materials are stored will be prepared and kept on site.

Income and Livelihoods – A Local Content Management Plan has been prepared by as part of the Project to address local income and livelihoods issues.

Traffic - The mitigation measures to be adopted for the Project's construction transport activities include the following, noting a degree of flexibility in the event of adverse weather or unforeseen circumstances:

- Stipulations that all driving is to occur during daytime hours where possible;
- Stipulations in regard to maximum driving hours per day and week;
- Strict adherence to speed limits;
- Strict adherence to spill response measures in the event of a spillage from a vehicle, particularly in the vicinity of the Rioni River;
- Consultation with local households, community groups, police, and emergency services along the transport routes; and
- Driver training programs to ensure that Contractors staff are aware of community sensitivities, such as specific livestock movement periods.

Air Quality - The access roads will be paved to minimize dust affects to neighboring households and, indirectly, livestock through dust deposition on pasture.

Schools - The Contractor will provide a series of road safety awareness sessions for schools in the Project area. The sessions will be provided on a six-monthly basis throughout the construction phase. As part of the awareness sessions children will be given reflective badges to fix to their coats and school bags.

Community Complaints
Ongoing community engagement will be required as well as the implementation of the grievance mechanism in order that any community or livestock safety issues are being adequately addressed and rectified.

APPENDIX A HEALTH & SAFETY CHECK LIST (HSCL)

Health & Safety Check List (HSCL)

The Employer	
The Consultant	
The Contractor	

Monitoring period/	Reporting date/
From/ *To/*	*Date/*
Reported by:	Checked by:
Position/ Environmental Expert/ *Name/* *Signature/*	*Position/* *Name/* *Signature/*
Date/ *Week No/*	*Date/* *Week No/*

1	**CONTRACTOR'S SITE ESTABLISHMENT**			
1. 1	Does an effective perimeter fence exist?			
1. 2	Are Health & Safety sign boards clearly displayed?			
1. 3	Is Health & Safety training taking place on a regular basis?			
1. 4	Have all workers been provided with the appropriate Personal Protective Equipment (PPE)?			
1. 5	All workers are wearing appropriate Personal Protective Equipment (PPE)?			*If 'No', assess the % of usage:*
1. 6	Are workers are using additional protective equipment for hazardous operations as required?			*If 'No', assess the % of usage:*
1.7	Are all working areas and trafficked areas effectively separated?			
1.8	Are all vehicles entering the site provided with a working audible reversing warning system?			
1.9	Are nominated Banksmen provided and trained / qualified?			*Name of Banksmen:*
	Are all vehicle movements involving maneuvers on the highway or reversing in any location controlled by a Banksman?			
	Are Flagmen provided for all activities that could affect traffic, in a number and at locations to suit varying conditions of work?			
2	**TRAFFIC SAFETY & MANAGEMENT**			
2. 1	Is the correct temporary signage provided on the Highway at all locations?			*If No - record exceptions/*
2. 2	Area working areas and trafficked areas effectively separated?			
2. 3	Have traffic flows been unreasonably disrupted?			
2. 4	Have there been any collisions / accidents involving Contractor's equipment / materials?			
2. 5	Are all vehicles entering the site provided with a working audible reversing warning system?			
2. 6	Are all vehicle movements involving manoeuvres on the highway or reversing in any location controlled by a Banksman?			
2.7	Are Flagmen provided for all activities that could affect traffic, in a number and at locations to suit varying conditions of work?			
3	**CONTRACTOR'S SITE OPERATIONS**			
3.1	**General**			
3.1.1	Have all workers been provided with appropriate Personal Protective Equipment (PPE)?			
3.1.2	Are all workers wearing appropriate Personal Protective Equipment (PPE)?			*If 'No', assess the % of usage:*
3.1.3	Are workers using additional protective equipment for hazardous operations as required?			*If 'No', assess the % of usage:*
3.1.4	Are all vehicles entering the site provided with a working audible reversing warning system?			
3.1.5	Are all vehicle movements involving maneuvers on the highway or reversing in any location controlled by a Banksman?			
3.1.6	Are Flagmen provided in a number and at locations to suit varying conditions of work for all activities that could affect traffic?			

3.2	**Excavations**			
3.2.1	Have existing underground utilities been located by means of trial holes and clearly identified on site? Have all utilities drawings have been checked by the Contractor's Engineer responsible for such works?			*Name of nominated person:*
	Have CAT Scans have been carried out?			
3.2.2	Are existing overhead cables protected by means of goal posts? Are any excavators working under power lines or within the restricted area of the goal posts?			
3.2.3	Within all current working areas, have goal posts been erected to protect Workers from danger, and prevent possible damage from, and to, the overhead power lines?			
3.2.4	For current working locations has the Contractor's nominated engineer contacted the relevant utilities providers with regard to excavation and possible effects / precautions / notifications that the utility provider may require? Chainage: Chainage:			*Name of nominated engineer/*
3.2.5	Is excavation work being supervised by a competent person?			*Name of competent person/*
3.2.6	Are Excavator Drivers competent and qualified?			*Certificate No*
3.2.7	Are nominated Banksmen provided and trained / qualified?			*Name of Banksmen*
3.2.8	Are all trench excavations in poor ground conditions (where the sides will not stand up), supported?			*State the method of support/*
3.2.9	Are trench excavations greater than 1.2m deep supported (in any type of ground)?			*State the method of support /*
3.2.10	* Alternative methods of support for trench excavations: Examples: Drag Box / Trench Box / Bench Cut or Sloped Sides / Battered Back*			
3.2.11	Is spoil from trench excavations, or any 'imported' material, stockpiled at a safe distance from the trench?			*State distance from trench:*
3.2.12	Are plant / equipment movements along trench excavations kept to a minimum and at a safe distance from the edge of trench?			*State distance from trench:*
3.2.13	Is backfilling of trenches carried out within an acceptable time frame?			*State time frame:*
3.2.14	Are physical barriers and signage for trench excavations in place?			
3.2.15	Is there flow of water into trench excavations?			*If yes, how is the water being controlled:*
3.3	**Bridges** (Please Note: The default is that if 'Yes' is ticked it means that <u>all</u> bridges are OK)			
3.3.1	**General**			
3.3.1.1	Have all workers been provided with appropriate Personal Protective Equipment (PPE)?			
3.3.1.2	Are all workers wearing appropriate Personal Protective Equipment (PPE)?			*If 'No', assess the % of usage:*
3.3.1.3	Are workers using additional protective equipment for hazardous operations as required?			*If 'No', assess the % of usage:*
3.3.1.4	Are all vehicles entering the site provided with a working audible reversing warning system?			

3.3.1.5	Are all vehicle movements involving manoeuvres on the highway or reversing in any location controlled by a Banksman?			
3.3.1.6	Are Flagmen provided for all activities that could affect traffic, in a number and locations to suit varying conditions of work?			
3.3.2	**Excavations /**			
3.3.2.1	Have existing underground utilities been located by means of trial holes and clearly identified on site? All utilities drawings have been checked by the Contractor's Engineer responsible for such works?			*Name of nominated person:*
	Have CAT Scan been carried out?			
3.3.2.2	Are existing overhead cables protected by means of goal posts? Are any excavators working under power lines or within the restricted area of the goal posts?			
3.3.2.3	Within all current working areas, have goal posts been erected to protect Workers from danger, and prevent possible damage from, and to, the overhead power lines?			
3.3.2.4	Has the Contractor's nominated engineer contacted the relevant utilities providers with regard to excavation and possible effects / precautions / notifications that the utility provider may require? Bridge No. Bridge No.			*Name of nominated engineer:*
3.3.2.5	Is excavation being supervised by a competent person?			*Name of competent person:*
3.3.2.6	Is the excavator driver competent and qualified?			*Certificate No./*
3.3.2.7	Are nominated Banksmen provided and trained / qualified?			*Name(s) of Banksman/*
3.3.2.8	Are all trench excavations in poor ground conditions (where the sides will not stand up), supported?			*State the method of support *:*
3.3.2.9	Are trench excavations greater than 1.2m deep supported (in any type of ground)?			*State the method of support *:*
3.3.2.10	* Alternative methods of support for trench excavations: Examples: Drag Box / Trench Box / Bench Cut or Sloped Sides / Battered Back*			
3.3.2.11	Is spoil from trench excavations, or any 'imported' materials, stockpiled at a safe distance from the trench?			*State distance from trench:*
3.3.2.12	Are plant / equipment movements along trench excavations kept to a minimum and at a safe distance from the edge of trench?			*State distance from trench:*
3.3.2.13	Is backfilling of trenches carried out within an acceptable time frame?			*State time frame:*
3.3.2.14	Are physical barriers and signage for trench excavations in place?			
3.3.2.15	Is there flow of water into trench excavations?			*If yes, how is the water being controlled:*
3.3.3	**Scaffolding**			
3.3.3.1	Has all scaffolding been erected by a competent person?			*Name of competent person:*
3.3.3.2	Is all scaffolding approved for use by a competent person?			*Name of competent person:*

3.3.3.3	Is scaffold identification in place?			*Red Tag / Green Tag Basic International Procedure implemented*
3.3.3.4	Has all scaffolding been inspected and signed off by a competent person on a weekly basis (Register to be kept of inspections)?			*Name of competent person:*
3.3.3.5	Scaffold boards – have they checked for damage / missing / correct placement? Date of last check:			
3.3.3.6	Toe boards – have they been checked for damage / missing / correct placement? Date of last check:			
3.3.3.7	Hand rails – have they been checked for damage / missing / incorrect placement? Date of last check:			
3.3.3.8	Loading Bays – have they been checked for overloading, damage, scaffold boards, hand rails and guard protection all in place and in good working order? Date of last check			
3.3.3.9	Are the ground conditions on which scaffolding has been erected satisfactory (level and stable)?			
3.3.3.10	Are base plates used (with or without screw jacks)?			
3.3.3.11	Is timber for load bearing placed under base plates?			
3.3.3.12	Have access ladders (and walkways) been checked for: suitable length, damage, missing rungs, etc. Are all parts tied and secured effectively? Date of last check:			
3.3.3.13	Are factory produced ladders in use?			
	If not, what is the construction/condition/safety of the ladders in use			
3.3.4	**Crane Lifting Operations**			
3.3.4.1	Do cranes have the required certification documentation?			*Certificate No./*
3.3.4.2	Are Crane Drivers qualified to operate the cranes?			*Qualification Ref. Nos.:*
3.3.4.3	Do lifting chains, slings, shackles have all the relevant SWL marked on them?			
3.3.4.4	Do lifting chains, slings, shackles have relevant Serial / Plant / ID numbers or references that can be checked against test certification documents?			
3.3.4.5	Are nominated Banksmen provided and trained / qualified?			*Name of Banksmen:*
3.3.4.6	Are any cranes operating with out-riggers fully extended?			
3.3.4.7	Are cranes set up on reasonably level and stable ground?			
3.3.4.8	Are cranes set up on soft unstable ground?			*If yes, what precautions are in place:*
3.3.4.9	Are cranes set up close to underground utilities?			*If yes, state which underground utility and the distance:*
3.3.4.10	If the answer is 'yes' to the above, is the location of the out-riggers directly above underground utilities?			*State the precautions taken/*

3.3.4.11	Does each crane driver have a 'Banksman' (who is trained / qualified) guiding him?			*Name of Banksman/*
3.3.4.12	Are any cranes slewing or operating over live traffic?			*State precautions taken/*
3.3.4.13	Are overhead power lines or any overhead utilities within the operating radius of the any crane? Location:			*State precautions taken/*
3.3.4.14	Are all personnel working within crane 'areas' wearing helmets and high visibility vests / jackets?			

Annex 12. Soil Disposal Assessment Template

1. Purpose

This assessment outlines the technical characteristics of the Spoil Disposal Site(s) that CONTRACTOR proposes for use for spoil disposal during construction of the XXX, Georgia.

The spoil disposal site will be considered as an associate facility by ADB and as such ADB are required to complete due diligence on the site to confirm that the site selected is appropriate and the level of assessment is sufficient to meet ADB safeguards requirements.

Therefore, this assessment, prepared by the CONTRACTOR, requires approval from the ADB and RD PIU prior to the application of licenses and approvals for the site and its subsequent use.

The CONTRACTOR shall ensure that the disposal of excess spoil material will be undertaken in a manner that verifiably minimises environmental and social risks.

2. Site Screening

Screening Summary

A screening assessment of potential sites for spoil disposal has been undertaken by the CONTRACTOR. The CONTRACTORs EcoW and a sub-contracted national environmental expert have undertaken the screening exercise.

The following table indicates the sites assessed.

Table 1: Sites Screened

#	Site Name	GPS Coordinates	Nearest Village

The following Figure indicates the location of each site.

Figure 1: Location of Screened Sites

The CONTRACTOR used the Rapid Environmental Assessment Checklist to summarise the potential impacts of the site. The completed checklists for each site are provided as **Appendix A**.

The following table summarises the findings of the checklists.

Table 1: Summary of Screening Activity

Site	Air quality Impacts	Hydrology Impacts	Topography Issues	Soils Impacts	Flora Impacts	Fauna Impacts	Protected Area Impacts	Access Issues	Impacts to Local Community, including compensations - resettlement	Safety Issues	Noise Impacts	Archaeology / PCR Issues

The results of the screening exercise indicate that the following sites were ***UNSUITABLE*** for use:
XXX
XXX
XXX
The results of the screening exercise indicate that the following sites are ***SUITABLE*** for use:
XXX
XXX
XXX

3. Site specific Environmental and Social Assessment

Following the rapid screening exercise, the locations considered for use as disposal site/s (including their access roads) have been inspected by CONTRACTOR personnel from project different disciplines, including:
Name / Position
Name / Position

The characteristic of the selected dump site is described in the following paragraphs

Name of Disposal Site

TO BE COMPLETED

Location/s

PROVIDE SITE COORDINATES

PROVIDE SITE BOUNDARY OVERLAID ON ORTHOPHOTO

PROVIDE ACCESS ROAD/S OVERLAID ON ORTHOPHOTO

PROVIDE FOR MULTIPLE SITES IF APPLICABLE

Cross sections of the sites (at 25 meter intervals) are provided in **Appendix B**.

A photographic record of the site pre-construction is provided by **Appendix C.**

3.1 Site Area And Estimated Volume Available

Estimated volume of material

Approximately XXX million cubic meters of material will be generated during the Project. The following table indicates the amount of material to be placed at each spoil disposal site and the volume of material allowed for disposal at each site according to their license.

Table 2: Available Site Areas

#	Site Name	Proposed Spoil Volume (m^2)	Volume Available According to License (m^2)

3.2 Social Issues

Access Arrangements, Route Selection and Traffic Management

The following figure/s provides the access routes for the site/s. These routes are also included in the CONTRACTORS Traffic Management Plan. No works shall start until the Traffic Management Plan and the access routes have been approved by the Engineer.

Figure 2: Access Roads

The route selection process was based on the following principles:

- Avoidance of natural hazards;
- Avoidance of populated areas; and
- No ban for travelling of HGV.

The route from the XXX to the spoil disposal site has a total length of XXX Km.

A summary condition survey of the access road has been undertaken and is included as **Appendix D**.

The route will pass through the following populated areas:
XXX
XXX

The following sensitive receptors were located along the route:

Table 3: Sensitive Sites

#	Type and Name	Coordinates	Distance to Route

The following upgrading works will be undertaken on the access road prior to its use:
XXX
XXX

Routine spraying of the access road with water will be undertaken during dry periods to limit dust impacts.

A speed limit of XXX has been set on the access roads.

Access to the site will be strictly controlled and will be fenced during the construction works to prohibit unauthorized access.

Warning signs will be places around the site to inform the local community of the safety issues.

3.3 Stakeholder Engagement

As part of the site selection process the CONTRACTOR has undertaken consultations with the local community regarding the use of the site and access roads.

The following table indicates the comments received during the consultations.

Table 4: Summary of Consultations

#	Village	Comment	Reply

A list of those present in the meeting is provided by **Appendix E**.

The attendees were informed during the meeting of the Grievance Redress Mechanism, and were provided a copy along with contact numbers for complaints.

3.4 Surface Water and Drainage and Groundwater

The following surface water features have been identified in the area:

Table 5: Surface Water Features

#	Name	Location

Outline if any crossings of these water courses will be necessary and if adequate crossing are available.

Outline here what site drainage will be installed, include designs, if relevant.

3.5 Reinstatement and Landscaping at Completion

The spoil disposal site shall be re-instated upon completion of works at the site.

Where practical, the site has been re-instated with similar species as those removed as part of the site clearance.

CONTRACTOR to provide full details of the reinstatement plan here, including area to be reinstated, schedule, types of plants and maintenance program.

Appendix F provides the profiles of the reinstated site.

3.6 Services Infrastructure & Plant On Site

The CONTRACTOR will use the following equipment on-site:

Table 6: Site Equipment

#	Type of Equipment	Number

XXX number of staff will be located at the site, they include:

Table 7: Staff

#	Staff Positions	Number

The site will be equipped with first aid facilities, mobile communications and toilets.

3.7 Biodiversity

A survey of flora and fauna was undertake at the site by a national specialist. The findings of the survey indicate that:
XXX
XXX

3.8. Archeology and PCR

A walkover survey of the site was undertake at the site by a national specialist. The findings of the survey indicate that:
XXX
XXX

3.9 Land Use

The spoil disposal sites, including access roads will affect the following
XXX Land Plots
XXX Productive Fruit Trees
XXX Residential Buildings
XXX Commercial Buildings
XXX Auxiliary Buildings
XXX Gates and Fences
XXX Businesses
XXX Fodder
XXX Agricultural Land

These features will be compensated by the RD per the conditions of the Project LARP

3.9 Proposed Preventive Measures

Appendix G provides the mitigation actions required for the operation and reinstatement of the site.

4. Conclusions & follow up actions

4.1 Conclusions

Based upon the results of this Assessment and on the basis that CONTRACTOR implements the mitigation measures under his responsibility and follow up actions identified, the following conclusions can be made with respect to proposed use of the disposal site assessed in this report:

- CONTRACTOR SEMP contains general mitigation measures to address the risks identified in this E&S Assessment;
- Where necessary, additional site-specific mitigation measures have been identified in this Assessment (see **Appendix G**), which provide further assurance to ADB that CONTRACTOR can meet its environmental and social Project Requirements;
- If implemented appropriately, the mitigation measures outlined in CONTRACTOR SEMP and this assessment will result in appropriate avoidance for reduction of impacts to an appropriate level;
- This assessment has taken into consideration all requirements of the EIA and EMP and CONTRACTOR SEMP;
- Where necessary, CONTRACTOR has highlighted additional actions to be undertaken, which will allow appropriate mitigation of environmental and social impacts (see **Appendix G**);
- CONTRACTOR will implement and monitor proposed use of the disposal site and amend mitigation measures as required to ensure they are effective.

4.2 Licenses and Approvals

Upon approval of this assessment by the ADB and the RD PIU, CONTRACTOR will complete his Spoil Disposal Plan. This plan shall be prepared in accordance with regulation N 424 on Approval the Rules for Removal, Storage and Use of Topsoil and Re-cultivation.

The CONTRACTOR shall also prepare and submit his EIA for the site which will be approved by MoEPA.

4.3 Follow-up

In addition to the implementation of those measures outlined in this report, the following Actions have been identified for addition to CONTRACTOR Action Tracking System, in order to close out issues identified in this PCS that require non-routine follow up action;

Table 8: Follow-up Actions

Action	Responsible
Periodic (Monthly) inspections/audits will be undertaken on the selected site to verify the respect of project requirements, as considered appropriate by the Engineer, the PIU and ADB	Contractor
Review of Grievance Reports relating to dump truck movements delivering spoil to the dump site. Address any grievances as required.	Contractor
Periodic inspections of dump truck movements on the approved route corridor to observe whether Project related vehicles are contributing to traffic delays, hold ups or incidents.	Contractor

LIST OF APPENDICES

APPENDIX A – SCREENING REPORTS

APPENDIX B – SITE CROSS SECTIONS

APPENDIX C – PHOTOGRAPHIC RECORD OF THE SITE/S

APPENDIC D – ACCESS ROAD CONDITION SURVEY

APPENDIX E – CONSULTATIONS

APPENDIX F – SITE PROFILES

APPENDIX G - PROPOSED MITIGATION MEASURES

Annex 13. Asbestos-Containing Waste Management Plan

Waste Asbestos-Containing Material Management Plan

1. Project Goals and Objectives

The goal of the following Asbestos-Containing Waste Management Plan ("ACW Management plan") is to avoid, reduce, or manage any potential adverse impact on the environment and/or humans caused by the project implementation.

In order to achieve this goal, the following measures are necessary:

- The quantity and content of the waste placed in the project zone in an uncontrolled manner is to be identified;
- The degree of risk of the negative impact of the existing situation on the environment is to be identified;
- A detailed ACW Management plan is to be developed;
- The separation/collection, transportation and safe disposal of the asbestos-containing (AC) waste is necessary;
- The monitoring plan is to be developed and implemented.

2. Rights and Responsibilities

The companies and organizations engaged in the AC waste have the following rights and obligations:

Executive Agency (RD of the MRDI):

- Approve risk assessment and ACW Management plans
- Ensure resources are allocated to enable thorough application of ACW Management plan on site
- Ensure employees are made available for asbestos awareness training and asbestos removal work
- Ensure an Asbestos Removal Business Certificate is maintained for the site where applicable
- Ensure the ACW Products Register is maintained for the site
- Ensure the Asbestos Exposure Register is maintained for the site
- Ensure compliance with ACW Management plan

Contractors:

- Submit risk assessment and ACW Management plans prior to performing waste separation (asbestos removal), transportation, and disposal works;
- Undergo site induction;
- Ensure no asbestos is removed or disturbed without prior notification to RD;
- Ensure legislative requirements and appropriate procedures are complied with;
- Upon job completion ensure all products are labelled using the correct identification stickers and disposed in safe manner; and
- Report immediately to RD any perceived asbestos risk.

3. Asbestos Risk Assessment

The asbestos risk assessment process involves identifying, analyzing, evaluating, controlling, and monitoring sources of asbestos (e.g., within buildings or illegal dumps). The presence of asbestos is considered a hazard, but the level of risk associated with the hazard is related to the presence of airborne fibers. For example, the identification of asbestos within a building doesn't automatically necessitate its immediate removal. Asbestos that is in a stable matrix, or effectively encapsulated or sealed, and remains in a sound condition while left undisturbed, represents low risk to health.

Asbestos becomes dangerous when the fibers are released into the air and inhaled or ingested in high concentrations over a prolonged period of time. Individuals face the risk of inhaling or ingesting airborne fibers when asbestos containing products are worn down, disturbed, or damaged.

There are some classifications to determine the risk of the Asbestos-Containing Material (ACMs), but the principal evaluation indicators are the same with all of them. The degree of risk increases as a result of the following factors:

1. High degree of the physical damage of the ACMs.
2. High probability of the future damage of the ACMs.
3. High degree of contact of the damaged ACMs with air.

4. Awareness Training

4.1 Asbestos Separators/Removalists

Persons carrying out asbestos removal work are to be trained so they can carry out this work safely and without risk to their own health or the health of others. This training must reflect the specific type of asbestos work to be undertaken. Asbestos Separators/Removalists are to keep written records of all training provided to their asbestos removal workers and these records should be requested before awarding the contract for any site removal work.

4.2 Site employees

Any project related employees who may come into contact with ACM on the site, either directly or indirectly, must be provided with adequate information and training. Depending on the circumstances the asbestos awareness training may include:

- the purpose of the training;
- the health risks of asbestos;
- the types, uses, and likely occurrence of ACM at the specific construction site;
- the trainees' roles and responsibilities under the project ACW Management plan;
- where each site-specific register of ACM is located and how it can be accessed;
- the timetable for removal of ACM from the particular construction site;
- the processes and procedures to be followed to prevent exposure, including exposure from any accidental release of asbestos dust into the workplace;
- where applicable, the correct use of maintenance and control measures, protective equipment and work methods to minimize the risks from asbestos, limit the exposure of workers and limit the spread of asbestos fibers outside any asbestos work area;
- control levels for asbestos; and
- the purpose of any air monitoring or health surveillance that may occur.

4.3 Local population

The awareness building training about the negative impact of the ACM waste on the environment should be held for the population living or working adjacent to the project zone. Depending on the circumstances the asbestos awareness training may include:

- the purpose of the training;
- the health risks of asbestos;
- the types, uses, and likely occurrence of ACM at the specific construction site;
- where each site-specific register of ACM is located and how it can be accessed;
- the timetable for removal of ACM from the particular construction site;
- the processes and procedures to be followed to prevent exposure, including exposure from any accidental release of asbestos dust into the workplace;

5. Waste Separation

5.1 General requirements

Management of debris and waste illegally disposed of must be properly separated to remove problem materials if the bulk of the debris or waste is to be managed at appropriate solid waste facilities and/or to be recycled. Careful waste separation is essential to expedite clean up and removals, hold down costs, reduce waste, and protect human health. Recycling certain materials will help hold down costs. Poorly separated waste or debris may not be managed as inert waste and may be subject to further waste evaluation and disposal costs as municipal waste, asbestos waste or even hazardous waste. Problem loads may be rejected, and contractors may be asked to do additional work.

Wastes should be carefully separated into categories described below and properly managed at approved recycling, processing or disposal facilities in accordance with International, national and local requirements. Keep records on the amount removed from each unit, how it is segregated and eventually managed, recycled or disposed:

- **Electronic waste** (E-Waste) including monitors, stereos, mercury devices and fluorescent lighting equipment such as thermostats, mercury switches, fluorescent fixtures and bulbs, light ballasts and similar materials. Please package fluorescent bulbs and other fragile materials to avoid breaking.
- **Hazardous waste** includes, but is not limited to: paints, solvents, varnishes, stains, cleaners, degreasers, spot removers and similar ignitable products; aerosol cans, and compressed gas containers or cylinders; ammunition including unused shells, lead shot, bullets, powder loading supplies, etc; oils, fuels, automotive additives, fluids (transmission , hydraulic, brake, etc.); batteries (including lead, mercury, ni-cd, etc.); acids and bases – often labeled corrosive (store acids separately from bases and do not mix); toxics, poisons, pesticides (includes insect, rodent and weed killers); electronics (computers and screens, TVs, stereo equipment, etc.); mercury devices (switches, fluorescent lighting, mercury bulbs, thermometers, etc.); light ballasts and transformers; antifreeze; fertilizers; and other ignitable, corrosive, reactive, toxic, pcb, problem or unknown wastes. Label containers and do not mix materials.
- **Medications and infectious waste** including pills, medicines, dressings, needles, sharps, human blood or tissue, isolation waste, pathological waste, infectious human or animal waste, etc.
- **Asbestos-containing material** from individual all sources may include asbestos pipe wrap, boiler coatings, loose insulation, transit (older cement type siding and electrical backing), vermiculite (light, platy insulating material) and other materials. Please label all bags or containers “Asbestos Waste.” Asbestos Waste must be disposed at approved solid waste facilities.

5.2 Fencing the working area

Any ACM found in the project area may be severely damaged and the degree of damage may create conditions for asbestos dust to carry at distance with the wind. Consequently, any additional intervention by a human may further boosts the risk of origination and movement of the asbestos dust to certain distances.

For safety reasons, aiming at avoiding the distribution of the asbestos dust originated in the process of separation, the area of the waste disposal must be divided into smaller areas and bordered with approximately 2-metre-high fences in the separation process. Plastic should be used as fences, as dust is easy to remove from it.

To the extent possible, the process of separation shall be started when the number of people is minimal in the project area.

Safety marks and signals shall be provided at the locations preventing foreign people from entering the area.

The works cannot be undertaken in windy weather to prevent the asbestos dust from spreading.

All personnel participating in the separation and packing of the ACM shall wear Personal Protective Equipment (PPE), and all workers shall be equipped with respirators.

6. Personal Protective Equipment (PPE)

The PPE requirements for work involving ACM at construction sites are to be based on the relevant risk assessment conducted by a suitably qualified person. The Occupational Safety and Health Administration (OSHA) of the United States Department of Labor should be consulted to determine the PPE needs.[69]

Protective clothing and equipment is to be worn at all times during work in the asbestos work area, prior to the final clearance inspection. Any PPE worn during asbestos disposal is to be treated as asbestos waste and disposed of in the approved waste bags. The laundering of contaminated protective clothing in workers' homes is strictly prohibited.

The employees, who are obliged to use the respirators, should be proficient of the rules of their exploitation. The training programs and labour protection guidance of the employees engaged in the operations with asbestos should cover the following questions:

a) Surroundings when the use of respirators is necessary and the identification of such surroundings;
b) The rules of exploitation and examination of the respirator's close attachment to one's face;
c) The rules of the right functioning, examination and right storage of the respirator.

Prior to the removal/separation, the asbestos materials must be wetted. The removal works must be accomplished with caution to avoid damage to ACM.

7. Packing Asbestos-Containing Materials (ACMs)

[69] https://www.osha.gov/SLTC/asbestos/index.html

Asbestos waste, including contaminated PPE and cleaning materials (e.g., cleaning rags and plastic sheeting used to fence the asbestos work area) are to be removed and disposed of into bags.

Loose asbestos waste is not to be allowed to accumulate within the asbestos work area. It must be collected and disposed of in asbestos waste bags and/or in a solid, sealable asbestos waste container, such as a bin or drum, as storage is required.

Controlled wetting of asbestos waste is to be done to reduce the possibility of dust emissions during the bagging or other containment of the waste. If asbestos waste cannot be disposed of immediately (e.g., because of volume requirements for disposal), it is to be stored in a solid waste drum, bin or container or skip and sealed and secured upon the completion of each day's work so that unauthorized access is prevented.

Waste Bags: asbestos waste is to be collected in heavy-duty 200 µm (minimum thickness) polythene bags that are no more than 1,200 mm long and 900 mm wide. The bags are to be labeled with an appropriate warning, clearly stating that they contain asbestos and that dust creation and inhalation should be avoided.

Asbestos should be packed and marked in tough, hermetic and dust-proof bags, with the marking or annotation about the safety with the following data:

- Name of the waste;
- Address of the product manufacturing company; chemical designation or common names of all components of the asbestos-containing production;
- Percentage ratio of asbestos in the mixture;
- Information about the asbestos properties dangerous for health;
- Indications about the necessity to use the PPE (respirators, protective clothing, etc.);

The bags should be hermetically closed with a thermal welded joint or stitched thread. In case of the damage to the bags, the damaged spots should be soldered with a joint tape, placed in the impermeable bags, sealed and marked.

8. Waste Transportation

The routes used for removing waste from the asbestos work area are to be designated in the ACW Management plan before the commencement of each removal. A competent person, following discussions with the asbestos removalist, should determine the methods used to transport wastes through a building. In occupied buildings, all movements of waste bags should occur outside normal working hours.

Once the waste bags have been removed from the asbestos work area, they are to be either:

- placed in a solid waste drum, bin or skip; or
- removed from the site by an approved and licensed carrier.

Waste bags should not be stored at the asbestos removal site if they are not placed in an asbestos waste drum, bin or skip. Drums or bins used to store asbestos waste should be stored in a secure location when they are not in use.

9. Offsite Waste Disposal

Transport and final disposal of asbestos waste material shall be carried out by a competent person who carries certification as a transporter of hazardous materials and in a manner that will prevent the liberation of asbestos dust to the atmosphere.

All asbestos waste material shall be buried at an approved landfill site and in a manner approved by the local and state authorities. Prior to payment of invoices, the RD must receive copies of waste disposal receipts, as provided by the approved landfills. All details of offsite disposal are to be included in the asbestos removal control plan.

No building materials are to be re-used or recycled unless they have undergone full successful decontamination. If this can't be achieved, then the building materials are to be treated as asbestos waste and disposed of accordingly. All waste disposals shall be recorded (date, quantity, disposal contract etc.) in an appropriate register (e.g., within the sites waste management plans for disposal of regulated wastes).

The waste unloaded on the landfill should be buried under at least 25-cm-thick soil layer. Leaving asbestos-containing waste open on the landfill is not permitted.

During the trench conservation, the final layer covering the asbestos-containing waste, should be at 2 m thick.

10. Asbestos Exposure Register

Contractor will maintain an asbestos exposure register that records persons that have been exposed, have potentially been exposed or have worked in close proximity to asbestos materials. A copy of the register will be provided to the RD.