"Darial Energy" LLC

Dariali Hydro Power Plant Construction and Operation Project

Environmental and Social Impact Assessment Report

(Non-Technical Summary)

Tbilisi 2014

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1 Introduction

This report represents a non-technical summary of the environmental and social impact assessment package, which has been prepared for the Dariali hydro power plant construction and operation.

Dariali Energy (DE) JSC is developing the Dariali Hydroelectric Power Plant (HPP) Project in the Kazbegi Municipality District of Georgia. The plant will comprise a run-of-river, 108MW-capacity hydropower facility with associated substation. A spillway dam will impound a section of the Tergi River and an intake structure will divert the water into a settlement basin and headrace tunnel towards the underground powerhouse. From the powerhouse the tailrace tunnel will take the water to the location where it will re-join the Tergi River channel. This 'diversion section', from the headrace dam to the tailrace tunnel outlet, will bypass approximately 5km of the Tergi River.Electricity generated by the power plant will be connected to the state power grid.The project commissioning is anticipated to be undertaken in 2015 with 3 months of trial operation. Regulation of the power plant operation, controlof the characteristics of the turbines and generators, improvement of deficiencies and personnel training will be carried out during this period.

This Non Technical Summaryis partof the disclosure packageof documentsthat include:

- Environmental andSocial Impact AssessmentReport(ESIA) 2011;
- Impact ofDarialiHPPon KazbegiNational Park Traditional Use Zone, 2013;
- Expert Advice on Terrestrial Biodiversity Conservation, Land Take and Compensation 2013;
- Expert Advice on Aquatic Biodiversity Conservation, 2014;
- StakeholderEngagementPlan (SEP);and
- Environmental andSocialAction Plan (ESAP).

This Non Technical Summary, together with other documents listed above, is available at the following addresses:

- The office of "Dariali Energy" JSC – 4 Besiki str. Tbilisi. Georgia, office 206, Public Relations Specialist Eka Kikadze (tel.:995 5 (51) 50 33 00. E-mail: info@darialienergy.ge;
- The local office of „Dariali Energy" JSC- Georgia, Kazbegi municipality, construction camp of Dariali HPP located near Larsi customs checkpoint;
- „Dariali Energy" JSC web-site: www.darialienergy.ge;
- EBRD London Business Information Center, One Exchange Square, London, EC2A 2JN;
- EBRD regional office -6 Marjanishvili street, (Green Building, IV - V floor) 0105 Tbilisi, Georgia
- EBRD web-site: www.ebrd.com
- Administrative building of Kazbegi Municipality – the village of Stepantsminda, Kazbegi st. №1;
- The office of scientific-research firm "Gamma" - 17a. Guramishvili av, Tbilisi. Tel: 5 (95) 59 52 55;

The document will be also available at construction camps of the proposed Dariali hydro power plant.

2 Framework of the Environmental and Social Impact Assessment (ESIA)

According to the Georgian **Law on Environmental Impact Permit**, activities related to the construction of a power plant with an installed capacity of 2 MW ormore is a subject of environmental assessment. Therefore, in order to obtain the permit for the implementation of the project, an environmental and social impact assessment of the planned activities (construction and operation of HPP) was required.

In addition, Environmental and Social Performance Requirementsare also part of theEnvironmental and Social Policy (2008) of a potential lender, the European Bank for Reconstruction and Development (EBRD) and have been taken into consideration during the preparation of the ESIA package.

The ESIA includes the following:

- Identification andscopingofkeyenvironmentalandsocio-economic issues;
- Description of the existing environmental and socio-economic baseline conditions;
- Assessment of potentialnegative and positive impacts, in case of the project implementation;
- Consultations with project stakeholders and project affected people as detailed within the Stakeholder Engagement Plan;
- Definitionof practical activities related to the project that will ensure significant environmental and social impacts avoidance, mitigation or compensation.
- Definitionof monitoring programs in order to confirm that the construction and operation are consistently and properly carried out, as well as the identification of changes in the Project environment.

3 Description of the project

The construction and operation of Dariali hydro power plant is planned in Mtskheta - Mtianeti region, in Kazbegi Municipality, near the Georgian - Russian border. Infrastructure facilities will be located on the right bank of Tergi River, on the 7 km long section between Kuro and KhdisTskalitributaries. Construction of the low dam is planned near the village of Stepantsminda, on the Tergi River at elevation of 1725 m. The powerhouse will be located 1.2 km away from Darialiborder crossing point, at elevation of 1325-1333 m. Situational scheme for hydropower plant communications is given in Figure 3.1., and some of the design parameters of the power plant – in Table 3.1.

Table 3.1 Key design parameters of Dariali hydro power plant

Characteristic	Unit	Significance
Elevation of the head water	m	1725
Elevation of the tail-water	m	1333
Design water flow of the power plant	m^3/s	33.0
Design head (net)	m	370-380
Installed capacity of the power plant	MW	108.0
Median annual energy production	Million KWh	510.0

Powerplantwillconsistof: intakeunit, sand basin, diversionpipeline, surge tunnel entrance, headracetunnel, surgetunnel, underground pressure shaft, undergroundpowerplantstation, tailrace tunnel and open substation. Darialihydropowerplantwillinitially beconnectedtothestatepowergridthrough 110 kVtransmissionlineswhich connect the Georgian and Russian energy systems (thevillageofStepantsminda – Vladikavkaz). A new 220 or 500kV capacity line is being considered by Georgian State Electro system in order to connectDariali HPP to the grid in the future.

Situational schemes for hydropower plant communications are given in Figures 3.2., 3.3 and 3.4.

Figure 3.1 Situational scheme for Dariali hydropower plant communications

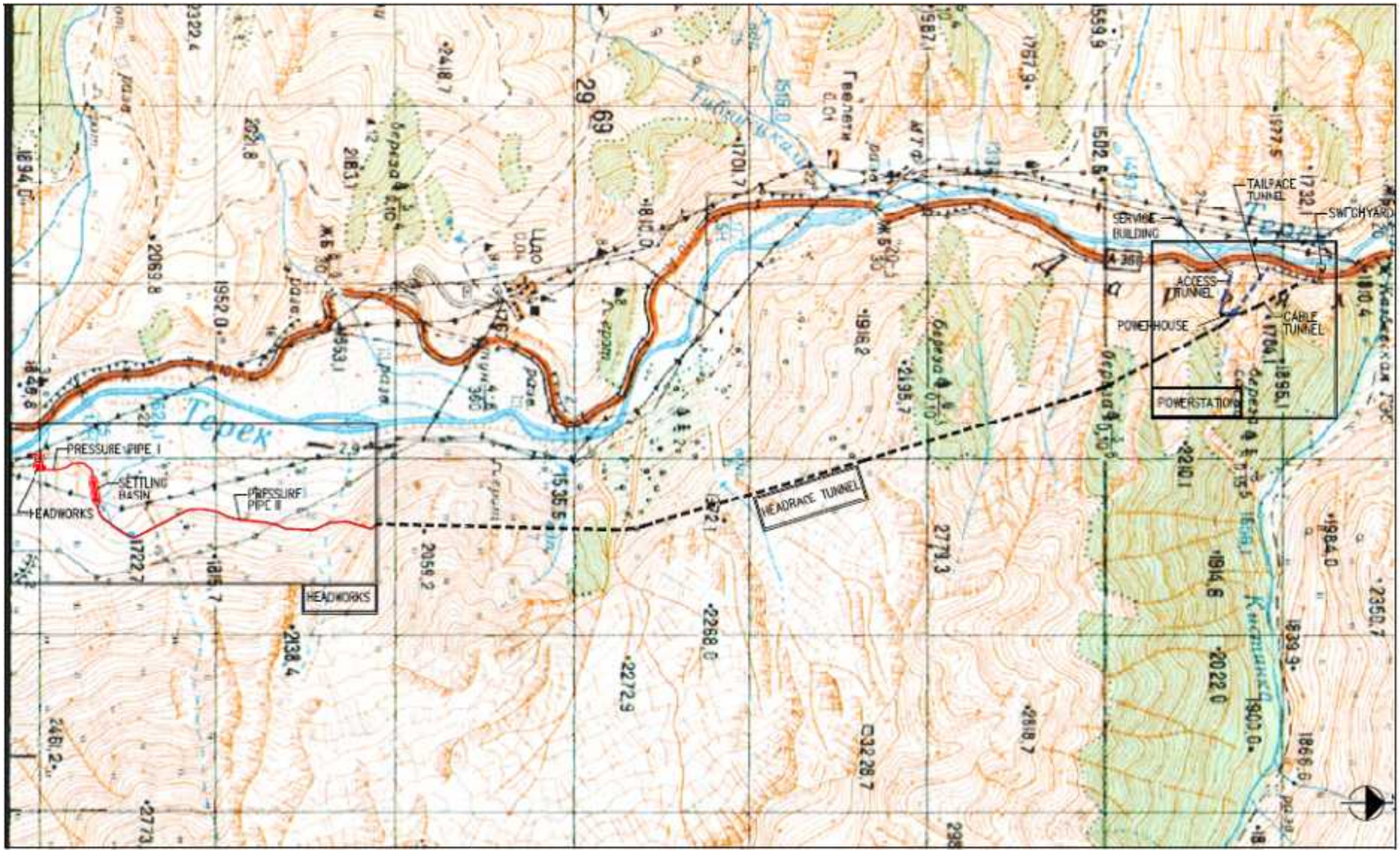


Figure 3.2 Situational scheme for headworks and diversion pipeline

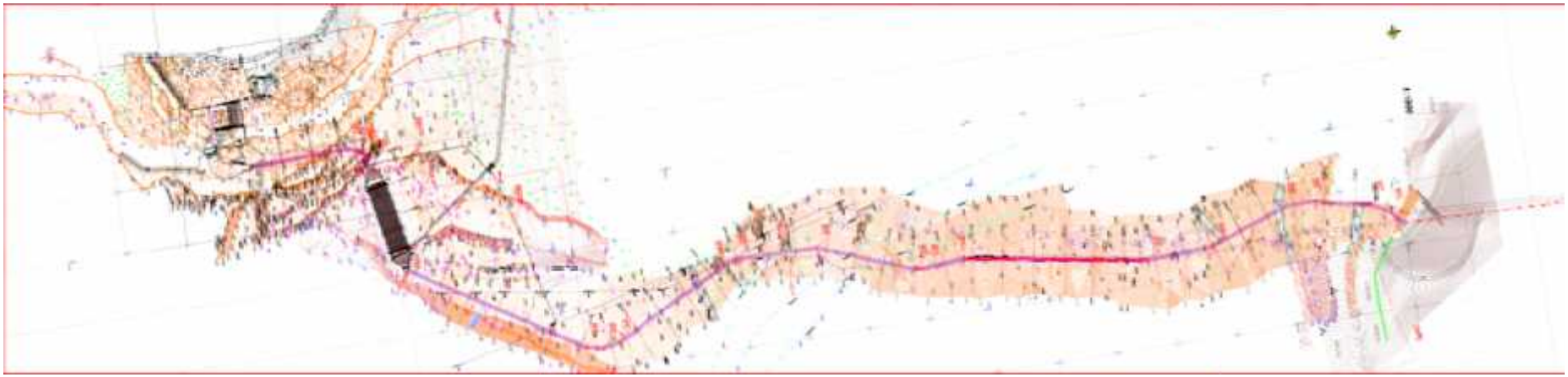


Figure 3.3 Situational schemes for diversion system

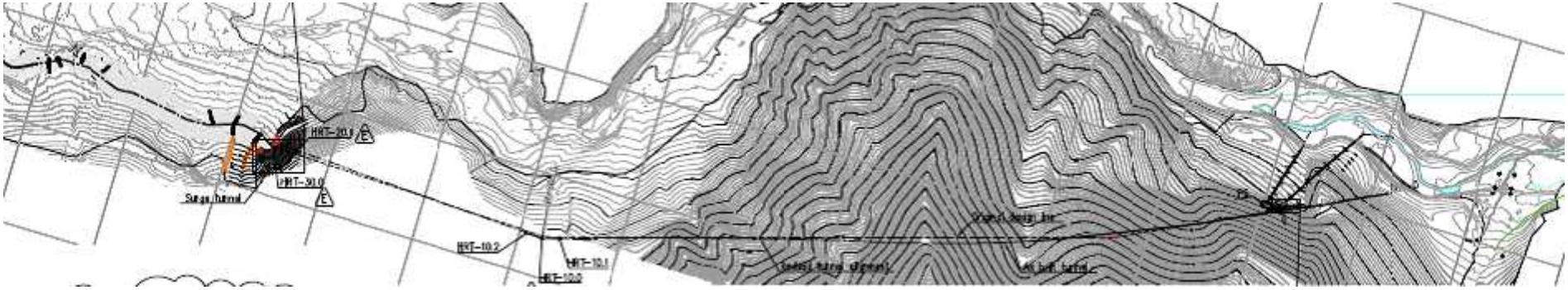
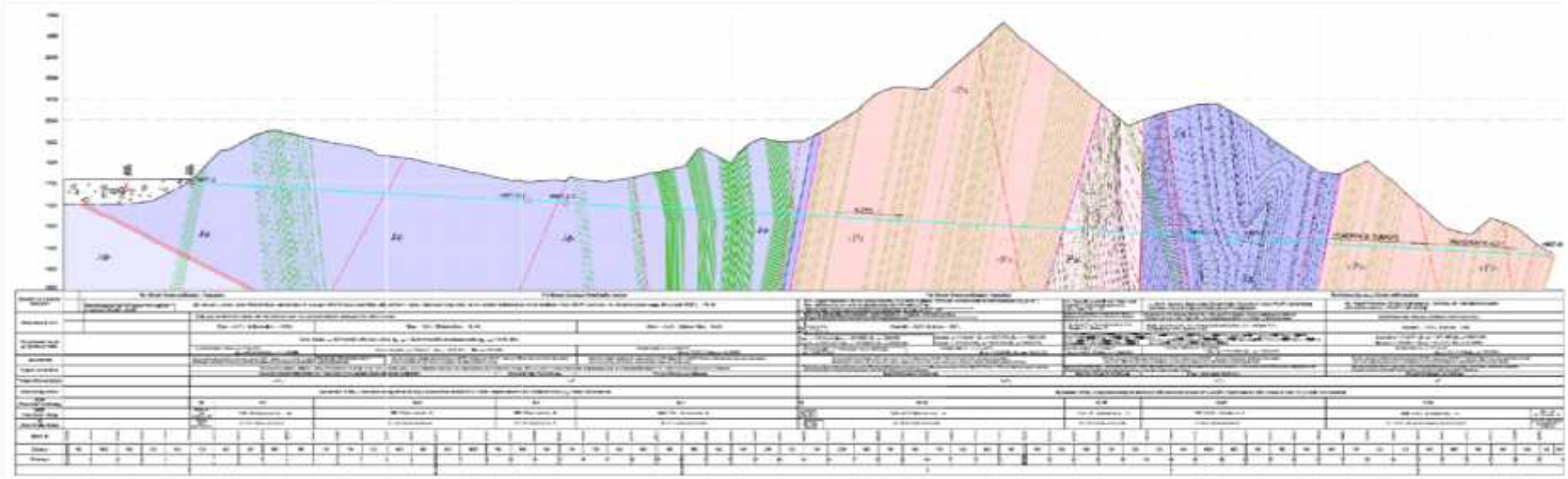


Figure 3.4 Cross section ofthediversion system



3.1 Headworks

The HPP headworksconsist of a dam, water intake and sand basin.

3.1.1 Dam

According to the project description, up to 6 m high concrete dam is considered to be constructed. The dam will be equipped with a spillway that will allow discharging excess water and sediments downstream during the flood season.

Concrete retaining walls areplanned on both banks of the river in head water, which will ensure the protection of banks from flooding and erosion up to the maximum design flood flow of the river.

The lateral intake, which will be arranged on the right bank of the river, near the bottom outlet, is a concrete chamber with intake gatesand protective grids. In order to prevent solid sediments and waste from getting into water intake, the entrance will be closed with two rows of metal grids.

The general scheme of the dam is given in Figure 3.1.1.1.,dam parameters are given in Table 3.1.1. Dam location view is provided on the picture 3.1.1.1.

Table3.1.1.1 The main parameters of the proposed dam

Spillway crest elevation	1729,3 ma.s.l
Highest flood water level (FWL)	1732,1 m a.s.l
Empty intake pond	1725 m a.s.l
Total volume of intake pond	7000 m^3
Length of the spillway dam	36 m
Sand sluices. 2 pcs	6,0x6,0m
Spillway capacity at FWL	220 m^3/sec
Sand sluices capacity at FWL	280 m^3/sec
Dimensions of water intake, 3 units	4,0x2,2m
Trashracks. 3 pcs	4,0x2.2m
Intake gates, 3pcs	4,0x2,2m

Figure 3.1.1.1 Scheme of the proposed dam

Picture 3.1.1.1. View of dam location area

3.1.2 Sand basin

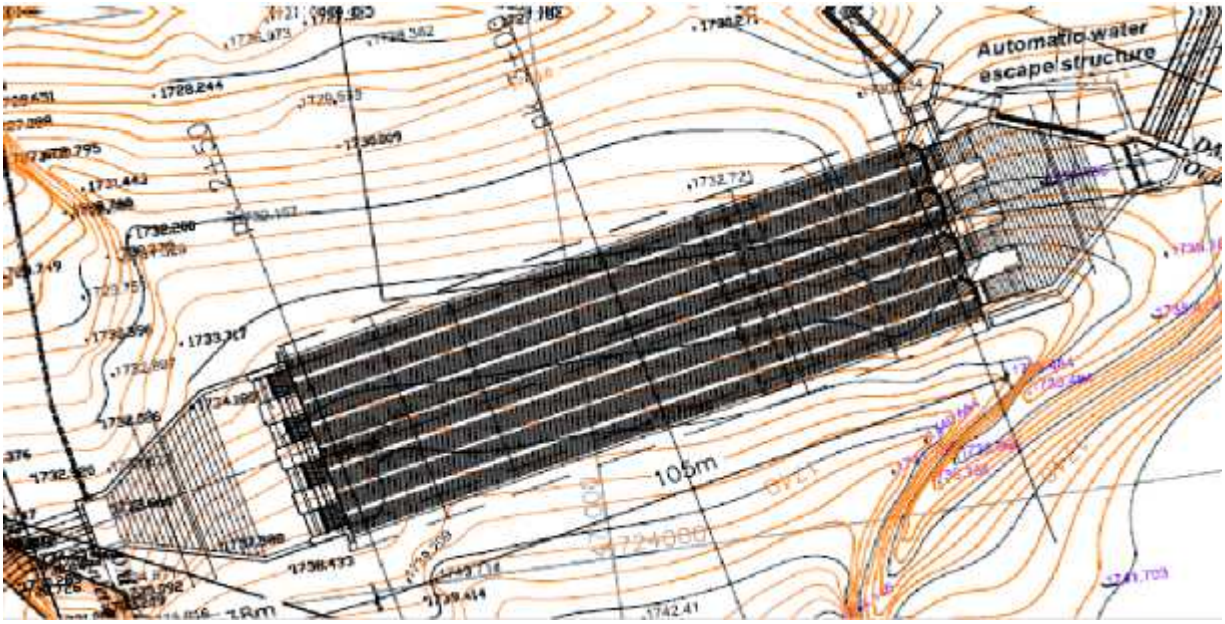
Sand basin will be arranged 209 meters away from water intake, on the right bankof Tergi River. Diversion steel pipeline of 4 meter diameter will be arranged for transportation of water to the sandbasin.Three-section sand basin (see Figure 3.1.2.1.)will hold suspended particles of more than 0.2 mm diameter in the water.

Sediments accumulated in the sand basin will be removed by ground shield, from where the water with sediments will be discharged into the river bed. The excess water will overflow from sand basin through spillway. A reinforced-concrete channelwill be arranged in order to discharge water from spillway and bottom outlet into Tergi River.

Perimeter of the sand basin will be protected by wire fence. The proposed structure does not require regular supervision. Technical staff will check the system every day and provide technical service, if necessary.

Water from the sand basin will be discharged into the diversion pipeline and then into the headracetunnel.

Figure 3.1.2.1



Picture 3.1.2.1 View of sand basin location area

3.1.3 Diversion Pipeline and Tunnel

Pipeline of 4 meter in diameter is proposed to be constructed from water intake to the entrance of headrace tunnel. The pipeline will be arranged underground and revegetationworks will be carried out on the surface. A typical cross section of the proposed pipeline is given in Figure 3.1.3.1.

The total length of the pipeline will be 2073m and will consist of two sections (See Figure 3.2.): the section between the water intake and sand basin is 209m long, while the section between the water intake and the entrance of headrace tunnelis 1864m long.

The diversion pipeline will be located under the gorge of Kuro river and other natural gorges. It will be covered by steel - concrete protective structures. A steel - concrete culvert aqueduct will be arranged on the surface of the structures.

The diameter of the headrace tunnel will be 5.5m. The portal of the upstream tunnel will be arranged at an elevation of 1705m. Technical parameters of pressure tunnel are given in Table 3.1.3.1.View of the pipeline corridor location is provided on the picture 3.1.3.1.

Table3.1.3.1 Parameters of Headrace tunnel

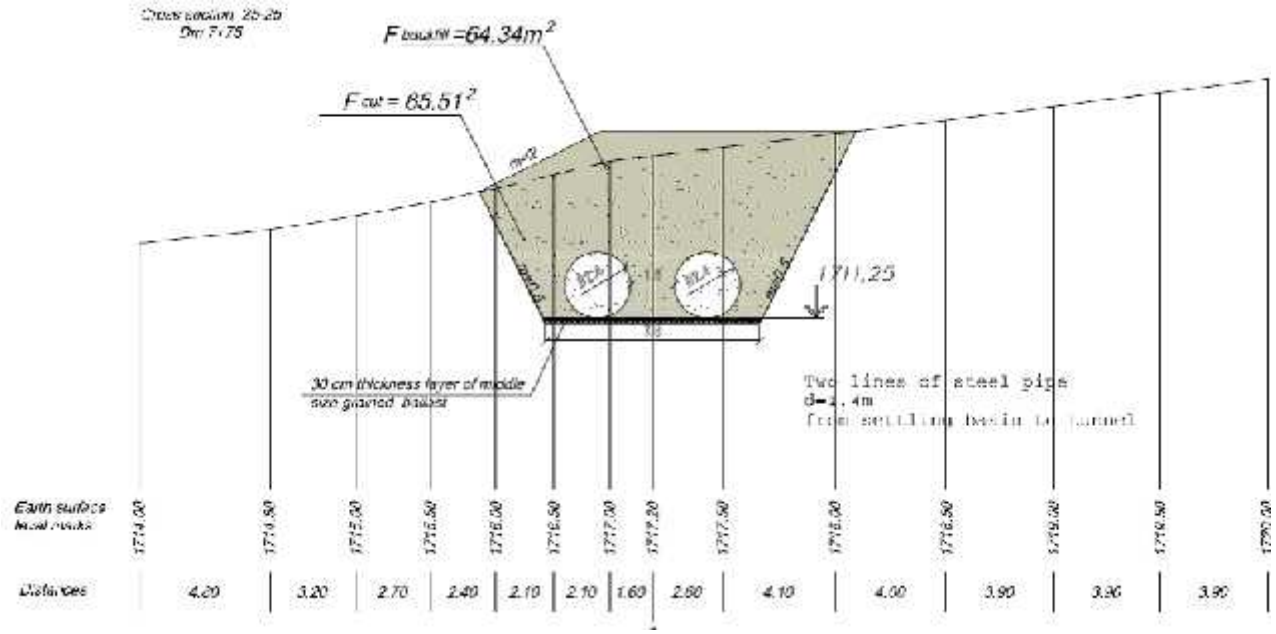
Length	5040 m
Diameter	5,5 m
Inclination	6,21%
Water velocity (rated)	1,33 m/sec

WorksrelatedtothetunnelwillbeperformedbyaTunnelBoringMachine. Tunnelinghas commencedfromlowerelevation (fromexitportal) and will be continued until the entry portal.

Waste rock from the tunnel will be removed through band conveyor, while transportation from exit portal to their temporary location will be carried out by means of road transport. Considering the proposed technology for the arrangement of tunnels, gravity drainage system will be used.

A spillway will be arranged at the entrance of pressure tunnel. Water will be discharged into the Tergi River through the spillway, if necessary. For this purpose, a reinforced concrete channel will be arranged.

Figure 3.1.3.1A typical cross section of the proposed pipeline



Picture 3.1.3.1 View of the pipeline corridor location

3.2 Power Unit of the Power Plant

Power unit structures will start from vertical pressure shaft,which will be connected to turbunes with high presure pipe.Disk valves will be also installed. The power unit includes underground power house, cable tunnel,access tunnel, tailrace tunnel and channel and open substation. Scheme of power unit is given in Figures 3.2.1 and3.2.2., while the technical parameters are given in Table3.2.1.

Figure 3.2. 1 Scheme of power unit

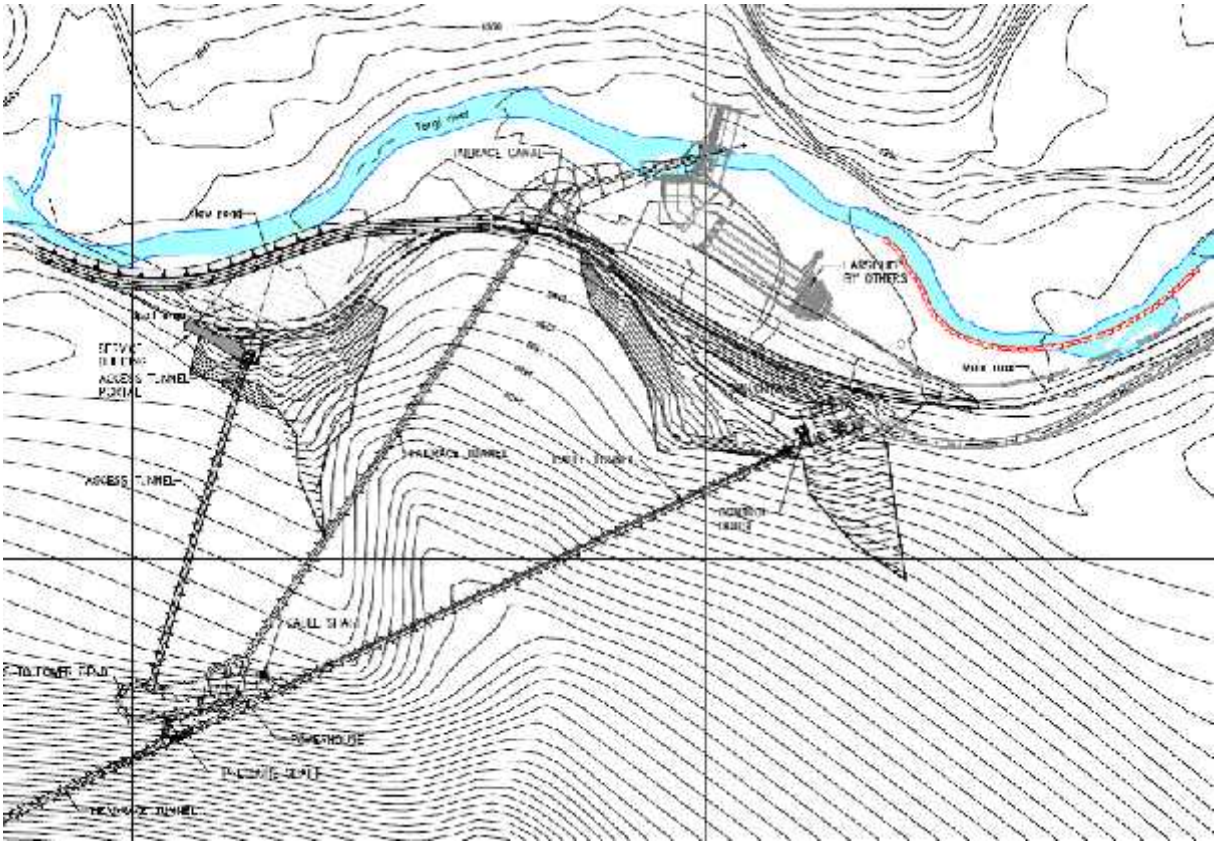


Figure 3.2. 2 The principal scheme of the power unit

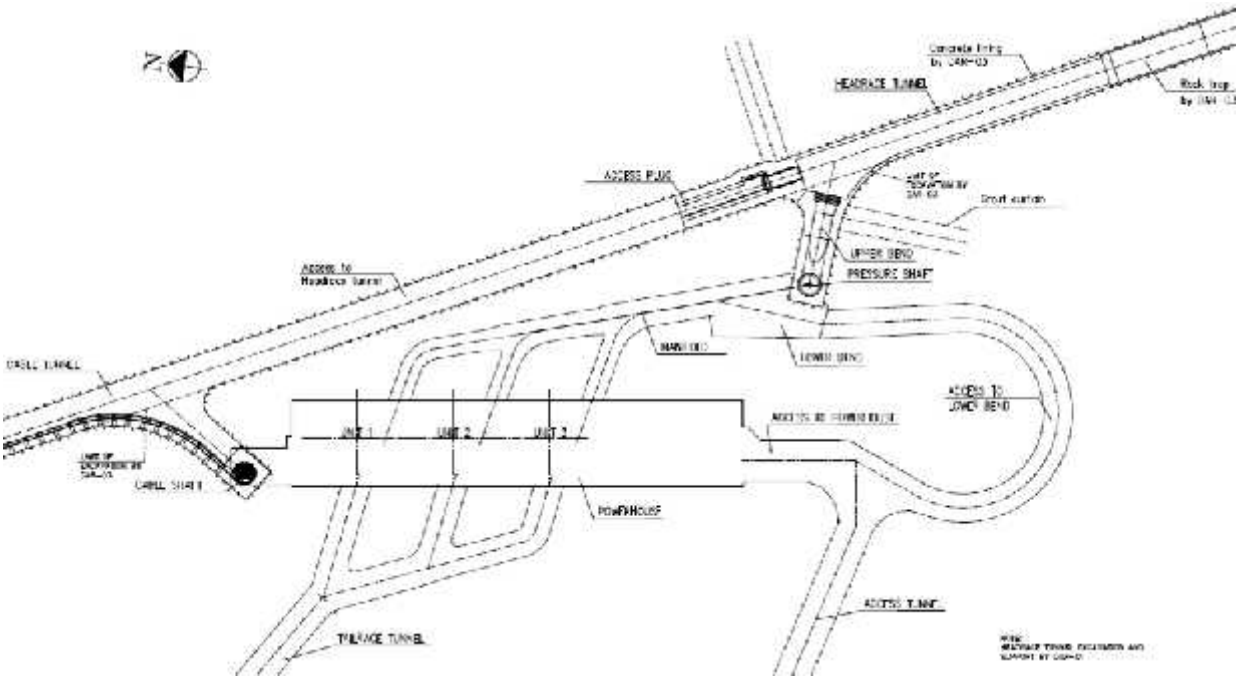


Table3.2.1 Technical parameters of power unit

Surge tunnel	Diameter of shaft	3,5 m
	Bottom of shaft	1420 m a.s.l
	Top of shaft	1735 m a.s.l
	Length of surge shaft	315 m
Pressure shaft	Vertical length	55 m
	Steel lining. Length excl. distributor	85 m
	Shaft excavated diameter	3,5 m
	Steel lining diameter	2,9 m
Power house	Units and installed capacity	3×36 MW
	Type Vertical	Pelton
	Rate speed	375 rpm
	Rated general capacity	3×45 MVA
	Size of powerhouse (wxlxh)	13,5 x 71 x 28 m
Powerhouse access tunnel	Length	330 m
	Width	5,5 m
	Height	6,0 m
	Invert	Asphalted
	Portal	Concrete structure
	Portal door	5,0 x 5,0 m
Cable tunnel	Length	510 m
	Diameter	5,5 m
	Invert	Gravel surface
	Cable Supports	Cable ladder

Tailrace tunnel	Length	500 m
	Tunnel Section. horseshoe	5,0 x 5,0 m
	Dam beam clamp	5,4 x 5,4 m
Tailrace canal	Length	125 m
	Bottom width	5,0 m
	Nominal tailwater elevation	1343,2 m a.s.l
	Maximum tailwater elevation	1346,4 m a.s.l

3.2.1 Open Substation

110/10 kV open substation will be arranged near the exit of the tunnel, on the right bank of Tergi River. 3 units of power transformers will be installed in the substation area. Transformers will be installed on reinforced-concrete structures, which will be equipped with oil collectors and in case of accidental spill, oil will be discharged into the underground oil collector reservoir with33 m^3 capacitythrough pipelines.

3.3 A Brief Overview of the Construction Works

Construction camp will be arranged on the right bank of the river Brolistskali, in the vicinity of Stefantsminda-Larsi highway. Housing facilities for the workers will be located on the right side of the road, and construction infrastructure (concrete units, drilling-sorting plant of inert materials and others) and warehouses – on the left side. Construction camp will be 8-9 km away from the nearest residential zones.

The construction camp will serve the construction of a power unit and headrace tunnel, as well as the headworks and diversion pipeline.

Preparation works for the construction of the headrace tunnel and underground power house is planned to be implemented in the first phase. Construction works for the arrangement of headworks and diversion pipeline will be carried out on the second phase(these works will commence in February, 2015).

Based on the results of engineering-geological survey, waste rock generated during the tunnel and underground power house arrangement, can be re-used in concrete production.In addition, waste rocks will be used forlocal road works. This will minimize the scope of works required for the storage of waste rocks.

It should be noted that the impact on topsoil during the implementation of the planned construction works will not be high. Such risk factors may occur during the preparation of the area proposed for the construction of diversion pipeline and open substation. The area, selected for the construction of the substation is located on the right bank of Tergi River, where notopsoil is present. As for the diversion pipeline, its corridor is mostly covered with weathered rock materials. Topsoil removed during the construction of diversion pipeline will be stored in the vicinity of the pipeline corridor and then it will be used for revegetation works.

As for the soil (non-humus layer) management issues. The majority of the excavation soils will be reusedfor the construction of the pipeline. Part of them will be used for the arrangement of the subgrade.

4 Environmental and Socio-Economic Impacts and Corresponding Mitigation Measures

The ESIA and the supplementary reports describe the current conditions of water, land use, fauna, flora, people and all other environmental and socioeconomic resources that the project could impact and describes how the project would affect these resources.

Where project impacts have been considered as'moderate' or 'major' impacts, mitigation measures and procedures have beenproposed to avoid, reduce, or otherwise mitigate the effects and reduce their significance (so called "mitigation measures").

Results of impact assessment are presented below and a summary of mitigation measures are provided in Tables 6.1 and 7.1.

4.1 Impact on Ambient Air Quality

Emission of pollutants and inorganic dust due to operations of construction machinery (excavators, bulldozers, etc) has been evaluated. The main ambient air pollution sourcesduringthis phase of works arethe traffic within the construction site and truck movement on Stephantsminda-Larsi motorway.

HPP power house is relatively close to a residential zone. However, theseworks willbeshort-termandnon-intense. Calculationandmodeling ofhazardous substances' propagation was conductedfor theconstruction camp. According to modeling results, concentrations of pollutants formed on the territory of construction camp will not exceed the standards established by the environmental legislation of Georgia. Therefore, the risk of negative impact on the closest receptors (Dariali monastery complex, biological environment) is limited. However, measures to minimize dust distribution need to be implemented, since in case of poor management the stipulated concentration norms may be exceeded.

During HPP operation there will be no emission sources at the powerhouse or power unit areas.

The reservoir that will be created by the dam will be small and therefore significant vaporization, increase of air humidity, methane emissions and climate change are not expected.

During the operational phase emissions are expected during maintenance service/repairs. Emission amount and impact level will be proportional to the work volume, duration and area; though these impacts will be limited in time and amount.

In order to minimize emissions during construction phase, the following mitigation measures are recommended:

- Ensure proper maintenance of construction equipment and vehicles;
- Systematically carry out dust emission reduction measures during dry weather (watering of the work sites and roads, following the rules of material storage, including covering of bulk surfaces or periodical moistening and etc.);
- Adopt precaution measures to prevent excessive dust distribution during ground works and loading-unloading of materials (eg.: prohibition of dropping materials from heights during unloading);
- Setting optimum speed for traffic;
- Provide personnel with protective equipment where/when necessary;
- Trainpersonnel prior to construction works and periodically every 6 months;
- Registry and appropriate response to received complaints, if any.

In order to minimize possible emissions during maintenance works on operation phase of the HPP, the same mitigation measures set for the construction phase must be carried out.

4.2 Greenhouse Gas Emissions

The use of construction plant and the manufacture of materials required to build the Project will contribute to greenhouse gas (GHG) emissions. During the operational phase of the Project, only minor GHG emissions are expected to occur given the type of operation. As is accepted practice, the impact of the Project in terms of GHG emissions was determined by calculating the carbon payback period; that is the length of time required for the Project to become a net avoider of GHG emissions rather than a net emitter when compared to a fossil fuel plant producing the same electrical output.

The payback time for the scheme when compared to a conventional Combined Cycle Gas Turbine (CCGT) generating plant (typically the most efficient type of fossil fuel plant) was calculated as 36 months. To further reduce the GHG impact Dariali will explore the possibility of reforesting areas of the Kazbegi national park, as detailed within the ESAP. This possibility is subject to discussion with the Authority in charge ofKazbegi national park.

It can be concluded that over the lifetime of the Project, enough renewable electricity will be produced to offset the emissions incurred during the construction of the project, as compared to if a thermal power plant was constructed instead. In this context the project can be considered to have a minimal negative impact on GHG emissions and an overall positive impact on climate change.

4.3 Noise and Vibration Generation

Calculation of noise (e.g.: noise generated during pressure tunnel and power unit construction) propagation, produced on construction camps during construction phase showed that noise levels at the borders of Stephantsminda borough populated areas will not exceed normative values.

Noise distribution during construction works in headrace of the HPP may cause temporary migration of the local wildlife, however, given the short period (7-8 months) and temporary nature of impact, the impact will not be significant and animal species will return to their natural habitat after completion of works.

During operation phase, main noise sources will be from the turbines and generator in the powerhouse. However, they will be placed inside of special case, which will have high index of noise consumption. In other cases, noise can be caused by repair works or/and transport movement during planned or emergency maintenance/repair works. This “additional” impact will be short-term and will depend on volume and duration of these works, however, it will not exceed the level of impact expected during the construction phase.

Considering the above, impacts caused by both phases will not be high and therefore in ESIA framework only standard mitigation measures were developed for this issue.

Vibration distribution on construction phase will be mainly related to movement of heavy equipment and performance of construction works. Considering, that construction sites are located on a significant distance from residential areas the risk of vibration-related impacts in that area will not be high. Generation of extra-normative vibration is not expected for the tunneling phase, since the tunnels will be arranged using the TBM.

In order to minimize noise and vibration distribution levels following mitigation measures are recommended:

- Ensure proper maintenance of machinery;
- Performance of “noisy” works only during daytime;
- Provide personnel with protective equipment (earmuffs), in necessary;
- Trainpersonnel prior to construction works and periodically every 6 months;
- Registry and appropriate response to received complaints, if any;
- On the operation phase equip personnel with special earmuffs;
- Machinery hall and operational must be arranged using special noise-insulation material.

4.4 Impact on Soil

Preparatory works (preparation of construction camp and building sites, rehabilitation /construction of access roads) and construction operations (ground works, machinery operations) are likely to have certain impact on soil integrity and stability (especially when operations occur on slopes), and soil quality (due to fuel/oil spills, improper management of waste and explosive materials, topsoil damage/loss).

Appropriate safety/security norms will be followedand a soil management and erosion prevention plan has been developed for implementation by the sponsor. There will be no fuel/lubricant stocks at construction grounds that present soil pollution risks due to their spill/leakage. Hazardous and non-hazardous waste produced at the construction sites will be managed in accordance with the waste management plan.

To avoid damage/loss of fertile soil layer during preparation of construction camps and building sites, surface soil layer will be stripped and stockpiled. Fertile soil layer will be stored separately from other ground layers. All stockpiles will be protected against exposure to wind and atmospheric precipitation. Throughout construction operations to avoid soil pollution/damage, the building contractor shall follow thestrict environmental requirements given in ESIA document.

Topsoil damage and lossof stability of fertile layers are mostly expected during preparation works and construction works which will be related to equipment movement, ground works and arrangement of temporary and permanent infrastructure.

As mentioned above, soil damage is also expected on construction phase (especially during works on slopes). It should also be noted, that a small scale land loss is inevitable during arrangement of permanent infrastructure (diversion pipeline, water intake, sand basintrap, etc).

Soil contamination is expected on both phases – preparation and construction. Soil quality may be affected by improper management of waste (both, solid and liquid), violation of rules for lubricants, fuel and construction material storage, as well as accidental oil spill from construction equipment and machinery.

Impact on soil is not expected during operation phase, except for the maintenance works.

In order to avoid soil contamination and damage the construction contractor is obliged to consider the following environmental requirements:

- Topsoil removal and temporary storage on pre-selected sites. Soil should be stored on a separate landfill. The bulk must be protected from wind and precipitation. The area selected for soil storage must be at least 50 m away from the surface water body;
- Strict adherence of the construction site boundaries in order to avoid possible contamination of ‘neighboring’ areas, topsoil damage and compaction of soil;
- Protection of routes of vehicles and machinery (prohibition of off-road movement);

- Ensuring proper working conditions of equipment to prevent soil contamination with leaking fuel/oil;
- Collection of generated waste and temporary storage on a specially selected area;
- Prohibition fueling and/or maintenance of vehicle/equipment on the construction site. In case of urgent need, the activities must be carried out at least 50 m away from surface water bodies with consideration of safety measures defined to avoid spill (and therefore, soil/water pollution);
- Prohibition of washing of cars and construction equipment on the territory;
- In case of spill, localization of spilled material and immediate cleaning of the contaminated area. Personnel must be equipped with relevant means (absorbents, shovels, etc) and personal protection equipment;
- Contaminated soil and ground must be removed from the territory for further remediation by the licensed contractor;
- Prior to commencement of works the personnel must be instructed on environmental and safety issues;
- After completion of works, the territory must be cleaned and revegetated.

During operation, there will be no impact on ground, except during maintenance works. During conducting of maintenance works, mitigation/prevention measures determined for construction process should be implemented.

4.5 Impact on Surface Water

During dam construction, restriction of sediment movement to the downstream and reduction of water debits will be short-term and will depend on construction timeline of works, that should be conducted in active riverbed. During this period, water to the downstream will be passed using channels; therefore flow will be reduced only insignificantly. It should also be mentioned that during floods, when river sediment movement is most active, construction works will not be conducted in the riverbed.

The most significant risks for the construction stage are related to surface water pollution. Impact on surface water objects is expected during works, which are conducted near such objects. Potential risks include:

- Pollution due to fuel/oil lubricant spillage from machinery/equipment;
- Increase of water turbidity;
- Pollution by construction and other kinds of waste, including untreated wastewater.

The company will carefully manage construction of the headworks and intake andthe construction camp territory to minimisethe potential for alterations in the surface water. Also management of drainage water, produced during arrangement of headrace tunnel and powerhouse, will be carefully managed accordingly.

Water pollution risk is highly dependent on implementation of environmental management measures definedby the constructioncontractor, also on the quality of the monitoring on waste management and equipment functionality.As such, contractor management plans are being developed in accordance with best practice to mitigate the risk of surface water impacts.

The proposed operation of the Dariali HPP will reduce the amount of water in the River Tergi between the headworks and the tailrace. These impacts will be greatest in the winter months when river flows are lowest. This has potential implications for anything that relies on flows being at their current levels.

The most significant concern is aquatic biodiversity within this section of the river, which is discussed in Section 4.6.

The River Tergi floodplain and valley sides are rich sources of fine sediment due to the abundanceof glacial material and active valley slopes.The headrace structure will have a sediment collection basin that will reduce the amount of fine sediment that is transported towards the turbines.The fine sediment collection basin will need to be periodically flushed in order for it to perform its function. The impact of this flushing should not be significant if it is flushed mainly during high flows, due to the existing abundance of fine sediment that is available to the river.

The Dariali HPP scheme will be designed so that gravels are able to be transported down the river during high flows. However, the overall impact of the Dariali HPP station on coarse sediment transport and change in river shape is difficult to predict precisely.

The impacts of the Dariali HPP operation on fine sediment, coarse sediment and channel condition will be observed and monitored and considered as part of adaptive management of the HPP.

Within the ESIA report, specific mitigation measures for surface water impacts are determined both for construction and operation phases.

4.6 Impact on Aquatic Biodiversity

The Dariali HPP will reduce the amount of water in the River Tergi between the headworks and the tailrace structure. This has the potential to negatively impact on species that rely on the river flow being above a certain minimum level. Accordingly, the Dariali HPP is obliged to release a minimum "environmental flow" that will allow the river to function as a habitat.

An environmental flow of 10% of the mean annual flow is proposed. This is a minimum flow of 2.54 m^3/s. In practice, this flow will be exceeded during the summer months by some margin. In the late Autumn, Winter and early Spring however, flows may be reduced to this level for extended periods. It therefore needs to be verified that this flow is sufficient to serve the needs of affected aquatic species, particularly the local trout population.

A 4-year ecological monitoring programme is proposed that will commence 1 year before the Dariali HPP is put into operation. The ecological data will be used to define any required additional measure, for example to develop and refine an environmental flow regime designed to ensure that any negative impacts on ecology are understood and managed. Temporary adjustments in the environmental flow to support seasonal migrations around April and October mayalso be necessary to fully mitigate these impacts. It has yet to be confirmed that the affected reaches of river are not used by fish in the winter months. If they are, then an adjustment in this minimum flow may be required.

4.7 Impact on Terrestrial Environment

4.7.1 Impact on Vegetation Cover

The detailed botanical studies were carried out in the river Tergi canyon within the borders of the Area of Influence. The expected negative impact on the botanical receptors caused by construction and

operation of the Dariali HPP in the Area of Influence and adjacent areas has been assessed. The plants communities and species of various conservation value spread in the project impacted area have been identified (attributed to the endemic, rare, endangered).

In Dariali Hydropower Plant Area of Influence are represented 2 high conservation value (HCV) habitats and 11 medium conservation value (MCV) habitats, where 7 sites of medium conservation value were located in the zone of Traditional Use of the Kazbegi National Park which were excluded from the Kazbegi Protected Area before the beginning of construction of Dariali Hydropower Plant.

As a result of detailed Botanical assessment high conservation value species populations on project areas have been revealed, as well as assessment of negative impact of construction and operation phases on flora and vegetation for the Area of Influence are identified and adequate conservation/reinstatement measures are elaborated for the implementation; Biodiversity monitoring/ management plan for the botanical component is already included in ESIA.

4.7.2 Impact on Fauna

The Tergi river valley within the Dariali Pass (the Area of Influence) and three land plots, excluded from the Kazbegi National Park sites can be referred as a modifiedhabitat conventionally.This area is not rich in biodiversity of animal species, and cannot be considered as area having high biodiversity value.

This area contains one nest of one Vulnerable bird species Bearded Vulture (*Gypaetusbarbatus*). Two Endangered species of mammals Brown Bear (*Ursusarctos*) and Chamois (*Rupicaprarupicapra*) are reported in interview of locals as visitors to this area as well as Vulnerable East Caucasian Tur (*Capra cylindricornis*). Both Critical Endangered bird species - the Sacker (*Falco cherrug*) and Lesser Kestrel (*Falco naumanni*), as well as two Endangered bird species - Red-footed Falcon (*Falco vespertinus*) and Common Crane (*Grusgrus*) are migratory species, which appear within the impact area only during spring and autumn passage. The third Endangered bird Cinereous Vulture (*Aegypiusmonachus*) is known as year-round visitor to this area, not related with this site in some important moments of life. Thus, the Project area is not fully appropriate to the second criteria of the Critical habitat definition (as of EBRD PR6).

The Area of Influence is situated within the ranges of distribution of following endemic and narrow ranged Vulnerable species: Kazbeg Birch Mouse (*Sicistakazbegica*), Long-Clawed Mole-Vole (*Prometheomysschaposchnikovi*), and Dinnik's viper (*Viperadinniki*). Only last one is found within the impact area. No changes in habitat quality, which can harm this species, are expected due to the project activities.

Thus, the Dariali Pass, river Tergi section with depleted water flow and sites, excluded from the Kazbegi National Park cannot be fully considered as the Critical Habitat, according to the key performance standards of the European Bank of Reconstruction and Development.

In case of proper implementation of the mitigation measures, the negative impact on populations of the protected by law species could be minimized to the acceptable level and will not lead to irreversible changes in biodiversity of the region.

4.7.3 Impact on Protected Areas

Three small areas of land were removed from the KNP for the Dariali HPP totaling 8,74 ha that belonged to the area within the Boundaries of Traditional Use Zone of the Kazbegi National Park.

Three territories have been added to the Kazbegi National Park as compensation areas for the land lost at Dariali due to HPP: Nature Monument of Sakhiznari Cliff Columns-335,7ha, Nature Monument of the Abano Mineral Lake-0,04 and Nature Monument of the TrusoTravertines-4,2.

The detailed botanical studies were carried out in the river Tergi canyon within the borders of the Compensation Sites. The plant communities and species of various conservation value spread in the compensation sites have been identified (attributed to the endemic, rare, endangered).

In Dariali Hydropower Plant Area of Influenceare represented 2 high conservation value (HCV) habitats and 11 medium conservation value (MCV) habitats, where 7 sites of medium conservation value were located in the zone of Traditional Use of the Kazbegi National Park which were excluded from the Kazbegi Protected Area before the beginning of construction of Dariali Hydropower Plant. As it is known, for compensation to it the Abano Mineral Lake, TrussoTravertines and Sakhiznari Cliffs were given the status of Natural Monument. On the above-mentioned compensation sites are represented 16 habitats of high conservation value and 11 habitats of medium conservation value. Hence, as a result of the comparative analysis of the Area of Influence and Compensation Sites we can conclude that in the context of sensitive habitats and communities as well as rare species populations the Compensation Sites represent the habitats of much higher conservation value.

From the faunal standpoint compensation sites – Abano Mineral Lake, TrusoTravertines and Sakhizari Cliff – the larger one, Sakhizari Cliff, can be considered as site, which can be noted as a Critical habitat in terms of the EBRD performance requirement. It contains home-ranges of Critical Endangered and Endangered species (Lynx, Chamois etc.), as well as populations of narrow-ranged Vulnerable species, is important for number of migratory birds, and is rich in biodiversity of animal species. Two smaller compensation sites Abano Mineral Lake and TrusoTravertines are mineralogical Natural monuments, but they cannot have any importance in animal biodiversity conservation, because of small size and while they are surrounded by pasture.

4.8 Impact Related to Waste Management

Waste management in Georgia has a low level of regulation and there is an absence of an overall, national waste management strategy and a weak legislative framework. Therefore, in order to ensure a satisfactory level of environmental performance, waste management for construction and operation phases of Dariali HPP must be carried out in accordance with the EU requirements. There are no waste landfills thatapplysuch standards on the territory of Kazbegi or Mtsketa-Mtianeti regions. The nearest landfill of such standards is located in Tbilisi.

The likely waste types from both the construction and operational phases of the Project include inert and hazardous wastes. Therefore, relevant waste management measures will be considered to minimize amount of waste, increase opportunities to recycle and re-use, and ultimately, safe disposal in appropriate locations. For this purpose, the construction contractor appointed the responsible person, who controls processes of temporary storage and removal of waste and keeps the record.

Waste sortingis introduced for construction phase. Special marked containers are being used. Storage for temporary disposal of hazardous waste is placed on the construction camp territory. Hazardous waste removal and further management will be carried out by the licensed contractor.

Considering number of staff employed on construction phase the maximum expected amount of household waste will be 210 m^3/year. Domesticwaste will be disposed on Stepantsminda landfill according to the agreement with the Municepality.

“Dariali Energy” JSC will assist the administration of Kazbegi Municipality to remediatethe old landfill and developa new one. "Dariali Energy" JSC will remove the domestic waste currently disposed near the proposed headworks, to an appropriately permitted landfill in Tbilisiand prevent further waste disposal in this area. This activity will represent a significant project benefit both to the protection of soil and surface water quality, in the appropirate management of waste by the local communities and in improvements in visual impacts.

Accumulation of significant amount of waste rock (approximately 200 thousand m^3) is expected during tunnelling, powerhouse construction and other ground works. According to preliminary results of laboratory tests, waste rock can be used as an inert material for concrete production. Full amount of waste rock generated during tunnelling and other ground works will be re-used in construction of Dariali HPP and Larsi HPP (filling diversion pipeline excavations and for vertical planning of surface). Additionally, waste rock will be donated to Kazbegi municipality for surfacing works of local roads.

Wood material generated during preparation of diversion pipeline corridor, which due to lack of vegetation cover on the territory will not be of significant amount, will be handed to the local population.

Generation of significant amount of wastes is not expected on operation phase. In terms of hazardous wastes only turbine and transformer oils are notable.

Potential negative impacts may occur should poor waste management activities be employed or if there is a violation of rules:

- Water and soil contamination, deterioration of sanitary condition on the territory and negative visual impacts;
- Damping of construction waste and metal scrap in improper areas may cause negative impact on traffic flow and road barrage;
- Contamination of the riv. Tergi and its tributaries with hazardous waste would jeopardize the Ichthyofauna.

As for waste management related mitigation measures, the following are important:

- Waste rock re-use for the project purposes;
- Regulation of household waste landfill of Stepantsminda;
- Arrangement of special temporary storage for hazardous waste on the territory of construction camp and sealed containers must be placed on construction site;
- Hazardous waste must be contained and removed from the territory for further management by the licensed contractor;
- Wastewater generated in construction camps must be discharged into surface waters only after appropirate treatment;

4.9 Visual-Landscape Impact

The landscape in which the majority of the Project will be located is considered to be of high value due tothe relative lack of development, presence of the Kazbegi national park, and sceniclandscape. Notwithstanding, the area of the project is not pristine and has been used for gas pipeline construction, overhead power line construction, road ways, the local settlements and areas of informal waste disposal.

During preparatory and construction works some landscape and visual impact will occur due to land disturbance, presence of construction sites, presence of personnel and machinery, building structuresand

reduced flow in the River Tergi. Construction works will cause partial alteration of usual views and landscape.

Expected visual and landscape changes will be slightly perceptible for passing traffic and local populations as infrastructural objects and construction sites are apart from residential zones. Sensitive receptors for visual-landscape changes, which will occur during construction of powerhouse and diversion system, will be passengers and tourists travelling on the motorway.

After construction all the personnel, machinery, building materials and waste (including domestic waste disposed illegally in the river bed at the dam site) will beremovedfrom the construction sites. Temporary structures will be also dismantled and removed, and the territory will be revegetated. However, the power houses with their infrastructure and substations and access roads to all the HPPs will be left, road profiles will be changed. This will change the landscape to some extent, what is inevitable during implementation of any project.

Impacts can be mitigated by selection of reasonable colors and designs for the buildings and also locating temporary structures, materials and wastes in the areas less visible for visual receptors. Tree curtains can also be used locally.

4.10 Impact on Cultural Heritage

According to the audit results of the HPP cascade infrastructure placement area, no historical, architectural or archeological sites were found in the areas selected for building sitesandaccess roads. However the potential for some archeological sites to be discovered later during ground works exists and a chance find procedure is therefore to be developed by Dariali.

During operation phase no impact on archeological and historical sites is expected, but a chance find procedure is being developed and will be implemented in anycase.

A road connecting Caucasus and Transcaucasia (now known as military road of Georgia) has always been located in the Darialiravine.The ravine is distinguished by its landscape and cultural value. It has been a source of inspiration for many writers and public figures of Georgia. The riverTergi and its ravine are repeatedly mentioned in historical literary works.Notwithstanding, the riverbanks are subject to a range of developments and uses including farming, permanent settlements, power line and gas pipeline constructions and unmanaged domestic waste disposal.

Therefore, release of significant amount of natural flow of the river into the headrace tunnel and decrease of water level in the natural riverbed on operational phase of the HPP will have an impact on the cultural value of the ravine. However, this impact will be limited to wintertime reduced flow regime and minimal; impacts are expected the rest of theyear. To mitigate these impacts, other related impacts(such as waste removal and revegtation) will be addressed by the company.

See waste disposal and visual impacts sections above for more details.

4.11 Impact on Socio-Economic Environment

Physical and economical resettlement or significant immigration of population is not anticipated as the result of the project implementation. It is notable, that the diversion pipeline corridor runs along the right bank of the riverTergi, which local population happens to use as pasture, as well as to obtain hay and other natural resources. Temporary use of the territory (approximately 8-10 ha area) during pipeline

construction will somewhat limit use of these resources. However, the impact is of temporary nature – pipeline will be placed underground and the local population will regain access to the area after revegetation works, during the construction period there are appropriate alternative locations for grazing and harvesting within the close proximity of the local settlements.

Major part of design facilities will be located underground (headrace tunnel, powerhouse) and impact related to land loss will not be significant. In order to minimize the impact the project implementing company will continue consultation with local population to select an alternative area for pastures.

All construction areas are located reasonably far from residential zones, therefore there will be no significant health impactsassociated with the cnstruciton and operation of the project. Given distances to residential zones there will not be any significant noise impact on population. Also, considering distances from nearest receptors to substations and power transmission lines electromagnetic field impact on population will not occur.

Rehabilitation of roads, waste disposal facilities, natural environment and improved power supply can be considered as positive effects of the project. Significant positive impact will be related to property tax of the company (1% of property value), which will benefit mobilization of additional funds in the municipality and will enable possibility to develop other infrastructural projects. Additionally, development of satellite businesses is expected due to required services for the employees of the project (trade, service, transportation, food production, etc).

Local population will be employed on construction and operational phases of the project, which is a positive impact. However, certain negative impacts associated with employment are also expected, namely: expectation of and dissatisfaction with employment, job cuts due to completion of the project and related dissatisfaction, disagreements between the local residents and non-local personnel.

Following measures are required to minimize the impact:

- Develop a public staff recruitment policy, including non-discrimination policy;
- Hiring basing on relevant testing;
- Providing staff with information regarding their work – development of the code of conduct;
- Informing non-local personnel about the local customs and culture;
- Develop and practice mechanism to review complaints; and
- Development of a grievance mechanism and maintance of personnel complaints journal and close out procedure.

4.12 Transboundary Impact

The riverTergi is transboundary river: its upper body is located on the Georgian territory, and the rest of it, through the Dariali gorge, flows on the territory of the Russian Federation.

Change of hydrological regime and sediment flow will not have significant transboundary impact, because sediments will be fully passed through the design dam and as for the reduced water flow.

As for deterioration of water quality – risks of it are limited to the construction phase, but considering planned mitigation measures, scale of impact will not be high.

4.13 Cumulative Impact

Dariali HPP project is one of the projects, planned by the Georgian government on the Kazbegi municipality territory, including territories of Dariali gorge. Besides Dariali HPP project, there are also two potential projects (KazbegiHPP,upstream and Larsi HPP, downstream from the proposed project)in Georgia and Ezminskaia HPP on the Russian side of the border (4 km after border line).

Together the above mentioned HPPs in the Dariali gorge have been considered in relation to cumulative impacts.Ezminskaia HPP on the Russian side of the border is known to have been constructed without a fish pass which limits the potential for migration of fish. Larsi HPP is the closest project on the Tergiriver and has been considered as the most relevant in terms of cumulative impacts and the ability of the company to influence the operations of this HPP.

DuringHPP operation the hydrological regime downstream of the dam will be altered. Given the proximity of Dariali HPP and Larsi HPP cumulative impactsto river biodiversity have the potential to occur.

In addition to the specific project related mitigation measures and adaptive management plans to maintain the aquatic biodiversity of the river Tergi, Dariali Energy will engage with the operator of LarsiHPP and enter into an agreement to jointly monitorthe effectiveness of fish passesand to review the mitigation measures proposed, thereby reducing the primary impact of cumulative impacts of the HPPs in the Dariali George.

5 Environmental and Social Action Planand Environmental and Social Management Plans

Environmental and Social Action Plan (ESAP), developed for the project is presented as a separate document. Keycomponentsinclude:

1. Environmental and social planning;
2. Employment and working conditions;
3. Pollution prevention and abatement;
4. Public health and safety;
5. Conservation of biodiversity and natural recourses;
6. Cultural heritage;
7. Publication and stakeholder angagement.

6 Appendix

6.1 Mitigation Measures and Monitoring

Potential impact can be managed and reduced, for which the following measures are to betaken:

- Impact avoidance/prevention;
- Impact reduction;
- Impact mitigation;
- Damage compensation.

Some of the impacts may be avoided through optimal construction and operational practices (activities).

Since the prevention of all the impacts is impossible, ESIA document provides mitigation planning for each stage of the construction works. Mitigation measures are listed in the following tables.

6.1.1 Mitigation Measures and Residual Impact – Construction Phase

Receptor/Impact	Impact Description	Mitigation Measures	Characteristics
Impact on ambient air quailty - Emissionofcombustionproducts and inorganic dust inambientair Greenhouse Gas Emissions **Significance:** Low	• Dust generated from earthwork;transportation; loading and unloading of materials. • Vehicles, construction machinery and generators emissions; • Welding aerosols.	• Ensure a proper maintenance of construction equipment and vehicles; • Systematically carry out dust emission reduction measures during dry weather (watering of the work sites and roads, following the rules of material storage, including covering of bulk surfaces or periodical moistening); • Provide preventive measures in order to avoid excessive dust • Emission during the earthwork and loading-unloading of materials (e.g. prohibition of material dropping from height during loading/unloading); • Setting optimum speed for traffic; • Provide personnel with protective equipment (respirators), in necessary; • Instruct personnel prior to construction works and periodically every 6 months; • Registry and appropriate response to received complaints, if any;andDevelop a project for reforestation in consultation with the regulators to off set construction related GHGs.	**ResidualImpactsignificance:**verylow **Responsibleforimplementationofmitigationmeasures:** Buildingcontractor **Monitoring:**Maintenanceofmachinesandequipment; Inspectionof driversduringthetransportation **Responsibleformonitoring:**Buildingcontractor **Monitoringexpenses:**Noadditional expenses **Expensesforimplementationofmitigationmeasures:**Expensesforthepersonalprotectiveequipment;otheractivitiesarenotrelatedto additional expenses. Reforestation project to be developed and costs to be determined.
Generation of noise and vibration **Significance:** Variable (from averageto short term high impact)	• Noise and vibration caused by vehicles; • Noise and vibration caused by construction equipment	• Ensure proper maintenance of machinery; • Performance of “noisy” works only during daytime; • Provide personnel with protective equipment (earmuffs), asnecessary; • Instruct personnel prior to construction works and periodically every 6 months; • Registry and appropriate response to received complaints, if any;	**ResidualImpactsignificance**: very low–medium **Responsible for implementation of mitigation measures**: Buildingcontractor **Monitoring:**Maintenanceofmachinesandequipment; **Responsibleformonitoring:**Buildingcontractor **Monitoringexpenses**:Noadditional expenses **Expensesforimplementationofmitigationmeasures:**Expensesforthepersonalprotectiveequipment;otheractivitiesarenotrelatedto additional expenses.
Impact on soil – stability and pollution **Significance:** Low	• Soil stability destruction, fertile soil layer damage risk during the construction works. • Soil pollution with waste; Contamination incase of oil/fuel spill.	• Topsoil removal and temporary storage on pre-selected sites. Soil willbe stored in a designed and engineered area. The bulk willbe protected from wind and precipitation. The area selected for soil storage will be at least 50 m away from the surface water body; • Strict adherence of the construction site boundaries in order to avoid possible contamination of ‘neighboring’ areas, topsoil damage and compaction of soil; • Protection of routes of vehicles and machinery (prohibition of off-road movement); • Ensuring proper working conditions of equipment to prevent soil contamination with leaking fuel/oil; • Collection of generated waste and temporary storage on a specially selected	**ResidualImpactsignificance:**verylow **Responsible for implementation of mitigation measures:**Buildingcontractor **Monitoring:**currentobservation **Responsibleformonitoring:**Buildingcontractor **Monitoringexpenses:**isnotrelatedto additional expenses **Expensesforimplementationofmitigationmeasures:** Costofreinforcingworksdependsonvolumeofworkandmarkettprices

		area; • Prohibition fueling and/or maintenance of vehicle/equipment on the construction site. In case of urgent need, the activities willbe carried out at least 50 m away from surface water bodies with consideration of safety measures defined to avoid spill (and therefore, soil/water pollution); • Prohibition of washing of cars and construction equipment on the territory; • In case of spill, localization of spilled material and immediate remediationof the contaminated area. Personnel will be equipped with relevant means (absorbents, shovels, etc) and personal protection equipment and appropirate training; • Contaminated soil and ground will be removed from the territory for further remediation by the licensed contractor; • Prior to commencement of works the personnel will be instructed on environmental and safety issues; • After completion of works, the territory will be cleaned and recultivated.	
Impact on surface water **Significance:** medium	• Contamination incase of oil/fuel spill.	• Decantation of water from tunnels; • Collection of generated waste and temporary storage on a specially selected area; • Prohibition fueling and/or maintenance of vehicle/equipment on the construction site. In case of urgent need, the activities will be carried out at least 50 m away from surface water bodies with consideration of safety measures defined to avoid spill (and therefore, soil/water pollution); • Prohibition of washing of cars and construction equipment on the territory; In case of spill, localization of spilled material and immediate remediation of the contaminated area.	**ResidualImpactsignificance**:low **Responsible for implementation of mitigation measures**: Buildingcontractor **Monitoring:**Visual inspection **Responsibleformonitoring:**Buildingcontractor **Monitoringexpenses**:Noadditional expenses **Expensesforimplementationofmitigationmeasures:**
Impact on non aquatic fauna **Significance:** medium	• Movement of construction machinery/transport and people temporary disturbance of local fauna during construction works (direct impact - collision– indirect impact dust emission)	• Strict adherence of traffic routes and borders of the construction sites; • Selection of optimal speeds to minimize probability of the direct impact (collision); • Adopt measures to minimize amount of dust generated during works; • Adopt measures to minimize levels of noise and vibration; • Record nests of the birds protected by the legislation and prohibit the approach from April till July; • Relevant waste management; • Prohibit spilling of oil and other toxic substances in water and on the ground; • Pits, trenches and others should be fenced with s bright-colored ribbon for big mammals and any flat material – iron, polyethylene and etc – for small animals. Long wooden logs or plancks must be placed in the pits at night,	**ResidualImpactsignificance**:low **Responsible for implementation of mitigation measures**: Buildingcontractor **Monitoring:**Maintenanceofmachinesandequipment; **Responsibleformonitoring:**Buildingcontractor **Monitoringexpenses**:Noadditional expenses **Expensesforimplementationofmitigationmeasures:**Expensesforthepersonalprotectiveequipment;otheractivitiesarenotrelatedto additional expenses.

		so that small animals could come out on the surface in case they fall inside. Pits and trenches must be checked before filling them with ground; • Instruction of personnel on issues regarding animal protection and illegal hunting; • Proper waste management to prevent water pollution; • Caution while working near water to avoid increase of turbidity; Headwork construction in less "sensitive" period for biological environment of water.	
Impact on vegetation cover **Significance:** Medium	• Direct impact on vegetation • Indirect impact - dust, emission	• Strict adherence of construction traffic routes and construction site boundaries, including mapping of no-go zones and sensitive areas; • Prior to commencement of works instruct personnel on vegetation cover protection issues; • If required, tree-plant cutting must be implemented under the supervision of authorized service of the Ministry of Environment and Natural Resource Protection; • In case of discovery of a protected specie, it must be removed in accordance with the requirement of the law on "The Red List and Red Book of Georgia", article 24, paragraph 1, sub-paragraph f), in coordination with the Ministry of Environment and Natural Recourse Protection of Georgia; • Implementation of all measures to prevent ambient air and soil quality deterioration; • If possible, planting of local species of trees and plants on the project territory adjacent areas.	**ResidualImpactsignificance:**verylow **Responsible for implementation of mitigation measures:**Buildingcontractor **Monitoring:**controltrafficroutesandbuildingsiteborders;ensurea propermaintenanceofmachineryand vehicles **Responsibleformonitoring:**Building Contractor **Monitoringexpenses:**Noadditional expenses **Expensesforimplementationofmitigationmeasures:** Expensesrelatedtopitfencingduringtheearthworks, whichisnotrelatedtosignificantfinancial costs. Otheractivitiesarenotrelatedto additional expenses.
Waste **Significance:**Positive impact	• Construction waste; • Household waste,	• Waste rock use for the project purposes to be managed appropriately to minimise potential for erosion / runoff and sediment loding of river; • Remediation and regulation of household waste landfill of Stepantsminda; • Arrangement of special temporary storage for hazardous waste on the territory of construction camp and sealed containers must be placed on construction site; • Hazardous waste must be removed from the territory for further management by the licensed contractor; • Wastewater generated in construction camps must be discharged into surface waters only after preliminary treatment; •	**ResidualImpactsignificance:**low **Responsible for implementation of mitigation measures:**Buildingcontractor **Monitoring:**controlofwastedisposal/management **Responsibleformonitoring:**Building Contractor **Monitoringexpenses**:isnotrelatedto additional expenses **Expensesforimplementationofmitigationmeasures:** • Expenses related to the arrangement of special facility for temporary storage of hazardous waste and hermetic containers; • Expenses related to the arrangement of waste rockdisposal area and revegetation costs; • Expenses related to the arrangement of sand basin for treatment of waste water; • Other activities are not related to additional expenses.
Impact on	• Landscape-visual	• Selection of reasonable colors and designs for the buildings, locating	**ResidualImpactsignificance:**low

landscape-visual environment **Significance:** medium	changes due to the construction of head works, diversion pipeline, substation and construction camp. • Visual change due to increased traffic flow	temporary structures, materials and wastes in the areas less visible for visual receptors.Treescurtains. • Cleaning and revegetation of the area after completion of works. • Covering of tunnels following construction • Remediation of informal waste disposal activities	**Responsible for implementation of mitigation measures:**Buildingcontractor,withtheconsentofclient **Monitoring:**visual,inordertocontrolsanitation-environmentalconditionsofarea; **Responsibleformonitoring**:Building Contractor **Expensesforimplementationofmitigationmeasures:**Expensesformitigationmeasuresaredefinedas per selectedmaterialprice.Expense/pricewillbe clarified duringworkingoutofdraftdesign considering market prices
Historical/ archaeological monuments **Significance:** Very low	• Damage	• If any artifact is discovered, construction works should be stopped.Ensure that artifact is examined by qualified archaeologists. Ensure its conservation or delivery to a vault if necessary. Continue works only after permission is obtained.	**ResidualImpactsignificance:**verylow **Responsible for implementation of mitigation measures:**Buildingcontractor,togetherwiththeclient **Monitoring:**observation **Responsibleformonitoring**:Building Contractor
Impact on socio-economical conditions **Significance:** medium	• Limitation of access to resources (pasture areas); • Employement-related displeasure of local population; • Health and safety risks; • Impact on transport infrastructure.	• Finding alternative pasture lands basing on consultations with local population; • Develop a public staff recruitment policy; • Hiring basing on relevant testing; • Providing staff with information regarding their work – development of the code of conduct; • Informing non-local personnel about the local customs and culture; • Develop and practice mechanism to review complaints; • Keeping personnel complains journal; • Adherence of safety rules during transport operations; • Installation of warning, pointing and prohibition signs in the areas dangerous for health; • Provision of staff with individual protection means; • Maximum minimization of caterpillar technique movement; • Restoration of every damaged section of the road after completion of works; • Providing population with information regarding time and period of works; • Registering and responding to complaints, if any;	**ResidualImpactsignificance:**verylow **Responsible for implementation of mitigation measures:**Buildingcontractor,togetherwiththeclient **Monitoring:**periodicalcontrol **Responsibleformonitoring:**Buildingcontractorshould provide H&S officers,whowillbeinchargeofcontrollingifsafetyrulesare respected. **Monitoringexpenses:**Costsassociatedwithhiringadditionalpersonnel. **Expensesforimplementationofmitigationmeasures:** • First medical aid inventory expenses; • Personnel medical insurance expenses; • Personnel individual protection means expenses; • Expenses related to the mitigation measures taken in order to prevent the deterioration of atmospheric air, water and soil quality.

6.1.2 Mitigation Measures and Residual Impact – Operational Phase

Receptor/Impact	Impact Description	Mitigation Measures	Characteristics
Noise and vibration **Significance:** medium	• Distribution of noise generated during operation of hydraulic units and power transformers	• Providing staff with special earmuffs; • Operation room in the machinary hall must be arranged by noise-insulation material; • Frequent change of personnel working with noisy equipment	**ResidualImpactsignificance:** low **Responsible for implementation of mitigation measures:** operator company **Monitoring:** control of technical condition of equipment **Responsibleformonitoring**:operator company **Monitoringexpenses:**not related to additional costs **Expensesforimplementationofmitigationmeasures:** individual protection means for personnel; other activities not related to costs.
Soil contamination **Significance:** low	• Soil contaminaiton with transformer oils and wastes.	• Visual monitoring of concrete tanks under transformers. Repairand maintain – if required; • In case of spill, localization of spilled material and immediate cleaning of the contaminated area. Personnel must be equiped with relevant means (absorbents, shovels and means of personal protection); • Contaminated soil must be removed from the territory for futher remediation by the licensed contractor; • Relevant waste management.	**ResidualImpactsignificance:** very low **Responsible for implementation of mitigation measures:** operator company **Monitoring:** observation **Responsibleformonitoring**:operator company **Monitoringexpenses:**not related to additional costs **Expensesforimplementationofmitigationmeasures:** costs for soil remediation (depending on scale of spill)
Impact on surface water **Significance:** high	• Morphological impacts resulting from changes to sediment transport.	• The impacts of the Dariali HPP operation on fine sediment, coarse sediment and channel condition will be observed and monitored and considered as part of adaptive management of the HPP.	**ResidualImpactsignificance:** low **Responsible for implementation of mitigation measures:** operator company **Monitoring:** Geomorphological survey and guided oobservation **Responsibleformonitoring**:operator company **Monitoringexpenses:**Survey and reporting costs **Expensesforimplementationofmitigationmeasures:** cost for any additional remediation measure
Impact on aquatic biodiversity **Significance** high	• Ecological impacts resulting from reduced flow.	• A 4-year ecological monitoring programme is to be undertaken that will commence 1 year before the Dariali HPP is in operation. • The ecological data will be used to develop adaptive measures such as an environmental flow regime that will ensure potential negative impacts on ecology are understood and managed. • The ongoing monitoring of river ecology and shape will inform adaptive management of the Dariali HPP.	**ResidualImpactsignificance:** low **Responsible for implementation of mitigation measures:** operator company **Monitoring:** Ecological monitoring linked to geomorphological monitoring. **Responsibleformonitoring**:operator company **Monitoringexpenses:**experts and equipment for themonitoring

			Expensesforimplementationofmitigationmeasures: operator company
Impact on Ichthyofauna **Significance:** medium	• Impact due to flow reduction; • Limitation of fish movement due to dam presence; • Fish trapped in the diversion system resulting death	• Headwork will be equipped with fish passage, which shall reduce impact risk at certain extent; • Installation of fish-evade equipment on the water intake; • Systematic release of ecological flow set for the tailrace. • Monitoring of Ichthyofauna must be carried out twice every 5 years during operation phase to evaluate fish passage efficiency and determine additional mitigation measures; • If monitoring results show that the fish passage efficiency is not enough, arrangement and operation of the river trout reproduction farm must be considered.	**ResidualImpactsignificance:** low
			Responsible for implementation of mitigation measures: operator company
			Monitoring: control waste management;quality control of devices
			Responsibleformonitoring:operator company
			Monitoringexpenses:related to Ichthyofauna monitoring
			Expensesforimplementationofmitigationmeasures: related to average costs
Waste **Significance:** low	• Household waste; • Turbine and transformer oil residues; • Other wastes	• Waste removal to Stepantsminda landfill; • Hazardous waste must be removed from the territory for further management by a licensed contractor	**ResidualImpactsignificance:** very low
			Responsible for implementation of mitigation measures: operator company
			Monitoring:control of waste removal/management
			Responsibleformonitoring:operator company
			Monitoringexpenses:not related to additional costs
			Expensesforimplementationofmitigationmeasures: related to small costs
Cultural Heritage, inspirational value of the river Tergi **Significant** low to moderate	• Reduced Flow;	• Specific stakeholder engagement to be undertaken; • Removing domestic waste from the river bank at dam site • Further mitigation measures (such as planting of trees to limit visual impacts) to be developed as necessary.	**ResidualImpactssignificance:** low
			Responsible for implementation of mitigation measures: operator company
			Monitoring:visual impacts during operation
			Responsibleformonitoring:operator company
			Monitoringexpenses:not related to additional costs
			Expensesforimplementationofmitigationmeasures: related to small costs associated with visual impacts

6.1.3 Terms of Safe Operation of the HPP

In order to ensure safe operation of the HPP with the established regime it is important to periodically carry out the following measures:

- Inspection: seasonal, annual and once every 5 years;
- Seasonal maintenance of the HPP and substation;
- Monitoring of turbine conditions;
- Repairs – eg. replacement of turbine rotors and generator repair (20-40 years interval);
- Maintenance-cleaning of headwork/intake, if required;
- Oil changing in transformers, lubrication of equipment;
- Fixing of buildings, fencing, gates, warning signs and lights, upon necessity;
- Cleaning the substation area, testing electrical equipment and maintenance;
- Regular repair/maintenance of equipment;
- Keeping access road (roads) in proper condition.

Water Intake:

- Periodical control and maintenance (cleaning, painting) of mechanical equipment of dam;
- To remove sediments from sand basin;
- To repair walls and bottom of the sand basin, if necessary;
- If meshes are used for slope protection, regular visual control and maintenance should be provided.

Diversion Pipeline

- Periodical maintenance of diversion pipeline. Detection of erosive timely recovery;
- Control of vegetation cover through pipeline parameter and its periodical cleaning;
- Maintenance of culvert aqueduct on crossing points arranged at pipeline deluge gorge. Cleaning of culvert aqueduct from sediment and sand-gravel;
- Leakage detection at the entrance and exit with measured flow comparison method.

HeadraceTunnel

- Tunnel inspection (at the end of 1st and 3rd years of operation and once per 5-years afterwards), check-up (including geophysical study) and cementation if needed.

Pressure Shaft

- Periodical (once per 5 years) ultrasound inspection of penstock's walls and welding joints.Repairs if needed;
- Leakage detection at the entrance and exit with measured flow comparison method.

Power House and Related Infrastructure

- Maintenance of the major technologic (turbines, generators, etc.) and auxiliary (valves, sluices, cranes, pumps, etc.) units, repairs if necessary.

Substation

- Visual monitoring and maintenance of technical conditions of transformers and switches; repairsif necessary;
- Visual monitoring and maintenance of concrete basins under transformers; repairs – if necessary;
- Adding/changing oil in transformers;
- Arrangement of the areas – grass mowing, regular mechanical control of weeds along fence;
- Visual control of the fence; repairing - if necessary.

Some small and short-term environmental impact may occur during the repairing/maintenance. Character of the impact is similar to the one expected during the construction phase. Impact significance depends on the scale and duration of rehabilitation/maintenance related works.

Mitigation measures and responsibility is defined by considering the character of each specific required for specific rehabilitation/construction project.