SFG1343 v2

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Georgia Irrigation and Land Market Development Project

Restoration of Instrumental Monitoring System of Algeti Reservoir and Weir and Hydraulic Structures of Tbisi-Kumisi Irrigation System, and Rehabilitation of the Main Canal and Headrace Pipeline on Khaishi and Marabda Massifs

February 2015

Section 1: Sub-project design and specifications

Institutional and Administrative Data				
1	**Project title**	Georgia Irrigation and Land Market Development		
2	**Sub-project title**	Restoration of Instrumental Monitoring System of Algeti Reservoir Weir and Hydraulic Structures of Tbisi-Kumisi Irrigation System, Rehabilitation of the Main Canal and Headrace Pipeline on Khaishi and Marabda Massifs		
3	**Sub-Project location**	Kvemo Kartli region,Tetritskaro municipality		
4	**Watershed (river basin)**	Catchment area of the riv. Algeti		
Institutional Arrangements				
5	**Institutional Arrangements (names and contacts)**	*WB (Task Team Leader)* Peter Goodman	*Project Management* Project Planning and Monitoring Division (PPMD)	*Local Counterpart or Recipient* United Amelioration Systems Company of Georgia
6	**Implementation arrangements (names and contacts)**	*Safeguard Supervision* Darejan Kapanadze (Environment) and Nino Metreveli (social)	*PPMD supervision (Env. Specialist)* Tbd	*Contractor (to be entered once contracted)*
Description of the territory				
7	**Geographical title of the territory**			
	Physical-geographical region of Kvemo (Lower) Kartli plains: Kumisi-Asureti sub-region, territory of south-east branches of Trialeti range.			
8	**Short description of the sub-sub-project activities (type of planned works)**			
	The sub-project considers restoration of Tbisi-Kumisi irrigation scheme, instrumental monitoring system of Algeti reservoir dam and hydro-technical facility, and rehabilitation of headrace pipelines on the Khaishi and Marabda massifs. Rehabilitation of Tbisi-Kumisi irrigation scheme is urgent due to its unsatisfactory technical condition. Irrigation system is supplied from 60 m^3 capacity Algeti reservoir, where water is accumulated in a reservoir supported by a86 m high stone dam. The body of the dam is in good condition, but its instrumental monitoring system is looted and damaged. Floating waste-trap on the shaft spillway is also damaged. Steel sheets covering intake valves are deformed. Sub-project includes the following types of works for the improvement of Algeti reservoir operation and maintenance: • Restoration of dam instrumental monitoring system; • Replacement of floating waste-trap on the shaft spillway with the similar equipment; • Reinforcement of deformed steel sheets covering intake valves. Rehabilitation works on the irrigation scheme include rehabilitation of the main canal and headrace pipeline on Khaishi and Marabda Massifs. **Khaishi:** As built originally according to the initial design, the pipeline serving agricultural area of about 4,600 ha on the slopes of Khaishi Massif received water through a pumping station. However the pumping station has been out of operation for almost two decades. After rehabilitation, most			

part of Khaishi irrigation system will be converted into gravity irritation to serve around 2000 ha (out of 4600 ha). Total length of the main canal is 24.99 km, including:

- Open sections with overall length 12.94 km;
- 13 underground water pipelines with overall length 11.64 km;
- 2 closed sections with overall length 0.41 km.

General condition of the main canal's open sections is satisfactory. At some places concrete tiles are damaged, we also encounter misplaced tiles. The loss due to water seepage is high, which decreased canal capacity significantly. Section arranged with grooves is damaged. The collector and operational road of the main canal are also damaged.

Rehabilitation sub-project of open section till the Dm 114+70 and sections Dm 114+70 – Dm 212+49.6, Dm 212+49.6 – Dm 216+89.4, Dm 216+89.4 – Dm 230+76, considers following activities:

- Removal of damaged trapezoidal and rectangular lining tiles and replacement with new reinforced-concrete tiles;
- Dismantling of misplaced intact tiles and reinstallation;
- Restoration of cracks;
- Dismantling of damaged edgings and arrangement of new ones with mass concrete;
- Cleaning and plastering of eroded concrete of edgings;
- Extraction of damaged ground and concrete at connection points and arrangement of new concrete surfacing;

Following activities are planned on the section arranged with parabolic grooves of „Лр 10" grade (Dm 230+76 –Dm 249+93.6):

- Removal of useless grooves and installation of new ones on new rubber stands;
- Restoration of slightly damaged grooves;
- Extraction of damaged ground and concrete at connection points and arrangement of new concrete surfacing;
- Restoration of collector's damaged section using smoothed stone;
- Arrangement of d=630 mm steel pipe (with sprinkles on it) parallel to the groove canal, in order to supply adjacent territories with water;
- Restoration of b=3.5 m wide operational road on the main canal using δ=20 cm thick sand-gravel mix.

Most of underground water pipelines are arranged with d-1420 mm pipes. Initial 0.98 km section of underground water pipeline Dm 186+18.6 – Dm 212+46 (l=3.03 km) is arranged using two-line d=1020 mm steel pipe and other section – two-line d=820 mm pipe. Dm216+94 –Dm219+70.5 underground water pipeline is arranged with two-line d=820 mm pipe.

Most of pipes, forming underground water pipelines, are in satisfactory conditions.

On the section Dm 186+18.6 – Dm 212+46 due to impact of aggressive soil, the pipeline is very corroded and damaged. At the initial section of Jorjiashvili underground water pipeline (Dm 59+79 – Dm 74+39) the ground is collapsed, stability of the route is deteriorated. At the Enageti underground water pipeline (Dm 97+55 – Dm 100+20) ground below the pipeline is misplaced and in result pipes are hanging in air. Initial 443 m of Asureti underground water pipeline (Dm 145+31.3 – Dm 165+84) are heavily damaged, pipes are deformed and curled, across almost the whole section the ground is washed out. At several points of Khaishi underground water pipeline there are illegal connections of water users.

Following rehabilitation works are planned for underground pipelines:

- Restoration of damaged concrete entrances of underground water pipelines and closed

canals by shotcreting and plastering;

- Arrangement of regulating valves on the entrances of underground water pipelines;
- Restoration of old and arrangement of new waste-traps;
- Roofing of inlet and outlet portals with reinforced concrete tiles;
- Arrangement of anchor and slippery pillars;
- Arrangement of an emptier using d-219 mm pipes;
- Arrangement of third line on the Jorjiashvili underground water pipeline using d-1420 mm l=1744 m pipe;
- Restoration of damaged Enageti underwater pipeline;
- Dismantling of two damaged lines on Asureti underground water pipeline and installation of new ones with dimensions 2X443=886 m;
- Replacement of two-line d=820 mm pipeline with plastic pipes of same diameter and overall length 3200 m on the Dm 195+00 – Dm 211+00 section of the underground water pipeline at Dm 1816+18.6 -Dm 212+46;
- Dismantling of d=1000 mm pipe connected to the Khaishi undergroundwater pipeline, deepening of the existing tranche and reinstallation of the pipe on 655 m length;
- Connection of new d=1200 mm pipe (l=1075 m) to the second line of Khaishi underground water pipeline near the pumping station for supply of water to the areas of Khaishi massif along with the existing with the existing pipe;
- Cutting off illegal users connected to the Khaishi underground water pipeline, installation of d=530 mm l=4390 m steel pipes into the tranche paralel to the pipeline and connection of users to this pipeline;
- Relocation of existing pipeline route of Khaishi underground water pipeline (Dm 37+57) by 25 m distance.

Marabda: As built originally according to the initial design, Marabda Massif was irrigated from Marabda Lake, which has become a private property later. Rehabilitation of a water outlet on Marabda Lake would therefore be impossible. An alternative solution provided through the rehabilitation design is to supply Marabda pipeline from the main canal through an inverted syphon and a new section of the connecting pipe. This technical solution guarantees stable supply of water to the plots located on the slopes of Marabda massif. For supplying Marabda massif and Koda areas with water, sub-project ensiages:

- For supplying territories adjacent to the Marabda Lake a d=325 mm pipe, connecting the damaged d=820 mm pipe will be dismantled and replaced with a new d=630 mm I=1240m underground pipe, bypassing areas damaged by landslide. Finally this new pipe will be connected to existing d=630 mm pipe;
- Arrangement of surge shaft at the end of the pipeline, near the Marabda Lake;
- Arrangement of an additional pipeline for Marabda massif and Koda areas using d=820 mm l=5500 m pipe (water will be delivered to reservoir, located a Koda-Marneuli motorway, from which water flows to the irrigation system of the area, adjacent to this motorway; areas dependent on Marabda irrigation system are supplied with water from the same reservoir, using d=630 mm l=1154 m pipe.)

All five water outlet facilities of the main canal have their water-regulating valves damaged, their directing valves, walls and bottoms are eroded. Sub-project considers replacement of regulating valves and restoration of eroded walls and bottom.

After the rehabilitation, irrigation system will service 3555 ha area.

Arrangement of Construction Camp

The location of construction camp, its characteristics and necessary temporary infrastructure will be specified after selection of constructing contractor on a competitive basis.

According to preliminary assumptions, territory of Tbisi-Kumisi irrigation system's former administration (coordinates X – 0473419; Y - 4603520.) is considered to be the most advantageous location for the construction camp. The approximate area of the territory is 0.5 ha. The main advantages of the location are:

- The territory belongs to the Ministry of Economy and Sustainable Development of Georgia, but it is decided to grant it to the United Amelioration Systems Company of Georgia LTD. There are office and maintenance facilities and 2 warehouses on the territory;
- The shortest distance from the nearest residential house is 70-80 m. Insignificant disturbance of local population during the camp operation is expected due to the noise propagation. Other types of negative impact are less expected.
- Proximity to the Tbilisi-Tsalka-Ninotsminda motorway (1 km distance) and gravel road of village Asureti, lying along the territory will ease transport operations;
- The territory is more or less equally distanced from initial and ending points of rehabilitation section and besides is distanced only by 1 km from the most difficult rehabilitation site – initial section of the Asureti underground water pipeline (Dm 145+31.3 – Dm 165+84);
- Use of additional land plots will not be necessary for arrangement of the construction camp;
- Removal of vegetation due to arrangement of the construction camp is not expected. Only herbaceous plants and bushes will be destroyed;
- Considering topographic conditions, implementation of ground works will not be required for arrangement of the construction camp;
- Use of warehouses existing on the territory will be possible;
- No signs of existing or developing hazardous geo-dynamic processes were detected within the territory boundaries;
- Supply of the camp with electricity will be possible by connecting it to the vil. Asureti supply system;
- Supply of the camp with drinking and technical water will be possible using vil. Asureti water.

2 alternative territories were selectedfor temporary parking of heavy machinery and transport means during the rehabilitation process:

- Approximately 2000 m^2 territory (coordinates X - 0461558 ; Y -4604388). The territory is under state ownership, is aligned and lacks vegetation and fertile soil covers. Proximity to the Tbilisi - Tsalka-Ninotsminda motorway (approximately 800m) is advantageous for transport operations (for accessing headwork of Algeti reservoir, as well as whole Dm 0+00 – Dm 114+70 rehabilitation section);
- Approximately 2500 m^2 territory (coordinates X - 0476879 ; Y - 4604534). The territory is under state ownership, is aligned and lacks vegetation and fertile soil covers. Proximity to Tbilisi-Tsalka-Ninotsminda motorway is advantageous for transport operations (for accessing rehabilitation sections, as well as other design sections of the canal).

Waste management:

Household, as well as construction waste (including hazardous waste) generation is expected during the rehabilitation process of Tbisi-Kumisi irrigation system. Waste generated from the construction camp and construction sites will be collected in a special hermetic containers and further they will be disposed at the Tetritskaro landfill. Prior to the construction works, open canals should be cleaned and waste should be temporarily stored at pre-selected sites, after which they will be disposed at the Tetritskaro landfill.

	Construction waste will be maximally used for sub-project purposes, while the rest part of the construction waste should be disposed at Tetritskaro municipal landfillfor construction waste. Hazardous waste (tires, oil filters, etc.) should to be temporarily stored at the construction camp area and then to be transferred to an appropriate licensed contractor for further management.
9	**Brief description of the territory (physical and natural environment)**
	Irrigation system of Tbisi-Kumisi is located in Kumisi-Asureti sub-region of the physical-geographical region of Kvemo Kartli. Kumisi-Asureti sub-region represents a deployed and inclined area with eroded surface. The sub-region is bordered by Mtkvari and Algeti valleys, east end of Trialeti range and Ialghuja ridge. Kumi-Asureti sub-region is bordered with Mtkvari and Algeti valleys, east end of Trialeti range and Ialghuji ridge. Absolute elevations within the region vary from 350-400 m (villages Soghanlughi and Jandari) to 700-800 m (Asureti, upper parts of Vashovani and other inclined planes). Moderately humid climate with moderately cold winters and long warm springs is dominant in the location of the irrigation system. Also, two minimums of precipitation per year are observed. Average annual temperature is 8.6^{0}C. Average temperature in January is -1.9^{0}C; August – 19.5^{0}C. Average annual amount of precipitation is 792 mm. Land use long the corridor of Tbisi-Kumisi irrigation system is predominantly agricultural. Due to anthropogenic influence, this area is transformed and does not represent an important habitat for wildlife. Headwork area is mainly represented by artificially planted trees: Spruce, Apple tree, Pear tree, Plum tree. Main canal corridor is dominated by Ash, Maple, Pear tree, Malus Orientalis, Apricot, Mulberry, Tree of Heaven, Hornbeam and other low-value trees. The following bushes and herbaceous vegetation dominate on the slopes adjacent to the canal and pipeline: Blackberry, Thorn, Spirea, Dog-rose, Astragal, Thyme, Bellflower, Foxtail, Bromus and Marshmallow. Due to the naturally poor vegetation and intensive agricultural activities, the corridor of the main channel does not support any large mammals. The following animals may be observed within these areas: white breasted marten, badger, rabbit, fox, mole-rat, snow vole, field mouse. Avifauna is represented by Rock Partridge, Eurasian Jay and Meadow Pipit. As for the reptiles, there are many turtles, slow worm and rock lizard. Fish species of Khramulya, Nases and Caspian shemaya are found in the rivers. For the irrigation system the water is abstracted from the reservoir of the riv. Algeti. Algeti river originates on the eastern slopes of Trialeti range from the springs located on the elevation of 1900 m. The river joins the river Mtkvari from the right side near the village Kesalo. The length of the river is 118 km, overall decline – 1625 m, average slope – 13.8, catchment area is 763 km^2. Two important tributaries are located upstream the reservoir: Bzistskali (with length of 15 km) and Usakhelo (11 km). The riv. Algeti is fed by snow, rain and ground waters. Its water regime is characterized by spring inundation, summer-autumn floods and unstable shallow water in winter. 44-50% of annual runoff flows in spring, 20-23% in summer, 5-7% in autumn and 4-10% in winter. The percentage distribution of annual flow is not stable and it is usually characterized by significant changes. During cold winters water in the upstream of the river freezes. Duration of such event reaches 32 days. During shallow water period the water is clean, transparent and suitable for drinking. Algeti reservoir was constructed and headwork of the irrigation scheme was put into operation in 1983. Entire flow of Algleti river enters this reservoir. Part of water is then released into the riverbed and part is supplied for irrigation via underground pipes. Useful volume of the Algeti

water reserve is 60 mln m^3 (total volume is 65 mln m^3). According to the original design, the ecological flow was set at Q_{eco}=2 m^3/s which, according to the Soviet standards, made 10% of the average annual river flow calculated over the extended period of time. Capacity of the irrigation channel is Q_{nor}=9 m^3/s, and Q_{for}=10 m^3/s.

In the past few years the technical condition of the channel sharply deteriorated due to incorrect operation of the system causing decrease in its capacity. At present capacity of the channel is 6 m^3/s. The capacity of the channel will be restored after implementation of the planned rehabilitation works, namely: Q_{nor}=9 m^3/s, and Q_{for}=10 m^3/s.

In the first years of the scheme's operation, natural bed of riv. Algeti downstream the reservoir had significantly transformed due to drastic drop of the water flow. Since then, the transformed ecosystem remains in balance for about 30 years and project implementation will not cause any additional changes to it as long as the established ecological flow continues to be respected. This will be a challenge, though, due to shortage of water in the Algeti reservoir. There are no downstream water users significantly depending on the water flow in riv. Algeti, however water shortage does not allow to fully meet the existing demand for the irrigation water.

Audit results for location corridor of the irrigation system

General review

Irrigation system of Tbisi-Kumisi is located in Kvemo (Lower) Kartli region, on the territory of Tetritskaro municipality.

The irrigation system is supplied with water by Algeti reservoir intake with capacity of 60 mln m^3, which is located west from the village Tbisi in Tetritskaro municipality. The parameters of the reservoir dam are as follows: height – 86 m, length of the ridge – 440 m and width of the bottom – 400 m.

The main canal of the irrigation system mostly runs from east to west and crosses arable and pasture lands of the villages Tbisi, Partskhisi, Sagrasheni, Bogvi, Jorjiashvili, Asureti and Koda, on a distance from the populated areas. The main canal ends near the village Koda.

During the environmental audit of the irrigation system sanitary-ecological conditions of the system head unit territory and main canal corridor have been studied. The audit results for the conventionally divided sections are provided below.

Head unit of the main canal

Water is supplied to the open type water outlet of the irrigation system with the Algeti reservoir water intake via tunnel arranged in the dam. The total area of the water discharge is approximately 3500 m^2. It is connected with the central highway of Tbilisi-Tsalka-Ninotsminda with a ≈1 km long ground road under the good condition.

Apart from Tbisi-Kumisi irrigation system, the water discharge supplies:

- Marneuli irrigation system;
- HPP of a small capacity (1,2 MW), which is located adjacent to the water discharge;
- Drinking water is supplied to the villages Tbisi, Partskhisi, Sagrasheni, Bogvi, Jorjiashvili via d=150 mm pipeline;
- Also, with the pumping station the water is supplied to the country house farms. The pump station is currently inactive.

Flat shields of the water discharge and left break lock are damaged. Bridge crane is not working.

Internal roads of the territory are asphalted and in a satisfactory condition. Plants are cultivated on

the biggest part of the area, namely: apple, pear and plum. Fir trees are also growing along the road. Transmission line is crossing the territory which delivers electricity from the HPP mentioned above to the power grid.

Sanitary-ecological condition of the discharge territory is overall satisfactory, although several minor flaws have been recorded, namely:

- A small oil spill has been recorded near the discharge regulation shields and engines of brake valves;
- A small amount of the organic waste (fragments of trees and other vegetation) is accumulated on the grid of the inverted siphon inlet.

The photo material depicting the discharge territory is provided below.

A ground road leading to discharge territory is running along the left side of the beginning of Tbisi inverted siphon, and from the right side it is bordered by agricultural lands. Pk12+11. The inverted siphon is crossing Tbilisi-Tsalka-Ninotsminda central highway and goes up the elevated slope on the other side which is a free area.

Open canal of Partsikhe mainly runs on the free territories, on 735-738 m asl. The bottom and slopes of the canal are clean from vegetation and sediment material. Ground road is located on the both sides. The technical condition of the road is satisfactory. A small metal pedestrian bridge is arranged across the canal, which is used by the population of the village Partsikhe for crossing to the forest located on the left side of the canal, where they gather fruit and berries. Transmission line is located along the right side of the canal. A pile of concrete waste with a total amount of ≈2.3 m^3 is recorded on the right side of the canal.

A small amount of tree-plant waste is accumulated on the inlet of Partskhisi inverted siphon. The concrete lining of inverted siphon entrance is damaged. The main canal crosses the Partskhisi ravine with the means of inverted siphon. No buildings were observed in the corridor of the inverted siphon.

The open canal of Saghrasheni runs through the territories adjacent to the north to the village Saghrasheni. Bush vegetation grows on the slopes of the canal. A ground road is located on the both sides of the canal. The roadbed on the left is in poor condition and is covered with bush vegetation. A pedestrian bridge is arranged across the canal connecting local population with the forest located on the left side. Small diameter pipelines cross the canal (in 3 spots) delivering drinking water to certain part of Saghrasheni population. On some sections talus from the slope on the left is being accumulated on the bottom of the canal.

Small amount of tree-plant waste and talus from the left slope is accumulated near the inlet of Saghrasheni inverted siphon. With the means of the inverted siphon the main canal crosses Saghrasheni ravine. Unauthorized farm built with construction blocks owned by the local resident is arranged in the corridor of the inverted siphon.

Open canal of Bogvi runs north-west of the village Bogvi, on the free territories. The access road of the canal is located on the steep slope and its bed is in poor condition. Due to big cover of vegetation the operational subgrade of the road is not defined. A drinking water supply pipeline is located on the right side of the canal supplying the village Jorjiashvili. Significant amount of vegetation grows on the slopes of the canal (apricot, blackberry, etc). On the starting section of the canal (on the inlet of inverted siphon) sediment is accumulated.

Small amount of tree-plant waste is accumulated on the inlet of Bogvi inverted siphon. Eroded slopes are observed on some section of the inverted siphon corridor. Due to erosion the pipeline is exposed creating a high risk of inverted siphon damage (this section was rehabilitated in 2012).

Open canal of Jorjiashvili is located on the territories adjacent north to the village Jorjiashvili.

	Technical condition on the right side of the canal is satisfactory, while the subgrade of the road to the left is damaged in some places. Transmission line runs in vicinity of the canal. The canal was recently cleaned and trees and plants are poorly present on the berms. Due to damage of the concrete filters and hi filtration the filters leak from the right side into the household plots located on relatively low elevation. Dissatisfaction from the damage of the property (basements of the residential houses, fence, etc.) is high among the local population (in total 5 cases were recorded). Six unauthorized water abstractions were recorded within the canal using siphons. A pedestrian bridge is arranged across the canal which connects local population with the agricultural lands located on the left side of the canal. Household waste with the total amount of 4-5 m^3 was observed on the right side of the canal. Facts of household waste incineration were observed in vicinity. Before connecting with the inverted siphon the canal turns north. Small amount of tree-plant waste is accumulated on the inlet of Jorjiashvili inverted siphon. 1,5-2,0 m^3 household waste is observed on the left side of the inverted siphon inlet. Ground on the surface of the beginning section of the inverted siphon (pk59+74-pk74+39) is failed and eroded, route stability is violated. Third line does not exist on this siphon. In order to restore capacity of the canal in accordance with the sub-project a third line must be arranged. Transmission line passes on the right side of the inverted siphon. Separate sections may be approached via ground motorway. Enageti open canal passes east from the village Enageti, away from the densely populated area, on free territories (agricultural and pasture lands). Ground roads under good condition run along the both sides of the canal. Vegetation cover within the corridor in not big. A small number of bushes and grass vegetation grows on the slopes and berms of the canal. In order to raise the water level concrete blocks are placed in the beginning of the canal. No eroded sections are observed within the canal. In the foot of the Enageti inverted siphon (pk97+55-pk100+20) pipeline the ground has moved and big part of the pipeline is hanging in the air. Eroded processes are also observed. Damage risk of the pipeline is high. After the inverted siphon the canal turns south-east and continues with Shavsakdrisi bridge. Shavsakrdisi open canal passes on the agricultural lands located between the villages Jorjiashvili, Enageti and Asureti, away from the populated areas. At Pk104+50, the canal crosses the main road of Tbilisi-Tsalka-Ninotsminda and the gas pipeline. After this it turns east. On pk109+70 it crosses the road connecting with the village Shavsakdrisi and connects with Shavsakdrisi inverted siphon. A ground road under satisfactory condition runs along the right side of the canal. The road on the left side is covered with vegetation. A few trees and bushes grow on the berm of the canal. Talus from the eroded slope located on the left side of the canal accumulates on the bottom on the section before crossing Tbilisi-Tsalka-Ninotsminda main highway. Eroded sections within the canal were not recorded. Small amount of vegetation waste and stone-gravel is accumulated on the bottom of the canal and discharge gates of the 9th pumping station located on the crossing of the access road leading to the village Shavsakdrisi. A pedestrian bridge is arranged across the canal which was supposed to be used for flow measurement. Small amount of tree-plant waste is accumulated on the inlet of Shavsakdrisi inverted siphon. Technical condition of the inverted siphon corridor is satisfactory. No erosion processes are observed within the territory. At the inlet of the Shavsakdrisi underground water pipeline small volume of the vegetation waste is accumulated. Emergency emptier is arranged at the outlet of the underground pipeline, which flows excessive water to the Lamiskana valley. Technical condition of the pipeline corridor is satisfying. No erosions are detected within its boundaries. Asureti #1 open canalpasses west to the vil. Asureti, on the territory of the pasture. From the left

	side, along the whole length of the canal, there is a gravel road in satisfying condition. As for the grave road to the right of the canal, it is covered with herbaceous plants and bushes. On the right berm of the canal there are poplar, apricot and mulberry trees (10 units in total). At two sites bricks, concrete tiles and large stones (total volume ≈3 m^3) are thrown into the canal for impoundment. On the left side of the canal stockpile of the household waste, with overall volume 1.0 m^3 was detected. Two illegal water users were detected at the final section of the canal using pumps to steal the water. On the final section the canal turns abruptly to the south and connects with the Asureti underground water pipeline #1. Asureti underground water pipeline #1. At its inlet small volume of the vegetation and household waste is accumulated. The pipeline passes underneath the agricultural lands of the population, turns east and connects with the Asureti underground water pipeline #2. Technical condition of the pipeline corridor is satisfying. No erosions are detected within its boundaries. Asureti open canal #2 passes south to the vil. Asureti, mainly through the pasture, far from the settlements. The canal is followed by the gravel road from both sides. The road is in good condition. Vegetation cover on the slopes and berms of the canal is negligible (only herbaceous plants are observed). Concrete tiles (total volume ≈2 m^3) are thrown into the canal for impoundment. At the final section the canal turns east and connects with the Asureti underground water pipeline #2. Asureti underground water pipeline #2 Crosses the Asureti gorge. It is the most amortized underground pipeline of the Tbisi-Kumisi main canal. Along almost the whole section the ground underneath the pipeline is washed-out. On the right, steep slope of the Asureti valley, in the maikop clays 2 landslide bodies have developed. Due to them on the initial 443 m pipes are deformed and curled. Accidents are frequent. The last rehabilitation works on this section were conducted three years ago: misplaced pipes were reconnected. Due to rehabilitation works, left pipeline shortened by 30-40 m. Besides, approximately 10 m, heavily curled section was cut out and replaced (removed pipeline is stored nearby the undergroun pipeline corridor). At the inlet of the pipeline ≈1 m^3 waste stockpile was detected. Vegetation cover is represented by trees and bushes. Underground water pipeline crosses overhead ETL. The last section of the pipeline urn abruptly to the north and connects with the closed canal #1. Closed section #1 passes through the hilly terrain on the empty territory. Around the canal inlet there are bushes and herbaceous plants. By the side of the inlet there is small eroded valley. No significant erosion processes were detected in the canal corridor. The closed canal connects with the Laloba open canal #1. Laloba open canal #1 passes through the pasture. From the left the canal is followed by the gravel road in good condition. Vegetation cover on the slopes and berms of the canal is negligible (only herbaceous plants are observed). Concrete tiles (total volume ≈2 m^3) and steel sheets are thrown into the initial section of the canal for impoundment. On the right side of the initial section there is a farm. Due to damaged concrete tiles and high seepage, leaked water flow to the farm, which causes owners' discontent. Canal corridor crosses high voltage overhead ETL. The canal connects with the Laloba underground water pipeline #1. Laloba underground water pipeline #1 is the shortest within the Tbisi-Kumisi main canal. It passes through the empty territory where no erosive or other hazardous processes are detected. Small volume of vegetation waste and slime is accumulated at its inlet. The pipeline turns east and connects with the Laloba open canal #2. Laloba open canal #2 passes through the pastures. The canal is followed by the gravel road from the both sides. Vegetation cover on the slopes and berms of the canal is negligible (only herbaceous plants, some bushes and several poplar trees are observed). In the last section canal turns abruptly

to north and connects with the Laloba underground water pipeline #2.

Laloba underground water pipeline #2 passes through the empty territory where no erosive or other hazardous processes are detected. Small volume of vegetation waste is accumulated at its inlet. Around the inlet there are blossoming bushes (blackberry). The pipeline connects with the closed canal #2.

Closed canal #2 passes through the hilly terrain on the empty territory. Its inlet is filled with the small volume of slime. Around its inlet there are bushes and herbaceous plants. In the canal corridor there is one large poplar tree and risk of is roots damaging the canal is high. The closed canal connects with the Borbalo open canal.

Borbalo open canal passes through the pasture, far from the settlements. The gravel road in satisfying conditions (some sections of it still require aligning of the subgrade) follows the canal from the left. From the right it is bordered by private land plots. On the right berm of the initial canal section there are 2 facilities (built with wooden and steel materials). To the right of the last section (near the emptier of excessive water) public food facility is arranged. Two wooden structures of this facility is located on the canal berm. Vegetation cover on both berms is intense (in total there are 30 units of apricot, poplar and other low-value trees and bushes). The canal connects with Borbalo underground water pipeline.

Borbalo underground water pipeline crosses Tbilisi-Tsalka-Ninotsminda main motorway, turns to the east and passes through the agricultural lands and pasture south to the vil. Borbalo. Small volume of vegetation waste is accumulated at its inlet. No erosive or other hazardous processes are detected within the pipeline corridor. The pipeline connects with the rectangular canal.

Rectangular canal passes south-east to the vil. Borbalo, through the agricultural lands. . The gravel road in unsatisfying conditions (the subgrade is damaged or covered with plants at some sections) follows the canal from the right. Vegetation cover on both berms is intense – up to 80 units of trees and bushes are represented. On some sections of the canal concrete lining is damaged and water is being taken illegally using pipelines. Rectangular canal connects with the Vashlovani underground water pipeline.

Vashlovani underground water pipeline. At its inlet small volume of vegetation waste is accumulated. No erosive or other hazardous processes are detected within the pipeline corridor. The pipeline connects with the Vashlovani trapezoidal open canal.

Vashlovani open canal passes south to the vil. Vashlovani, through agricultural lands and pasture, far from the settlements. The canal is followed by the gravel road from the both sides. Vegetation cover on canal slopes and berms is not intense. On the right berm up to 10 units of large trees (apricot and mulberry trees) were detected. At the bottom of the canal vegetation waste and stone is accumulated. At some sighs concrete tiles are thrown into the canal for water impoundment. 6 illegal water outlets were detected. On the canal there is 1 pedestrian bridge. The canal ends at distributional well, from where parabolic inclined canal begins. Concrete surfacing of the surge shaft is eroded and it is filled with vegetation waste and rocks.

Parabolic inclined canal lies north to the vil. Koda, through the agricultural lands. The canal is followed by the gravel road from the both sides. The road is in unsatisfactory conditions (the road subgrade is eroded by the artificial ground canals). On the slopes of the canal several large trees blossom (mainly apricot trees). At some sections concrete surfacing of the canal is seriously damaged, concrete tiles are broken by the local population. Water is stolen illegally using pipelines and ground canals (up to 10 illegal water users were detected). The bottom of the canal is filled with large volume of vegetation waste, rocks and slime. The canal ends at regulating basin. The concrete surfacing of the basin is damaged, it is filled with rocks, slime and vegetation waste.

	Stockpiles of household waste were detected around the basin (overall volume 5-7 m^3). The corridor of pipeline (d=820 mm, l=5500) from the Borbalo underwater water pipeline till the reservoir located adjacent to the Koda-Marneuli motorway According to the design solution, for water supply of the Marabda massif and Koda areas arrangement of the pipeline (d=820 mm, l=5500) from the Borbalo underwater water pipeline till the reservoir located adjacent to the Koda-Marneuli motorway is envisaged. The design pipeline crosses Tbilisi-Tsalka-Ninotsminda motorway at its initial section and for 2 km distance goes through this motorway and agricultural lands, located right to the road's corridor. After the route of the corridor goes through agricultural lands of vil. Koda, goes around the settlement from the south and end at the reservoir, located next to the Koda-Marneuli motorway. From the reservoir water will be supplied to the territories subjected to the Marabda irrigation system using D=630 mm and L=1153 m steel pipe. 60 m gravel road subgrade of the access road to the reservoir is in poor condition. The bottom of the reservoir is filled with slime and herbaceous plants are blossoming. Concrete surfacing of the reservoir is in satisfying conditions. The design pipeline corridor is selected in a manner to bypass household land plots of the population. On the agricultural lands, where this pipeline will go through, mainly annual plants are grown. Considering aforementioned construction of the pipeline will not require resettlement. Within the design corridor there only are trees and bushes of low value (mainly poplar trees). No hazardous geo-dynamic processes are observed in the corridor.
10	**Locations and distances from the nearest sources of licensed materials, especially aggregates, water, stones**
	During the sub-project implementation, construction materials (inert materials, concrete mixture, reinforced concrete structures, etc.) will be provided by the relevant enterprises. The important thing is that there are no enterprises of inert materials and reinforced - concrete structures in the sub-project area and they should be imported from Tbilisi and Marneuli plants. The nearest licensed quarries of inert materials are located in the riverbeds of Mtkvari and Khrami, which is far from the sub-project area. Concrete mixture can be supplied from concrete plants located in Tetritskaro and Marneuli. Reinforced concrete structures will be available only from Tbilisi. Technical water will be supplied from Algeti River and its tributaries, while drinking water will be supplied from water supply sources of the nearest residential areas.
11	**Legislation**
	Law of Georgia on "Licenses and Permits" – this law arranges fields regulated by licenses and permits, gives full list of licenses and permits, and defines rules for issuing, amending and cancellation of licenses and permits. *As the sub-project envisages only restoration and rehabilitation of existing facilities and structures and construction of new structures is not considered, no license or permit is required.* **Law of Georgia on "Environmental Impact Permit"** – the law enlists all activities subjected to the compulsory ecological expertise (article 4, paragraph 2). *According to this law, rehabilitation of Tbili-Kumili irrigation scheme is not subject to the environmental expertise and therefore do not require Environmental Impact Assessment.* **Law of Georgia on "Water"** – this law covers issues related to water protection, research and use. According to article 4, the objective of the law is to protect the water objects and ensure rational use of water.

The sub-project implementation will result in the decrease of water loss during its transportation to end-users, which is in line with the legal requirement of the rational water use. Also, the sub-project considers cleaning of the canals that will result in decreased water pollution, which meets the legal requirement.

Law of Georgia on "Soil Protection" – one of the main objectives of this law is to ensure integrity, increase productivity and maintain the soil cover. It prohibits use of fertile soil for non-agricultural purposes, action which will worsen soil properties, soil pollution and etc.

Implementation of irrigation scheme rehabilitation sub-project creates risks of fertile soil layer damage and soil quality deterioration. These risks must be addressed and avoided during the construction phase. Also, poor maintenance of canals during operation may cause waterlogging of territories adjacent to the canals and development of erosion processes. Such type of damage to soil would be in conflict with the legal requirements and must be avoided by proper operation and maintenance of the rehabilitated canals.

Law of Georgia on "Ambient Air Protection" – The purpose of the law is to ensure protection of the ambient air from pollutants (including hazardous substances, as well as distribution of noise and vibration) and to regulate legal issues related to protection of the ambient air.

Implementation of the sub-project will cause noise and emissions from the construction machinery. Although this impact will be limited in time and scale, the noise and emissions' levels must be kept to the minimum by application of good construction practice.

The Civil Code of Georgia – regulates private civic relations, determines property, family and neighborhood rights and inheritance rules.

On some sections of the irrigation system (mainly on sections passing through settlements), on the main canal's right of way, there are various facilities of private owners, and land is used for agricultural purpose. Right of way for the canal is not respected, no service roads exist and consequently it is impossible to conduct rehabilitation works. These issues must be handled in accordance with the Civil Code of Georgia and with the World Bank OP/BP 4.12 Involuntary Resettlement.

Law of Georgia on "Registration of Rights for Real Estate" – defines organizational and legislative basis for registering rights on real estate, sequestration and lien/mortgage, also rights and obligations of the body keeping the register.

This law should be applied in case of damage or loss of private land plots or other types of real estate.

Law of Georgia on "Rule for Seizure of Property Rights for Pressing Public Need" – defines conditions and rules for expropriation in the name of pressing public need.

Enforcement of this law along with the World Bank's OP/BP 4.12 Involuntary Resettlement may become necessary if the sub-project implementation requires resettlement.

Law of Georgia on "Calculating Costs and Compensating Damage Due to Use of Agricultural Lands for Non-agricultural Means" – this law regulates rules for paying compensation (land replacement cost) to the state or private land owner due to deterioration of soil quality. According to the law, there are fixed rates which depend on quality and location of the land plot. Land compensation fees are given in Appendix 1 to the law. The law does not consider compensation for facilities, annual or perennial plants.

On some sections of the irrigation system (mainly on sections passing through settlements), some private land plots may be damaged. Damage done must be compensated in compliance with the requirements of the law, as well as in conformity with the Resettlement Policy Framework (RPF)

	and a Resettlement Action Plan (RAP), if needed and prepared for this sub-project.
12	**Public Disclosure:**
	Consultation meeting on the present draft EMP with farmers of every residential area affected by the sub-project was held on February 2, 2015 (villages Tbisi, Partskhisi, Saghrasheni, Bogvi, Jorjiashvili, Enageti, Asureti, Shavsakdrisi, Borbalo, Vashlovani, Koda, Kumisi, Marabda, Khaishi). The meeting took place in Tetritskharo district. The beneficiaries were informed about the meetings via announcements published in the centers of the villages, the hard copies of the present draft EMP were made available at local municipal offices.

SECTION 2: ENVIRONMENTAL MANAGEMENT PLAN

ACTIVITY	PARAMETER	MITIGATION MEASURES CHECKLIST
General	Notification	(a) Notification of public about the works using media (local newspaper) and/or publicly accessible sites (distribution of notifications at public places of villages within the sub-project impact zone) (b) All legally required permits, agreements, licenses, and clearances acquired for the sub-project activities (c) The Contractor formally agrees that all works will be carried out in a safe and disciplined manner designed to minimize impacts on neighboring residents and environment.
	Worker Safety	(a) Workers' PPE will comply with international good practice (hardhats, masks, safety glasses, harnesses and safety boots, tec.) (b) First aide medical kits and fire extinguishers available at work site (c) Contact information for emergency services (medical, fire) posted on the information board at work site
Pollution Management	Air Quality	(a) Construction machinery and equipment maintained in adequate working condition on regular basis (b) Spoils storage piles compacted (c) Dust sources watered to minimize discomfort to nearby residents (d) Materials and wastes are transported under a covered hood of a truck (e) Vehicle speed under control to lessen suspension of road dust (f) Implementation of safety norms during loading-unloading of waste materials
	Noise	(a) Reduction of noise propagation to the settlements by limiting working hours (implementation of noisy work during daytime) (b) Ensure technical functionality of machinery and equipment (c) Engine covers of generators, air compressors, and other powered mechanical equipment closed during operation, and equipment placed as far away from residential areas as possible
	Soil quality	(a) Ensure technical functionality of machinery and equipment. In case of oil/lubricant leakage detection, maintenance works must be conducted as soon as possible. Damaged machinery should not be allowed to the construction site. (b) Removal of fertile soil layer (especially at construction sites) and storage for further restoration works. Stockpiles of fertile soil layer must be protected from wind, atmospheric precipitations and drainage water, therefore it must be distanced from surface water objects/irrigation canal at least by 50 m; the height of the stockpile should not exceed 2 m; slopes of the stockpiles must be properly inclined (45^0); water abstraction canals must be arranged on the territory if necessary (c) Implementation of construction works strictly within the construction sites' borders in order to prevent possible pollution or damage of adjacent territories (d) Selection of traffic routes for machinery (restriction of movement outside the route borders) in order to minimize possibility of adjacent territories' damage (e) Localization of spill and immediate treatment of polluted area; (f) In case of serious pollution, polluted ground and soil must be removed an taken for further remediation by the contractor holding corresponding permit
	Waste	(a) Permanent disposal of the waste at Tetritskaro household and construction waste landfills; this issue must be agreed with local government; (b) Sites for temporary storage of waste allocated to prevent scattered dumping of waste on and around the work site; (c) Reuse and recycle construction waste whenever feasible (except asbestos) (d) Negotiations with licensed companies, as available, for removal and recycling of used tires and filters of construction vehicles and machinery (e) No open air burning of waste on and off the work site

Control of erosion and landslide areas		(a) Slope protection provided through bank compaction, rip-rapping on critical sections, or vegetative stabilization (b) Removal of fertile soil layer and temporary storage for further restoration works, in compliance with corresponding rules (c) Excess material used for restoration of degraded areas (d) Cleanup of underwater pipeline corridors from landslide deposits as far as possible; (e) Deepening of underwater pipeline pillars into the ground at landslide areas and protection from watering the areas of their location; (f) Measures to reduce the loads that move Maikop clays.
Handling Chance Finds		(a) In case of chance finds during earth works - all activity taken on hold, a State entity in charge of cultural heritage preservation notified in written, and work resumed upon formal permission received from the above entity
Protection of Water Bodies	Turbidity	(a) Arrangement of sediment traps or gabions along valleys to filter out eroded sediments; (b) Erosion control measures applied as provided above
	Pollution	(a) Vehicle and machinery servicing prohibited in the immediate proximity to water bodies (b) Servicing and fueling of vehicles and machinery limited to an allocated site with non-permeable floor and capacity to contain spills if occurred (c) Arrangements made with licensed companies, as available, for removal and recycling/deactivation of used oils and sand/gravel saturated with oil products
Protection of Biodiversity	Protection of the vegetation	(a) In case a specimen included in the Red List of Georgia has to be removed (although species subjected to special protection have not been detected in the influence zone during the walk-over), it should be extracted in compliance with requirements of article 24, paragraph 6 of the Georgian Law on Georgian Red List and Red Book. (b) Selection of traffic routes for machinery (restriction of movement outside the route borders) in order to minimize damage of vegetation on the adjacent territories (c) Mechanical equipment should be considered more preferable for vegetation cleaning
	Protection of the animal wildlife	(a) Selection of optimal transport movement speed in order to minimize possibility of negative direct impact (collision) on animals (b) Canal must be inspected before launch of cleaning and other types of works, in order to identify animals fallen into it and prevent impact on them (c) Minimal use of directed light at the construction camp for minimization of light propagation (d) Restoration of the adjacent territories after the end of construction works (e) Additionally: proper waste management. Efficient implementation of mitigation measures for water, soil and ambient air quality and other mitigations measures
Visual-landscape Changes		(a) Protection of sanitary-environmental conditions in the canal corridor and surrounding areas of the construction site. Proper waste management.
Management of Social Issues	Physical and economic resettlement	(a) According to the audit results, physical resettlement issues related to the implementation of the sub-project is not expected, while economic resettlement will not be significant.
	Impact on transport infrastructure, restriction of free movement	(a) Selection of optimal, bypass access roads (b) Restriction of the machinery movement on the public roads to the maximum extent possible (c) Maximum restriction of caterpillar machinery movement (d) Population must be provided with the information about time and period of works (if necessary) (e) Maximum rehabilitation of damaged road sections, to make it accessible for the population (f) If needed, the transport movement must be regulated by the special personnel.

Nuisance to Local Communities		(a) Sub-project works are scheduled beyond irrigation season to the extent possible in order to avoid/minimize service disruption (b) Work site is properly marked and fenced as appropriate (c) No temporary storage of construction materials and waste occurs within cultivated land plots or any type of private property (d) Areas for temporary storage of construction materials and waste allocated so that free movement of traffic and pedestrians is not hindered (e) Individuals engaged in unauthorized water abstraction will be notified that they will not be allowed to continue an illegal practice of damaging irrigation infrastructure to create leakages, which decreases efficiency of the system. Upfront notice will encourage illegal users of irrigation water to make alternative arrangements for watering their cattle and/or addressing other needs that had been met through informal water use in the past.

SECTION 3: ENVIRONMENTAL MONITORING PLAN

№	**What** (Parameter is subjected to the monitoring?)	**Where** (Is the parameter subjected to the monitoring?)	**How** (Is the parameter subjected to the monitoring?)	**When** (define frequency and repeatability)	**Why** (Is the parameter subjected to the monitoring?)	**Cost** (if not considered by the project)	**Who** (Is responsible for implementation of the monitoring?)
CONSTRUCTION PHASE							
1.	PERSONNEL'S WORKING CONDITIONS AND SAFETY: - Workers are supplied with and actually wear uniforms and personal safety gear; - Workers operating complex machinery are trained and licensed; - There are first medical aid kit at the construction camp and at work site; - Contact information for emergency services (medical, fire) is posted on the information board at construction camp and at work site	• Construction camp; • Construction site.	Visual observation and interviews with personnel	Recurrent	Prevent damage to heath and avoid work-related accidents	Included into the total contract cost	HSE officer of the works contractor
2.	AIR POLLUTION: - Construction vehicles and machinery are in good technical condition that excludes excessive emissions; - Idling of engines disallowed; - Construction materials and waste are transported under cover; - Service roads are sprinkled in hot and dry weather to decrease dust emission.	Work sites (especially ones adjacent to the populated areas)	Visual observation	Recurrent	To minimize disturbance of public and animal wildlife by the dust propagation	No additional costs required	Works contractor though an environmental officer
3.	NOISE: - Observe working hours, especially during works within settlements;	All work sites	Visual observation	Recurrent	Minimize nuisance to local communities and	No additional costs required	Works contractor

	- Ensure good technical condition of construction vehicles and machinery excluding excessive noise from engines.				possible disruption of wildlife		
4.	SOIL PROTECTION: - Conduct works within the delineated corridor, without spreading over an excessive area around; - Stockpile construction materials and waste in the allocated sites, without spreading over an excessive area around; - For the arrangement of work site, preparation of areas of storage, or earth works, remove fertile topsoil layer and store it separately aside for the use for reinstatement; - Conduct servicing of vehicles and machinery at the service centers if feasible, or in the allocated sites with non- permeable flooring and containment walls.	All work sites	Visual observation	Recurrent	Avoid pollution of soil and deterioration of its physical and chemical characteristics	No additional cost required	Works contractor through an environmental officer
5.	WASTE MANAGEMENT: - Timely permission obtained and agreements concluded with the waste company under the Ministry of Regional Development and Infrastructure and the local municipalities for the final disposal of waste at Tetritskaro municipal household and construction waste landfill; - Sites for temporary storage of waste allocated to prevent scattered dumping	• Construction camp; • work site; • Temporary and permanent waste disposal sites; • Transport corridors for waste.	Visual observation	Recurrent	Avoid pollution and deterioration of aesthetic appearance of the work sites and area around them	Costs of waste transportation to the locations of final disposal should be included by works contractor in the bill of quantities	Works contractor

	of waste on and around the work site; - Construction waste is reused or recycled, as feasible (except asbestos-containing materials); - Licensed companies contracted, as available, for removal and recycling of used tires, filters and oils of construction vehicles and machinery; - No open air burning of waste on and off the construction camp and work site allowed.						
6.	EROSION CONTROL: - If earth works undertaken affect steep slopes, then compaction, terracing, rip-rapping, and/or vegetative stabilization techniques are applied as feasible	Work site with steep slopes	Visual observation	During earth works	Avoid or minimize erosion	Included into the general contract cost	Contractor in agreement with supervising engineer
7.	HANDLING OF CHANCE FINDS: - If chance finds are encountered, take all works on hold, contact Ministry of Culture and Monument Protection, and do not resume works until written permission from the Ministry	Earth work sites	Visual observation; Inspection of correspondence	In case of chance finds	Avoid loss of cultural heritage	Additional cost to be covered from the LMID Project proceeds or the State budget – subject to agreement	Works contractor. Ministry of Agriculture, Ministry of Culture and Monument Protection
8.	PROTECTION OF WATER BODIES: - Disallow storage of waste and construction materials near the natural water bodies; - Disallow washing of vehicles and machinery within the river bed or in its immediate proximity; - If servicing of vehicles and machinery is done on-site, arrange	Parts of work sites in the proximity to the natural water bodies	Visual inspection	Recurrent	Avoid deterioration of water quality and disruption of aquatic life in the natural water bodies.	No additional cost	Works contractor through an environmental officer

	special location with non-permeable floor and containment walls; - Establish strict control over workers and personnel to avoid littering of river beds.						
9.	PROTECTION OF VEGETATIVE COVER: - Observe operation of construction machinery to ensure that no unnecessary damage is made to trees and other vegetation; - Disallow uncontrolled movement of construction vehicles and machinery and confine their movement to the existing or provided service roads; - Upon completion of works, undertake final clearing of work sites and their reinstatement to the quazi-original condition to the extent feasible.	• Construction camp; • All work sites	Visual observation	• Recurrent; • Upon completion of works in each work site	Prevent excessive damage of vegetative cover.	No additional cost	Works contractor

10.	MANAGING NUISANCE TO LOCAL COMMUNITIES: - Delineate and fence, as appropriate, construction camp and work sites; - Install posters with the name and contact information of the work contractor in those parts of work sites that are close to settlements and well visible for people; - Explain to local communities duration and scope of planned works; - Avoid or minimize disruption of local traffic and blocking of access as a result of improper storage of construction materials and waste, and the movement of construction vehicles and machinery; - Disallow idling of machine engines, observe working hours, and sprinkle work sites in dry weather.	Work sites in the vicinity of settlements and the area around them	Visual observation	Recurrent	Prevent disruption of economic and social life of the sub-project affected communities	No additional cost	Works contractor
OPERATION PHASE							
1.	WATER SUPPLY TO USERS: All hydraulic structures and canals of the scheme are maintained in good operating condition	Entire scheme	Visual inspection Inspection of water flow measurement records	During water supply season	Prevent congestion of canals, water overflow and waterlogging of areas in proximity to the scheme	Operation and maintenance costs included into the annual budgets of UASCG	UASCG

2.	MANAGEMENT OF IRRIGATION WATER QUALITY: - Any discharges into irrigation canals are timely identified and terminated; - Dumping of agricultural and household waste into canals timely identified and terminated; - Possible erosion of canals' banks and nearby slopes timely identified and managed	Along irrigation canals, especially in the vicinity of settlements	Visual inspection	Recurrent	Prevent water contamination and congestion of canals	Costs of erosion control to be included into annual operation and maintenance budget of UASCG	UASCG and water user associations
3.	IRRIGATION OF SERVICE AREAS: - Water supplied to farms used efficiently, without excess; - Surplus water drained from irrigated fields to avoid water logging;	Service area	Visual inspection Interviews with water users	Recurrent	- Service area does not affected with erosion and water logging	Oversight on the water use to be included into annual budgets of water user associations	Water user associations
4.	CONTROL OF LANDSLIDE AREAS - Cleanup of bottom pipe corridors from landslide bodies, if possible; - In landslide areas deepening of footings for bottom pipes and implementation of water-prevention measures; - Implementation of Maikop clay moving load reduction measures.	Landslide areas (Enageti, Asureti bottom pipe corridors)	Visual inspection	Once a month	• Pipeline protection; • Ensuring population's safety; • Protection of soil and vegetation cover; • Implementation of correcting measures.	Not related with additional costs	Personnel of irrigation system operator company, geologist.
5.	CHANGE OF RIV. ALGETI HYDROLOGICAL REGIME Limiting water intake to the designed volumes at all times of the scheme operation	Section of riv. Algeti within tailrace of hydraulic unit	Control of ecological flow amount released in tailrace	Systematically	• Reduction of risk of impact on wildlife, including Ichthyofauna inhabiting territory of the	Not related with additional costs	Personnel of Algeti hydraulic unit operator company

					tailrace; • Reduction of risks of impacting vegetation cover on the shore-line of the river.		
6.	INCREASED USE OF PESTICIDES INCREASED USE OF PESTICIDES - Pesticides are applied in the farms of improved irrigation service areas safely and in a rational manner; - IPM practices are used to the extent possible.	Service area of target irrigation schemes	Water and soil quality monitoring data of the Environment Protection Agency Data on the occurrence of trace amounts of pesticides in food products from the National Food Agency	Recurrent	• Prevention soil and water pollution; • Ensuring quality and safety of agricultural produce	2,000 GEL from the ILMD Project proceeds State funding or payments to private extension service providers	PPMD through consultant for schemes completed before ILMD Project closing date; National providers of extension services

Discharge territory

Discharge of the main canal

Partskhisicanal

Partskhisiinverted siphon inlet

Bogviinverted siphon corridor

Damaged section of Bogvi inverted siphon

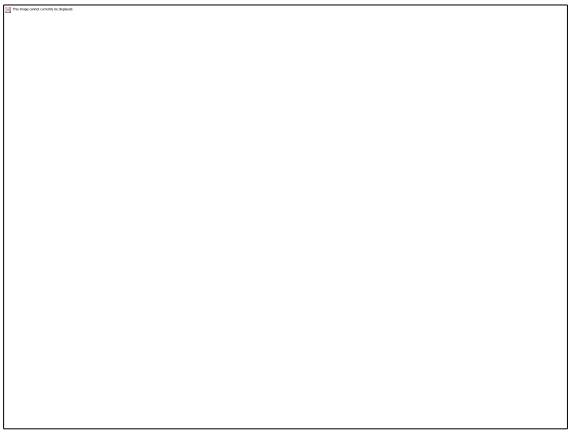
Jorjiashvilicanal

Damaged fence as a result of Jorjiashvili canal filtration

Jorjiashvili inverted siphon corridor

Shavsakdrisi canal crossing the motorway

AsureticanalN2



Canal of Asureti inverted siphon №2. Landslide section

Borbalocanal

Rectangular canal

Parabolic inclined canal

Reservoir adjacent to Koda-Marneuli motorway

Ministry of Agriculture of Georgia

Georgian Irrigation and Land Market Development Project

Rehabilitation of Algeti reservoir dam, instrumental monitoring system of hydro-technical structures, main canal of Tbisi-Kumisi irrigation scheme and water delivering pipelines to "Khaishi" and "Marabda" massifs

Minutes of public discussion on Environment Management Plan

Place of meeting: Building of Tetritskaro Municipality Governance. (Address: #34, Tamar Mepe str, Tetritskaro)

Date: 02.02.2015

The meeting was convened by representatives of Tetritskaro Municipality Governance and regional service of United Amelioration Systems Company of Georgia.

Attendee of the meeting:
Besik Tsiklauri – Head of Tetritskaro municipality Governance;
Kakha Samkharadze- First Deputy Head of Tetritskaro Municipality Governance;
Vakhtang Gardapkhadze – Director of Kvemo Kartli Regional Service of United Amelioration Systems Company of Georgia
Eka Skhirtladze –Senior Specialist of Investment Programs Division of United Amelioration Systems Company of Georgia.
Ketevan Katsadze – Senior Specialist of PR Division of United Amelioration Systems Company of Georgia
Valerian Mchedlidze- Head of Amelioration Department of the Ministry of Agriculture of Georgia
George Bjhalava – Representative of "GAMA" Ltd, the company prepared the EMP
Lali Durmishidze -Projects Manager; Consultant to the Ministry of Agriculture of Georgia
Levan Tskhovrebashvili- Engineer, Consultant to the Ministry of Agriculture of Georgia
Tamar Tsintsadze – Monitoring and Evaluation Specialist; Consultant to the Ministry of Agriculture of Georgia

Local representatives of Municipality Governance and United Amelioration Systems Company of Georgia, village trustees and farmers also attended the meeting. (See app.)

Vakhtang Gardapkhadze greeted the audience and introduced them the aim of the visit. It was mentioned that the meeting was convened for the purpose to discuss Environment Management Plan for the design of "Rehabilitation of Algeti reservoir dam, instrumental monitoring system of hydro-technical structures, main canal of Tbisi-Kumisi irrigation scheme and water delivering pipelines to "Khaishi" and "Marabda" massifs", which would be implemented under the World Bank funding.

V. Gardapkadze asked the author of the document, representative of "GAMA" Ltd –George Bjhalava to discuss important aspects of Environment Management Plan.

George Bjhalava made a brief review of Environment Management Plan and spoke about number of important issues; arrangement of construction infrastructure; waste management, liabilities of Construction Company towards population.

Technical condition of the canal has been significantly deteriorated due to non-proper operation of Tbisi-Kumisi irrigation scheme that caused reduction of its flow rate. Number of violations, sanitary-environmental conditions that were detected on the adjacent territory of the beneficiary villages were registered and mentioned in the document.

G. Bjhalava also spoke about legislation framework, that regulates waste management, rational use of water, protection of soil and atmospheric air, periodic monitoring which would be implemented by different agencies;

Lali Durmishidze addressed the population not to pollute and damage rehabilitated canals. It's a great support from the Government, though it's a loan to be paid by future generation. Therefore the Government will be very strict towards any violation and will not close eyes on vandal facts, such as break out of canals, damage of gates, and pollution of irrigation canals with waste and different kind of water.

Improper operation, damage and pollution of rehabilitated canals will be wrongly reflected on Donor Organization's decision to continue investing in the region. While there are plenty of problems and issues in the region and on the existing irrigation scheme that need to be solved.

Question: Trees that grew on the berm of the canal and their root system cause problem. How should the problem be solved?

Answer: the Botanists, engaged in the research process revealed plants and bushes that grew on the adjacent territory of the canal and pipeline: eglantine, locoweed, blackberry, grakle, campanula and other low-value plants and trees. The rehabilitation design envisages cutting and uprooting of such plants. Afterwards, refilling of the berm and restoration of the canal will take place.

Question: Absence of on-farm network causes flooding of several districts and road of the village. Will this issue be address through the project implementation?

Answer: Rehabilitation works designed at present do not envisage repair of on-farm network. However this may be considered later under the frames of the ILMDP.

Question: What is the reason that irrigation water isn't supplied to the village Kumisi, which is the ultimate point of this irrigation system?

Answer: The project envisages rehabilitation of the main canal that will facilitate reduction of water loss, leakage, increase of debit and finally water will be sufficient for all beneficiary on-farm networks.

Several questions were raised with respect to repair of on-farm network, irrigation water fee, payment terms and coincidence of rehabilitation with irrigation season.

Environment Management Plan was published on the official webpage of United Amelioration Systems Company of Georgia. Printed version of the document was available for any interested person in the regional office of the Company. Locals were informed about public discussion via posted announcements in the villages (announcements posted on January 26, 2015).

საქართველოს ირიგაციისა და მიწის ბაზრის განვითარების პროექტი (GILMDP)

გარემოზე ზემოქმედების მართვის გეგმის საჯარო განხილება

ტბისი-კუმისის სარწყავი სისტემის რეაბილიტაცი

10	[illegible]	[illegible]	სოფ. ხაიში	595-393-317	[illegible]
11	[illegible]	[illegible]	სოფ. [illegible]	558-05-65-45	[illegible]
12	[illegible]	[illegible]	[illegible]	591-81-35-04	[illegible]
13	[illegible]	[illegible]	[illegible]	558-12-35-21	[illegible]
14	[illegible]	[illegible]	სოფ. [illegible]	598-92-68-09	[illegible]
15	[illegible]	სოფ. [illegible]	სოფ. [illegible]	577-71-63-53	[illegible]
16	[illegible]	სოფ. [illegible]	"	577-78-14-78	[illegible]

17	ქეთევა ლეჩხელიშვილი	თ/ს. სოფ. მარაბდა	―――/	599 123 599	[signature]
18	იგორი ავნაძიშვილი	თ/ს სოფ. [illegible]	―――/	551-40-77-17	[signature]
19	ივანე [illegible]	[illegible]	[illegible]	577980044	[signature]
20	ლევანი [illegible]შვილი	გ.რ. სოფ. კუმისი	სოფ. კუმისი	598 80 5355	[signature]
21	კახა თათარაშვილი	გ.რ. სოფ. კუმისი	სოფ. კუმისი	593 31 52 80	[signature]
22	ნანული [illegible]	[illegible]	სოფ. [illegible]	577 95-47-50	[signature]
23	მარიამი კახელაშვილი	გარდაბნის ~~[illegible]~~	სოფ. კუმისი	57710-90-60	[signature]
24	ნათელა [illegible]შვილი	[illegible]		599-97-69-25	[signature]
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