SFG1343 v1

საქართველოს
გაერთიანებული
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კომპანია

Georgia Irrigation and Land Market Development Project

Rehabilitation of the Right Main Canal (pk0+00 to pk244+20) of Kvemo Samgori Irrigation System

February 2015

Section 1: Project design and specifications

Institutional and Administrative Data				
1	**Project name**	Georgia Irrigation and Land Market Development		
2	**Sub-project title**	Rehabilitation of the right main canal of Qvemo Samgori irrigation system from pk0+00 to pk244+20		
3	**Sub-Project location**	Kakheti region. Territory of Sagarejo municipality		
4	**Watershed (river basin)**	Iori river basin		
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* DarejanKapanadze (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**			
	The northern part of Ivri or Hereti upland geographic (physical) region – sub-region of Gareja-Ivri. (According to L. Maruashvili)			
8	**Short description of the sub-project activities (type of planned works)**			
	The sub-project envisages rehabilitation of electrical-mechanic equipment of Kvemo Samgori irrigation system headwork and Dm 0+00 = Dm 244+20 section of the right main canal. Necessity for rehabilitation of irrigation scheme emerged due to its unsatisfactory conditions. Due to such conditions it is impossible to supply beneficiaries with necessary volume of irrigation water, namely: according to the existing data, right main canal must supply 9500 ha area with water and actually in 2012, only 2154 ha was irrigated and 1054 beneficiaries were served. The sub-project was divided into two stages, including: rehabilitation works on the headwork and rehabilitation works on the right main canal. Important rehabilitation works on the headwork are: • Rehabilitation of the flushing sluice and facilities of right canal cranes; • Rehabilitation of inlet wells of the right main canal; • Rehabilitation of walls, roof, floor, stairs and railings and replacement of doors and windows at the facility of regulating valves' cranes; • Fencing and installation of the gate at the left intake zone; • Arrangement of borehole and water supply system for supply of the personnel with drinking water; • Construction of a single level extension (dimensions: 3.36 X 1.6 m) to the existing			

operational building, where facilities will be located (hand-washer, toilet and shower cabin);
- Arrangement of sewer systems and hermetic sanitary pit;
- Rehabilitation of headwork valves and their cranes;
- Arrangement of the new ladder and maintenance platform to make cleaning of waste-traps easy;
- Rehabilitation of electrical section;
- Arrangement of system for continuous monitoring, processing and registering (SCADA) of the data received from the ultrasound flow-meters.

The length of the right main canal section, which is planned to be rehabilitated (Dm 0+00 – Dm 224+20) is 24613 m, including: open section – 22995.8 m; underground water pipelines – 777.7 m and closed section – 879.5 m.

Rehabilitation works at the main canal are divided into 6 categories:
- Main canal rehabilitation works;
- Rehabilitation works of spillways, underground water pipelines and their mechanical equipment;
- Rehabilitation works of water outlets;
- Rehabilitation works of bridges and drainage canals;
- Rehabilitation works of sections' ameliorator facilities.

Rehabilitation works of right main canal envisage:
- Restoration of damaged sections at rectangular sections (length = 378m, b=2.3 m, m=0) using mass concrete. Plastering of damaged walls using cement solution with active mineral materials;
- Increase of existing canal crest by 10 cm from Dm 2+77 till Dm 3+78/2+20;
- Arrangement of mass reinforced-concrete deterrent portal at the entrance of Dm 3+78/2+20 closed canal;
- Restoration of damaged roofing using reinforced-concrete structure and filling of the existing pits with ground at the rectangular closed canal (l=879.5m, b X h=2.3 x 2.0 m), which connects with the trapezoidal canal (b=1.5 m, m=1.5 m) through the transitional section; At the transitional section, washed-out surfaces must be covered with the mass concrete and 5 cm shotcreting (layering of cement solution with a special pneumatic device using compressed air) on the steel net;
- Removal of damaged concrete tiles at the open section and refilling with mass concrete;
- Reinstallation of misplaced tiles;
- Increasing crest elevation by arranging edgings;
- Surfacing of the canal perimeter with wet gunite (at some sections gunite will be used only on the bottom of the canal);
- Arrangement of the spacer bricks with 20 m intervals at the shotcreted (layering of cement solution with a special pneumatic device using compressed air) sections of the canal;
- Arrangement of pedestrian bridges at points of water-meters' location (Dm0+70, Dm88+20, Dm102+40, Dm104+90, Dm165+44, Dm215+60, Dm237+33).

After the construction of the canal (46 years ago) no significant rehabilitation works were conducted on spillways and inlet chambers of underground pipelines. Therefore all these structures are in unsatisfying conditions. None of them have any mechanical equipment, only some spillways have valves, which are damaged and out of order. Considering aforementioned following

rehabilitation works are planned on spillways and underground water pipelines:

- Dismantling of transitional sections of spillways and underground pipelines' inlet and outlet chambers and construction of new ones within the existing facilities;
- Arrangement of 2 m wide spillway; Dismantling of the wall around the precast reinforced-concrete pipe (d=1.5 m) of the spillway and conduct of manual ground works to extract one, 2 m long section of the pipe for further use during the wall restoration;
- Arrangement of isolation joints between the walls of transitional sections and spillway cofferdams (or inlet chambers of underwater pipelines)
- Arrangement of stop logs with valves and maintenance platforms at spillways, cofferdams and inlet chambers of underground pipelines;
- Arrangement of rough waste-traps at the inlet chambers of underground pipelines and roofing of the openings left outside the traps using the wire;
- Arrangement of new surge shafts;
- Arrangement ladder for going down to the canal on the transitional section near each facility.

There are total of 44 water outlets on the main canal, 13 of which were rehabilitated in 2012 and 1 was eliminated. Planned rehabilitation works of water outlets are:

- Restoration of damaged concrete surfacing of water outlet inlet wells' bottoms and walls;
- Removal of damaged valves at water outlets and installation of new leaning sunken valves;
- Arrangement of new water outlets (Dm129+78.3; Dm224+12; Dm239+00).

21 bridges and 4 drainage canals were constructed on the main canal. They are in unsatisfying condition: pillars are damaged, surfacing is cracked; concrete is eroded. Envisaged rehabilitation works of bridges and drainage canals:

- Elimination of 1 bridge (Dm 83+26) as the nearby bridge (Dm 83+41) on the Sagarejo-David Gareji road is in good condition;
- Removal of existing bridges and drainage canals and arrangement of new ones.

At the crossing with the valleys, 29 water-supply pipes are arranged underneath the canal using precast reinforced-concrete pipes of different diameters. Most of them are in poor conditions. Rehabilitation of pipes underneath the canal envisages:

- Arrangement of additional mass reinforced-concrete walls at inlet wells of pipes underneath the canal;
- Restoration of bottoms and slopes of surge shafts;
- Cleaning of water-supply pipes from sediment and restoration of water-supply canals in the earth bed (length 30-50 m).

Sub-project envisages construction of premises for the scheme operation facility with following dimensions: length – 11.0 m, width – 9.4 m and height – 3.0 m. The foundation of the facility will be arranged with strip and pad mass reinforced concrete of B-20 grade. Pillars, cofferdams, beams and roofing tiles will be arranged with B-20 grade mass reinforced-concrete, as for the floor – B-12.5 grade concrete will be used for it. Filling of inner and outer walls of the facility is planned using light concrete blocks.

For the purposes of potable water supply to the scheme operation facility, arrangement of 0.5 m^3 capacity tank is envisaged in the ceiling. The tank will be filled with the water delivered by the tanker. For the hot water supply, installation of electrical heater is envisaged.

For collection of sewage water, arrangement of a hermetic sanitary pit in the yard is planned. The pit will be emptied periodically by the Sagarejo water supply service on the basis of an agreement between the works contractor and the Sagarejo water supply service.

Arrangement of Construction Camp

The construction camp location and the necessary infrastructure will be identified after the construction contractor is selected on a competitive basis.

Based on a preliminary opinion, the best possible location for the construction camp may be considered the headworks complex area. Coordinates for this location are: X – 0524336; Y - 4616665. Approximate area of the territory is 1.2 ha. Main advantages of the territory are:

- The area is owned by the United Amelioration Systems Company of Georgia;
- The shortest distance from the nearest residence is 2.7 km. Thus, local population is not likely to be disturbed with noise, dust and other negative impacts during the construction camp operation;
- Utilization of additional land will not be required for the arrangement of the construction camp;
- The vegetation is less represented there;
- Significant earth works will not be required for the arrangement of the construction camp due to the topographic conditions of the territory;
- Development of any kind of dangerous geodynamic processes is not expected within the area;
- Energy supply of the construction camp will be possible through the electrical system of headworks;
- Technical water supply will be possible through Iori River water. At the initial stage, tank trucks will be used for drinking and agricultural water supply. After arrangement of the planned wells, groundwater will be used for drinking and agricultural purposes.

Alternative location of the construction camp may be the area in the vicinity of the cross section of the right main canal and Sagarejo-Davit Gareji highway (83+41), on the left side of the canal, with coordinates X – 0528944; Y – 4611643. Approximate area of the territory is 1.5 ha. Main advantages of the territory are:

- The distance to the start and end points of the rehabilitation canal from the area is almost equal;
- Due to the proximity to the highway, transportation operations will be facilitated;
- Construction camp area will be far away from residential areas. Thus, local population is not likely to be disturbed with noise, dust and other negative impacts;
- The vegetation is less represented there. Only herbaceous vegetation will be damaged ;
- Significant earth works will not be required for the arrangement of the construction camp due to the topographic conditions of the territory (the area is flat);
- Development of any kind of dangerous geodynamic processes is not expected within the area;
- Energy supply of the construction camp will be possible through the transmission lines passing to the east of the area; Tank trucks will be used for water supply.

Waste management:

As revealed during audit there is no landfill of household or construction waste located in the region of the right main canal of Kvemo Samgori irrigation system.

	Therefore, waste generated during rehabilitation works must be removed to the relevant disposal area in Sagarejo. This issue must be agreed with the local authorities. Household waste generated on the territories of construction camp and construction sites must be collected in the special hermetic containers and after removed to Sagarejo landfill by a special vehicle. Prior to commencement of works open sections of the canal will need to be cleaned. Waste removed as the result of cleaning must be temporarily disposed on pre-selected locations and then removed to relevant landfill. Construction waste will be maximally used for sub-project necessities, for example: major part of inert material will be placed in the valley adjacent to III inverted siphon on the main canal. Excess waste may be required to be removed to the polygon of construction waste. Hazardous waste (asbestos, tires, oil filters and etc.) will be temporarily stored on the territory of construction camp and after handed to the contractor with the relevant license. Protected containers must be installed on the territory of construction camp for temporary storage of hazardous waste.
9	**Brief description of the territory (physical and natural environment):**
	The service area of the right main canal of Lower Samgory irrigation system is located in the south - western part of Kakheti region, within the boundaries of Ivri upland region. The upland region covers an extensive area in the midstream of Mtkvari and Alazani rivers. Its length from the northwest to the southeast direction is 168 km. Its maximum width is 55-60km. Geographic (physical) region of Ivri upland borders the geographic (physical) regions of Eldari plain, Lower Kartli, Upper Kartli plain, Gombori range and Alazani plain. The service area of Lower Samgory irrigation system is characterized by a moderately warm steppe climate with hot summers and two annual minimums of precipitation. Based on multiannual observation of Iormughanlo meteorological station in Lower Samgori, average annual air temperature is 11.9^0. Average monthly air temperature in July (the hottest month) is 23.5^0. Average monthly air temperature in January (the coldest month) is 0.3^0. The absolute maximum temperature is recorded in July and August - 39^0. The absolute minimum temperature is recorded in January - 26^0. The annual total precipitation does not exceed 593 mm. The maximum precipitation is observed in May and its average monthly volume is 92 mm. The minimum precipitation is observed in December, January and August and its average monthly volume is 25, 26 and 30 mm, respectively. Vegetation period (V-IX) precipitation in the service area of the right main canal of Lower Samgory irrigation system is equal to 301 mm, which is 50% of annual amount of precipitation. Soil cover of Gareja-Ivri subregion is characterized by brown and black soils. Steppe vegetation is developed there: Forb meadow and steppe vegetation species. Two species of shrub – juniper, Caucasian Astragalus, Ephedra, Willow-leaved Pear, Imeretian buckthorn and Honeysuckle are observed on the slopes. Endemic Salvia GarejiBhave been recorded among the herbaceous species. Apricot and poplar trees are observed in the corridor of the main canal. As for the bushes, there are blackberry and wild rose. Forested areas are not represented in the corridors of the main canal. Respectively, large mammals do not occur there. Mouse, vole and other rodents are widespread within agricultural lands. As for the birds, partridges, quail, wild pigeons, blackbirds, jays, magpie, hawks and others have been observed there. Salmon, river Chondrostoma, Varicorhinus, Mtkvari barbel, Alburnoides, Bleaks, Loach, etc., are known to inhabit Iori River.

Headwork of the irrigation system: Lower Samgory irrigation system and consequently its right main canal are supplied by irrigation water through Iori River, which is regulated by Sioni reservoir. The river originates from the southern slope of Caucasus range, at 2600 m a.s.l. It joins Mingechauri reservoir. The length of the river is 320 km. Total drop is 2520 m. Average inclination is 0, 79. Catchment area is 4650 km^2.

Iori River is fed by snow, rain and ground waters. River regime in natural conditions (currently its runoff is regulated by Sioni reservoir) is characterized by spring floods, summer - autumn high waters and winter sustained low waters. 40-47% of annual runoff in spring, 27-33% in summer, 16-17% in autumn. Autumn runoff in some years depends on the abundance of precipitation and it is possible to be increased up to the volume expected in summer. Winter runoff is equal to 8-14% of annual runoff.

Total volume of Sioni reservoir is 325 mln m^3. Useful volume is 318 mln m^3. Water source for Kvemo Samgori irrigation system is the river Iori through the existing headwork in Sartichala that has been operating since 1968. Water is supplied to the reservoir by river Iori which flows entirely into the reservoir. Sartichala headwork delivers water to the right branch of Kvemo samgori schcme, left branch of the same irrigation scheme as well as to the river bed.

According to the initial design of the system capacity of the channel is Q_{nor}=9 m^3/s, Q_{forc}=10.8 m^3/s.

At the design stage, the ecological flow to be released into the tailrace of the Sartichala headwork was established at 3 m^3/s which, according to the Soviet standards, represented 10% of the average annual flow derived from data of an extended period of time.

No maintenance works have been implemented for the system during years; operation rules were violated causing deterioration of technical condition of the channel and consequent reduction of capacity. Currently capacity is 7m^3/s. After rehabilitation, Kvemo Samgori irrigation system will re-gain the original design parameters for capacity (Q_{nor}=9 m^3/s, Q_{form}=10.8 m^3/s). 3 m^3/s ecological flow will continue to be enforced. Therefore, no significant impact on riv. Iori is expected. After putting Sartichala headwork into operation in 1968, only the established ecological flow was being released through the tailrace. Therefore the ecosystem, transformed upon entry of the irrigation scheme into operation about 50 years ago, remained unchanged ever since. No additional changes will result from the project implementation given that the established ecological flow will continue to be respected. Area downstream Sioni reservoir along rv. Iori is predominantly used for agriculture and do not represent natural habitats for wildlife.

Headwork unit

Headwork unit of Kvemo Samgori irrigation system is located south to the village Tskarostavi, Sagarejo municipality, on the elevation of 610-615 m.

Water is supplied to the system via low pressure concrete gravitational spillway dam. The dam has one main discharge shield with the length of 14 m. Water intakes of the right and left main canals are located on the right side of the concrete dam. The right main canal is supplied with water via tunnel located inside the dam. Ecological flow is released with idle spillway arranged on the right side of the dam. The dam has no fish passage.

The reservoir and tailrace of the dam are filled with sediment creating base for water-loving and marsh plants. Regulation shields and their lifting mechanisms are in poor condition and cannot adequate regulation of water. Inlet of the water intake as well as the deep and surface cleaners is filled with sediment and plant debris.

Open canal of rectangular cross-section and the gallery (pk0+00-pk11+07.5)

From the south the right main canal of Kvemo Samgori irrigation system begins with an open canal

of rectangular cross-section, turns east and joins the closed gallery. A ground road under the satisfactory condition passes on the slope on the right side of the canal. Only grass vegetation is presented on the banks of the canal.

On pk3+78.3/2+20 water is supplied to the fish farm located on the right bank of the riv. Iori via water discharge well-rranged at the inlet of the gallery. Concrete lining of the well is damaged. The well is filled with sediments and talus from the slopes. Technical condition of the locking shield is unsatisfactory.

The length of the gallery is 879.5 m. a ground work in satisfactory condition passes along the whole length of the gallery. Hollows are observed on certain sections of the gallery corridor. Vegetation coverage is not high.

Open canal of trapezoidal cross-section – pk11=07.5-pk102+67

This section of the right canal corridor covers territory from outlet portal of the gallery to the beginning of the inverted siphon. Calculation flow – 9 m^3/s, total length – 9159.5 m.

Following sanitary-ecological condition was observed on this section of the irrigation system:

- Concrete lining of the canal is very damaged and some sections are characterized by high filtration;
- Ground road passes along almost full length of the canal. In general, technical condition of the road is satisfactory (is some parts subgrade is deformed);
- Around 60 apricot, 10 asp trees and bush (blackberry, wild rose, etc) and herbaceous vegetation grows along the slopes of the canal and the berms;
- Piles of household waste was observed in some sections in vicinity of the canal with a total amount of approximately 5 m^3;
- In some sections of the berms ground removed after cleaning of the bottom is disposed;
- 6 facts of unauthorized water abstraction by the local population is observed;
- Two facts of unauthorized water discharge are observed, from the farms adjacent to the canal corridor;
- Silt is accumulated on the water intake inlets of the distributor. Some are contaminated with construction waste. Concrete lining is eroded;
- Concrete lining of drainage bridges places across the canal are damaged, dikes are collapsed. The slopes near the bridges are eroded, the bottom is filled with stones-gravels and construction waste;
- Drainage piping bridges are filled with stones and gravels and vegetation debris. Erosion processes are observed in vicinity of the piping bridges, creating a threat for stability of the irrigation canal is some sections;
- Pedestrian bridges are arranged over the canal is some parts which connect local population and domestic animals with the agricultural and pasture lands located on the other side;

- Transmission line crosses the canal in 6 points;
- The canal crosses water supply pipeline of the village Udabno.

Open canal of trapezoidal cross-section between the inverted siphons I and II – pk104+70-pk147+68

This section covers territory from the outlet portal of the inverted siphon I and beginning of the inverted siphon II, with calculation flow of 7.5 m^3/s and total length of 4298 m.

Following sanitary-ecological condition was observed on this section of the irrigation system:

- Concrete lining of the canal is very damaged and deformed, tiles are outfallen and some areas are characterized by high filtration;
- Ground roads pass along almost all length of the canal on both sides. In total, technical condition of the roads is satisfactory (subgrade is deformed in some sections);
- 15-20 apricot trees grow on the slopes of the canal and berms, as well as poplar and other trees and bush vegetation. Roots of the plants are damaging the concrete lining of the canal;
- In some sections the bottom of the canal is filled with household, construction and vegetation waste;
- In some sections of the berms ground removed after cleaning of the bottom is disposed;
- 5 facts of unauthorized water abstraction were observed. On two sections (on the crossing with drainage piping bridges) water is being collected next to the canal, in the artificially arranged ponds. The pond is being used as a source of drinking water for domestic animals. Due to existence of the pond erosion processes are activated creating a threat to stability of the canal;
- Intake inlets of the distributor are filled with silt and vegetation and construction waste. Concrete lining is eroded;
- Drainage piping bridges are filled with stones-gravels and vegetation. Erosion processes are observed in vicinity of the piping bridges creating threat to stability of the irrigation canal;
- Pedestrian bridges are arranged on some sections of the canal which are being used by the local population and domestic animals to cross to agricultural lands and pastures located on the other side;
- The canal crosses the gas pipeline and in some areas – transmission lines.

Open canal of trapezoidal cross-section between the inverted siphons II and III – pk149+30-pk210+12

This section covers territory between outlet portal of inverted siphon II and beginning of inverted siphon III, with calculation flow of 7.5 and 6.6 m^3/s, total length – 6082 m.

Following sanitary-ecological condition was observed on this section of the irrigation system:

- Concrete lining of the canal is greatly damaged and deformed, tiles are dis-attached and some areas are characterized by high filtration;
- Ground roads pass along almost all length of the canal on both sides. In total, technical

condition of the roads is satisfactory. However, subgrade is deformed and in some sections (on the crossing with piping bridges) the subgrade is narrowed due to erosion processes making free movement very hard;

- Vegetation coverage on the berms is not high. Several apricot, poplar and other trees are observed together with bush plants. Herbs are growing on the slopes of the canal;
- In some sections the bottom is filled with stone-gravel and talus from the slopes;
- On some sections, in order to raise water level, stones and other materials are placed;
- Piles of household waste with approximate total amount of 2 m^3 are observed in the canal corridor;
- Pedestrian bridges are arranged on two sections which are being used by the local population and domestic animals to cross to the agricultural and pasture lands;
- Five facts of unauthorized water abstraction are observed. Water is used to fill the artificially arranged ponds. The ponds represent a source of drinking water for domestic animals. Erosion processes are activated due to existence of ponds creating threat to stability of the canal;
- Silt is accumulated on the water intake inlets of the distributor; some are contaminated with construction waste. Concrete lining is eroded;
- Drainage piping bridges are filled with stones-gravels and vegetation. Erosion processes are observed in vicinity of the piping bridges creating threat to stability of the irrigation canal.

Open canal of trapezoidal cross-section on the outlet of inverted siphon III – pk215+17.3-pk244+55

This section covers territory from outlet portal of the inverted siphon II till the last point of the canal to be rehabilitated (distribution well) with a calculation flow 6.6 and 3.0 m^3/s and total length of 2937 m. the beginning part of the canal passes from north-west in south-east direction, turns left and ends at the distribution well.

Following sanitary-ecological condition was observed on this section of the irrigation system:

- Concrete lining of the canal is greatly damaged and deformed, tiles are outfallen and some areas are characterized by high filtration;
- Ground roads pass along almost all length of the canal on both sides. In total, technical condition of the roads is satisfactory. However, subgrade is eroded in some sections;
- Vegetation cover is practically absent in the corridor. Grass and rarely bush plants grow on the berms;
- In some sections bottom of the canal is filled with stones and talus from the slope, as well as vegetation waste;
- Approximately on the distance of 150-200 m ground removed after cleaning of the canal is piled with the total amount of 15 m^3;
- Several facts of unauthorized water abstraction are observed;
- Silt is accumulated on the water intake inlets of the distributor, some are contaminated

	with vegetation waste. Concrete lining is eroded; • The last section of the canal is bordered with elevated plateau on the right. Probability of talus accumulation in the bottom of the canal form this slope is very high; • Transmission line passes along the canal. Transformer is arranged on the right side of the canal. Its technical condition is satisfactory (no signs of oil spill were identified); • The distribution well in the end of the canal is filled with silt. Concrete lining is damaged. **Spillways and inverted siphons** Five spillways and three inverted siphons are arranged on the right main canal of Kvemo Samgori irrigation system, namely from pk0+00 to pk244+55. Three spillways pk88+35, pk164+80.5 and pk236+81.2 are independent constructions and the remaining two pk102+70 and pk210+19.85 are connected to the inverted siphons. Inverted siphon I and II (pk102+63.5-pk104+70.5 and pk147+68-pk149+30) have one line, and inverted siphon II (pk210+12-pk215+17.3) has two lines. All constructions listed above are in very bad condition. The concrete is eroded, there is no mechanical equipment, only some spillway pipes have shields, however they are damaged and do not work. Following sanitary-ecological condition was observed in the corridor of the mentioned constructions: • Inlets of the spillways and inverted siphons are filled with stones, vegetation and household waste. The territory is surrounded by bush vegetation cover. Water is being impounded; • Significant erosion is developed in the corridor of I and II inverted siphon (within the valleys crossing the canal). The valley crossing inverted siphon II is less eroded; • A pond is formed in the corridor of I inverted siphon creating additional reason for erosion. A fully developed tree is growing here; • Ground under III inverted siphon is washed out and pipes are hanging in the air; • A pile of household waste with total amount of 3-4 m^3 is observed within the corridor of III inverted siphon; • Subgrades of the ground roads crossing the valleys are deformed.
10	**Locations and distances from the nearest sources of licensed materials, especially aggregates, water, stones**
	Construction materials (inert materials, concrete mixture, reinforced-concrete structures, etc.) for the sub-project implementation will be supplied from the corresponding factories and enterprises. The nearest licensed inert material quarries are located in the riverbed of the riv. Iori and therefore long-range transportation will not be required. It is possible to deliver concrete mix from concrete factories on the territory of Sagarejo, as for reinforced-concrete structures – they may be acquired from enterprises located only in Tbilisi. Technical water will be supplied from the riv. Ipri, as for the drinking water – at the initial stage it

	will be delivered by tankers and after arrangement of envisaged borehole at the headwork, water from this borehole will be used.
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 Kvemo Samgori irrigation scheme is not subjected 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 (RPF), if needed and prepared for this sub-project.*
12	**Public Disclosure**
	Consultation meeting to discuss present EMP with farmers of every residential area affected by the sub-project was held on February 10, 2015 (the minutes are attached). The meeting took place in Sagarejo district. The beneficiaries were informed about the meeting via announcements published in the centers of the villages the hard copies of the present draft EMP was made available at the 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 project impact zone) (b) All legally required permits, agreements, licenses, and clearances acquired for the 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 construction camps and construction sites; (c) Contact information for emergency services (medical, fire) posted on the information board at work site; (d) Only special tank trucks will be used at construction camps and construction sites for drinking - agricultural water supply.
Pollution Management	Air Quality	(a) Construction machinery and equipment maintained in adequate working condition on regular basis (b) Spoils storage piles compacted (c) Periodic Watering of dust sources (if necessary); (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) Ensure proper maintenance of construction machinery and equipment; (b) Generators, air compressors and other mechanical equipment motors should be covered during the operation.
	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 Sagarejo 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		(a) Slope protection through bank strengthening, arrangement of rock fill at critical sections; (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/eroded sites (particularly, valleys cross sections).
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 enlisted in the Red List of Georgia has to be removed (although such species were not detected as a result of field work), 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) The main canal passes through the area, which is far away from residential area. According to the audit results, physical resettlement issues related to the implementation of the 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) Ensure the free movement of people and domestic animals throughout the agricultural land and pastures on the right side of the canal during the rehabilitation process (pedestrian bridges of the canal should be maintained until the end of the project).

Nuisance to Local Communities		(a) 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 MONITROING 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	All work sites	Visual observation	Recurrent	Minimize nuisance to local communities and	No additional costs required	Works contractor

	during works within settlements; - 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 Sagarejo municipal household and construction waste landfills; - Sites for temporary storage of waste allocated to prevent scattered dumping of waste on and around the work site;	- 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

	- 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 special location with non-permeable floor and containment walls;	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

	- 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;	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

	- Disallow idling of machine engines, observe working hours, and sprinkle work sites in dry weather.						
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	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	Prevention of 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 and extension centers operating in the sub-project area	Water user associations
4.	CHANGE OF RIV. IORI HYDROLOGICAL REGIME Limiting water intake to the designed volumes at all times of the scheme operation	Section of riv. Iori within tailrace of hydraulic unit	Control of ecological flow amount released in tailrace	Systematically	- Risk of impacting wildlife, including Ichthyofauna inhabiting territory of the tailrace reduced; - Risks of impacting	Not related with additional costs	Personnel of hydraulic unit company

					vegetation cover on the shore-line of the river reduced.		
5.	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

Annex 1

Inlet of water intake of the right main canal

Tailrace, idle spillway

Open rectangular canal

Water discharge well

Drainage bridge over the canal

Canal of trapezoidal cross-section

Canal of trapezoidal cross-section

Erosion developed within artificially arranged pond

Raising water level by using material placed on the bottom of the canal

Unauthorized water abstraction and artificially arranged pond

Corridor of the trapezoidal canal

Canal of trapezoidal cross-section

Spillway

I inverted siphon corridor

III inverted siphon corridor

III inverted siphon outlet

Annex 2

Ministry of Agriculture of Georgia

Georgian Irrigation and Land Market Development Project
Rehabilitation of Right Main canal of Kvemo Samgori Irrigation Scheme

Minutes of public discussion on Environment Management Plan

Place of meeting: Building of Sagarejo Democratic Engagement Centre. #240 Rustaveli str., Sagarejo

Date: 10.02.2015

The meeting was convened by representatives of regional service of United Amelioration Systems Company of Georgia.

Attendees of the meeting:
Irakli Napetvaridze- Director of Shida Kartli Regional Service of United Amelioration Systems Company of Georgia
Ushangi Tabagari-Head of Kvemo Samgori Systemic Division
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
George Bjhalava – Representative of "GAMMA" Ltd
Levan Tskhovrebashvili- Engineer, Consultant to the Ministry of Agriculture of Georgia

Local representatives of United Amelioration Systems Company of Georgia and farmers also attended the meeting. (See app.)

Irakli Napetvaridze 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 Right Main canal of Kvemo Samgori Irrigation Scheme" which would be implemented under the World Bank funding.

Ekaterine Skhirtladze spoke about the overall objective of the project, its components. She mentioned that population should be more careful in polluting and damaging of rehabilitated canals. There will be very strict monitoring from UASCG towards any violation such as break out of canals, damage of gates, and pollution of irrigation canals with waste and different kind of water.

Levan Tskhovrebashvili made a brief review of design and also of the current technical condition of the scheme and asked the author of the document, representative of "GAMA" Ltd –George Bjhlava to discuss important aspects of Environment Management Plan.

George Jalava 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.

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;

Question: Does the current design envisage rehabilitation of on-farm network?

Answer: The current rehabilitation design doesn't envisage repair of on-farm network.

Question: When will rehabilitation of on-farm network be implemented?

Answer: On the first stage only rehabilitation of main system is envisaged. After, organizational forms of farmers' unification should be defined and established.

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 were posted on February 4, 2015)

საქართველოს ირიგაციისა და მიწის ბაზრის განვითარების პროექტი (GILMDP)

გარემოზე ზემოქმედების მართვის გეგმის საჯარო განხილვა

ქვემო სამგორის სარწყავი სისტემის მარჯვენა მაგისტრალური არხის რეაბილიტაცია

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თარიღი: 10/02/15

#	სახელი და გვარი	მოქალაქე/ორგანიზაცია	მისამართი	საკონტაქტო ინფორმაცია (მობ. ტელეფონი)	ხელმოწერა
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