

WATER SECTOR DEVELOPMENT
AND INSTITUTIONAL IMPROVEMENTS PIU

Environmental Management Plan

**Rehabilitation of Tertiary Irrigation
Network in Armavir Marz**

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Glossary

AMD	Armenian Dram
CJSC	Closed Joint Stock Company
DM	Distance Marker (or “Picket Number”)
EMP	Environmental Management Plan
ESHSP	Environmental, Social, Health and Safety Plan
GoA	Government of Armenia
IA	Infrastructure Activity
IAP	Irrigated Agriculture Project
ICID	International Commission on Irrigation and Drainage
MCA-Armenia	Millennium Challenge Account - Armenia SNCO
MCC	Millennium Challenge Corporation
NGO	Non-Governmental Organization
NSS	National Statistical Service of the Republic of Armenia
PAP	Project Affected Party
RAP	Resettlement Action Plan
RA	Republic of Armenia
RPF	Resettlement Policy Framework
SNCO	State Non Commercial Organization
TO	Task Order
USD	United States of America Dollars
WB	World Bank
WTM	Water-to-Market Activity
WUA	Water User Association

Executive Summary

Rehabilitation of tertiary irrigation network is envisaged under the Additional Financing of the Irrigation Rehabilitation Emergency Project (IREP). These tertiary irrigation networks are located in Armavir Marz and belong to the communities under the command of the following irrigation schemes (IS): Talin IS - Bagramyan, Myasnikyan, Dalarik, Karakert, Bagaran, Vanand, Yervandashat, and Lernagog communities; Armavir IS - Arevadasht, Hatsik, and Noravan communities; and Lower Hrazdan IS - Agavnatun community. Rehabilitation of these tertiary irrigation networks was envisaged under the MCA-Armenia program. For this purposes the Environmental Impact Assessment (EIA), including the Environmental Management Plan (EMP), was prepared by the *Mott MacDonald, Inc.*, Environmental and Social Assessment and Oversight Consultant (ESAOC), based on the final designs prepared by the Design Consultant - Institute of Water Problems and Hydraulic Engineering after Academician V. Yeghiazarov CJSC (Armenia) in association with WYG International Ltd. (UK) and Jen Financial, Engineering and Management Consulting Limited (Armenia). The EIA and EMP were prepared based on the requirements set by the RA legislation, RA Law on Environmental Impact Assessment, MCC Environmental Guidelines, MCC Gender Policy and the World Bank's (WB) Operational Policy on Involuntary Resettlement (OP4.12). However, because of the limited time and resources the proposed rehabilitation works were not carried out under the MCA-Armenia program.

Currently the WB considers Additional Financing of IREP to address rehabilitation of tertiary irrigation networks. Taking into account that EMP prepared under the MCA-Armenia program for Talin, Armavir, and Lower Hrazdan Irrigation Schemes of Armavir Marz covers the stretches to be rehabilitated on the tertiary irrigation networks of above mentioned 12 communities of Armavir Marz in the scope of the IREP AF, thus the EMP prepared by MCA-Armenia is applicable for rehabilitation of the above tertiary irrigation networks.

Rehabilitation of the tertiary canals of 12 communities in Armavir Marz will improve the operation of the tertiary networks of the communities by providing reliable supply of irrigation water for the agricultural lands. It will contribute to the expansion of irrigated lands and increasing volumes of agricultural production, increased food security, growing incomes in agricultural sector, thereby reducing the number of poor population and the migration in the area. In addition, this will encourage farmers to expand irrigated agricultural production and apply high value crops. The anticipated overall positive environmental and social impacts from the improved tertiary canals in the project area will be long-term and cumulative contributing to the improvement of social and economic conditions in affected communities.

The likely adverse environmental impacts expected as a result of rehabilitation works are expected to be insignificant, short-term and localized. These may include, but are not limited to the following: pollution of surface and ground water resources; degradation of agricultural lands and landscape, soil erosion due to improper disposal of excavated soil, sediments and construction waste; spillage of oil and other substances during the rehabilitation; use of temporary construction sites (camps, machinery sites, storage facilities, etc); use of borrow pits; temporary air pollution related to increased truck traffic during the civil works; noise and vibration disturbances of flora and fauna and local population during trench excavation, as well as other likely impacts on biodiversity. The study of baseline environmental data, site investigations and analyses revealed no major environmental impacts to be likely caused by implementation of the proposed rehabilitation works, assuming proper application and monitoring of the EMP. The expected impacts, depending on rehabilitation works implementation, will be small-scale and temporary.

Adverse social impacts may occur in case it is required to temporarily or permanently use private lands or other assets for implementation of the rehabilitation works. If the rehabilitation and/or further operation

and maintenance of the tertiary canal results in temporary or permanent use of lands and/or other assets, project affected parties (PAPs) shall be compensated in accordance with the requirements of the Resettlement Policy Framework (RPF), Armenian legislation the World Bank's Operational Policy on Involuntary Resettlement (OP 4.12). A Resettlement Action Plan (RAP) will be developed consistent with the RFP and will be implemented prior to construction in the affected areas to ensure proper compensation to the affected people. Inventory and analysis of technical and social data obtained from the design phase, as well as site investigations demonstrate that no land take is likely to be required for the rehabilitation of the targeted tertiary networks.

For the tertiary irrigation networks with possible site-specific impacts, adequate mitigation measures were proposed in Annex A. These measures are specifically developed for the design, rehabilitation and operation phases of the project to address any of the identified negative environmental and social impacts and duly consider public concerns and views that were obtained in the design phase, in the process of informal and formal consultations with the public affected by the project. The monitoring plan to ensure compliance with the requirements of **Annex A** is described in **Annex B**. A set of environmentally and socially sound clauses for civil works contracts is incorporated in the Technical Specifications for rehabilitation of tertiary irrigation networks of Armavir marz and included in **Annex E**.

1 Introduction

Rehabilitation of tertiary irrigation network is envisaged under the Additional Financing of the Irrigation Rehabilitation Emergency Project (IREP). These tertiary irrigation networks are located in Armavir Marz and belong to communities under the command of the following irrigation schemes: Talin IS - Bagramyan, Myasnikyan, Dalarik, Karakert, Bagaran, Vanand, Yervandashat, Lernagog communities, Armavir IS - Arevadasht, Hatsik, Noravan communities, and Lower Hrazdan IS - Agavnatun community. Rehabilitation of these tertiary irrigation networks was envisaged under the MCA-Armenia program. For this purpose Environmental Management Plan was prepared under the MCA-Armenia program, however because of the limited time and resources these rehabilitation works were not carried out under the MCA-Armenia program.

Currently the WB considers Additional Financing of IREP to address rehabilitation of tertiary irrigation networks. Taking into account that EMP prepared under the MCA-Armenia program for Talin, Armavir, and Lower Hrazdan Irrigation Schemes of Armavir Marz covers the stretches to be rehabilitated on the tertiary irrigation networks of the above 12 communities of Armavir Marz included into IREP AF, the EMP prepared by MCA-Armenia is applicable for rehabilitation of mentioned tertiary irrigation networks. This EMP covers rehabilitation of nearly 36.8 km of degraded irrigation networks and/or stretches thereof.

The rehabilitation works are expected to start in 2012 and finished in April 2013 and will be carried out mainly within off-irrigation season. If civil works are to be implemented during the irrigation period, the Construction contractor will need to ensure uninterrupted irrigation water supply by providing by-pass channels or other means, which are subject to approval by the respective WUA.

2 Project Description

This chapter was developed using the baseline environmental and social data collected and provided by the Design Consultants – “Jrtuk” Ltd, “Jrarbi” Ltd., “Haygiughshinnakhagits” Ltd.

Tertiary irrigation networks to be rehabilitated are located in Armavir Marz. Bagramyan, Myasnikyan, Dalarik, Karakert, Bagaran, Vanand, Yervandashat, Lernagog communities get water from Talin Main Canal. The communities of Arevadasht, Hatsik, Noravan get water from Armavir Main Canal, and Agavnatun community – from Lower Hrazdan Main Canal.

Rehabilitation of the existing canals is envisaged without increasing the quantity of current water intakes. The expansion of irrigated areas will be achieved from the reduction of water losses.

The main types of works to be carried out for rehabilitation of tertiary irrigation networks in Jrashen community of Lori Marz, Verin Getashen, Martuni, Dzoragyug, Astghadzor, Vagashen communities of Gegarkunik Marz, and Megrashen community of Shirak Marz includes:

- Replacement of damaged pipelines and other water supply structures.
- Earthworks: excavation of topsoil, backfill and compaction, compacted earth embankment.
- Concrete works: demolition and dismantling of existing concrete structures and canal sections requiring repair or replacement, supply and installation of new concrete works (pre-cast and cast in-situ) including canal lining and structures.
- Mechanical works including installation of gates, embedded frames, gate hoists, protective coatings, dismantling and disposal of old items.
- Joint sealants and insulation for contraction and expansion joints (joint coatings and sealers).

Description of the existing state of the tertiary canals and proposed rehabilitation works

Table 1 below presents key data on the tertiary irrigation networks to be rehabilitated under the Additional Financing of the Irrigation Rehabilitation Emergency Project, data on the length of the canal and stretches to be rehabilitated in each community, irrigated area before and after rehabilitation.

Table 1: Key data on tertiary irrigation networks in Armavir Marz planned for rehabilitation under the Additional Financing of the Irrigation Rehabilitation Emergency Project

No.	Name of the community	Irrigated area before rehabilitation (ha)	Irrigated area after rehabilitation (ha)	Total length of the canal (km)	Length of the stretches to be rehabilitated (km)
Talin Irrigation Scheme					
<i>“Karakert” WUA</i>					
1.	Bagramyan	40	80	0.5	0.4
2.	Myasnikya	330	659	8.0	7.8
3.	Dalarik	120	239	5.0	4.2
4.	Karakert	110	220	9.2	4.5
<i>“Shenik” WUA</i>					
5.	Bagaran	24	55	0.7	0.7
6.	Vanand	380	678	6.8	6.2
7.	Yervandashat	63	113	3.2	0.7
<i>“Talin” WUA</i>					
8.	Lernagog	83	183	4.0	0.9
<i>Total: Talin I/S</i>		<i>1150</i>	<i>2227</i>	<i>37.4</i>	<i>25.4</i>
Armavir Irrigation Scheme					
<i>“Armavir” WUA</i>					
9.	Arevadasht	90	137	5.3	2.8
10.	Hatsik	140	259	2.5	2.0
11.	Noravan	100	153	1.7	0.8
<i>Total: Armavir I/S</i>		<i>330</i>	<i>549</i>	<i>9.5</i>	<i>5.6</i>
Low Hrazdan Irrigation Scheme					
<i>“Khoy” WUA</i>					
12.	Agavnatun	180	334	7.5	6.0
<i>Total: Low Hrazdan I/S</i>		<i>180</i>	<i>334</i>	<i>7.5</i>	<i>6.0</i>
<i>TOTAL:</i>		<i>1660</i>	<i>3110</i>	<i>54.4</i>	<i>37</i>

Further is the description of the existing state of tertiary canals and proposed rehabilitation works

Bagramyan Community

The administrative area of Bagramyan community is located in the south-eastern part of the Armenia in Armavir Marz at the elevation of 942 m above sea level. It is envisaged to rehabilitate Mx-7-1 distributor for irrigation of 80 ha under command of Talin Irrigation Scheme, within the service area of “Karakert” WUA. The distributor Mx-7-1 starts from the right branch of Talin Main Canal at the distributing well at D/M 32+44. Rehabilitation works will enable reliable operation of the distributor and its structures which will reduce water losses from the network, supply community with required volume of irrigation water and improve crop yield. A water measurement structure will be installed on the distributor.

Mx-7-1 distributor is a concrete canal with trapezoidal cross-section. Concrete lining of the canal is destroyed.

It is envisaged to rehabilitate 361m long stretch of the distributor by removing concrete lining of the canal and placing new concrete lining 12cm thick and to construct longitudinal joints after each 4 meter. It is also envisaged to construct concrete boards on two sides of the distributor - 30cm width and 10 thick.

Required structures will be constructed along the full length of the distributor providing normal operation during irrigation season and complete emptying of the network in the off-irrigation season.

Table 2: Key data on the tertiary irrigation network of Bagramyan community

No.	Name of the distributor	Irrigated area before rehabilitation (ha)	Irrigated area after rehabilitation (ha)	Total length of the canal (km)	Length of the stretches to be rehabilitated (km)	Type of precast elements and pipes
1.	Mx-7-1	40	80	0.5	0.4	Concrete lining
	Total	40	80	0.5	0.4	

Myasnikyan Community

The administrative area of Myasnikyan community is located in the south-eastern part of Armenia in Armavir Marz at the altitude of 927m above sea level. It is envisaged to repair B-1 and B-1-1 distributors of Myasnikyan community for irrigation of 659ha of lands under command of Talin Irrigation Scheme, within the service area of “Karakert” WUA. At present water delivery to these lands is unreliable. Repair works would enable uninterrupted operation of the distributor and its structures which will reduce water losses from the network, supply community with required volume of irrigation water and improve crop yield.

Total length of distributors B-1 and B-1-1 proposed for rehabilitation is 7.8km. Both distributors have an earth bed. It is envisaged to construct new distributors with polyethylene pipes: B-1 distributor with D=500-225mm and B-1-1 distributor with D=225mm pipes.

Current outlets of the distributors are non-professionally made structures. Technical state of distributors and their structures is unsatisfactory. Required structures will be constructed along the full length of canal ensuring normal operation during irrigation season and complete emptying of the network in the off-irrigation season.

Table 3: Key data on the tertiary irrigation network of Myasnikyan community

No.	Name of the distributor	Irrigated area before rehabilitation (ha)	Irrigated area after rehabilitation (ha)	Total length of the canal (km)	Length of the stretches to be rehabilitated (km)	Type of precast elements and pipes
1.	B-1	330	659	8.0	7.8	Steel pipes
2.	B-1-1					
	Total:	330	659	8.0	7.8	

Dalarik Community

The administrative area of Dalarik community is located in the south-western part of Armenia in Armavir Marz at the altitude of 998 m above sea level. It is envisaged to rehabilitate Mx-5-1, Mx-5-1-1 and Mx-5-2 distributors for irrigation of 239 ha under command of Talin Irrigation Scheme, within the service area of “Karakert” WUA, which will enable uninterrupted operation of the distributor and its structures which will reduce water losses from the network, supply community with required volume of irrigation water and improve crop yield.

Distributors start from Mx-5 distributor, which is constructed without headwork structures. Total length of distributors proposed for rehabilitation is 4.2 km, including 1.737 km for Mx-5-1 (including 0.363 km Mx-5-1-1) and 2.314 km for Mx-5-2. Distributors are constructed with LP-4 and LP-6 precast flumes, which are in highly degraded state. Outlet structures on the distributors are also in unsatisfactory state: concrete of outlet structures is deteriorated, valves are in poor condition, joints of the precast flumes are deteriorated, concrete supports are deteriorated, some of them are lopsided.

It is proposed to dismantle flumes of the existing Mx-5-1 and Mx-5-2 distributors and rehabilitation them with new LP-4 flumes. Construction of one-side outlet structures and water metering posts is envisaged in the headworks of distributors Mx-5-1 and Mx-5-2. Pipe-crossings will be constructed at the all necessary stretches.

The Distributor Mx-5-1-1, which has an earth bed, will be rehabilitated by LP-4 flumes. Outlets will be constructed on the both sides of the distributor.

Required structures will be constructed along full length of the canal to provide normal operation during irrigation season and enable complete emptying of the network in the off-irrigation season.

Table 4: Key data on the tertiary irrigation network of Dalarik community

No.	Name of the distributor	Irrigated area before rehabilitation (ha)	Irrigated area after rehabilitation (ha)	Total length of the canal (km)	Length of the stretches to be rehabilitated (km)	Type of precast elements and pipes
1.	Mx-5-1	120	239	5.0	4.2	LR-4 precast flumes
2.	Mx-5-1-1					
	Mx-5-2					
	Total:	120	239	5.0	4.2	

Karakert Community

The administrative area of Karakert community is located in the south-eastern part of Armenia in Armavir Marz at the altitude of 1245 m above sea level. It is envisaged to rehabilitate Mx-3 distributor of Karakert community for irrigation of 220 ha under command of Talin Irrigation Scheme, within the service area of “Karakert” WUA. Rehabilitation will enable uninterrupted operation of the distributor and its structures which will reduce water losses from the network, supply community with required volume of irrigation water and improve crop yield.

The total length of distributor Mx-3 proposed for rehabilitation is 4.5km.

Mx-3 distributor is a concrete canal with trapezoidal cross-section. Concrete lining of the canal is destroyed. Siphon constructed at this stretch is in poor state.

It is envisaged to remove existing concrete and place new concrete lining 12 cm thick, as well as perform longitudinal joints after each 4 m. It is also envisaged to construct new siphon at DM 3+20-DM4+66, dismantle existing pipeline and install new pipes D=700 m to ensure the required discharge.

Required structures will be constructed along full length of the distributor to provide normal operation during irrigation season and complete emptying of the network in the off-irrigation season.

Table 5: Key data on the tertiary irrigation network of Karakert community

No.	Name of the distributor	Irrigated area before rehabilitation (ha)	Irrigated area after rehabilitation (ha)	Total length of the canal (km)	Length of the stretches to be rehabilitated (km)	Type of precast elements and pipes
1.	Mx-3	110	55	9.2	4.5	Concrete lining
	Total:	110	55	9.2	4.5	

Bagaran Community

The administrative area of Bagaran community is located in the south-western part of Armenia in Armavir Marz at the altitude of 1018 m above sea level. It is envisaged to rehabilitate Bagaran outlet canal for irrigation 55 ha of Bagaran community under command of Talin Irrigation Scheme, within the service area of “Shenik” WUA. The main water source of the region is Akhuryan River which starts from Arpi Lake and flows into Araks River near Bagaran village. The distributor starts from the end of the pressure pipeline of pumping station constructed on Bagaran canal. The total length of the distributor proposed for rehabilitation is 0.7 km. Some sections of the distributor are made of LP-8 precast flumes, however most stretches have earth bed. LP-8 flumes are in unsatisfactory conditions, joints of precast flumes are destroyed, paraizole is missing at some sections.

It is proposed to dismantle existing flumes and install new LP-4 flumes. It is envisaged to construct outlet structures on one side of the distributor and install water metering posts at the headworks. It is also proposed to construct pipe-crossings at the all required sections.

Table 6: Key data on the tertiary irrigation network of Bagaran community

No.	Name of the distributor	Irrigated area before rehabilitation (ha)	Irrigated area after rehabilitation (ha)	Total length of the canal (km)	Length of the stretches to be rehabilitated (km)	Type of precast elements and pipes
1.	Outlet canal	24	55	0.7	0.7	LR-4 precast flumes
	Total:	24	55	0.7	0.7	

Vanand Community

The administrative area of Vanand community is located at the altitude of 1930-950m above sea level. The tertiary network of the community is under the command of Talin Irrigation Scheme, within the service area of “Shenik” WUA. The total length of the irrigation network of Vanand village is 6.8 km. The total length of sections proposed for rehabilitation is 6.2 km. B-1 distributor starts from B-10 distributor of Talin main canal and irrigates community lands on the left side of the distributor through of 31 distributing canals of different length. Most of them are made of LP-4 precast flumes. Five distributors have an earth bed.

The tertiary canals were in operation for about 30-40 years. During this period no repair or preventive maintenance were carried out which resulted in unsatisfactory condition of the network. As a result of poor condition of the irrigation network, the fields are not supplied with the required water volume resulting in the reduction of agricultural production and many plots are not irrigated.

It is envisaged to dismantle the existing destroyed LP-6 flumes and supports, demolish pipe-crossings and wells at the headworks of distributors and rehabilitate distributors with LP-6 and LP-4 precast flumes. It is also envisaged to construct pipe-crossings through the distributors, construct distributing wells and outlets with their pipe-crossings and install bulkhead gates.

Table 7. Key data on the tertiary irrigation network of Vanand community

No.	Name of the distributor	Irrigated area before rehabilitation (ha)	Irrigated area after rehabilitation (ha)	Total length of the canal (km)	Length of the stretches to be rehabilitated (km)	Type of precast elements and pipes
1.	B-1	380	678	6.8	6.2	LR-4 & LR-6 precast flumes
	Total:	380	678	6.8	6.2	

Yervandashat Community

The administrative area of Yervandashat community is located in the south-western part of Armenia in Armavir Marz at altitude of 645 m above sea level. It is envisaged to rehabilitate Coly Aru distributor for irrigation 113 ha of Yervandashat community under command of Talin Irrigation Scheme, within the service area of “Shenik” WUA. 610 m long section of distributor proposed for rehabilitation has an earth bed with trapezoidal cross-section. Water delivery to community lands is insufficient as a result of water losses in the earth canal. Distributor is in poor technical conditions, there are no structures on it.

It is proposed to install LP-4 precast flumes. It is also envisaged to install D=300 mm pipes for new siphon to ensure the required water discharge.

Required structures will be constructed along full length of the distributor providing normal operation during irrigation season and complete emptying of the network in the off-irrigation season.

Table 8: Key data on the tertiary irrigation network of Yervandashat community

No.	Name of the distributor	Irrigated area before rehabilitation (ha)	Irrigated area after rehabilitation (ha)	Total length of the canal (km)	Length of the stretches to be rehabilitated (km)	Type of precast elements and pipes
1.	Coly Aru	63	113	3.2	0.7	LR-4 precast flumes & D=300 mm pipes
	Total:	63	113	3.2	0.7	

Lernagog Community

The administrative area of Lernagog community is located at the altitude of 1012m above sea level. The tertiary network of the community is under command of Talin Irrigation Scheme, within the service area of “Talin” WUA. Water source of the community is the 3 km long B-3 distributor of Talin main canal. The total length of sections proposed for rehabilitation is 0.9 km. It is envisaged to rehabilitate B-1 and B-2 distributors of Lernagog community for irrigation of 183 ha. It is proposed to construct new 672 m long B-1 distributor with distributing wells and bulkhead gates. 282 m long B-2 distributor starts from D=250 mm surface pipeline and is made of steel pipes of different diameters. 100 m of distributor goes along the curb of the road with asphalt cover, and 182 m goes along the unpaved street.

The distributors were in operation for about 30-40 years. During this period no repair or preventive maintenance were carried out which resulted in unsatisfactory condition of the network. As a result of poor condition of the irrigation network, fields are not supplied with the required water volume resulting in reduction of agricultural production, and many plots are not irrigated.

Table 9: Key data on the tertiary irrigation network of Lernagog community

No.	Name of the distributor	Irrigated area before rehabilitation (ha)	Irrigated area after rehabilitation (ha)	Total length of the canal (km)	Length of the stretches to be rehabilitated (km)	Type of precast elements and pipes
1.	B-1	83	183	4.0	0.672	D=250mm steel pipes
2.	B-2				0.282	D=219x4mm steel pipes
	Total:	83	183	4.0	0.954	

Arevadasht community

The tertiary irrigation network of Arevadasht community is located at an elevation of 890-960m. The tertiary network of the community is under command of Armavir Irrigation Scheme, within the service area of “Armavir” WUA. Water source is a distributor constructed with LP-8 precast flumes, which originates from the Arevadasht pumping station’s feeding canal. The total length of the tertiary irrigation network in Arevadasht village is 5.3km. The total length of sections proposed for rehabilitation is 2.8km.

It is envisaged to rehabilitate Arevadasht community's B-I and B-2 distributors for irrigation of proposed 137ha of lands. Rehabilitation works will enable uninterrupted operation of distributors and their structures which will reduce water losses from the networks, supply community with required volume of irrigation water, and improve crop yield.

Distributor B-1 is constructed with LP-4 precast flumes. Flumes and concrete supports at this section are completely destroyed and lopsided. Structures on the distributor are also completely destroyed.

Distributor B-1-1 has an earth bed along the full length. It originates from B-1 distributor. There are no structures on the distributor.

Table 10: Key data on the tertiary irrigation network of Arevadasht community

No.	Name of the distributor	Irrigated area before rehabilitation (ha)	Irrigated area after rehabilitation (ha)	Total length of the canal (km)	Length of the stretches to be rehabilitated (km)	Type of precast elements and pipes
1.	B-1	90	137	5.3	2.8	LR-4 precast flumes
2.	B-1-1					
	Total:	90	137	5.3	2.8	

Hatsik community

The tertiary irrigation network of Hatsik community is located at an elevation of 890 m above sea level. The tertiary network of the community is under command of Armavir Irrigation Scheme, within the service area of "Armavir" WUA. The total length of the tertiary irrigation network of Hatsik village is 2.5 km. The total length of the sections proposed for rehabilitation is 2.0 km. It is envisaged to rehabilitate B-I and B-2 distributors of Hatsik community for irrigation of 259 ha. Rehabilitation works will enable uninterrupted operation of distributors and their structures which will reduce water losses from the networks, supply community with required volume of irrigation water and improve crop yield.

1720 m long distributor B-1 is located far from the community. It gets water from distributor 10 of Armavir Main Canal. B-2 distributor goes through the village. It also gets water from Armavir Main Canal, and is 234 m long. Rehabilitation of distributors is proposed with LR-4 prefabricated reinforced concrete flumes.

Table 11: Key data on the tertiary irrigation network of Hatsik community

No.	Name of the distributor	Irrigated area before rehabilitation (ha)	Irrigated area after rehabilitation (ha)	Total length of the canal (km)	Length of the stretches to be rehabilitated (km)	Type of precast elements and pipes
1.	B-1	140	259	2.5	1.720	LR-4 precast flumes
2.	B-2				0.234	
	Total:	140	259	2.5	1.954	

All the required structures will be constructed along the full length of the distributors providing normal water supply during irrigation season and their emptying in the off-irrigation season.

Noravan community

The administrative area of Noravan community is located at the elevation of 880 m above sea level. The tertiary network of the community is under command of Armavir Irrigation Scheme, within the service area of “Armavir” WUA. The total length of the tertiary irrigation network in Noravan village is 1.7 km. The total length of sections proposed for rehabilitation is 0.8 km. It is envisaged to rehabilitate Noravan community’s distributor which goes along the No.1 street of Noravan community for irrigation of 153 ha. The distributor gets water from the canal which starts from Armavir main canal. Rehabilitation of the distributor is proposed with LR-4 prefabricated reinforced concrete flumes.

Table 12: Key data on the tertiary irrigation network of Noravan community

No.	Name of the distributor	Irrigated area before rehabilitation (ha)	Irrigated area after rehabilitation (ha)	Total length of the canal (km)	Length of the stretches to be rehabilitated (km)	Type of precast elements and pipes
1.	B-1 distributor, No.1 street	100	153	1.7	0.8	LR-4 precast flumes
	Total:	100	153	1.7	0.8	

All required structures will be installed along the full length of the distributors providing normal water supply during irrigation season and distributors’ emptying in the off-irrigation season.

Agavnatun community

The administrative area of Agavnatun community is located at the elevation of 927m above sea level. The tertiary network of the community is under command of Lower Hrazdan Irrigation Scheme, within the service area of “Khoy” WUA. The total length of the tertiary irrigation network of Agavnatun village is 7.5 km. The total length of sections proposed for rehabilitation is 6.0 km. It is envisaged to rehabilitate distributors of Agavnatun community for irrigation of 334 ha to enable uninterrupted operation of distributors and their structures, reduce water losses from the networks, supply community with required volume of irrigation water and improve crop yield.

The distributors of Agavnatun community get water from Lower Hrazdan II Stage Canal. They include earth, concrete and half-pipe stretches. Water losses in the canals according to the operational data are about of 60%, which makes impossible water supply to the lands located far from the intakes structures. Outlets of distributors are implemented in non-professional manner. Distributors and their structures are completely deteriorated.

Table 13: Key data on the tertiary irrigation network of the Agavnatun community

No.	Name of the distributor	Irrigated area before rehabilitation (ha)	Irrigated area after rehabilitation (ha)	Total length of the canal (km)	Length of the stretches to be rehabilitated (km)	Type of precast elements and pipes
1.	Matevosyan str., right branch	180	334	7.5	1.850	LR-4 precast flumes
2.	Matevosyan str., left branch				1.856	

No.	Name of the distributor	Irrigated area before rehabilitation (ha)	Irrigated area after rehabilitation (ha)	Total length of the canal (km)	Length of the stretches to be rehabilitated (km)	Type of precast elements and pipes			
3.	R.Avagyan str., right branch				0.562				
4.	R.Avagyan str., left branch				0.580				
5.	B-1 distributor				0.145				
6.	B-2 distributor				0.325				
7.	B-3 distributor				0.113				
8.	B-3-1 distributor				0.150				
9.	B-3-2 distributor				0.155				
10.	Virabyan str., left branch				0.310		D=250mm Polyethylene pipes		
11.	Virabyan str., right branch				0.315				
	TOTAL:				180	334	7.5	6.0	

All the required structures will be installed along the full length of the distributors to provide normal water supply during irrigation season and distributors emptying in the off-irrigation season.

3. Description of Existing Conditions

Climate

Armavir Marz

The tertiary canal infrastructures of the selected communities of Armavir Marz proposed for rehabilitation under the IREP AF are located at an average altitude of 850-1100 m above sea level. Armavir Marz is located at the northern part of Ararat Valley. The climate is severely continental (from semi-arid to arid (semi-desert) zone). Annual precipitation is reported at only around 250 mm. Summer lasts 5-6 months and is warm and hot with temperatures reaching up to 30-32°C (max 41°C) with average annual relative humidity of about 70%. Winters are cold and rather long, with thin snow cover lasting from early December until early March. Minimum temperatures typically drop to -33°C and even -35°C: The frost depth is 0.6- 0.8 m. Winds are predominantly from the South or Southwest.

Given the extreme arid conditions farming is carried out exclusively by irrigation.

Table 14. Air temperature in Armavir Marz

Elevation, m a.s.l	Average monthly air temperature, °C												Average annual	Absolute minimum	Absolute maximum
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII			
850-1100 m	-4.7	-2.1	-4.6	12.3	17.5	21.6	25.6	25.1	20.1	12.7	5.7	-1.1	11.4	-33	41

Table 15: Air humidity in Armavir Marz:

Name of the Marz	Air relative humidity, %												
	By months												Average annual
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Armavir	65	66	71	70	73	76	72	71	74	76	72	66	71

Table 16: Precipitation and snow cover in Armavir Marz

Name of the Marz	Precipitation, mm												
	Average monthly daily maximum												Annual
	By months												
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Armavir	19	19	24	29	41	26	12	9	11	25	20	16	251

Bagramyan community

Bagramyan community is located in south-western part of the Armenia, in Armavir Marz at the elevation of 924 m above sea level. The climate is specified with hot summer and cold winter. The average annual air temperature is 10.7°C. The coldest month is January and the hottest – July. In summer the temperature reaches +41°C (maximum). The minimum registered temperature is -38°C. Annual precipitation makes up 250 mm, relative air humidity is 61%. Main perceptions take place in April-May. Maximal frost depth is 82 cm.

From the hydro geological point of view, the project area is considered as a shallow zone with groundwater level 50 m below surface.

The following tables represent the climate conditions for Bagramyan community:

Table 17. Air temperature in Bagramyan community

Elevation, a.s.l. (m)	Average monthly air temperature, °C												Average annual	Absolute minimum	Absolute maximum
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII			
942	-4.7	-2.1	4.6	12.3	17.5	21.6	25.6	25.1	20.1	12.7	5.7	-1.1	11.4	-38	41

Table 18. Air humidity in Bagramyan community

Community	Air relative humidity, %												
	By months												Average annual
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Bagramyan	76	7.1	6.2	56	56	50	46	46	52	63	74	78	61

Table 19. Precipitation and snow cover in Bagramyan community

Community	Precipitation, mm Average monthly daily maximum												
	By months												Annual
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Bagramyan	19	19	24	29	41	26	12	9	11	25	20	16	251
	19	21	26	37	42	21	38	31	23	30	30	20	42

Myasnikyan community

Myasnikyan community is located in south-western part of Armenia, in Armavir Marz, at the elevation of 927 m above sea level. The climate is specified by hot summer and cold winter. The average annual air temperature is 10.7°C. The coldest month is January and the hottest – July and August. In summer the temperature reaches +41°C (maximum). The minimum registered temperature is -38°C. Annual precipitation makes up 251 mm, relative air humidity about 60%. Main perceptions take place in April-May. Maximal frost depth is 76 cm.

From hydrogeological point of view the project area is considered as shallow zone with very deep level of groundwater.

The following tables represent the climate conditions for Myasnikyan community:

Table 20. Air temperature in Myasnikyan community

Elevation, a.s.l. (m)	Average monthly air temperature, °C												Average annual	Absolute minimum	Absolute maximum
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII			
927	-4.7	-2.1	4.6	12.3	17.5	21.6	25.6	25.1	20.1	12.7	5.7	-1.1	11.4	-38	41

Table 21. Air humidity in Myasnikyan community

Community	Air relative humidity, %												
	By months												Average annual
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Bagramyan	76	7.1	6.2	56	56	50	46	46	52	63	74	78	61

Table 22. Precipitation and snow cover in Myasnikyan c community

Community	Precipitation, mm Average monthly daily maximum												
	By months												Annual
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Bagramyan	19	19	24	29	41	26	12	9	11	25	20	16	251
	19	21	26	37	42	21	38	31	23	30	30	20	42

Dalarik community

Dalarik community is located in the south-western part of the RA, in Armavir Marz at the elevation of 998 m above sea level. The climate is specified by hot summer and cold winter. The average annual air temperature is 10.7°C. The coldest month is January and the hottest – July and August. In summer the temperature reaches +41°C (maximum). The minimum temperature registered is -38°C. Annual precipitation makes up 251 mm, relative air humidity - 58%. Main precipitations take place in April-May. Maximal frost depth reaches 82 cm.

From hydro geological point of view, the project area is considered as shallow zone with very deep level of groundwater.

The following tables represent the climate conditions for Dalarik community:

Table 23. Air temperature in Dalarik community.

Elevation, a.s.l. (m)	Average monthly air temperature, °C												Average annual	Absolute minimum	Absolute maximum
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII			
998	-4.7	-2.1	4.6	12.3	17.5	21.6	25.6	25.1	20.1	12.7	5.7	-1.1	11.4	-38	41

Table 24. Air humidity in Dalarik community

Community	Air relative humidity, %													Average annual
	By months													
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII		
Dalarik	76	7.1	6.2	56	56	50	46	46	52	63	74	78	61	

Table 25. Precipitation and snow cover in Dalarik community

Community	Precipitation, mm													Annual
	Average monthly daily maximum													
	By months													
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII			
Dalarik	19	19	24	29	41	26	12	9	11	25	20	16	251	
	19	21	26	37	42	21	38	31	23	30	30	20	42	

Karakert community

Karakert community is located in south-western part of the RA, in Armavir Marz at the elevation of 1245 m above sea level. The climate is specified by hot summer and cold winter. The average annual air temperature is 10.7°C. The coldest month is January and the hottest – July and August. In summer the temperature reaches +41°C (maximum). The minimum temperature registered is -38°C. Annual precipitation makes up 251 mm, relative air humidity – around 60%. Main perceptions take place in April-May. Maximal frost depth is 82 cm.

From hydro geological point of view, the project area is a zone with intense filtration with groundwater level 100 m below surface.

The following tables represent the climate conditions for Karakert community:

Table 26. Air temperature in Karakert community.

Elevation, a.s.l. (m)	Average monthly air temperature, °C												Average annual	Absolute minimum	Absolute maximum
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII			
1245	-4.7	-2.1	4.6	12.3	17.5	21.6	25.6	25.1	20.1	12.7	5.7	-1.1	11.4	-38	41

Table 27. Air humidity in Karakert community

Community	Air relative humidity, %													Average annual
	By months													
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII		
Karakert	76	7.1	6.2	56	56	50	46	46	52	63	74	78	61	

Table 28. Precipitation and snow cover in Karakert community

Community	Precipitation, mm													Annual
	Average monthly daily maximum													
	By months													
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII		
Karakert	19	19	24	29	41	26	12	9	11	25	20	16	251	
	19	21	26	37	42	21	38	31	23	30	30	20	42	

Bagaran community

Bagaran community is located in south-western part of the RA, in Armavir Marz at the elevation of 1018 m. The climate is dry continental with hot summer and strong frosty winter. The average annual air temperature is +8°C. The coldest month is January and the hottest – July and August. In summer the temperature reaches +41°C (maximum). The minimum temperature registered is -38°C. Annual precipitation makes up 251 mm. Maximal perceptions take place in May-June. Maximal frost depth is 70 cm.

From the hydro geological aspect, the project area is considered as shallow zone with very deep level of ground waters.

The following tables represent the climate conditions for Bagaran community:

Table 29. Air temperature in Bagaran community.

Elevation, a.s.l. (m)	Average monthly air temperature, °C												Average annual	Absolute minimum	Absolute maximum
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII			
1018	-4.7	-2.1	4.6	12.3	17.5	21.6	25.6	25.1	20.1	12.7	5.7	-1.1	11.4	-38	41

Table 30. Air humidity in Bagaran community

Community	Air relative humidity, %												
	By months												Average annual
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Bagaran	76	7.1	6.2	56	56	50	46	46	52	63	74	78	61

Table 31. Precipitation and snow cover in Bagaran community

Community	Precipitation, mm												
	Average monthly daily maximum												Annual
	By months												
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Bagaran	19	19	24	29	41	26	12	9	11	25	20	16	251
	19	21	26	37	42	21	38	31	23	30	30	20	42

Vanand community

Vanand community is located in south-western part of Armavir Marz at the elevation of 1110 m above sea level. The average annual air temperature varies within +10-12°C. The average air temperature in July is approximately +26°C. In summer the temperature reaches +410C (maximum). In January the average air temperature varies between -30 to -6°C. The minimum temperature registered is -330C. Annual precipitation makes up 200-300 mm, relative air humidity - 6%.

The following tables represent the climate conditions for Vanand community:

Table 32. Air temperature in Vanand community

Elevation, a.s.l. (m)	Average monthly air temperature, °C												Average annual	Absolute minimum	Absolute maximum
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII			
1110	-4.7	-2.1	4.6	12.3	17.5	21.6	25.6	25.1	20.1	12.7	5.7	-1.1	11.4	-33	41

Table 33. Air humidity in Vanand community

Community	Air relative humidity, %												
	By months												Average annual
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Vanand	76	7.1	6.2	56	56	50	46	46	52	63	74	78	61

Table 34. Precipitation and snow cover in Vanand community

Community	Precipitation, mm Average monthly daily maximum												
	By months												Annual
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Vanand	19	19	24	29	41	26	12	9	11	25	20	16	251

Yervandashat community

Yervandashat community is located in south-western part of the RA, in Armavir Marz at the elevation of 645 m above sea level. Climate conditions are specified as continental - with hot summer and strong frosty winter. The average annual air temperature is 11.8°C. The coldest month is January and the hottest – July and August. In summer the temperature reaches +41°C (maximum). The minimum temperature registered is -38°C. Annual precipitation makes up 250-300 mm, relative air humidity - 65%. Maximal frost depth is 70 cm.

From the hydro geological aspect the project area is considered as a zone with very deep level of ground waters.

The following tables represent the climate conditions for Yervandashat community:

Table 35. Air temperature in Yervandashat community

Elevation, a.s.l. (m)	Average monthly air temperature, °C												Average annual	Absolute minimum	Absolute maximum
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII			
645	-4.7	-2.1	4.6	12.3	17.5	21.6	25.6	25.1	20.1	12.7	5.7	-1.1	11.4	-38	41

Table 36. Air humidity in Yervandashat community

Community	Air relative humidity, %												
	By months												Average annual
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Yervandashat	76	7.1	6.2	56	56	50	46	46	52	63	74	78	61

Table 37. Precipitation and snow cover in Yervandashat community

Community	Precipitation, mm Average monthly daily maximum												
	By months												Annual
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Yervandashat	19	19	24	29	41	26	12	9	11	25	20	16	251
	19	21	26	37	42	21	38	31	23	30	30	20	42

Lernagog community

Lernagog community is located in south-western part of the RA, in Armavir Marz, at the elevation of 1000 m above sea level. The average annual air temperature varies within +10-12°C. The average air temperature in July is approximately +26°C. In summer the temperature reaches +41°C (maximum). In January the average air temperature varies between -30 to -6°C. The minimum temperature registered is -33°C. Annual precipitation makes up 200-300 mm, relative air humidity – about 60%.

The following Tables represent the climate conditions for Vanand community:

Table 38. Air temperature in Lernagog community

Elevation, a.s.l. (m)	Average monthly air temperature, °C												Average annual	Absolute minimum	Absolute maximum
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII			
1000	-4.7	-2.1	4.6	12.3	17.5	21.6	25.6	25.1	20.1	12.7	5.7	-1.1	11.4	33	41

Table 39. Air humidity in Lernagog community

Community	Air relative humidity, %													Average annual
	By months													
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII		
Lernagog	76	7.1	6.2	56	56	50	46	46	52	63	74	78	61	

Table 40. Precipitation and snow cover in Lernagog community

Community	Precipitation, mm													Annual
	Average monthly daily maximum													
	By months													
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII			
Lernagog	19	19	24	29	41	26	12	9	11	25	20	16	251	

Arevadasht community

Arevadasht community is located in south-western part of Armavir Marz at the elevation of 950 m above sea level. The average annual air temperature varies within +10-12°C. The average air temperature in July is approximately +26°C. In summer the temperature reaches +41°C (maximum). In January the average air temperature varies between -3° to -6°C. The minimum temperature registered is -33°C. Annual precipitation makes up 200-300 mm, relative air humidity - 61%.

The following Tables represent the climate conditions for Arevadasht community:

Table 41. Air temperature in Arevadasht community

Elevation, a.s.l. (m)	Average monthly air temperature, °C												Average annual	Absolute minimum	Absolute maximum
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII			
950	-4.7	-2.1	4.6	12.3	17.5	21.6	25.6	25.1	20.1	12.7	5.7	-1.1	11.4	33	41

Table 42. Air humidity in Arevadasht community

Community	Air relative humidity, %												
	By months												Average annual
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Arevadasht	76	7.1	6.2	56	56	50	46	46	52	63	74	78	61

Table 43. Precipitation and snow cover in Arevadasht community

Community	Precipitation, mm												
	Average monthly daily maximum												Annual
	By months												
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Arevadasht	19	19	24	29	41	26	12	9	11	25	20	16	251

Hatsik community

Hatsik community is located in south-western part of Armavir Marz at the elevation of 890 m above sea level. The climate is specified by hot summer and short and mild winter. The coldest month is January, and the hottest month – July, The average annual air temperature is 11.4°C. The maximum temperature in summer reaches +41°C. In winter the temperature reaches -31°C. Annual precipitation makes up 251 mm, maximum precipitation take place in May and June, relative air humidity - 61%. Maximal frost depth is 70 cm.

Table 44. Air temperature in Hatsik community.

Elevation, a.s.l. (m)	Average monthly air temperature, °C												Average annual	Absolute minimum	Absolute maximum
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII			
890	-4.7	-2.1	4.6	12.3	17.5	21.6	25.6	25.1	20.1	12.7	5.7	-1.1	11.4	-31	41

Table 45. Air humidity in Hatsik community

Community	Air relative humidity, %												
	By months												Average annual
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Hacik	76	7.1	6.2	56	56	50	46	46	52	63	74	78	61

Table 46. Precipitation and snow cover in Hatsik community

Community	Precipitation, mm													Annual
	Average monthly daily maximum													
	By months													
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII		
Hacik	19	19	24	29	41	26	12	9	11	25	20	16	251	
	19	21	26	37	42	21	38	31	23	30	30	20	42	

Noravan community

Noravan community is located in south-western part of Armavir Marz at the elevation of 880 m. The climate is specified by hot summer and short and mild winter. The coldest month is January, and the hottest month – July, The average annual air temperature is 11.4°C. The maximum temperature in summer reaches +41°C. In winter the temperature reaches -31°C. Annual precipitation makes up 251 mm, maximum precipitation take place in May and June, relative air humidity 61%. Maximal frost depth is 70 cm.

Table 47. Air temperature in Noravan community.

Elevation, a.s.l. (m)	Average monthly air temperature, °C												Average annual	Absolute minimum	Absolute maximum
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII			
880	-4.7	-2.1	4.6	12.3	17.5	21.6	25.6	25.1	20.1	12.7	5.7	-1.1	11.4	-31	41

Table 48. Air humidity in Noravan community

Community	Air relative humidity, %													Average annual
	By months													
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII		
Noravan	76	7.1	6.2	56	56	50	46	46	52	63	74	78	61	

Table 49. Precipitation and snow cover in Noravan community

Community	Precipitation, mm													Annual
	Average monthly daily maximum													
	By months													
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII		
Noravan	19	19	24	29	41	26	12	9	11	25	20	16	251	
	19	21	26	37	42	21	38	31	23	30	30	20	42	

Agavnatun community

Agavnatun community is located in south-western part of Armavir Marz at the elevation of 927 m. The climate is specified by hot summer and short and mild winter. The coldest month is January, and the hottest month – July, The average annual air temperature is 11.4°C. The maximum temperature in summer reaches +41°C. In winter the temperature reaches -31°C. Annual precipitation makes up 251 mm, maximum precipitation take place in May and June, relative air humidity - 61%. Maximal frost depth is 70 cm.

Table 50. Air temperature in Agavnatun community.

Elevation, a.s.l. (m)	Average monthly air temperature, °C												Average annual	Absolute minimum	Absolute maximum
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII			
927	-4.7	-2.1	4.6	12.3	17.5	21.6	25.6	25.1	20.1	12.7	5.7	-1.1	11.4	-31	41

Table 51. Air humidity in Agavnatun community

Community	Air relative humidity, %													Average annual
	By months													
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII		
Agavnatun	76	7.1	6.2	56	56	50	46	46	52	63	74	78	61	

Table 52. Precipitation and snow cover in Agavnatun community

Community	Precipitation, mm													Annual
	Average monthly daily maximum													
	By months													
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII		
Agavnatun	19	19	24	29	41	26	12	9	11	25	20	16	251	
	19	21	26	37	42	21	38	31	23	30	30	20	42	

Biological diversity

Flora

Wild vegetation occupies a relatively small space in the project affected area – Ararat Valley, since the main part of the area is under agricultural crops. Wild vegetation is represented by the wormwood species of the Yerevan floristic semi-desert vegetation type. The floristic area is represented by halophyte, gypsophyte, psammophyte, wormwood, salt-wort, and ephemeral-salt-wort symbioses which compose semi-desert vegetation.

The area’s vegetation subtype is wormwood semi-desert which spread as a rule on non saline, or slightly saline carbonate and superficial stony grey soil, where, in spite of its xerophite nature, vegetation stands out by rich biodiversity. The main component of wormwood semi-deserts is wormwood odorous

(*Artemisia fragrans*), which is a half-bush, lower than 50 cm in height with woody stem. It does not form dense cover maintaining its grey appearance throughout summer and spring, and only in autumn it is covered with tiny yellow flowers. In spring the space between bushes is occupied by ephemers: *Ceratocephalus falcatus*, *Ziziphora tenuiflora*, *Ziziphora persica*, *Alyssium desertorum*, *Poa bulbosa*, *Bromus tectorum*, *Lepidium vesicarium* and etc.

From tuberous and rhizome plants there must be mentioned *Muscari caucasicum*, *M. Szowitsianum*, *Iris elegantissima*, *Tulipa polychroma*, *Merendera caucasica*, *Ornithogalum tenuifolium*, *Gagea* species and *Ixiolirion tataricum*:

Wormwood is permanently escorted by *Capparis spinosa*, *Kochia prostata*, *Acantholimon armenum*, *Thymus Kotshyanus*, *Centaurea squarrosa*, *Teucrium pollium*, *Euphorbia seguierana*, *Tanacetum argyrophyllum*, *Scutellaria orientalis* subsp. karjagini, *Dianthus crinitus*, *D. floribundus*, *D. Bicolor*, *Polygala hohenackeriana*, *Astragalus stevenianus* subsp. Kochianus, *A. orthopoides*, *Tamanthea phaeopappa*, *Noaea micronata*, *Herniaria incana*, *Ranunculus oxyspermus*, *Veronica orientalis*, *Scaligeria glaucescens*, *Achillea biebersteinii*, *Eryngium billardieri*, *Phelypaea coccinea*.

Biennial plants, typical for this zone, are presented by *Erysimum subulatum*, *Verbascum saccatum*, *V. Songaricum*, *Scorzonera laciniata*, *Gentiana olivieri*: From perennial graminces the common are *Stipa caspia*, *S. Hohenackeriana*, *Agropyron trichopharum*, *A. cristatum* subsp. *Pectinatum*, *Poa bulbosa*, *Catabrosella humilis*: from the fescue species the typical are *Carex stenophylla* subsp. *Stenophylloides*.

Numerous monocotyledonous are in blossom in May and April. Wormwood semi-deserts are mainly characterized by annual plants. The spring vegetation in wormwood deserts is rich and diverse. In winter and early spring the ground is nearly fully covered with *Poa bulbosa* and *Pterygoneurum ovatum* (Hedw.) Dix. Moss and some ephemers (*Ceratocephala falcata*, *Androsace maxima* subsp. caucasica, *Koelpinia linaris*, *Aizyphoria tenuior*, *Alyssum linifolium*, *Valeranella*, *Arabidopsis pumila*, *Holosteum umbellatum* subsp. glutinosum, *Drabopsis nuda*, *Erophila verna*, *Roemeria hybrida*, *Papaver argemone* subsp. belangeri, *Hypocoum pendulum*, *Callipteltis cucularis*, *Bromus* and *Eremopyrum* class species, etc) as well.

In early April *Poa bulbosa*, *Carex stenophylla* subsp. *stenophylloides* and *Bomus* species homogeneously cover the land. In mid April the flowering types number increases, and the number of ephemers reaches the maximum. In late spring *Allium pseudoflavum* and *A. dictyoprasum* species start to bloom.

In the second half of May and in early June the vegetation becomes relatively invariable. Within this period *Chardinia orientalis*, *Eryngium billardieri*, *Scutellaria orientalis* subsp. karjagini, *Centaurea squarrosa*, *Euphorbia seguierana*, *Tanacetum argyrophyllum*, *Thymus kotshyanus*, *Tamanthea phaeopappa*, *Dianthus floribundus*, *Scaligeria glaucescens*, *Polygala hohenackeriana*, *Stipa caspia*, *Crupina vulgaris*, *Herniaria incana*, *Gaudinopsis macra* are in blossom.

In mid June, as the precipitation amount decreases and air temperature increases, nearly all spring types wither and only some of them go on giving fruit. During this period the wormwood desert vegetation mainly consists of perennial xerophytes. Most of them bloom in early July giving up in mid July. In the latter period the wormwood desert is like being in anabiosis, and in early autumn it revives again: wormwood, *Kochia prostata*, *Noaea mucronata* and some other plant species bloom. Due to the precipitation increase, the ground is covered with a green carpet of growing ephemers. In some parts the abundant cover of wormwood gets mixed with *Capparis spinosa*. The inseparable typical components of landscape are *Populus nigra* var. *italica*, *P. gracilis* and *Eleagnus angustifolia*, which have been planted here for thousand years. Against the general background of the project areas, throughout the vegetative period the surroundings of the water halls and irrigation networks stand out by waterlog vegetation elements (*Phragmites australis*, *Typha latifolia*, etc.) and shrub vegetation (*Elaeagnus angustifolia*, *Populus euphratica*, etc).

Fauna

The Ararat Valley fauna is mostly represented by the elements of old Mediterranean and Iranian Turkish origin. Some species typical of this zone also appear in the mountain-steppe zone. Contrary to flora, the fauna species due to their high mobility obtain inter zonal widespread habitat diversity and are seen in many different landscape zones.

Invertebrates: For wood semi-deserts mollusks (Mollusca) *Xerosecta crenimargo* is typical. In hides and their surroundings *Trungatellina callicratis*, *Pupilla tripicata*, *P. Interrupta*, *P. Signata*, *Imparietula sieversi*, *Eupolita derbentina*, *Phenacolimax annularis* can occur. Adapted to the antropogenetic mezophil areas, there, on leaves and ground openly creep *Succinea putris*, *Oxyloma elegans* and *O.sarsi*: On plants there are *Vertigo anivertigo* and *V. Moilinsiana*, under the stones and in other hides like those one can see *Zonitoides nitidus*, *Deroceras transcaucasicum*, *Pseudotrachia rubiginosa*. From scorpions only *Buttus caucasicus* is found. *Phytodrymadusa armeniaca* (cicadas), *Nocarodes armenus* (grasshoppers), *Dictyla subdola*, *Geotomus punctulatus* (Big bedbugs), *Amphicoma eichleri*, *Cantharis araxicola* (beetles), *Tomomyza araxana*, *Bombilius schelkovnikovi* (two-winged flies), *Zodarion petrobium* (spiders) and some others are also found.

Vertebrates: Around the reservoirs and open channels from amphibious *Bufo viridis*, *Rana ridibunda* and *Rana macrocnemis* occur. The semi-desert zone herpetofauna is mainly represented by lizards: *Eremias trauchi*, *Lacerta media*, *Lacerta strigata*, *Darevskia nairensis*, *Lacerta raddei*, *Ophisops elegans*, *Ophisop Eumeces schneideri*, *Mabuya aurata*, *Lacerta strigata*. From snakes there are *Coluber najadum*, *Eryx jaculus*, *Natrix natrix*, *N. tessellata*, *Vipera lebetina*, *Malpolon monspessulanus*, *Eirenis collaris*, *Tylops vermicularis*, *Eirenis punctatolineata*, *Elaphe quatorlineata*, from tortoise- *Testudo graec.*:

Fish fauna of the Ararat plateau rivers and water wells is represented by Sand and Caucasus Sand and Brown Bullhead (*Neogobius fluviatilis*, *Knipowitschina caucasica*), Bitterling (*Rhodeus sericus*), Common Carp (*Cyprinus carpio*), trout(karmrakhait) (*Salmo trutta m. Fario*), Barbel (*Barbus capito*), Blackbrow bleak (*canthalburnus microlepis*), Eastern mosquitofish (*Gambusia holbrooki*). Mursa (*Barbus mursa*) Barbel beghlou (*Barbus lacerta cyri*), Brown fork-tail loach (*Varicorhinus capoeta capoeta*), Terek nase (*Chondrostoma oxyrhynchum cyri*), Grass carp (*Ctenopharyngodon idella*), Silver carp (*Alburnus filippi*) etc.

From the vertebrates, the most dynamic are birds, and their habitation is relative as there are transit, settled and migrating species. In addition they are very sensitive to fear factor (shoots, noise etc.) and changes are likely to occur on their migration routes and transit points. Bird species that occur in the area are following: (Aves). *Buteo rufinus*, *Falco naumanni*, *Coturnix coturnix*, *Larus armeniacus*, *Pterocles orientalis*, *Pterocles alchata*, *Athena noctua*, *Otus scops*, *Columbia livia*, *Caprimulgus europaeus*, *Coractas garullus*, *Merops apiaster*, *Upupa epops*, *Alectoris chukar*, *Calandrella brachydactyla artemisiana*, *C.rufescens pseudobaetica*, *Galerida cristata*, *Alauda arvensis*, *Hirundo rustica*, *Motocilla alba*, *Anthus campestris*, *Cereotrichas galactotes*, *Saxicola torquata*, *Oenanthe isabellina*, *Oenanthe finschii*, *Hippolais pallida*, *H. Languida*, *Sylvia hortensis*, *Muscicopa striata*, *Sitta neumayer*, *Sitta tephronota*, *Milaria calandra*, *Emberizia buchanani*, *Emb. Hortulana*, *Emb. Melanocaphala*, *Emb. Citrinella*, *Carduelis carduelis*, *Carduelis fravirostris*, *C.cannabina*, *Rhodopechys sanguinea* *Passer domesticus*, *Petronia petronia*, *Sturnus vulgaris*, *St. Roseus*, *Pica pica*. Some of species built their nests on earth, they are: *Emberizia buchanani**, *Emb. Hortulana*, *Alauda arvensis*, *Anthus campestris*, others in holes: *Merops apiaster*, *Coractas garullus* ~ *Oenanthe isabellina*, in bushes and shrubs: *Hippolais pallida*, *H. languida*, in the crevices, bare rocks and in the earth-holes, stone heaps *Falco naumanni*, *Sturnus roseus*, *Petronia petronia* etc., warblers, woodchat shrikes build their nests in shrubs, etc.

Mammals (*Mammalia*) typical of desert and semi-desert zones are of small number. Everywhere can occur common campagnols (*Microtus arvalis*), foxes (*Vulpes vulpes*), wolves (*Canis lupus*), long-eared hedgehogs (*Erinaceus auritus*). There also occur several species of bats: red nocturnal bat (*Nyctalus noctula*), Ognev's bat (*Vespertilio ognevi*), long-eared bat (*Plecotus auritus*), insectivores (*Hemiechinus auritus*, *Mustela nivalis*) and from rodents: brown hare (*Lepus europaeus*) and other rodents (*Allactaga elater*, *Allactaga euphratica*, *Sylvaemus uralensis*, *Microtus socialis*, *Microtus arvalis*, *Cricetulus migratorius*, *Meriones persicus*, *Meriones tristrami*, *Meriones vinogradovi*).

There are no nearby unique natural ecosystems subjected to special protection affected by the rehabilitation of the existing tertiary irrigation networks. The nearest reservation is "Vordan Karmir", which is founded in 1987 and covering 200 ha area. It is situated among Argavand, Arazap and Sovetakan communities in Armavir Marz. The reservation aims at conservation of the Ararat valley salt marsh (halophyte) lands ecosystems and their flora and fauna. The proposed rehabilitation works are at significant distance from the abovementioned reservation (approximately 30-40 km). No environmental or social impacts are expected in the reserved area.

Mitigation measures to protect both flora and fauna of the project affected areas are presented below in this EMP under the specific mitigation measures envisaged to be implemented during the rehabilitation works.

Soil properties and erosion

Project affected area is located in Armavir Marz, in semi-desert zone, where the semi-desert brown soils are spread.

Semi-desert brown soils are characterized with humus average content (1.5-2.0%), soil pH indices show that it ranges from 7.5-8.5, thus the soils have mostly slight alkaline and alkaline reaction. Absorbability is 20-30 mg equivalent in 100g. Hydrophysical properties of the project lands are considered to be insufficient; soil density varies within 1.2-2.0g/cm³, consequently the total porosity is very low, and water penetration velocity is in first hour comprises 18-35cm. In field conditions the soil layer with strength of 35-40cm can bear only 38mm of water, out of which 50% is available.

These lands under the influence of irrigation water were reached with mineral substances and particularly with potassium. Under the influence of mineralized underground water in separate places, the salinized-alkalinized horizons were formed in medium and low layers of soil. 49% of the lands are of sufficient strength, 50% of average and only 1 % of insufficient strength. The mechanical composition of soil includes clay (61.7%) and loam (38.3%). The lands are mostly free of stones, and only separate areas with low strength are slightly stony.

Social-economic conditions

All water users of 12 affected communities are member of WUAs serving their communities. Bagramyan, Myasnikyan, Dalarik and Karakert communities are within the service areas of "Karakert", WUA, Bagaran, Vanand and Yervandashat communities are within the service area of "Shenik" WUA, Lernagog community is within the service area of "Talin" WUA, Arevadasht, Hatsik, Noravan communities are within the service area of "Armavir" WUA, Agavnatun community is within the service area of "Khoy" WUA. In all WUAs are established problem-solving commissions for examination and decision making if any dispute arise concerning the water distribution.

Water users of these communities are cultivating cereals (wheat mostly), vegetables and fruits, including grapes, fodder crops, etc. Due to poor condition of the water conveyance infrastructure the farming activities has declined. Due to low incomes from farming and lack of job opportunities, in all the

communities affected there is a permanent and seasonal out migration. Mostly men of working age work abroad, especially in the Russian Federation and financially support their families. In these households mainly women run the farms, supported by children and elder family members. Water users are expected to benefit from the rehabilitation of tertiary irrigation networks under the IREP AF.

According to the general opinion of the people affected by the project that was obtained by the Design Consultant during the design phase, the proposed rehabilitation of the selected tertiary irrigation networks and degraded stretches are considered to be important for the well being of their community water users. The project is expected to promote and intensify the land cultivation activities by local farmers. It is envisaged that the increased water availability will lead to improvement of incomes and living standards and will help reducing youth emigration.

4 Environmental and Social Impacts

Only rehabilitation works on existing canals are to be carried out. Due to its rehabilitation nature, the proposed project is not likely to cause significant negative environmental and/or social impacts. Rehabilitation works envisages improvement of irrigation canals in 12 communities of Armavir Marz of the RA. This will ensure an uninterrupted irrigation of the existing arable lands as well as extension of irrigated lands at the expense of significantly reduced water losses and improved management of water resources available. Due to the nature of rehabilitation works proposed by the project, it is not likely to cause significant adverse environmental and/or social impacts. Rehabilitation of tertiary irrigation networks and degraded stretches thereof will bring positive changes to delivery of irrigation water providing water users with required dependable amount of water. This will increase food security, incomes in agricultural sector thereby reducing the number of poor population and the migration in the area. In addition, improved water delivery will encourage farmers to expand irrigated agricultural production and apply high value crops. The expected overall positive environmental and social impacts from the improved tertiary irrigation networks will be long-term and cumulative contributing to the improvement of social and economic conditions in affected communities and in general reducing the pressure on marginal areas. Almost no site specific impacts are revealed due to the similar nature of rehabilitation works proposed for all the tertiary irrigation networks to be improved under the Project.

The adverse impacts are likely to occur during rehabilitation and operation phases of the proposed project. These may include, but are not limited to the following: pollution of surface and ground water resources; degradation of soil, landscape and soil erosion because of improper disposal of excavated materials and construction waste, spillage of oil and toxic substances during the construction; use of temporary construction sites (camps, machinery sites, storage facilities, etc); use of borrow pits; temporary air pollution related to increased truck traffic during the rehabilitation; noise and vibration disturbances during trench excavation; as well as potential impacts on flora and fauna, etc. Social adverse impacts may occur as a result of temporary and/or permanent use of private and/or community owned lands for rehabilitation works. Rehabilitation works of tertiary irrigation networks will be carried out within the alienation zone of the existing tertiary irrigation networks. Permanent and/or temporary use of public or private lands or other assets will not be required for the implementation of those works. In case any resettlement issue occurs during the implementation of rehabilitation, the works will be terminated and will recommence after the development and implementation of the RAP in accordance with the requirements of the RA legislation and WB requirements.

Short-term social adverse impacts may occur only in cases when cutting plants and/or demolition of light structures appearing within the alienation zone of the main canal cannot be avoided. It is expected that within the proposed project such adverse impact will be avoided through application of appropriate construction techniques. However, if conduct of construction works is not possible without cleaning of

the alienation zone from cultivated plants and/or structures, a RAP will be developed in accordance with RPF as required by the World Bank's OP/BP 4.12 Involuntary Resettlement.

The likely negative environmental and social impacts of the construction phase are expected to be localized and short-term. As a result of timely and proper implementation of this Environmental Management Plan with practical implementation of mitigation measures presented in Annex A to this report, all identified potential negative impacts can be prevented and minimized. In addition to this, regular monitoring over the civil works, in accordance with the Monitoring Plan provided in Annex B, will ensure effective implementation of mitigation measures included in EMP. A possible negative environmental impact of the operation phase may be an increased use of agrochemicals in the areas of the project coverage, provided that with improved access to irrigation, farmers opt to increase volume of high value crops grown in their fields and apply increased amount of pesticides. This can be mitigated by carrying out a public information campaign on the optimal use of pesticides and extending some elements of the integrated pest management (IPM) relevant in the current country context.

5 Mitigation and Enhancement Measures

The likely negative environmental and social impacts are expected to be localized and short-term. As a result of timely and proper implementation of this Environmental Management Plan with appropriate mitigation measures, which is presented in **Annex A** to this report, all these potential negative impacts can be prevented and minimized.

The mitigation and enhancement measures are proposed for the design of the rehabilitation project, the rehabilitation and further operation of the tertiary canals that shall be undertaken by executing agencies to prevent and/or minimize the likely adverse environmental and social impacts listed above.

Design Phase

Environmental and social mitigation requirements shall be incorporated into final design, technical specifications and tender documents to be implemented by the Construction Contractor and the agency operating the system in order to prevent and mitigate the potential adverse impacts.

The final design documents package shall include a list of approved borrow pits and agreed spoil disposal sites; permits, agreements obtained from the relevant local/regional authorities for use of borrow pits and sites for disposal of wastes as appropriate; list of construction preparation temporary sites such as access roads, construction camps, transport and machinery sites, storage facilities, etc.

The final design documents shall also provide, to the extent possible, such technical approaches and solutions to the rehabilitation of separate stretches of the main canals where encroachments of the alienation zone are observed that do not require demolition of temporary and permanent private properties (structures, fences, poles, fruit trees, etc). In case the demolition (including tree cutting) or dislocation of private/state holdings is required for the rehabilitation works, a resettlement action plan (RAP) shall be prepared based on the existing RPF and in agreement with the guiding principles of the WB OP 4.12. Compensation will then be provided to the affected population according to RAP.

Construction Phase

Measures to prevent and/or minimize the degradation of landscapes and soil erosion, pollution of surface and groundwater resources and soils by construction run-off should be implemented by the contractor during the construction phase. Measures to prevent and/or minimize the degradation of landscapes and

soil erosion, pollution of surface and groundwater resources and soils by construction run-off should be implemented by the contractor during the construction phase. This may include, but may not be limited to:

- the use of already existing quarries and disposal sites, according to the requirements set in the appropriate permits and agreements obtained at the design phase;
- zones of preliminary accumulation of wastes that will cause no damage to the vegetation cover and other components of the environment should be maintained by the contractor;
- all vegetative cover should be restored to its original condition;
- sites for storage of oil and chemicals should be properly equipped to minimize the risks of polluting soils and waters;
- dust and noise from the construction site should be minimized, especially in resident areas, public places, near schools, etc.

If historical and/or cultural monuments or artifacts are unexpectedly found during earthworks, the construction contractors must cease the works and provide relevant information to the State Agency for Protection of Historical and Cultural Monuments which, after due consideration of the findings, shall recommend whether the works can be continued or the design must be revised.

Operational Phase

During operation it is essential that canal beds be periodically maintained to ensure proper conveyance, to avoid stagnation, to prevent flooding and damages caused by frost.

The detailed mitigation measures to be undertaken by the executing agencies are presented in **Annex A** to this document.

The following enhancement measures are proposed to strengthen the positive impacts expected as a result of rehabilitation of the selected tertiary networks of Armavir Marz:

- Involve the local population in project related activities (e.g. work force during construction phase, etc.)
- Increase local water users' knowledge on more efficient water management through providing training and practice, on-farm water management, higher value agricultural production, etc.
- Raise awareness of integrated pest management and sound application of pesticides among water users;
- Build capacity of local water users through provision of credits;
- Support the institutional strengthening of the water supply and delivery organizations (Water Supply Agencies and Water Users Associations).

6 Institutional Responsibilities, Reporting and Budget

Institutional responsibility for implementation of the proposed mitigation measures will be shared amongst the following agencies:

6.1 Institutional Responsibilities

Institutional responsibility for implementation of the proposed mitigation measures will be shared amongst the following agencies:

Executing agencies

Executing Agencies are responsible for executing the measures of the EMP. During the design phase, the executing agency, Design Consultant shall ensure that all the necessary permits and agreements (e.g. permits for the disposal of excavated materials, wastes, and demolition debris, etc.) are obtained from relevant state and local authorities before the construction works are tendered out. Executing agencies during construction phase (Construction contractors) shall take the responsibility for physical implementation of mitigation measures provided under the EMP, as well as for obtaining all permits and agreements related to construction activities (e.g. agreement with Historic and Cultural Monuments Protection Agency if any new historical/cultural/archaeological monument or artifacts are unexpectedly found during civil works) in accordance with the WB Environmental Policies and applicable environmental and social legislation of the Republic of Armenia. WUAs will be responsible for conducting awareness campaign among their members on integrated pest management and sound application of pesticides, using printed material and other training aids provided by PIU.

Supervising agencies

Supervising Agencies are responsible for supervising the executing agencies to ensure that they execute the mitigation measures as planned. The Construction Supervision Company hired by PIU for daily supervision over the implementation of civil works will be responsible for supervising the timely, proper and reliable implementation of works and measures as provided by the EMP (including oversight over the environmental and social aspects of all activities implemented under the project in order to ensure that mitigation measures are designed and implemented properly to prevent and minimize likely adverse environmental and social impacts).

The supervising agencies will also ensure that all necessary agreements and permits are obtained by the appropriate contractors from relevant state and local authorities before the construction works are tendered out. The WB may request to check if such permits are issued and valid (e.g., not expired) as well as if the EMP mitigation and monitoring aspects are implemented on the ground during the canal rehabilitation phases according to the WB Environmental Policies and applicable Armenian environmental and social legislation.

Monitoring agencies

Monitoring agencies are in charge of monitoring the extent of implementation and the effectiveness of the mitigation and enhancement measures and of adjusting the program if needed. Monitoring agencies will be responsible for covering all measures requiring some sort of monitoring by PIU/WB.

The government entities with respective mandates, in particular the Ministry of Nature Protection and its affiliated agencies (State Environmental Inspectorate etc.), the Ministry of Health (State Hygienic Anti-Epidemiologic Inspectorate) and the Ministry of Culture (Historic and Cultural Monuments Protection Agency) may also be involved in the monitoring activities, as a part of their mandate.

6.2 Reporting Format and Schedule

The Construction Supervision Company, working in cooperation with the Construction Contractor, will be responsible for reporting to PIU on the implementation of the mitigation measures included in **Annex A** and according to the monitoring plan presented in **Annex B**. The Incident Report Form shall be completed and submitted to PIU if any major environmental and social occurrences are observed (such as spills, explosions, etc.). The Incident form is presented in **Annex C**.

6.3 Budget

The budget for civil works contracts includes costs allocated for implementation of environmental and social mitigation measures. Appropriate mitigation measures to be fulfilled by the construction contractor are presented in **Annex A**.

The rates of EMP measures are estimated mainly on the basis of quantities dismantling/removing of r/c LR-4 & LR-6 flumes, old monolithic concrete lining, cleaning/removing of canal sediments provided in BOQs, cleaning of the sites after completion of civil works, and transportation of wastes. The distance of removal is agreed with local authorities. The difference in rates comes from the quantity of r/c LR-4 & LR-6 flumes, concrete lining, sediments and the removal distance.

The tertiary canal canals in communities of Armavir Marz are made of r/c LR-4 & LR-6 flumes or lined with monolithic concrete, which have to be dismantled and removed, therefore the cost of implementation of mitigation measures is estimated at 1.15% of the cost of the total construction contract.

7 Public Consultations

According to the FS/FD Consultant's report the area affected by the rehabilitation works of tertiary irrigation network in Armavir Marz covers 12 communities, including: 8 communities under command of the Talin Irrigation Scheme: Bagtamyán, Myasnikyan, Dalarik, Karakert communities in the service area of "Karakert" WUA, Bagaran, Vanand, Yervandashat community in the service area of "Shenik" WUA, Lernagog community in the service area of "Talin" WUA; 3 communities under command of the Armavir Irrigation Scheme: Arevadasht, Hatsik and Noravan communities in the service area of "Armavir" WUA; and one community – Agavnatun under command of Lower-Hrazdan Irrigation Scheme in the service area of "Khoy" WUA.

The aim of the public consultations was to discuss the environmental and social issues related to the rehabilitation of tertiary canal systems in the selected communities. The overall description of the scope and activities to be implemented under the Additional Financing of the Irrigation Rehabilitation Emergency Project (IREP AF), details of the proposed rehabilitation activities, potential negative impacts, the envisaged mitigation measures, the importance of the project activities for the local people, the expected outcomes and other issues were presented and discussed at each meeting. Appropriate records have been developed about the public consultations held in the communities and the participants have confirmed their participation with a signature on an appropriate attendance paper.

Public consultations for tertiary canals rehabilitation project were conducted in July, 2011 in the above mentioned communities. Prior announcements on the upcoming public consultations were made in each affected community, by placing notifications at the publicly accessible places and verbal announcements made to the WUAs, community heads and councils, Marzpetarans, etc. Information bulletins were prepared and distributed among the participants and other concerned parties. The consultations involved representatives from the PIU, Design Consultant, WUAs, community leaders and farmers.

Participants from all communities involved in the public consultations attached high importance to the rehabilitation of the proposed tertiary canals and made propositions in relation to the implementation of the activities. Particularly, the participants suggested take into consideration duration of irrigation season in affected communities while implementing civil works in order to not disturb implementation of agricultural works. They were interested in methods of water distribution once the canal construction is completed and whether the sufficient number of outlets is envisaged. The participants from affected communities raised questions related to duration and quality of construction works. They also suggested involving local population in construction activities.

The participants, including the women, attached high significance to the implemented activities in general. They were interested in all the details of the activities; whether an oversight over the quality of

the implemented works is planned, and the schedule of the implemented activities. They also underlined the importance of the quality of the activities that are to be implemented, asking to provide high quality standard work. There were suggestions to involve local workforce in the civil works process. In addition, women participants emphasized the importance of reliable irrigation water supply, which they consider as a crucial factor in ensuring high income from agricultural production in order to take care of their family needs.

All questions raised in the communities received exhaustive answers from the specialists of PIU. The environmental and social issues presented by the concerned people and the associated mitigation measures have been included in the present EMP.

8 Environmental and Social Clauses for Civil Works' Contracts

Most negative impacts that are likely to occur during the rehabilitation works may be mitigated by including appropriate clauses into the civil works contracts. This EMP will be made a part of the Technical Specification and incorporated into the Civil Works Contract clauses are included in **Annex E** of this document.

9 Main Findings

This EMP examined the implementation of the proposed rehabilitation of the selected tertiary irrigation networks. All the likely negative environmental and social impacts are to be short-term and localized and envisaged to be prevented and/or mitigated and the positive impacts strengthened in the result of implementation of mitigation and enhancement measures included in the EMP (**Annex A**) and environmental and social clauses of the civil works' contracts (**Annex E**).

The positive socio-economic and environmental effects of the project outweigh the likely environmental risks associated with its implementation. Implementation of the project will improve the productivity of irrigated arable lands, as well as quality and quantity of the crops applied leading to improved social and economic welfare of the local farmers, including men and women. It will provide with more reliable supply of irrigation water with considerable savings in operation and maintenance costs and water losses will be significantly reduced. All these will facilitate extension of irrigated land holdings thereby reducing erosion and desertification.

Annexes

Annex A: Environmental Management Plan: Mitigation Measures

POTENTIAL NEGATIVE IMPACT	ENVIRONMENTAL AND SOCIAL MITIGATION OR MONITORING MEASURES	EXECUTING AGENCY	SUPERVISING AGENCY	COST (To be quantified where possible)	TIMING
<i>Design Phase</i>					
Pollution of water and soil, degradation of landscapes as a result of improper disposal of excavated materials and construction wastes	Obtain appropriate permits and/or agreements for disposal of excavated materials and construction wastes, use of water resource and water systems, etc.	FS/FD Consultant	PIU	Part of the contract with the FS/FD Consultant	During design
	Develop a list and specifications for construction temporary sites such as access roads, construction camps, transport and machinery maintenance sites, storage facilities, etc.	FS/FD Consultant	PIU	Part of the contract with the FS/FD Consultant	During design
Temporary air pollution (dust) related to the transportation of construction materials and truck traffic	Develop the traffic management plan on canal service roads to ensure smooth traffic flow and safety both for workers, local traffic and population	FS/FD Consultant	PIU	Part of the contract with the FS/FD Consultant	During design
Landscape degradation and soil erosion	Develop measures to strengthen the steep slopes with vegetation, grass and plants or gabions. Consider the use of plant species characteristic for the landscape in the course of restoration of the vegetation cover.	FS/FD Consultant	PIU	Part of the contract with the FS/FD Consultant	During design

POTENTIAL NEGATIVE IMPACT	ENVIRONMENTAL AND SOCIAL MITIGATION OR MONITORING MEASURES	EXECUTING AGENCY	SUPERVISING AGENCY	COST (To be quantified where possible)	TIMING
	Develop efficient methods for disposal or backfilling of extracted soils. Sites without vegetative cover and within the alienation zone or specifically designated by local areas shall be used for storing the excavated soils.	FS/FD Consultant	PIU	Part of the contract with the FS/FD Consultant	During design
Temporary or permanent taking of property or productive assets, including peoples' access to such assets that appear within the alienation zone that hinder construction works	Develop such technical approaches and solutions to the construction of the system, which, to the extent possible, allow implementation of construction works without demolition and dislocation of private and community properties. Any taking of property, permanent or temporary, will be in compliance with WB OP4.12, the RPF and a RAP.	FS/FD Consultant	PIU	Part of the contract with the FS/FD Consultant	During design
	If dislocation and/or demolition or temporary or permanent use of the assets is required for implementation of the works, the compensation shall be envisaged for the affected people in compliance with WB OP4.12, the RPF and a RAP.	FS/FD Consultant	PIU	Part of the contract with the FS/FD Consultant	During design
	Servitudes must be ensured for the temporary and permanent use of community and private lands (if applicable).	FS/FD Consultant	PIU	Part of the contract with the FS/FD Consultant	During design, before construction works start

POTENTIAL NEGATIVE IMPACT	ENVIRONMENTAL AND SOCIAL MITIGATION OR MONITORING MEASURES	EXECUTING AGENCY	SUPERVISING AGENCY	COST (To be quantified where possible)	TIMING
<i>Construction Phase</i>					
Spillage of oil or toxic substances	Implement the measures to control spillage of toxic substances that will be included in construction contracts, including: guidelines for the proper storage and siting of hazardous material such as oil, grease, fuel, asphalt, or ignitable and corrosive materials; lubricants will be collected in clearly marked containers and reused if possible, or disposed of at properly regulated offsite locations; water samples will be taken and tested for oil when there is a risk of spills or leakages to canal waters, surface waters, or groundwater.	Construction Contractor	PIU through Construction Supervisor	Part of the contract with Construction Contractor	During construction works
Temporary air pollution (dust) related to the transportation of construction materials and truck traffic	Use closed/covered trucks for transportation of construction materials and wastes. Depending on season, wash truck tires as appropriate at the specially designed car washing sites to control tracking mud and dust onto paved roads.	Construction Contractor	PIU through Construction Supervisor	Part of the contract with Construction Contractor	During construction works
noise and. vibration disturbances	Clean the surrounding area from dust by water sprinkling (except in Winter), remove excess materials and clean the sites upon completion of activities	Construction Contractor	PIU through Construction Supervisor	Part of the contract with Construction Contractor	During construction works

POTENTIAL NEGATIVE IMPACT	ENVIRONMENTAL AND SOCIAL MITIGATION OR MONITORING MEASURES	EXECUTING AGENCY	SUPERVISING AGENCY	COST (To be quantified where possible)	TIMING
	Provide workers that deal with hazardous materials or exposed to dust with necessary protection gear, and follow applicable regulations and procedures as established by GoA authorities.	Construction Contractor	PIU through Construction Supervisor	Part of the contract with Construction Contractor	During construction works
	Terminate the works at the established time (e.g. work in daylight time) and avoid increase of noise and number of peak hours. Consult with local authorities	Construction Contractor	PIU through Construction Supervisor	Part of the contract with Construction Contractor	During construction works
Impacts on safety of personnel	Workers during cement pouring and while using heavy equipment shall have and use safety equipment	Construction Contractor	PIU through Construction Supervisor	Part of the contract with Construction Contractor	During construction works
Impacts on historic-cultural monuments or artifacts	Cease the works as soon as historical and cultural monuments or artifacts are encountered and immediately provide relevant information to the State Agency for Historical and Cultural Monuments Protection	Construction Contractor	PIU through Construction Supervisor	GoA funding if urgent excavations are required	During construction works
Landscape degradation and soil erosion	Arable land shall not be used as earth borrowing. If unavoidable the topsoil (about 30 cm) shall be removed, kept at specifically designated sites and refilled.	Construction Contractor	PIU through Construction Supervisor	Part of the contract with Construction Contractor	During construction works
	Dump excavated soils and substances only within the areas designated for that purpose.	Construction Contractor	PIU through Construction Supervisor	Part of the contract with Construction Contractor	During construction works

POTENTIAL NEGATIVE IMPACT	ENVIRONMENTAL AND SOCIAL MITIGATION OR MONITORING MEASURES	EXECUTING AGENCY	SUPERVISING AGENCY	COST (To be quantified where possible)	TIMING
	Restore landscape to quasi-original vegetation cover after completion of rehabilitation works.	Construction Contractor	PIU through Construction Supervisor	Part of the contract with Construction Contractor	During construction works
Temporary or permanent taking of property or productive assets, including peoples' access to such assets, (including tree cutting) that appear within the alienation zone that hinder construction works	If it is required to develop and implement the Resettlement Action Plan, and/or obtain servitude, the construction works will start after the compensations are paid to the project affected persons (PAPs) and servitudes acquired. These must be guided by the Armenian legislation and WB guidelines.	GoA through relevant entity	PIU	GoA funding	Before construction works start in the particular section
	If demolition and/or dislocation is required, the project affected persons will be compensated in accordance with WB OP4.12 before the construction starts.	GoA through relevant entity	PIU	GoA funding	Before construction works start in the particular section
<i>Operation Phase</i>					
Hydrological issues of flooding, low flow and water stagnation	Maintain the water conduit and hydro-technical structures to minimize the risk for water stagnation and accidents.	WSA, WUA	SCWS	Regular Operation and Maintenance cost	During operation
	Operate the water intakes in such a way that the water withdrawal is properly controlled to avoid withdrawing more water than allowed.	WSA, WUA	SCWS	Regular Operation and Maintenance cost	During operation

POTENTIAL NEGATIVE IMPACT	ENVIRONMENTAL AND SOCIAL MITIGATION OR MONITORING MEASURES	EXECUTING AGENCY	SUPERVISING AGENCY	COST (To be quantified where possible)	TIMING
	Maintain the canal beds and hydraulic structures to avoid water stagnation.	WSA, WUA	SCWS	Regular Operation and Maintenance cost	During operation
	Regularly clean slit from the canals bed and dispose the removed slit in the approved waste disposal sites. The removed slit can be also applied in the farm-fields as a fertilizer.	WSA, WUA	SCWS	Regular Operation and Maintenance cost	During operation
Negative impact on human and environmental health as a result of increased use of pesticides in the areas with improved irrigation	Conduct of public awareness campaign and extension of applicable IPM technologies to water users	PIU through pest management consultant, WSA, WUA	SCWS	Included in the project procurement plan as procurement of consulting services	Although this impact is expected during operation, the mitigation measure is proactive and will be applied during operation
Siltation in canals	Training of WSA staff on proper operation and maintenance	PIU/WSA	SCWS	Regular operation and maintenance	During operation

Annex B: Monitoring Plan

This monitoring plan will be used to determine compliance with the Environmental Management Plan (Annex A).

Phase	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored?/ type of monitoring equipment	When is the parameter to be monitored? (frequency of measurement or continuous)	Cost	Reporting Agency
Design	Material borrows and dumps	At the design consultant	Perspective borrows and dumps identified	During the design	Minimal additional design cost	PIU
	Road accessibility to the structures	At the design consultant	Inspection	During the design	Minimal additional design cost	PIU
Construction	Soil erosion	In new cutting areas and slopes	Inspections at site and soils mechanical information	During and after construction work, when deemed necessary	Minimal additional construction cost	PIU through Construction Supervisor
	Water pollution	In water bodies	Inspection	During construction works	Minimal additional construction cost	PIU through Construction Supervisor
	Air pollution/dust	At working site	Visual inspection	During earth works, when deemed necessary	Minimal additional construction cost	PIU through Construction Supervisor
	Noise	At working site	Inspection of noise levels (dB)	During earth works and blast, when deemed necessary and on complaint	Minimal additional construction cost	PIU through Construction Supervisor

Phase	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored?/ type of monitoring equipment	When is the parameter to be monitored? (frequency of measurement or continuous)	Cost	Reporting Agency
	Conservation of vegetation resources	At working site	Inspection	When cutting and restoring used areas	Minimal additional construction cost	PIU through Construction Supervisor
	Staff safety (protective equipment)	At work site	Inspection	Unannounced inspections during work	Minimal additional construction cost	PIU through Construction Supervisor
	Overall workers' camp site conditions	On the camp site during construction activities	Inspection	According to the existing regulations	Minimal additional construction cost	PIU through Construction Supervisor
	Conduct of campaign for rising awareness of IPM and sound use of pesticides	WUA offices and water user communities	Inspection Survey	After formal launch of the campaign	Minimal additional cost to operational budget of PIU	PIU
Operation	Maintenance of irrigation delivery system	On site	Inspection	Continuous – full scale desiltation required yearly	Routine operation and maintenance cost	WSA, WUA
	Maintenance of irrigation off-takes and other structures	On site	Inspection	When needed	Routine operation and maintenance cost	WSA, WUA

Annex C: Incident Report Form

REHABILITATION OF TERTIARY IRRIGATION NETWORKS IN ARMAVIR MARZ

1	Date:	
2	Tertiary Canal:	
3	Location:	
4	Construction Contractor:	
5	Marz and Community:	
6	WUA	
7	Incident Type:	
8	Severity:	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low
9	Reported By:	
10	Description of Incident Root Cause:	
11	Corrective Action Taken:	
12	Corrective Action to be Taken:	
13	Action Taken to Prevent Recurrence:	
14	Corrective Action Carried Out By:	
15	Close Out By:	
16	Close Out Date:	
17	Person Involved:	
18	Machine Involved:	
19	Contractor/Sub Contractor Involved:	
20	Third Party Involvement:	
21	Photo Reference – Attached:	<i>The photos with appropriate descriptions shall be presented as an Attachment to the Incident Report</i>

For PIU use only

<i>Date</i>	
<i>Received by:</i>	
<i>Decision/Action made:</i>	

Annex D: Check List of Potential Environmental and Social Impacts

Project Name/location: **Rehabilitation of Bagramyan Community Tertiary Canal**

Assessor's name/position: Design Consultant, "Jrtuk" LLC, Chief Design Engineer's Team

Date(s) of Assessment: August, 2011

		Positive impact likely	Positive impact possible	No impact likely	Negative impact possible	Negative impact likely	No judgment possible at present	Comments
For each environmental effect place a cross (X) in one or two of the columns								N/A = Environmental effect is Not Applicable in this case For detailed explanation refer to the appropriate sections of this EMP
Hydrology	1-1 Low flow regime				X			Irrigation water shortage
	1-2 Flood regime			X				N/A, as the water intake is regulated.
	1-3 Operation of dams			X				N/A within the context of this project
	1-4 Fall of water table			X				Ground water in this area is 70 m and more deep.
	1-5 Rise of water table			X				Ground water in this area is 70 m and more deep.
Pollution	2-1 Solute dispersion			X				Not observed
	2-2 Toxic substances			X				Not observed
	2-3 Organic pollution			X				Not observed
	2-4 Anaerobic effects			X				N/A within the context of this project
	2-5 Gas emissions			X				N/A within the context of this project
Soils	3-1 Soil salinity			X				
	3-2 Soil properties		X					
	3-3 Saline groundwater			X				N/A
	3-4 Saline drainage			X				N/A within the context of this project
	3-5 Saline intrusion			X				N/A within the context of this project
Sediments	4-1 Local erosion					X		
	4-2 Hinterland effect			X				
	4-3 River morphology			X				
	4-4 Channel regime			X				
	4-5 Sedimentation			X				
	4-6 Estuary erosion			X				N/A within the context of this project
Ecology	5-1 Project lands		X			X		
	5-2 Water bodies			X				N/A within the context of this project
	5-3 Surrounding area			X				N/A within the context of this project
	5-4 Valleys & shores			X				N/A within the context of this project
	5-5 Wetlands & plains			X				N/A within the context of this project
	5-6 Rare species			X				No specially protected areas observed
	5-7 Animal migration					X		Temporarily, caused by civil works
	5-8 Natural industry	X						
Socio-economic	6-1 Population change	X						
	6-2 Income & amenity	X						
	6-3 Human migration		X					
	6-4 Resettlement							All the works will be implemented within the alienation zone of the existing infrastructure.
	6-5 Women's role			X				
	6-6 Minority groups			X				Existing minority groups equally share project benefits.
	6-7 Sites of value			X				N/A within the context of this project
	6-8 Regional effects			X				
	6-9 User involvement							The design was prepared in consultation with "Karakert" WUA and other stakeholders. Formal and informal public consultations were held during the design phase.
	6-10 Recreation			X				
Health	7-1 Water & sanitation			X				
	7-2 Habitation			X				
	7-3 Health services			X				
	7-4 Nutrition			X				N/A within the context of tertiary canals
	7-5 Relocation effect			X				N/A within the context of tertiary canals
	7-6 Disease ecology			X				N/A within the context of tertiary canals
	7-7 Disease hosts			X				N/A within the context of tertiary canals
	7-8 Disease control			X				N/A within the context of tertiary canals
Imbalances	7-9 Other hazards			X				N/A within the context of tertiary canals
	8-1 Pests & weeds			X				N/A within the context of tertiary canals
	8-2 Animal diseases			X				N/A within the context of tertiary canals
	8-3 Aquatic weeds			X				
	8-4 Structural damage			X				
8-5 Animal imbalances			X					
Number of crosses		3	4	43	1	3	0	Total possible = 53 (Unless positive & negative impacts)

Project Name/location: **Rehabilitation of Myasniky Community Tertiary Canal**

Assessor's name/position: Design Consultant, "Jrtuk" LLC, Chief Design Engineer's Team

Date(s) of Assessment: July, 2011

		Positive impact likely	Positive impact possible	No impact likely	Negative impact possible	Negative impact likely	No judgement possible at present	Comments
		For each environmental effect place a cross (X) in one or two of the columns						N/A = Environmental effect is Not Applicable in this case For detailed explanation refer to the appropriate sections of this EMP
Hydrology	1-1 Low flow regime			X				N/A within the context of this project
	1-2 Flood regime			X				N/A within the context of this project
	1-3 Operation of dams			X				N/A within the context of this project
	1-4 Fall of water table			X				Ground water in this area is 3-5 m deep.
	1-5 Rise of water table			X				Ground water in this area is 3-5 m deep.
Pollution	2-1 Solute dispersion			X				N/A within the context of this project
	2-2 Toxic substances			X				N/A within the context of this project
	2-3 Organic pollution			X				N/A within the context of this project
	2-4 Anaerobic effects			X				N/A within the context of this project
	2-5 Gas emissions			X				N/A within the context of this project
Soils	3-1 Soil salinity			X				
	3-2 Soil properties		X					
	3-3 Saline groundwater			X				
	3-4 Saline drainage			X				N/A within the context of this project
	3-5 Saline intrusion			X				N/A within the context of this project
Sediments	4-1 Local erosion					X		
	4-2 Hinterland effect			X				
	4-3 River morphology			X				N/A within the context of this project
	4-4 Channel regime			X				
	4-5 Sedimentation		X					
	4-6 Estuary erosion			X				N/A within the context of this project
Ecology	5-1 Project lands					X		
	5-2 Water bodies			X				N/A within the context of this project
	5-3 Surrounding area			X				N/A within the context of this project
	5-4 Valleys & shores			X				N/A within the context of this project
	5-5 Wetlands & plains			X				N/A within the context of this project
	5-6 Rare species			X				No specially protected areas observed
	5-7 Animal migration					X		Temporarily, caused by civil works
	5-8 Natural industry			X				
Socio-economic	6-1 Population change			X				
	6-2 Income & amenity			X				
	6-3 Human migration			X				
	6-4 Resettlement			X				All the works will be implemented within the alienation zone of the existing infrastructure.
	6-5 Women's role			X				
	6-6 Minority groups			X				Existing minority groups equally share project benefits.
	6-7 Sites of value			X				N/A within the context of this project
	6-8 Regional effects			X				
	6-9 User involvement			X				The design was prepared in consultation with "Karakert" WUA and other stakeholders. Formal and informal public consultations were held during the design phase.
	6-10 Recreation			X				
Health	7-1 Water & sanitation			X				
	7-2 Habitation			X				
	7-3 Health services			X				
	7-4 Nutrition			X				N/A within the context of tertiary canals
	7-5 Relocation effect			X				N/A within the context of tertiary canals
	7-6 Disease ecology			X				N/A within the context of tertiary canals
	7-7 Disease hosts			X				N/A within the context of tertiary canals
	7-8 Disease control			X				N/A within the context of tertiary canals
	7-9 Other hazards			X				N/A within the context of tertiary canals
Imbalances	8-1 Pests & weeds			X				N/A within the context of tertiary canals
	8-2 Animal diseases			X				N/A within the context of tertiary canals
	8-3 Aquatic weeds		X					
	8-4 Structural damage			X				
	8-5 Animal imbalances			X				
Number of crosses		0	3	47	0	3	0	Total possible = 53 (Unless positive & negative impacts)

Project Name/location: **Rehabilitation of Dalarik Community Tertiary Canal**

Assessor's name/position: Design Consultant, "Jrtuk" LLC, Chief Design Engineer's Team

Date(s) of Assessment: June, 2011

		Positive impact likely	Positive impact possible	No impact likely	Negative impact possible	Negative impact likely	No judgement possible at present	Comments
		For each environmental effect place a cross (X) in one or two of the columns						N/A = Environmental effect is Not Applicable in this case For detailed explanation refer to the appropriate sections of this EMP
Hydrology	1-1 Low flow regime			X				N/A within the context of this project
	1-2 Flood regime			X				N/A within the context of this project
	1-3 Operation of dams			X				N/A within the context of this project
	1-4 Fall of water table			X				Ground water in this area is 3-5 m deep.
	1-5 Rise of water table			X				Ground water in this area is 3-5 m deep.
Pollution	2-1 Solute dispersion			X				N/A within the context of this project
	2-2 Toxic substances			X				N/A within the context of this project
	2-3 Organic pollution			X				N/A within the context of this project
	2-4 Anaerobic effects			X				N/A within the context of this project
	2-5 Gas emissions			X				N/A within the context of this project
Soils	3-1 Soil salinity			X				
	3-2 Soil properties		X					
	3-3 Saline groundwater			X				
	3-4 Saline drainage			X				N/A within the context of this project
	3-5 Saline intrusion			X				N/A within the context of this project
Sediments	4-1 Local erosion					X		
	4-2 Hinterland effect			X				
	4-3 River morphology			X				N/A within the context of this project
	4-4 Channel regime			X				
	4-5 Sedimentation		X					
	4-6 Estuary erosion			X				N/A within the context of this project
Ecology	5-1 Project lands					X		
	5-2 Water bodies			X				N/A within the context of this project
	5-3 Surrounding area			X				N/A within the context of this project
	5-4 Valleys & shores			X				N/A within the context of this project
	5-5 Wetlands & plains			X				N/A within the context of this project
	5-6 Rare species			X				No specially protected areas observed
	5-7 Animal migration					X		Temporarily, caused by civil works
	5-8 Natural industry			X				
Socio-economic	6-1 Population change			X				
	6-2 Income & amenity			X				
	6-3 Human migration			X				
	6-4 Resettlement			X				All the works will be implemented within the alienation zone of the existing infrastructure.
	6-5 Women's role			X				
	6-6 Minority groups			X				Existing minority groups equally share project benefits.
	6-7 Sites of value			X				N/A within the context of this project
	6-8 Regional effects			X				
	6-9 User involvement			X				The design was prepared in consultation with "Karakert" WUA and other stakeholders. Formal and informal public consultations were held during the design phase.
	6-10 Recreation			X				
Health	7-1 Water & sanitation			X				
	7-2 Habitation			X				
	7-3 Health services			X				
	7-4 Nutrition			X				N/A within the context of tertiary canals
	7-5 Relocation effect			X				N/A within the context of tertiary canals
	7-6 Disease ecology			X				N/A within the context of tertiary canals
	7-7 Disease hosts			X				N/A within the context of tertiary canals
	7-8 Disease control			X				N/A within the context of tertiary canals
	7-9 Other hazards			X				N/A within the context of tertiary canals
Imbalances	8-1 Pests & weeds			X				N/A within the context of tertiary canals
	8-2 Animal diseases			X				N/A within the context of tertiary canals
	8-3 Aquatic weeds		X					
	8-4 Structural damage			X				
	8-5 Animal imbalances			X				
Number of crosses		0	3	47	0	3	0	Total possible = 53 (Unless positive & negative impacts)

Project Name/location:

Rehabilitation of Karakert Community Tertiary Canal

Assessor's name/position: Design Consultant, "Jrtuk" LLC, Chief Design Engineer's Team

Date(s) of Assessment: August, 2011

		Positive impact likely	Positive impact possible	No impact likely	Negative impact possible	Negative impact likely	No judgment possible at present	Comments	
		For each environmental effect place a cross (X) in one or two of the columns							N/A = Environmental effect is Not Applicable in this case For detailed explanation refer to the appropriate sections of this EMP
Hydrology	1-1 Low flow regime			X				N/A within the context of this project	
	1-2 Flood regime			X				N/A within the context of this project	
	1-3 Operation of dams			X				N/A within the context of this project	
	1-4 Fall of water table			X				Ground water in this area is 3-5 m deep.	
	1-5 Rise of water table			X				Ground water in this area is 3-5 m deep.	
Pollution	2-1 Solute dispersion			X				N/A within the context of this project	
	2-2 Toxic substances			X				N/A within the context of this project	
	2-3 Organic pollution			X				N/A within the context of this project	
	2-4 Anaerobic effects			X				N/A within the context of this project	
	2-5 Gas emissions			X				N/A within the context of this project	
Soils	3-1 Soil salinity			X					
	3-2 Soil properties		X						
	3-3 Saline groundwater			X					
	3-4 Saline drainage			X				N/A within the context of this project	
	3-5 Saline intrusion			X				N/A within the context of this project	
Sediments	4-1 Local erosion					X			
	4-2 Hinterland effect			X					
	4-3 River morphology			X				N/A within the context of this project	
	4-4 Channel regime			X					
	4-5 Sedimentation		X						
	4-6 Estuary erosion			X				N/A within the context of this project	
Ecology	5-1 Project lands					X			
	5-2 Water bodies			X				N/A within the context of this project	
	5-3 Surrounding area			X				N/A within the context of this project	
	5-4 Valleys & shores			X				N/A within the context of this project	
	5-5 Wetlands & plains			X				N/A within the context of this project	
	5-6 Rare species			X				No specially protected areas observed	
	5-7 Animal migration					X		Temporarily, caused by civil works	
	5-8 Natural industry			X					
Socio-economic	6-1 Population change			X					
	6-2 Income & amenity			X					
	6-3 Human migration			X					
	6-4 Resettlement			X				All the works will be implemented within the alienation zone of the existing infrastructure.	
	6-5 Women's role			X					
	6-6 Minority groups			X				Existing minority groups equally share project benefits.	
	6-7 Sites of value			X				N/A within the context of this project	
	6-8 Regional effects			X					
	6-9 User involvement			X				The design was prepared in consultation with "Karakert" WUA and other stakeholders. Formal and informal public consultations were held during the design phase.	
	6-10 Recreation			X					
Health	7-1 Water & sanitation			X					
	7-2 Habitation			X					
	7-3 Health services			X					
	7-4 Nutrition			X				N/A within the context of tertiary canals	
	7-5 Relocation effect			X				N/A within the context of tertiary canals	
	7-6 Disease ecology			X				N/A within the context of tertiary canals	
	7-7 Disease hosts			X				N/A within the context of tertiary canals	
	7-8 Disease control			X				N/A within the context of tertiary canals	
	7-9 Other hazards			X				N/A within the context of tertiary canals	
Imbalances	8-1 Pests & weeds			X				N/A within the context of tertiary canals	
	8-2 Animal diseases			X				N/A within the context of tertiary canals	
	8-3 Aquatic weeds		X						
	8-4 Structural damage			X					
	8-5 Animal imbalances			X					
Number of crosses		0	3	47	0	3	0	Total possible = 53 (Unless positive & negative impacts)	

Project Name/location: **Rehabilitation of Bagaran Community Tertiary Canal**

Assessor's name/position: Design Consultant, "Jrtuk" LLC, Chief Design Engineer's Team

Date(s) of Assessment: August, 2011

		Positive impact likely	Positive impact possible	No impact likely	Negative impact possible	Negative impact likely	No judgement possible at present	Comments
		For each environmental effect place a cross (X) in one or two of the columns						N/A = Environmental effect is Not Applicable in this case For detailed explanation refer to the appropriate sections of this EMP
Hydrology	1-1 Low flow regime			X				N/A within the context of this project
	1-2 Flood regime			X				N/A within the context of this project
	1-3 Operation of dams			X				N/A within the context of this project
	1-4 Fall of water table			X				Ground water in this area is 3-5 m deep.
	1-5 Rise of water table			X				Ground water in this area is 3-5 m deep.
Pollution	2-1 Solute dispersion			X				N/A within the context of this project
	2-2 Toxic substances			X				N/A within the context of this project
	2-3 Organic pollution			X				N/A within the context of this project
	2-4 Anaerobic effects			X				N/A within the context of this project
	2-5 Gas emissions			X				N/A within the context of this project
Soils	3-1 Soil salinity			X				
	3-2 Soil properties		X					
	3-3 Saline groundwater			X				
	3-4 Saline drainage			X				N/A within the context of this project
	3-5 Saline intrusion			X				N/A within the context of this project
Sediments	4-1 Local erosion					X		
	4-2 Hinterland effect			X				
	4-3 River morphology			X				N/A within the context of this project
	4-4 Channel regime			X				
	4-5 Sedimentation		X					
	4-6 Estuary erosion			X				N/A within the context of this project
Ecology	5-1 Project lands					X		
	5-2 Water bodies			X				N/A within the context of this project
	5-3 Surrounding area			X				N/A within the context of this project
	5-4 Valleys & shores			X				N/A within the context of this project
	5-5 Wetlands & plains			X				N/A within the context of this project
	5-6 Rare species			X				No specially protected areas observed
	5-7 Animal migration					X		Temporarily, caused by civil works
	5-8 Natural industry			X				
Socio-economic	6-1 Population change			X				
	6-2 Income & amenity			X				
	6-3 Human migration			X				
	6-4 Resettlement			X				All the works will be implemented within the alienation zone of the existing infrastructure.
	6-5 Women's role			X				
	6-6 Minority groups			X				Existing minority groups equally share project benefits.
	6-7 Sites of value			X				N/A within the context of this project
	6-8 Regional effects			X				
	6-9 User involvement			X				The design was prepared in consultation with "Shenik" WUA and other stakeholders. Formal and informal public consultations were held during the design phase.
	6-10 Recreation			X				
Health	7-1 Water & sanitation			X				
	7-2 Habitation			X				
	7-3 Health services			X				
	7-4 Nutrition			X				N/A within the context of tertiary canals
	7-5 Relocation effect			X				N/A within the context of tertiary canals
	7-6 Disease ecology			X				N/A within the context of tertiary canals
	7-7 Disease hosts			X				N/A within the context of tertiary canals
	7-8 Disease control			X				N/A within the context of tertiary canals
	7-9 Other hazards			X				N/A within the context of tertiary canals
Imbalances	8-1 Pests & weeds			X				N/A within the context of tertiary canals
	8-2 Animal diseases			X				N/A within the context of tertiary canals
	8-3 Aquatic weeds		X					
	8-4 Structural damage			X				
	8-5 Animal imbalances			X				
Number of crosses		0	3	47	0	3	0	Total possible = 53 (Unless positive & negative impacts)

Project Name/location: **Rehabilitation of Vanand Community Tertiary Canal**

Assessor's name/position: Design Consultant, "Haygiughshinnakhagits" Ltd., Chief Design Engineer's Team

Date(s) of Assessment: August, 2011

		Positive impact likely	Positive impact possible	No impact likely	Negative impact possible	Negative impact likely	No judgment possible at present	Comments	
		For each environmental effect place a cross (X) in one or two of the columns							N/A = Environmental effect is Not Applicable in this case For detailed explanation refer to the appropriate sections of this EMP
Hydrology	1-1 Low flow regime			X				N/A within the context of this project	
	1-2 Flood regime			X				N/A within the context of this project	
	1-3 Operation of dams			X				N/A within the context of this project	
	1-4 Fall of water table			X				Ground water in this area is 3-5 m deep.	
	1-5 Rise of water table			X				Ground water in this area is 3-5 m deep.	
Pollution	2-1 Solute dispersion			X				N/A within the context of this project	
	2-2 Toxic substances			X				N/A within the context of this project	
	2-3 Organic pollution			X				N/A within the context of this project	
	2-4 Anaerobic effects			X				N/A within the context of this project	
	2-5 Gas emissions			X				N/A within the context of this project	
Soils	3-1 Soil salinity			X					
	3-2 Soil properties		X						
	3-3 Saline groundwater			X					
	3-4 Saline drainage			X				N/A within the context of this project	
	3-5 Saline intrusion			X				N/A within the context of this project	
Sediments	4-1 Local erosion					X			
	4-2 Hinterland effect			X					
	4-3 River morphology			X				N/A within the context of this project	
	4-4 Channel regime			X					
	4-5 Sedimentation		X						
	4-6 Estuary erosion			X				N/A within the context of this project	
Ecology	5-1 Project lands					X			
	5-2 Water bodies			X				N/A within the context of this project	
	5-3 Surrounding area			X				N/A within the context of this project	
	5-4 Valleys & shores			X				N/A within the context of this project	
	5-5 Wetlands & plains			X				N/A within the context of this project	
	5-6 Rare species			X				No specially protected areas observed	
	5-7 Animal migration					X		Temporarily, caused by civil works	
	5-8 Natural industry			X					
Socio-economic	6-1 Population change			X					
	6-2 Income & amenity			X					
	6-3 Human migration			X					
	6-4 Resettlement			X				All the works will be implemented within the alienation zone of the existing infrastructure.	
	6-5 Women's role			X					
	6-6 Minority groups			X				Existing minority groups equally share project benefits.	
	6-7 Sites of value			X				N/A within the context of this project	
	6-8 Regional effects			X					
	6-9 User involvement			X				The design was prepared in consultation with "Shenik" WUA and other stakeholders. Formal and informal public consultations were held during the design phase.	
	6-10 Recreation			X					
Health	7-1 Water & sanitation			X					
	7-2 Habitation			X					
	7-3 Health services			X					
	7-4 Nutrition			X				N/A within the context of tertiary canals	
	7-5 Relocation effect			X				N/A within the context of tertiary canals	
	7-6 Disease ecology			X				N/A within the context of tertiary canals	
	7-7 Disease hosts			X				N/A within the context of tertiary canals	
	7-8 Disease control			X				N/A within the context of tertiary canals	
	7-9 Other hazards			X				N/A within the context of tertiary canals	
Imbalances	8-1 Pests & weeds			X				N/A within the context of tertiary canals	
	8-2 Animal diseases			X				N/A within the context of tertiary canals	
	8-3 Aquatic weeds		X						
	8-4 Structural damage			X					
	8-5 Animal imbalances			X					
Number of crosses		0	3	47	0	3	0	Total possible = 53 (Unless positive & negative impacts)	

Project Name/location: **Rehabilitation of Yervandashat Community Tertiary Canal**

Assessor's name/position: Design Consultant, "Jrtuk" LLC, Chief Design Engineer's Team

Date(s) of Assessment: August, 2011

		Positive impact likely	Positive impact possible	No impact likely	Negative impact possible	Negative impact likely	No judgement possible at present	Comments
For each environmental effect place a cross (X) in one or two of the columns								N/A = Environmental effect is Not Applicable in this case For detailed explanation refer to the appropriate sections of this EMP
Hydrology	1-1 Low flow regime			X				N/A within the context of this project
	1-2 Flood regime			X				N/A within the context of this project
	1-3 Operation of dams			X				N/A within the context of this project
	1-4 Fall of water table			X				Ground water in this area is 3-5 m deep.
	1-5 Rise of water table			X				Ground water in this area is 3-5 m deep.
Pollution	2-1 Solute dispersion			X				N/A within the context of this project
	2-2 Toxic substances			X				N/A within the context of this project
	2-3 Organic pollution			X				N/A within the context of this project
	2-4 Anaerobic effects			X				N/A within the context of this project
	2-5 Gas emissions			X				N/A within the context of this project
Soils	3-1 Soil salinity			X				
	3-2 Soil properties		X					
	3-3 Saline groundwater			X				
	3-4 Saline drainage			X				N/A within the context of this project
	3-5 Saline intrusion			X				N/A within the context of this project
Sediments	4-1 Local erosion					X		
	4-2 Hinterland effect			X				
	4-3 River morphology			X				
	4-4 Channel regime			X				N/A within the context of this project
	4-5 Sedimentation		X					
Ecology	4-6 Estuary erosion			X				N/A within the context of this project
	5-1 Project lands					X		
	5-2 Water bodies			X				N/A within the context of this project
	5-3 Surrounding area			X				N/A within the context of this project
	5-4 Valleys & shores			X				N/A within the context of this project
	5-5 Wetlands & plains			X				N/A within the context of this project
	5-6 Rare species			X				No specially protected areas observed
	5-7 Animal migration					X		Temporarily, caused by civil works
Socio-economic	5-8 Natural industry			X				
	6-1 Population change			X				
	6-2 Income & amenity			X				
	6-3 Human migration			X				
	6-4 Resettlement			X				All the works will be implemented within the alienation zone of the existing infrastructure.
	6-5 Women's role			X				
	6-6 Minority groups			X				Existing minority groups equally share project benefits.
	6-7 Sites of value			X				N/A within the context of this project
	6-8 Regional effects			X				
	6-9 User involvement			X				The design was prepared in consultation with "Shenik" WUA and other stakeholders. Formal and informal public consultations were held during the design phase.
Health	6-10 Recreation			X				
	7-1 Water & sanitation			X				
	7-2 Habitation			X				
	7-3 Health services			X				
	7-4 Nutrition			X				N/A within the context of tertiary canals
	7-5 Relocation effect			X				N/A within the context of tertiary canals
	7-6 Disease ecology			X				N/A within the context of tertiary canals
	7-7 Disease hosts			X				N/A within the context of tertiary canals
	7-8 Disease control			X				N/A within the context of tertiary canals
	7-9 Other hazards			X				N/A within the context of tertiary canals
Imbalances	8-1 Pests & weeds			X				N/A within the context of tertiary canals
	8-2 Animal diseases			X				N/A within the context of tertiary canals
	8-3 Aquatic weeds		X					
	8-4 Structural damage			X				
	8-5 Animal imbalances			X				
Number of crosses		0	3	47	0	3	0	Total possible = 53 (Unless positive & negative impacts)

Project Name/location:

Rehabilitation of Lernag Community Tertiary Canal

Assessor's name/position: Design Consultant, "Haygiughshinnakhagits" Ltd., Chief Design Engineer's Team

Date(s) of Assessment: August, 2011

		Positive impact likely	Positive impact possible	No impact likely	Negative impact possible	Negative impact likely	No judgment possible at present	Comments
For each environmental effect place a cross (X) in one or two of the columns								N/A = Environmental effect is Not Applicable in this case For detailed explanation refer to the appropriate sections of this EMP
Hydrology	1-1 Low flow regime			X				N/A within the context of this project
	1-2 Flood regime			X				N/A within the context of this project
	1-3 Operation of dams			X				N/A within the context of this project
	1-4 Fall of water table			X				Ground water in this area is 3-5 m deep.
	1-5 Rise of water table			X				Ground water in this area is 3-5 m deep.
Pollution	2-1 Solute dispersion			X				N/A within the context of this project
	2-2 Toxic substances			X				N/A within the context of this project
	2-3 Organic pollution			X				N/A within the context of this project
	2-4 Anaerobic effects			X				N/A within the context of this project
	2-5 Gas emissions			X				N/A within the context of this project
Soils	3-1 Soil salinity			X				
	3-2 Soil properties		X					
	3-3 Saline groundwater			X				
	3-4 Saline drainage			X				N/A within the context of this project
	3-5 Saline intrusion			X				N/A within the context of this project
Sediments	4-1 Local erosion					X		
	4-2 Hinterland effect			X				
	4-3 River morphology			X				N/A within the context of this project
	4-4 Channel regime			X				
	4-5 Sedimentation		X					
	4-6 Estuary erosion			X				N/A within the context of this project
Ecology	5-1 Project lands					X		
	5-2 Water bodies			X				N/A within the context of this project
	5-3 Surrounding area			X				N/A within the context of this project
	5-4 Valleys & shores			X				N/A within the context of this project
	5-5 Wetlands & plains			X				N/A within the context of this project
	5-6 Rare species			X				No specially protected areas observed
	5-7 Animal migration					X		Temporarily, caused by civil works
	5-8 Natural industry			X				
Socio-economic	6-1 Population change			X				
	6-2 Income & amenity			X				
	6-3 Human migration			X				
	6-4 Resettlement			X				All the works will be implemented within the alienation zone of the existing infrastructure.
	6-5 Women's role			X				
	6-6 Minority groups			X				Existing minority groups equally share project benefits.
	6-7 Sites of value			X				N/A within the context of this project
	6-8 Regional effects			X				
	6-9 User involvement			X				The design was prepared in consultation with "Talin" WUA and other stakeholders. Formal and informal public consultations were held during the design phase.
	6-10 Recreation			X				
Health	7-1 Water & sanitation			X				
	7-2 Habitation			X				
	7-3 Health services			X				
	7-4 Nutrition			X				N/A within the context of tertiary canals
	7-5 Relocation effect			X				N/A within the context of tertiary canals
	7-6 Disease ecology			X				N/A within the context of tertiary canals
	7-7 Disease hosts			X				N/A within the context of tertiary canals
	7-8 Disease control			X				N/A within the context of tertiary canals
	7-9 Other hazards			X				N/A within the context of tertiary canals
Imbalances	8-1 Pests & weeds			X				N/A within the context of tertiary canals
	8-2 Animal diseases			X				N/A within the context of tertiary canals
	8-3 Aquatic weeds		X					
	8-4 Structural damage			X				
	8-5 Animal imbalances			X				
Number of crosses		0	3	47	0	3	0	Total possible = 53 (Unless positive & negative impacts)

Project Name/location: **Rehabilitation of Arevadasht Community Tertiary Canal**

Assessor's name/position: Design Consultant, "Haygiughshinnakhagits" Ltd., Chief Design Engineer's Team

Date(s) of Assessment: September, 2011

		Positive impact likely	Positive impact possible	No impact likely	Negative impact possible	Negative impact likely	No judgment possible at present	Comments	
		For each environmental effect place a cross (X) in one or two of the columns							N/A = Environmental effect is Not Applicable in this case For detailed explanation refer to the appropriate sections of this EMP
Hydrology	1-1 Low flow regime			X				N/A within the context of this project	
	1-2 Flood regime			X				N/A within the context of this project	
	1-3 Operation of dams			X				N/A within the context of this project	
	1-4 Fall of water table			X				Ground water in this area is 3-5 m deep.	
	1-5 Rise of water table			X				Ground water in this area is 3-5 m deep.	
Pollution	2-1 Solute dispersion			X				N/A within the context of this project	
	2-2 Toxic substances			X				N/A within the context of this project	
	2-3 Organic pollution			X				N/A within the context of this project	
	2-4 Anaerobic effects			X				N/A within the context of this project	
	2-5 Gas emissions			X				N/A within the context of this project	
Soils	3-1 Soil salinity			X					
	3-2 Soil properties		X						
	3-3 Saline groundwater			X					
	3-4 Saline drainage			X				N/A within the context of this project	
	3-5 Saline intrusion			X				N/A within the context of this project	
Sediments	4-1 Local erosion					X			
	4-2 Hinterland effect			X					
	4-3 River morphology			X				N/A within the context of this project	
	4-4 Channel regime			X					
	4-5 Sedimentation		X						
	4-6 Estuary erosion			X				N/A within the context of this project	
Ecology	5-1 Project lands					X			
	5-2 Water bodies			X				N/A within the context of this project	
	5-3 Surrounding area			X				N/A within the context of this project	
	5-4 Valleys & shores			X				N/A within the context of this project	
	5-5 Wetlands & plains			X				N/A within the context of this project	
	5-6 Rare species			X				No specially protected areas observed	
	5-7 Animal migration					X		Temporarily, caused by civil works	
	5-8 Natural industry			X					
Socio-economic	6-1 Population change			X					
	6-2 Income & amenity			X					
	6-3 Human migration			X					
	6-4 Resettlement			X				All the works will be implemented within the alienation zone of the existing infrastructure.	
	6-5 Women's role			X					
	6-6 Minority groups			X				Existing minority groups equally share project benefits.	
	6-7 Sites of value			X				N/A within the context of this project	
	6-8 Regional effects			X					
	6-9 User involvement			X				The design was prepared in consultation with "Armarir" WUA and other stakeholders. Formal and informal public consultations were held during the design phase.	
	6-10 Recreation			X					
Health	7-1 Water & sanitation			X					
	7-2 Habitation			X					
	7-3 Health services			X					
	7-4 Nutrition			X				N/A within the context of tertiary canals	
	7-5 Relocation effect			X				N/A within the context of tertiary canals	
	7-6 Disease ecology			X				N/A within the context of tertiary canals	
	7-7 Disease hosts			X				N/A within the context of tertiary canals	
	7-8 Disease control			X				N/A within the context of tertiary canals	
	7-9 Other hazards			X				N/A within the context of tertiary canals	
Imbalances	8-1 Pests & weeds			X				N/A within the context of tertiary canals	
	8-2 Animal diseases			X				N/A within the context of tertiary canals	
	8-3 Aquatic weeds		X						
	8-4 Structural damage			X					
	8-5 Animal imbalances			X					
Number of crosses		0	3	47	0	3	0	Total possible = 53 (Unless positive & negative impacts)	

Project Name/location: **Rehabilitation of Hatsik Community Tertiary Canal**

Assessor's name/position: Design Consultant, "Jrarbi" Ltd., Chief Design Engineer's Team

Date(s) of Assessment:: June, 2011

		Positive impact likely	Positive impact possible	No impact likely	Negative impact possible	Negative impact likely	No judgement possible at present	Comments
								Comments
								N/A = Environmental effect is Not Applicable in this case
								For detailed explanation refer to the appropriate sections of this EMP
For each environmental effect place a cross (X) in one or two of the columns								
Hydrology	1-1 Low flow regime			X				N/A within the context of this project
	1-2 Flood regime			X				N/A within the context of this project
	1-3 Operation of dams			X				N/A within the context of this project
	1-4 Fall of water table			X				Ground water in this area is 3-5 m deep.
	1-5 Rise of water table			X				Ground water in this area is 3-5 m deep.
Pollution	2-1 Solute dispersion			X				N/A within the context of this project
	2-2 Toxic substances			X				N/A within the context of this project
	2-3 Organic pollution			X				N/A within the context of this project
	2-4 Anaerobic effects			X				N/A within the context of this project
	2-5 Gas emissions			X				N/A within the context of this project
Soils	3-1 Soil salinity			X				
	3-2 Soil properties		X					
	3-3 Saline groundwater			X				
	3-4 Saline drainage			X				N/A within the context of this project
	3-5 Saline intrusion			X				N/A within the context of this project
Sediments	4-1 Local erosion					X		
	4-2 Hinterland effect			X				
	4-3 River morphology			X				N/A within the context of this project
	4-4 Channel regime			X				
	4-5 Sedimentation		X					
	4-6 Estuary erosion			X				N/A within the context of this project
Ecology	5-1 Project lands					X		
	5-2 Water bodies			X				N/A within the context of this project
	5-3 Surrounding area			X				N/A within the context of this project
	5-4 Valleys & shores			X				N/A within the context of this project
	5-5 Wetlands & plains			X				N/A within the context of this project
	5-6 Rare species			X				No specially protected areas observed
	5-7 Animal migration					X		Temporarily, caused by civil works
	5-8 Natural industry			X				
Socio-economic	6-1 Population change			X				
	6-2 Income & amenity			X				
	6-3 Human migration			X				
	6-4 Resettlement			X				All the works will be implemented within the alienation zone of the existing infrastructure.
	6-5 Women's role			X				
	6-6 Minority groups			X				Existing minority groups equally share project benefits.
	6-7 Sites of value			X				N/A within the context of this project
	6-8 Regional effects			X				
	6-9 User involvement			X				The design was prepared in consultation with "Armarir" WUA and other stakeholders. Formal and informal public consultations were held during the design phase.
	6-10 Recreation			X				
Health	7-1 Water & sanitation			X				
	7-2 Habitation			X				
	7-3 Health services			X				
	7-4 Nutrition			X				N/A within the context of tertiary canals
	7-5 Relocation effect			X				N/A within the context of tertiary canals
	7-6 Disease ecology			X				N/A within the context of tertiary canals
	7-7 Disease hosts			X				N/A within the context of tertiary canals
	7-8 Disease control			X				N/A within the context of tertiary canals
	7-9 Other hazards			X				N/A within the context of tertiary canals
Imbalances	8-1 Pests & weeds			X				N/A within the context of tertiary canals
	8-2 Animal diseases			X				N/A within the context of tertiary canals
	8-3 Aquatic weeds		X					
	8-4 Structural damage			X				
	8-5 Animal imbalances			X				
Number of crosses		0	3	47	0	3	0	Total possible = 53 (Unless positive & negative impacts)

Project Name/location: **Rehabilitation of Noravan Community Tertiary Canal**

Assessor's name/position: Design Consultant, "Jrarbi" Ltd., Chief Design Engineer's Team

Date(s) of Assessment: June, 2011

		Positive impact likely	Positive impact possible	No impact likely	Negative impact possible	Negative impact likely	No judgement possible at present	Comments
For each environmental effect place a cross (X) in one or two of the columns								N/A = Environmental effect is Not Applicable in this case For detailed explanation refer to the appropriate sections of this EMP
Hydrology	1-1 Low flow regime			X				N/A within the context of this project
	1-2 Flood regime			X				N/A within the context of this project
	1-3 Operation of dams			X				N/A within the context of this project
	1-4 Fall of water table			X				Ground water in this area is 3-5 m deep.
	1-5 Rise of water table			X				Ground water in this area is 3-5 m deep.
Pollution	2-1 Solute dispersion			X				N/A within the context of this project
	2-2 Toxic substances			X				N/A within the context of this project
	2-3 Organic pollution			X				N/A within the context of this project
	2-4 Anaerobic effects			X				N/A within the context of this project
	2-5 Gas emissions			X				N/A within the context of this project
Soils	3-1 Soil salinity			X				
	3-2 Soil properties		X					
	3-3 Saline groundwater			X				
	3-4 Saline drainage			X				N/A within the context of this project
	3-5 Saline intrusion			X				N/A within the context of this project
Sediments	4-1 Local erosion					X		
	4-2 Hinterland effect			X				
	4-3 River morphology			X				N/A within the context of this project
	4-4 Channel regime			X				
	4-5 Sedimentation		X					
	4-6 Estuary erosion			X				N/A within the context of this project
Ecology	5-1 Project lands					X		
	5-2 Water bodies			X				N/A within the context of this project
	5-3 Surrounding area			X				N/A within the context of this project
	5-4 Valleys & shores			X				N/A within the context of this project
	5-5 Wetlands & plains			X				N/A within the context of this project
	5-6 Rare species			X				No specially protected areas observed
	5-7 Animal migration					X		Temporarily, caused by civil works
	5-8 Natural industry			X				
Socio-economic	6-1 Population change			X				
	6-2 Income & amenity			X				
	6-3 Human migration			X				
	6-4 Resettlement			X				All the works will be implemented within the alienation zone of the existing infrastructure.
	6-5 Women's role			X				
	6-6 Minority groups			X				Existing minority groups equally share project benefits.
	6-7 Sites of value			X				N/A within the context of this project
	6-8 Regional effects			X				
	6-9 User involvement			X				The design was prepared in consultation with "Arnavir" WUA and other stakeholders. Formal and informal public consultations were held during the design phase.
	6-10 Recreation			X				
Health	7-1 Water & sanitation			X				
	7-2 Habitation			X				
	7-3 Health services			X				
	7-4 Nutrition			X				N/A within the context of tertiary canals
	7-5 Relocation effect			X				N/A within the context of tertiary canals
	7-6 Disease ecology			X				N/A within the context of tertiary canals
	7-7 Disease hosts			X				N/A within the context of tertiary canals
	7-8 Disease control			X				N/A within the context of tertiary canals
	7-9 Other hazards			X				N/A within the context of tertiary canals
Imbalances	8-1 Pests & weeds			X				N/A within the context of tertiary canals
	8-2 Animal diseases			X				N/A within the context of tertiary canals
	8-3 Aquatic weeds		X					
	8-4 Structural damage			X				
	8-5 Animal imbalances			X				
Number of crosses		0	3	47	0	3	0	Total possible = 53 (Unless positive & negative impacts)

Project Name/location: **Rehabilitation of Agavnatun Community Tertiary Canal**

Assessor's name/position: Design Consultant, "Jrarbi" Ltd., Chief Design Engineer's Team

Date(s) of Assessment:: July 2011

		Positive impact likely	Positive impact possible	No impact likely	Negative impact possible	Negative impact likely	No judgement possible at present	Comments
For each environmental effect place a cross (X) in one or two of the columns								N/A = Environmental effect is Not Applicable in this case For detailed explanation refer to the appropriate sections of this EMP
Hydrology	1-1 Low flow regime			X				N/A within the context of this project
	1-2 Flood regime			X				N/A within the context of this project
	1-3 Operation of dams			X				N/A within the context of this project
	1-4 Fall of water table			X				Ground water in this area is 3-5 m deep.
	1-5 Rise of water table			X				Ground water in this area is 3-5 m deep.
Pollution	2-1 Solute dispersion			X				N/A within the context of this project
	2-2 Toxic substances			X				N/A within the context of this project
	2-3 Organic pollution			X				N/A within the context of this project
	2-4 Anaerobic effects			X				N/A within the context of this project
	2-5 Gas emissions			X				N/A within the context of this project
Soils	3-1 Soil salinity			X				
	3-2 Soil properties		X					
	3-3 Saline groundwater			X				
	3-4 Saline drainage			X				N/A within the context of this project
	3-5 Saline intrusion			X				N/A within the context of this project
Sediments	4-1 Local erosion					X		
	4-2 Hinterland effect			X				
	4-3 River morphology			X				
	4-4 Channel regime			X				N/A within the context of this project
	4-5 Sedimentation		X					
Ecology	4-6 Estuary erosion			X				N/A within the context of this project
	5-1 Project lands					X		
	5-2 Water bodies			X				N/A within the context of this project
	5-3 Surrounding area			X				N/A within the context of this project
	5-4 Valleys & shores			X				N/A within the context of this project
	5-5 Wetlands & plains			X				N/A within the context of this project
	5-6 Rare species			X				No specially protected areas observed
	5-7 Animal migration					X		Temporarily, caused by civil works
Socio-economic	5-8 Natural industry			X				
	6-1 Population change			X				
	6-2 Income & amenity			X				
	6-3 Human migration			X				
	6-4 Resettlement			X				All the works will be implemented within the alienation zone of the existing infrastructure.
	6-5 Women's role			X				
	6-6 Minority groups			X				Existing minority groups equally share project benefits.
	6-7 Sites of value			X				N/A within the context of this project
	6-8 Regional effects			X				
	6-9 User involvement			X				The design was prepared in consultation with "Kboy" WUA and other stakeholders. Formal and informal public consultations were held during the design phase.
Health	6-10 Recreation			X				
	7-1 Water & sanitation			X				
	7-2 Habitation			X				
	7-3 Health services			X				
	7-4 Nutrition			X				N/A within the context of tertiary canals
	7-5 Relocation effect			X				N/A within the context of tertiary canals
	7-6 Disease ecology			X				N/A within the context of tertiary canals
	7-7 Disease hosts			X				N/A within the context of tertiary canals
	7-8 Disease control			X				N/A within the context of tertiary canals
	7-9 Other hazards			X				N/A within the context of tertiary canals
Imbalances	8-1 Pests & weeds			X				N/A within the context of tertiary canals
	8-2 Animal diseases			X				N/A within the context of tertiary canals
	8-3 Aquatic weeds		X					
	8-4 Structural damage			X				
	8-5 Animal imbalances			X				
Number of crosses		0	3	47	0	3	0	Total possible = 53 (Unless positive & negative impacts)

Annex E: Environmental and Social Clauses for Civil Works' Contracts

The Environmental Management Plans (EMPs) that are to be provided to the Contractor under this Contract shall be considered as binding. The Mitigation Measures to be included in the EMPs will provide general and specific guidance on protection and mitigation of potential environmental damage. All necessary measures on protection of the environment shall be carried out by the Contractor in accordance with the order of competent authorities, the EMPs, and instructions of the Engineer.

Obligations of the Contractor

The general environmental and social obligations of the Contractor within this Contract, without prejudice to other official provisions in force, include the following:

- The Contractor shall respect the environmental, health, safety and labor regulatory provisions in force in the Republic of Armenia (including those announced during the execution of the works if imposed by the Engineer), the contractual provisions of this Contract as well as the conditions fixed by the various authorizations or approvals required;
- The Contractor shall respect national and international labor codes, ratified by the Republic of Armenia and ensure that it and its sub-contractors make available employment opportunities for both men and women and ensuring a gender-sensitive work environment;
- The Contractor shall assume full responsibility for the consequences of its choices and actions; in particular, and without prejudice to the regulatory provisions in force, it guarantees, if necessary, the repair at its cost and according to the most appropriate technologies and deadlines, notably with regard to the level of sensitivity of the site concerned, of damage caused to the environment and residents by failure to respect regulatory and/or administrative provisions and/or the applicable technical specifications, as well as the payment of fines, damages or other penalties which may be incumbent upon it. All such accidental claims and penalties will be settled before final payment is made;
- For those sections of the Tertiary Canals, which require temporary land use the Contractor is responsible for obtaining the right to access the site, including a written notary verified agreement with the land owner, and for paying the cost for land rental for a season and/or for any tree loss, if any. These costs will be covered under the line “Accidental damage during temporary land use” in Contractor’s budget. However, preference should be given to the technical solutions that do not require taking or demolition of temporary and permanent private properties. Such solutions shall be agreed with the Engineer. Construction activities on such stretches only proceed with approval of the Engineer. Any grievances (such as absence of final agreement between Contractor and land/asset owner, etc.) shall be addressed to Community leader;
- The Contractor shall take all measures to ensure the environmental quality of operations which are the subject of this contract and not disrupt the quality of life of the adjacent villages, in particular by applying the applicable specifications and provisions. The Contractor shall consider the execution of works or the implementation of environmental and social provisions as an integral part of the operations relating to the general construction program of the works;
- Appropriate information and training for Contractor personnel, including management staff, with regard to the security and/or quality of operations;
- The Contractor shall inform the local authorities (village mayor, council of elders) and the affected population on planned construction activities, sites and schedule at least 2 weeks in advance of any planned construction activities (including signage);

- The Contractor shall hold information meetings at least 2 weeks before entering any village area for planned construction activities, to inform and consult with the villagers regarding the nature of the forthcoming works, their duration and all effects such as dust, smoke, or noise that will be felt in the village, the mitigation measures that will be applied, and provide villagers with opportunities to ask questions and express concerns;
- The Contractor shall refrain from destroying, removing or clearing trees, timber, scrub, crops and other flora to any extent greater than is approved by the Engineer as being necessary for the execution of this Contract and shall take such measures as may be necessary to prevent its employees from hunting, disturbing, capturing or destroying stock, crops and such flora as may be protected by relevant statutes;
- Borrow pits or other similar excavations as well as waste accumulation and disposal sites shall be in locations approved by the Engineer. Disposal sites for waste shall be officially agreed in writing with the head of community in administrative area of which the approved disposal site is located;
- Controlling pollution, noise and nuisances generated by the works;
- The re-use of materials available on the existing site each time the technical and financial conditions allow for this in a satisfactory manner from the point of view of the Engineer. Recycling and reuse of wastes (e.g. lubricants, plastic bottles, paper) is encouraged where appropriate. Strictly banning the use of fire for clearing and grubbing and cleaning sites, except for the treatment of organic waste as approved by the Engineer;
- The maximum preservation of natural resources and the minimization of the use of space, soil and vegetation, in particular by minimizing cleared and stripped surfaces, by the passage of blades at a high level (5 cm above the natural ground level) each time that a simple clearing or a provisional storage of material is required, by controlling logging, including any tree alignments, by the appropriate management of the topsoil, by driving and working the machines perpendicular to the slope, by the maintenance on the sites of naturally grassed areas, and by the control of site erosion;
- As appropriate, the systematic stripping of topsoil of all work sites unless (with prior consent of the Engineer) the soil structure of the surface, predominantly organic matter ("topsoil" or mud), does not exist or has a thickness less than the working height adjustment of the blade of the excavator or machine used, taking into account the state of the terrain (eroded soil, gravel, soil with rocks that prevent the passage of the machine, etc.);
- The Contractor shall respect, for the whole of its site (including borrow sites and disposal areas, quarries and installations) the zones, areas, elements and periods which are environmentally sensitive, including, but not limited to locations and areas identified in the EMP. In the project areas adjacent to specially protected areas, machinery shall not go beyond the alienation zone; there shall be no waste accumulations and waste disposal sites in the same areas; and there shall be no use and storage of explosives and toxic and chemical substances;
- Any discharge or disposal of used water, mud, grout, bituminous products, pollutants of any kind, waste etc. into wells, boreholes, surface water or groundwater, water courses, natural streams, drains, ditches, etc. is strictly forbidden. Waste shall be transported and dumped at the sites officially designated for disposal and agreed in writing with the head of community in administrative area of which such site is located.
- It is forbidden to create a dam or alter a permanent or temporary watercourse for the requirements of the site (unless otherwise specified in the Design), without authorization of the Engineer;
- All construction vehicles shall travel at low speed (as specified in Armenian legislation) within 100 m on either side of any areas around villages where children are present;
- The control of health risks relating to the works and personnel of the Contractor, in particular the adoption of minimum hygiene rules at the work sites and camps and for the benefit of residents in the affected communities, the control of dust emissions in populated areas and the control of stagnant waters as specified in the EMP;

- The Contractor shall exercise every reasonable precaution to protect persons or property from injury. The Contractor shall erect and maintain all necessary temporary fencing, barricades, barriers, signs and lights and provide fire alarm, fire extinguishing and fire fighting services at strategic points on the Site. The Contractor shall also be responsible for erecting and maintaining structures for storage and containment of hazardous materials or liquids. The Contractor shall adopt and enforce such rules and regulations as may be necessary, desirable or proper to safeguard the public, all persons engaged in the work and its supervision. The Contractor shall be responsible for the flagging and control of traffic and he shall comply with the requirements of the Engineer and competent authority in these matters. The Contractor shall keep clear and in good working order all temporary access road structures, bridges, culverts, drains and other waterways necessary for the execution of the works during the term of the Contract;
- The Contractor shall ensure, so far as is reasonably practicable, the health, safety and welfare at work of its personnel including those of its subcontractors and of all other persons on the Site or crossing the site. The Contractor shall provide protective clothing and equipment to workers that are appropriate to the workers' tasks. The Contractor shall be fully responsible for ensuring necessary first aid services to its staff and workers, including transport for injured personnel to hospital or other appropriate accommodation as and when required;
- The cleaning, restoration and then, if necessary, the appropriate rehabilitation or redevelopment of work sites, camps, quarries and borrow pits released by the Contractor as the work progresses. This obligation, which includes possible drainage of stagnant water and the completion of compensatory tree plantations (if envisaged by the Design), is a condition of the acceptance of the works;
- Taking appropriate sanctions against personnel violating the applicable specifications and provisions on environmental and social matters;
- Checking, by regular inspection, that all stipulated environmental and social provisions are being adhered to;
- Systematically and in a timely manner informing PIU (Engineer and Environmental and Social Impact Officer) of each incident or accident, damage or degradation caused to the environment, workers or residents or their assets, in the course of the works. Contractor shall also take appropriate measures, as approved by the Engineer, to address the incident or accident in timely fashion.
- The Contractor shall be responsible for the safety of its staff and all others who are on the Site when under the Contractor's control. The Contractor shall observe high standards of safety for people and machines at all times. The Contractor shall ensure, inter alia, that staff and labor on Site are issued with personal protection equipment appropriate to their tasks and to the climatic conditions.

Annex F: Minutes of Public Consultation Meetings

Date: 12.07.2011

Community: Baghramyan

Participants:

S.Karapetyan	PIU Irrigation Officer
N.Atayan	PIU Environmental and Social Impact Officer,
V.Movsisyan	Institutional Improvements Officer
M.Hartenyan	Head of Karakert community
A.Petrosyan	Head of Myasnikyan community
P.Saghatelyan	Head of Dalarik community
M.Kirakosyan	Head of Baghramyan community
T.Ghazaryan	Executive Director of “Karakert” WUA

Agenda

To carry out public discussions of environmental and social impacts and other issues related to rehabilitation of tertiary irrigation networks of Karakert, Myasnikyan, Dalarik and Baghramyan communities being under command of Talin Irrigation Scheme..

PIU Irrigation Officer S.Karapetyan presented in details the proposed project and the nature of anticipated activities.

Executive Director of “Karakert” WUA T.Ghazaryan expressed his gratitude for proposed project, presented to attendees information on irrigated lands, mentioned importance of rehabilitation works for expansion of irrigable land in Karakert, Myasnikyan, Dalarik and Baghramyan communities.

V. Movsisyan clarified that proposed rehabilitation works will provide reduction of water losses and reliable water supply

Leaders of Karakert, Myasnikyan, Dalarik and Baghramyan communities also spoke about importance of rehabilitation of tertiary irrigation network in their community and expressed their willing to involve population of their communities in rehabilitation works in case of possibility.

PIU specialists clarified that one of the Project’s objectives is to involve in civil works as much local population as possible to increase local employment, and also raise the sense of responsibility of water users in maintaining in future the quality of implemented rehabilitation works.

The list of water users having participated in public consultations is attached.

Executive Director of “Karakert” WUA [SIGNATURE] T.Ghazaryan

Secretary [SIGNATURE] A.Petrosyan

[SEAL]

List of participants of the Public Consultations
TALIN IRRIGATION SCHEME / “Karakert” WUA

Date 12.07.2011

	Community's Name	Participant's name	Signature	Comments
1.	Bagramyan	M.Kirakosyan	(Signature) [SEAL]	Head of the community
2.	Myasnikyan	A.Petrosyan		Head of the community
3.	Dalarik	P.Saghatelyan		Head of the community
4.	Karakert	M.Darbinyan		Head of the community

Leader of “Karakert” WUA (Signature) /Tonakan Ghazaryan/

Secretary (Signature) /A.Petrosyan/

Date: 13.07.2011

Community: Arevadasht

Participants:

S.Karapetyan	PIU Irrigation Officer
N.Atayan	PIU Environmental and Social Impact Officer,
V.Movsisyan	Institutional Improvements Officer
H.Ohanyan	Head of Arevadasht community
A.Eranosyan	Head of Hacik community
A.Mikaelyan	Head of Noravan community
H.Petrosyan	Executive Director of “Armavir” WUA

Agenda

To carry out public discussions of environmental and social impacts and other issues related to rehabilitation of tertiary irrigation networks of Arevadasht, Hacik and Noravan communities being under command of Armavir Irrigation Scheme.

PIU Irrigation Officer S.Karapetyan presented in details the proposed project and the nature of anticipated activities.

V. Movsisyan clarified that proposed rehabilitation works will provide reduction of water losses and reliable water supply

Executive Director of “Armavir” WUA H.Petrosyan expressed his gratitude for proposed project, presented to attendants information on irrigated lands, mentioned importance of rehabilitation works for expansion of irrigable land in Arevadasht, Hacik and Noravan communities.

Leaders of Arevadasht, Hacik and Noravan communities also mentioned importance of rehabilitation of tertiary irrigation network in their community and expressed their willing to involve population of their communities in rehabilitation works in case of possibility.

PIU specialists clarified that one of the Project’s objectives is to involve in civil works as much local population as possible to increase local employment, and also raise the sense of responsibility of water users in maintaining in future the quality of implemented rehabilitation works.

The list of water users having participated in public consultations is attached.

Executive Director of “Armavir” WUA	[SIGNATURE]	H,Petrosyan
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Secretary	[SIGNATURE]	H,Ohanyan
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[SEAL]

List of participants of the Public Consultations
TALIN IRRIGATION SCHEME / “Armavir” WUA

Date 13.07.2011

	Community's Name	Participant's name	Signature	Comments
1.	Arevadasht	H.Ohanyan	(Signature) [SEAL]	Head of Arevadasht community
2.	Myasnikyan	A.Petrosyan		Head of Hacik community
3.	Dalarik	P.Saghatelyan		Head of Noravan community

Executive Director of “Armavir” WUA (Signature) /Hovhannes Petrosyan/
[SEAL]

Head of Arevadasht community (Signature) /H,Ohanyann/
[SEAL]

Head of Hacik community (Signature) /A,Eghiazaryan/
[SEAL]

Head of Noravan community (Signature) /A,Mikaelyan/
[SEAL]

Date: 12.07.2011

Community: Vanand

Participants:

S.Karapetyan	PIU Irrigation Officer
N.Atayan	PIU Environmental and Social Impact Officer,
V.Movsisyan	Institutional Improvements Officer
J,Manoukyan	Head of Vanand community
A.Eranosyan	Head of Bagaran community
S,Sargsyan	Executive Director of “Shenik” WUA

Agenda

To carry out public discussions of environmental and social impacts and other issues related to rehabilitation of tertiary irrigation networks of Vanand and Bagaran communities being under command of Talin Irrigation Scheme..

PIU Irrigation Officer S.Karapetyan presented in details the proposed project and the nature of anticipated activities.

V. Movsisyan clarified that proposed rehabilitation works will provide reduction of water losses and reliable water supply

N.Atayan presented environmental and social aspects of the anticipated works.

Executive Director of “Shenik” WUA H.Petrosyan expressed his gratitude for proposed project, presented to attendants information on irrigated lands, mentioned importance of rehabilitation works for expansion of irrigable land in Vanand and Bagaran communities.

Leaders of Vanand and Bagaran communities also mentioned importance of rehabilitation of tertiary irrigation network in their community and expressed their willing to involve population of their communities in rehabilitation works in case of possibility.

PIU specialists clarified that one of the Project’s objectives is to involve in civil works as much local population as possible to increase local employment, and also raise the sense of responsibility of water users in maintaining in future the quality of implemented rehabilitation works.

The list of water users having participated in public consultations is attached.

Executive Director of “Shenik” WUA	[SIGNATURE]	S,Sargsyan
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Secretary	[SIGNATURE]	J,Manoukyan
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[SEAL]

List of participants of the Public Consultations
TALIN IRRIGATION SCHEME / “Armavir” WUA

Date 13.07.2011

	Community's Name	Participant's name	Signature	Comments
1.	Arevadasht	H.Ohanyan	(Signature) [SEAL]	Head of Arevadasht community
2.	Myasnikyan	A.Petrosyan		Head of Hacik community
3.	Dalarik	P.Saghatelyan		Head of Noravan community

Executive Director of “Armavir” WUA (Signature) /Hovhannes Petrosyan/
[SEAL]

Secretary (Signature) /J.Manoukyan/