

No.8 Kamkhut

Information on Existing Water Sources (Shirak)

Study for Improvement of
Rural Water Supply and
Sewage Systems in RA

No.8 Community Kamkhut
District Amasia
Marz Shirak

No	Water source	Latitude			Longitude			Atitude (m)	Yield(L/sec)		
		deg	min	sec	deg	min	sec		Min	Max	At site
1	Water Main	40	53	54.9	43	42	13.8	1,871	0.1	2.0	0.3
2	Spring	-	-	-	-	-	-	-	-	-	0.0
3											
4											
5											
6											
7											
8											
9											
10											

Notes:

Latitude, Longitude, Atitude:	Measured at site
Yield (Min, Max):	Interviewed to the Community
Yield (at site):	Measured / estimated at site in summer of 2007

Users Acceptnace for water quality	Acceptable
Notes	Only 1 tap exists in the Community, which receives water from "Ghazanchi" system's water pipeline. Spring intake has dried and is located outside of the community.
Alternative sources if any	There are other springs located at other side of the community boundary.

No.8 Community Kamkhut
District Amasia
Marz Shirak
Sampling date 07/Aug/2007

	Parameters analysed	Units	No.1	Guidelines	
				WHO	Armenia
a	pH		7.5		6.5-8 6.0 - 9.0
b	Temperature	Deg.C	13.5		
c	TDS	Mg/L	147		1000 1000
1	Al:Aluminum	Mg/L	n.d		0.10 0.50
2	B:Boron	Mg/L	n.d		0.70 0.50
3	Cl:Chloride	Mg/L	8		250 350
4	Cr:Chrome	Mg/L	<0.01		0.05 0.05
5	Cu:Copper	Mg/L	n.d		2 1
6	F:Fluoride	Mg/L	0.43		1.50
7	Hardness	Mg/L	310		500 700
8	Fe:Iron	Mg/L	n.d		0.30 0.30
9	Mn:Manganese	Mg/L	n.d		0.40 0.10
10	Mo:Moibdenum	Mg/L	n.d		0.070 0.250
11	Ni:Nickel	Mg/L	n.d		0.020 0.100
12	Nitrate(NO3+)	Mg/L	6.2		50.0 45.0
13	SO4:Sulfate	Mg/L	8.0		250.0 500.0
14	Zn:Zink	Mg/L	n.d		3.0 5.0
15	As:Arsenic	Mg/L	n.d		0.0 0.1
16	Ba:Barium	Mg/L	0.01		0.70 0.10
17	Be:Berillium	Mg/L	0.00009		NA 0.00020
18	Cd:Cadmium	Mg/L	n.d		0.0030 0.0010
19	Pb:Lead	Mg/L	0.001		0.010 0.030
20	Hg:Mercury	Mg/L	<0.0002		0.00100 0.00050
21	Se:Selenium	Mg/L	0.001		0.010 0.010
22	Sr:Strontium	Mg/L	n.d		NA 7.0
23	CN:Cyanide	Mg/L	n.d		0.070 0.035
24	Coli form bacteria	bacteria per 100 ml			- 0
25	Thermo-tolerant coli form bacteria	bacteria per 100 ml			0 0
26	Total bacteria	bacteria per 1 ml			- 50

Information on Existing Water Sources

Existing Bacteriological Test

Study for Improvement of Rural Water Supply and Sewage Systems in RA

No.8	Community District Marz	Kamkhut Amasia Shirak
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No. 8 Marz Shirak Community Kamkhut**1. ACCESSIBILITY TO THE SITE**

No.	Structures	Access by vehicle	Machine construction	Remarks
1	Intake	Possible	Possible	
2	Transmission pipeline			No transmission pipeline
3	Reservoir			No reservoir

2. INTAKE STRUCTURE

No.	Water source	N	E	El. (m)	Year	Material	Volume (l/s)	Rehabilitation Necessity (Y/N)
1	Fed from mai	40°53'54,9"	43°42'13,8"	1,871	1990	Steel	0.3	Yes

3. TRANSMISSION PIPELINE

No.	Pipeline length (m)	Pipe diameter	Material	Flow rate (l/s)	Year	Leakage	Rehabilitation Necessity (Y/N)
1	No						

4. RESERVOIR

No.	N	E	El. (m)	Material	Shape	Dimension (m)	Volume (m3)	Rehabilitation Necessity (Y/N)
1	No							

5. CHLORINATION EQUIPMENT

No.	Existence (Y/N)	Location	Chlorine type	Chlorine duration
1	No			

6. DISTRIBUTION PIPELINE

No.	Pipeline length (m)	Pipe diameter	Material	Year	Leakage	Rehabilitation Necessity (Y/N)
1	250	100	Polyethylene	1990	no	No

7. PUMP STATION

Existence (Y/N)	Power source	Type	Capacity (l/s)	Pump head (m)	Tank cap. (m3)	House size (m)	Rehabilitation Necessity (Y/N)
No							

8. PUBLIC TAPS

No. of taps	Old one (year)	New one (year)	Valves (Y/N)	Valve rate (%)	Rehabilitation Necessity (Y/N)
1	1991		Yes	100	No

9. DRAINAGE SYSTEM

Existence (Y/N)	Rehabilitation Necessity (Y/N)	Remarks
No	Yes	

**Questionnaire on Existing Water Supply Conditions
by Socio-Economic Survey**

Marz	Shirak
Number and Name of Community	No.8 Kamkhus
District	Amasia

No.	Question	Answer
A: Baseline Data		
A1	Actual population in 2001	385
A2	Actual population in 2007	293
A3	Number of households	103
A4.1	Elderly people	43
A4.2	Population in labor force (age from 16 to 62)	132
A4.3	Children	118
A5.1	Pensioners	50
A5.2	Unemployed	4
A5.3	Receiving benefits	1
A6	Average monthly income of household (AMD)	25,000
A7	Number of medical ambulance station/first and health post	absent
A8	Number of beds in each medical ambulance station	0
A9	Number of school	1
A10	Number of pupils	85
B: Budget		
B1	Annual Budget of the community 2004, in thousand AMD	3,129
	Annual Budget of the community 2005, in thousand AMD	2,158
	Annual Budget of the community 2006, in thousand AMD	2,655
	Annual Budget of the community 2007, in thousand AMD	3,600
	Annual Budget of the community 2008, in thousand AMD	is not planned
B2	Amount spent in drinking water sector 2004, in thousand AMD	0
	Amount spent in drinking water sector 2005, in thousand AMD	0
	Amount spent in drinking water sector 2006, in thousand AMD	0
	Amount spent in drinking water sector 2007, in thousand AMD	0
	Amount spent in drinking water sector 2008, in thousand AMD	is not planned
C: Socio-Economic Survey		
C1	Major industries of the community:	dairy, meat
C2	Is there any community activities carrying out by women? 1-Yes, 2-No	no
D: Water Usage and Water Demand Survey		
D1	Does the community hold water use permit? 1-Yes 2-No	no
D2	Water use permit number	-
D3	Date of expiry of water use permit	-
D4	Planned date of obtaining water use permit	is not planned
D5	Present condition of the water supply volume of Domestic use	sufficient
D6	Present condition of the water supply volume of Irrigation water	sufficient
D7	Number of house connection to drinking water system	40
D8	How many house connection household set the water meter	0
D9	Number of public taps	0
D10.1	How is the regime of water supply in your community in the dry season?	24 hrs
D10.2	How is the regime of water supply in your community in the wet season?	24 hrs
D11	What time of day water is given?	-
D12	Are you pleased with duration of domestic water supply?	fully pleased
D13	Are hours of water supply convenient?	-
D14.1	How long the taps are open to provide the domestic water (cooking, washing, foodstuffs, dishes, Landry, bathing, etc) of each household a day?	-
D14.2	Estimate quantity of domestic water use of each household (liter per day)	200

No.	Question	Answer
D15.1	How long the taps are open to provide the each household for filling	-
D15.2	Estimate quantity of water for filling containers of each household (liter per	200
D16	Drinking water monthly water fee per household	1,500 AMD HH/year
D17	How often do you usually pay water fees?	monthly
D18	Water fee structure 1Flat rate, 2 Having water tariff	flat rate
D19	Where do you acquire the irrigation water?	from lake
D20	Are you satisfied with irrigation water supply volume?	sufficient

E: Present Operation and Maintenance Works

E1	Name of responsible for water supply	Israyelyan Karapet
E2	Position	water distributor
E3	Telephone	(094) 915746
E4	Quantity and present condition of the water supply facilities: spring/ intake	absent
E5	Quantity and present condition of the water supply facilities:	1-partially repaired
E6	Quantity and present condition of the water supply facilities: DRR(Daily Regulatory Reservoir)	1-partially repaired
E7	Quantity and present condition of the water supply facilities: net/distribution	partially repaired
E8	Quantity and present condition of the water supply facilities: public tap	deteriorated
E9	Quantity and present condition of the water supply facilities: pump	absent
E10	Who is the owner of the water supply facilities?	community
E11	Who is engaged in the water supply facilities repairing works?	nobody
E12	How do you repair the water supply facilities?	no way at all
E13	Who is in charge of the repair work in the community?	hired specialist from
E14	How you prepare O&M costs?	no collection
E15	Please indicate the O&M cost breakdown per year for water supply	
	Electricity (AMD)	0
	Labor cost (AMD)	360,000
	Repair cost(AMD)	0
	Others(AMD)	0
	Total (AMD)	360,000
E16	Do the residents participate in the O&M works?	no
E17	What kind of OM method is preferable to you?	water fee

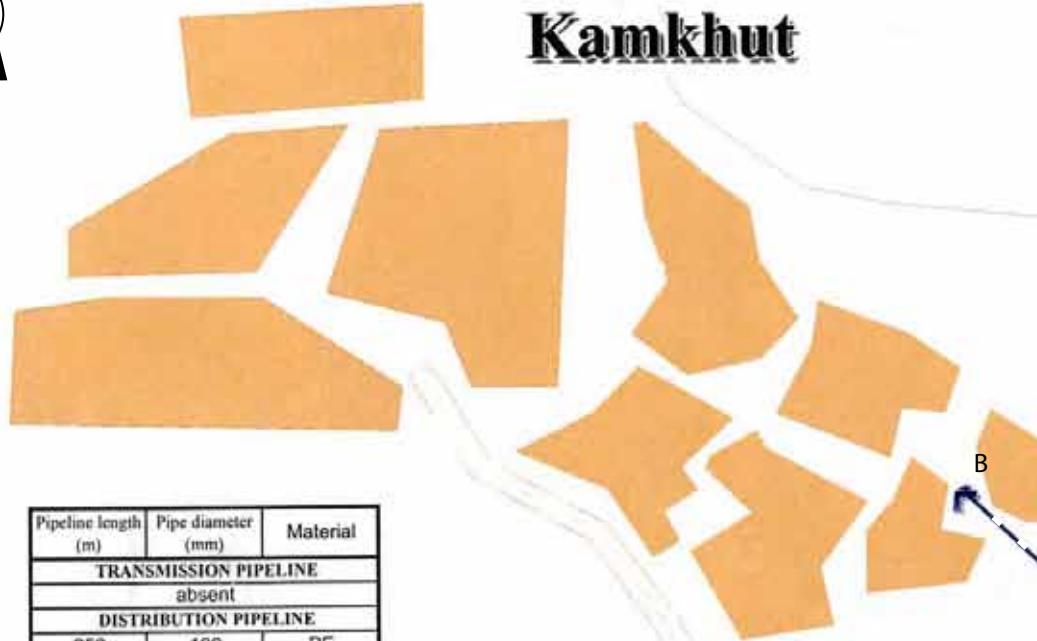
F: Initial Environmental Examination (IEE)

F1	Are any of the following areas located inside or around the project site?	
F1.1	National park, protected area designated by the government (coast line, water lands, reserved are for ethnic or indigenous people, cultural heritage), and areas being considered for national parks or proposed areas.	absent
F1.2	Virgin forests, tropical forests	absent
F1.3	Ecological improvement habits areas (coral reef, mangrove wetland, tidal	absent
F1.4	Habit of valuable species protected by domestic laws or international treaties	absent
F1.5	Likely salts cumulus or soil erosion areas on a massive scale	absent
F1.6	Remarkable desertification trend areas	absent
F1.7	Archaeological historical or cultural valuable areas	yes
F1.8	Living areas of ethic, indigenous people or nomads who have a traditional lifestyle or special socially valuable areas	absent

Shirak
No.8 Kamkhus



Kamkhut



Pipeline length (m)	Pipe diameter (mm)	Material
TRANSMISSION PIPELINE		
absent		
DISTRIBUTION PIPELINE		
250	100	PE

LEGENDS

- Tap
- Connection to water main
- Transmission pipeline

	N	E	H (m)
A	40°53'54.9"	43°42'13.8"	1871
B	40°54'01.27"	43°42'09.5"	1844

A

B

SCALE

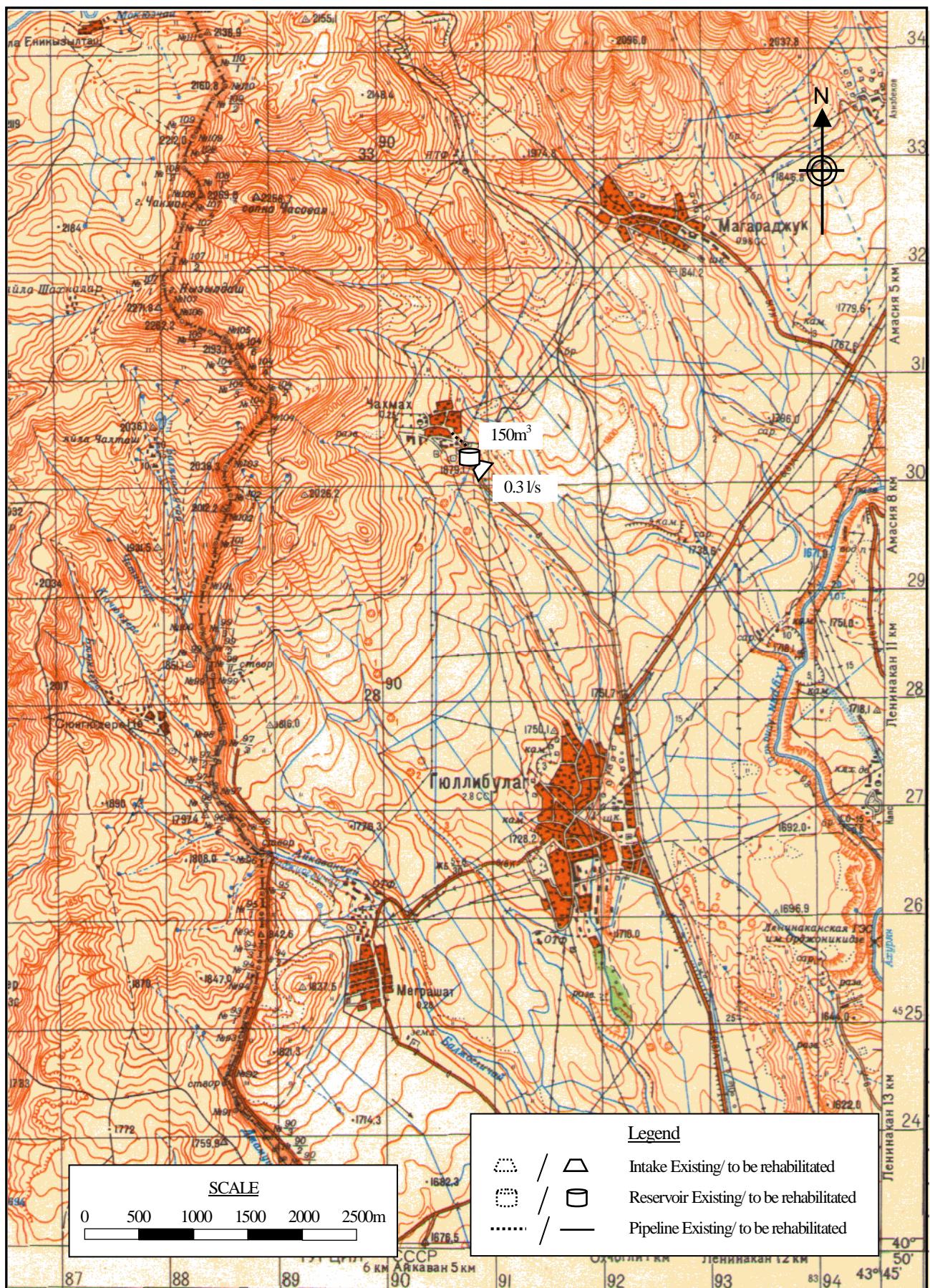
0	50	100	150	200	250 m
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Shirak Marz		The Study for Improvement of Rural Water Supply and Sewerage Systems in the Republic of Armenia
No.	Community	
08	Kamkhut	JICA STUDY TEAM 2007

Marz : Shirak
Name : Kamkhut

No.8

No.	Item	Quantity	Unit	Water demand (m3/d)
A. WATER DEMAND				
1	Population	293	persons	29.3
2	Factory	-	nos	0.0
3	School (pupils)	85	pupils	0.9
4	Medical Ambulance Station	-	nos	-
5	Policlinic	-	nos	-
7	Livestocks (87lit/household)	103	household	9
Sub-total				39.2
Unaccounted for water (20%)				7.8
1	Average Daily Water Demand	29.5		47.0 m3/day
2	Maximum Daily Water Demand			56.4 m3/day
3	Maximum Hourly Water Demand			12.2 m3/hr
B. WATER SUPPLY PLAN				
1	Water source type	Nr.	Total vol.	
a	Existing pipeline	1	0.3	lit/sec 25.9 m3/day
b	Spring	1	0	lit/sec
Total				25.9 m3/day
2 Additional water source				
2 Required reservoir volume				147 m3
C. WATER SUPPLY FACILITIES REHABILITATION PLAN				
No	Item	Quantity	Unit	
1	Intake			
1m3		1	nos	
2m3			nos	
3m3			nos	
4m3			nos	
2	Transmission pipe			
50mm diameter			m	
75mm diameter			m	
90mm diameter			m	
110mm diameter			m	
150mm diameter			m	
200mm diameter			m	
250mm diameter			m	
3	Reservoir			
150m3 capacity		1	nos	
4	Distribution pipe			
50mm diameter			m	
75mm diameter			m	
90mm diameter			m	
110mm diameter			m	
150mm diameter			m	
200mm diameter			m	
250mm diameter			m	
5	House connection	63	nos	
6	Water meter installation	103	nos	
7	Public tap	2	nos	
8	Chlorination	1	nos	
9	Pumps	-	nos	



Water Supply Facilities Rehabilitation Plan

The Study for Improvement of Rural Water Supply and Sewerage Systems in the Republic of Armenia

Marz Shirak

No. 08 Kamkhut

JICA STUDY TEAM

STUDY FOR IMPROVEMENT OF
RURAL WATER SUPPLY AND
SEWAGE SYSTEMS IN RA

Marz : **Shirak**

No. : **8**

Name : **Kamkhut**

No	Item	Specification	Quantity	Unit	Unit Price	Total
1	Intake					
		1m3	1	nos	367,700	367,700
		2m3		nos	545,000	
		3m3		nos	669,100	
		4m3		nos	805,100	
	Sub-total					367,700
2	Transmission Pipe					
		50mm		m	5,520	
		75mm		m	7,160	
		90mm		m	8,040	
		110mm		m	9,680	
		150mm		m	13,140	
		200mm		m	19,440	
		250mm		m	27,040	
	Sub-total					
3	Reservoir					
		50m3		nos	8,363,900	
		100m3		nos	12,968,300	
		150m3	1	nos	18,804,500	18,804,500
		200m3		nos	22,524,600	
		250m3		nos	25,952,800	
		300m3		nos	29,630,400	
		350m3		nos	33,528,700	
		400m3		nos	36,388,000	
		450m3		nos	39,392,500	
		500m3		nos	42,520,900	
	Sub-total					18,804,500
4	Distribution Pipe					
		50mm		m	5,520	
		75mm		m	7,160	
		90mm		m	8,040	
		110mm		m	9,680	
		150mm		m	13,140	
		200mm		m	19,440	
		250mm		m	27,040	
	Sub-total					
5	House Connection		63	nos	74,000	4,662,000
6	Water Meter Installation		103	nos	80,000	8,240,000
7	Public Tap		2	nos	90,000	180,000
8	Chlorilation Equipment		1	nos	500,000	500,000
9	Pump Replacement			nos	10,000,000	
10	Drainage and Sewerage concrete surfa			m	3,600	
	Total				AMD	32,754,200
					Equivalent to USD	107,208
					Equivalent to JPY	11,310,448
					AMD	USD
	Investment Cost per household		103	HH	318,002	1,041
	Investment Cost per person		293	persons	111,789	366

**SHIRAK MARZ
Amasia District
No 8 Kamkhut**

PROJECTED INCOME STATEMENT

Unit: million AMD

PROJECTED CASH FLOW STATEMENT

Unit: million AMD

SHIRAK MARZ
Amasia District
No 8 Kamkhut

FINANCIAL ANALYSIS

A COST RECOVERY ANALYSIS

Item	Million AMD	Rate
1 Revenue		
Water fee revenue	80.77	90.3%
Subsidy	8.68	9.7%
Total	89.45	100.0%
2 Expenditure		
OM cost	22.20	24.8%
Loan repayment	49.25	55.1%
Interest paid	11.53	12.9%
Surplus cash	6.47	7.2%
Total	89.45	100.0%

B. FIRR CALCULATION

FIRR = -0.32%

C. SENSITIVITY ANALYSIS

No.	Description	FIRR	Sensitivity indicator	Switching value
1	1 Capital cost 10% up	-0.79%	-5.91	-16.92%
	2 Capital cost 20% up	-1.20%		-13.66%
2	1 OM cost 10% up	-0.46%	-2.96	-33.75%
	2 OM cost 20% up	-0.60%		-21.79%
3	1 Revenue 10% down	-0.98%	-6.72	-14.89%
	2 Revenue 20% down	-1.71%		-12.32%

No.9 Zari Shat

Information on Existing Water Sources (Shirak)

Study for Improvement of
Rural Water Supply and
Sewage Systems in RA

No.9 Community Zarishat
District Amasia
Marz Shirak

No	Water source	Latitude			Longitude			Atitude (m)	Yield(L/sec)		
		deg	min	sec	deg	min	sec		Min	Max	At site
1	Spring	40	59	37.6	43	39	27.4	2,113	0.5	4.0	1.5
2											
3											
4											
5											
6											
7											
8											
9											
10											

Notes:

Latitude, Longitude, Atitude:	Measured at site
Yield (Min, Max):	Interviewed to the Community
Yield (at site):	Measured / estimated at site in summer of 2007

Users Acceptnace for water quality	Acceptable
Notes	
Alternative sources if any	There is a spring at 250m distance from the spring intake.

No.9 Community Zarishat
District Amasia
Marz Shirak
Sampling date 14/Aug/2007

	Parameters analysed	Units	No.1	Guidelines	
				WHO	Armenia
a	pH		7.1		6.5-8 6.0 - 9.0
b	Temperature	Deg.C	9.6		
c	TDS	Mg/L	63		1000 1000
1	Al:Aluminum	Mg/L	0.06		0.10 0.50
2	B:Boron	Mg/L	n.d		0.70 0.50
3	Cl:Chloride	Mg/L	5		250 350
4	Cr:Chrome	Mg/L	0.01		0.05 0.05
5	Cu:Copper	Mg/L	n.d		2 1
6	F:Fluoride	Mg/L	0.26		1.50
7	Hardness	Mg/L	115		500 700
8	Fe:Iron	Mg/L	n.d		0.30 0.30
9	Mn:Manganese	Mg/L	n.d		0.40 0.10
10	Mo:Mobdenium	Mg/L	0.040		0.070 0.250
11	Ni:Nickel	Mg/L	n.d		0.020 0.100
12	Nitrate(NO3+)	Mg/L	0.9		50.0 45.0
13	SO4:Sulfate	Mg/L	5.0		250.0 500.0
14	Zn:Zink	Mg/L	n.d		3.0 5.0
15	As:Arsenic	Mg/L	n.d		0.0 0.1
16	Ba:Barium	Mg/L	0.02		0.70 0.10
17	Be:Berillium	Mg/L	0.00006		NA 0.00020
18	Cd:Cadmium	Mg/L	n.d		0.0030 0.0010
19	Pb:Lead	Mg/L	<0.001		0.010 0.030
20	Hg:Mercury	Mg/L	<0.0002		0.00100 0.00050
21	Se:Selenium	Mg/L	n.d		0.010 0.010
22	Sr:Strontium	Mg/L	n.d		NA 7.0
23	CN:Cyanide	Mg/L	n.d		0.070 0.035
24	Coli form bacteria	bacteria per 100 ml		-	0
25	Thermo-tolerant coli form bacteria	bacteria per 100 ml		0	0
26	Total bacteria	bacteria per 1 ml		-	50

Information on Existing Water Sources Existing Bacteriological Test

Study for Improvement of Rural Water Supply and Sewage Systems in RA

No.9	Community District Marz	Zari Shat Amasia Shirak
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No. 9 Marz Shirak Community Zari Shat**1. ACCESSIBILITY TO THE SITE**

No.	Structures	Access by vehicle	Machine construction	Remarks
1	Intake	Possible	Possible	
2	Transmission pipeline	Possible	Possible	Pipeline is mostly far from the road
3	Reservoir			No reservoir

2. INTAKE STRUCTURE

No.	Water source	N	E	El. (m)	Year	Material	Volume (l/s)	Rehabilitation Necessity (Y/N)
1	Spring	41°59'37,6"	43°39'27,4"	2,113	1950	Concrete	1.5	Yes

3. TRANSMISSION PIPELINE

No.	Pipeline length (m)	Pipe diameter	Material	Flow rate (l/s)	Year	Leakage	Rehabilitation Necessity (Y/N)
1	400	100	Steel	1.2	1950	Little	Yes

4. RESERVOIR

No.	N	E	El. (m)	Material	Shape	Dimension (m)	Volume (m3)	Rehabilitation Necessity (Y/N)
1	No							

5. CHLORINATION

No.	Existence (Y/N)	Location	Chlorine type	Chlorine duration
1	Yes	Intake	Powder	once per year

6. DISTRIBUTION PIPELINE

No.	Pipeline length (m)	Pipe diameter	Material	Year	Leakage	Rehabilitation Necessity (Y/N)
1	1,100	100	Steel	1950	Little	Yes

7. PUMP STATION

Existence (Y/N)	Power source	Type	Capacity (l/s)	Pump head (m)	Tank cap. (m3)	House size (m)	Rehabilitation Necessity (Y/N)
No							

8. PUBLIC TAPS

No. of taps	Old one (year)	New one (year)	Valves (Y/N)	Valve rate (%)	Rehabilitation Necessity (Y/N)
8		1950	Yes	100	Yes

9. DRAINAGE SYSTEM

Existence (Y/N)	Rehabilitation Necessity (Y/N)	Remarks
No	Yes	

**Questionnaire on Existing Water Supply Conditions
by Socio-Economic Survey**

Marz	Shirak
Number and Name of Community	No.9 Zari Shat
District	Amasia

No.	Question	Answer
A: Baseline Data		
A1	Actual population in 2001	109
A2	Actual population in 2007	114
A3	Number of households	21
A4.1	Elderly people	10
A4.2	Population in labor force (age from 16 to 62)	76
A4.3	Children	28
A5.1	Pensioners	6
A5.2	Unemployed	0
A5.3	Receiving benefits	0
A6	Average monthly income of household (AMD)	13,000
A7	Number of medical ambulance staion/first and health post	absent
A8	Number of beds in each medical ambulance staion	0
A9	Number of school	1
A10	Number of pupils	12

B: Budget	
B1	Annual Budget of the community 2004, in thousand AMD
	3,900
	Annual Budget of the community 2005, in thousand AMD
	4,300
	Annual Budget of the community 2006, in thousand AMD
	3,200
	Annual Budget of the community 2007, in thousand AMD
	1,900
	Annual Budget of the community 2008, in thousand AMD
	is not planned
B2	Amount spent in drinking water sector 2004, in thousand AMD
	0
	Amount spent in drinking water sector 2005, in thousand AMD
	0
	Amount spent in drinking water sector 2006, in thousand AMD
	0
	Amount spent in drinking water sector 2007, in thousand AMD
	0
	Amount spent in drinking water sector 2008, in thousand AMD
	is not planned

C: Socio-Economic Survey	
C1	Major industries of the community:
	dairy, meat
D: Water Usage and Water Demand Survey	
C2	Is there any community activities carrying out by women? 1-Yes, 2-No
	no
D1	Does the community hold water use permit? 1-Yes 2-No
	no
D2	Water use permit number
	-
D3	Date of expiry of water use permit
	-
D4	Planned date of obtaining water use permit
	2007
D5	Present condition of the water supply volume of Domestic use
	insufficient
D6	Present condition of the water supply volume of Irrigation water
	absent
D7	Number of house connection to drinking water system
	0
D8	How many house connection household set the water meter
	0
D9	Number of public taps
	8
D10.1	How is the regime of water supply in your community in the dry season?
	24 hrs
D10.2	How is the regime of water supply in your community in the wet season?
	24 hrs
D11	What time of day water is given?
	-
D12	Are you pleased with duration of domestic water supply?
	fully pleased
D13	Are hours of water supply convenient?
	-
D14.1	How long the taps are open to provide the domestic water (cooking, washing, foodstuffs, dishes, Landry, bathing, etc) of each household a day?
	-
D14.2	Estimate quantity of domestic water use of each household (liter per day)
	200

No.	Question	Answer
D15.1	How long the taps are open to provide the each household for filling	-
D15.2	Estimate quantity of water for filling containers of each household (liter per	200
D16	Drinking water monthly water fee per household	0
D17	How often do you usually pay water fees?	-
D18	Water fee structure 1Flat rate, 2 Having water tariff	-
D19	Where do you acquire the irrigation water?	absent
D20	Are you satisfied with irrigation water supply volume?	insufficient

E: Present Operation and Maintenance Works

E1	Name of responsible for water supply	nobody
E2	Position	-
E3	Telephone	-
E4	Quantity and present condition of the water supply facilities: spring/ intake	2-deteriorated
E5	Quantity and present condition of the water supply facilities:	1-deteriorated
E6	Quantity and present condition of the water supply facilities: DRR(Daily Regulatory Reservoir)	1-deteriorated
E7	Quantity and present condition of the water supply facilities: net/distribution	deteriorated
E8	Quantity and present condition of the water supply facilities: public tap	partially repaired
E9	Quantity and present condition of the water supply facilities: pump	absent
E10	Who is the owner of the water supply facilities?	community
E11	Who is engaged in the water supply facilities repairing works?	residents
E12	How do you repair the water supply facilities?	by ourselves
E13	Who is in charge of the repair work in the community?	community
E14	How you prepare O&M costs?	no collection
E15	Please indicate the O&M cost breakdown per year for water supply	
	Electricity (AMD)	0
	Labor cost (AMD)	0
	Repair cost(AMD)	0
	Others(AMD)	0
	Total (AMD)	0
E16	Do the residents participate in the O&M works?	manpower
E17	What kind of OM method is preferable to you?	residents participation

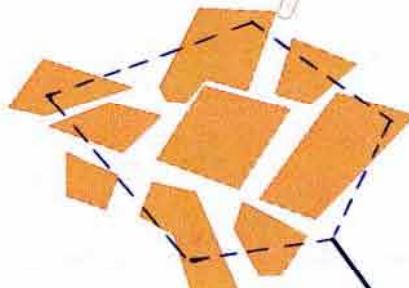
F: Initial Environmental Examination (IEE)

F1	Are any of the following areas located inside or around the project site?	
F1.1	National park, protected area designated by the government (coast line, water lands, reserved are for ethnic or indigenous people, cultural heritage), and areas being considered for national parks or proposed areas.	absent
F1.2	Virgin forests, tropical forests	absent
F1.3	Ecological improvement habits areas (coral reef, mangrove wetland, tidal	absent
F1.4	Habit of valuable species protected by domestic laws or international treaties	absent
F1.5	Likely salts cumulus or soil erosion areas on a massive scale	absent
F1.6	Remarkable desertification trend areas	absent
F1.7	Archaeological historical or cultural valuable areas	absent
F1.8	Living areas of ethic, indigenous people or nomads who have a traditional lifestyle or special socially valuable areas	absent

Shirak
No.9 Zari Shat



Zarishat



A
Nameless

	N	E	H (m)
A	41°59'37.6"	43°39'27.4"	2113

Pipeline length (m)	Pipe diameter (mm)	Material
TRANSMISSION PIPELINE		
400	100	steel
DISTRIBUTION PIPELINE		
1100	100	steel

LEGENDS

- Spring intake
- Transmission pipeline
- Distribution pipeline

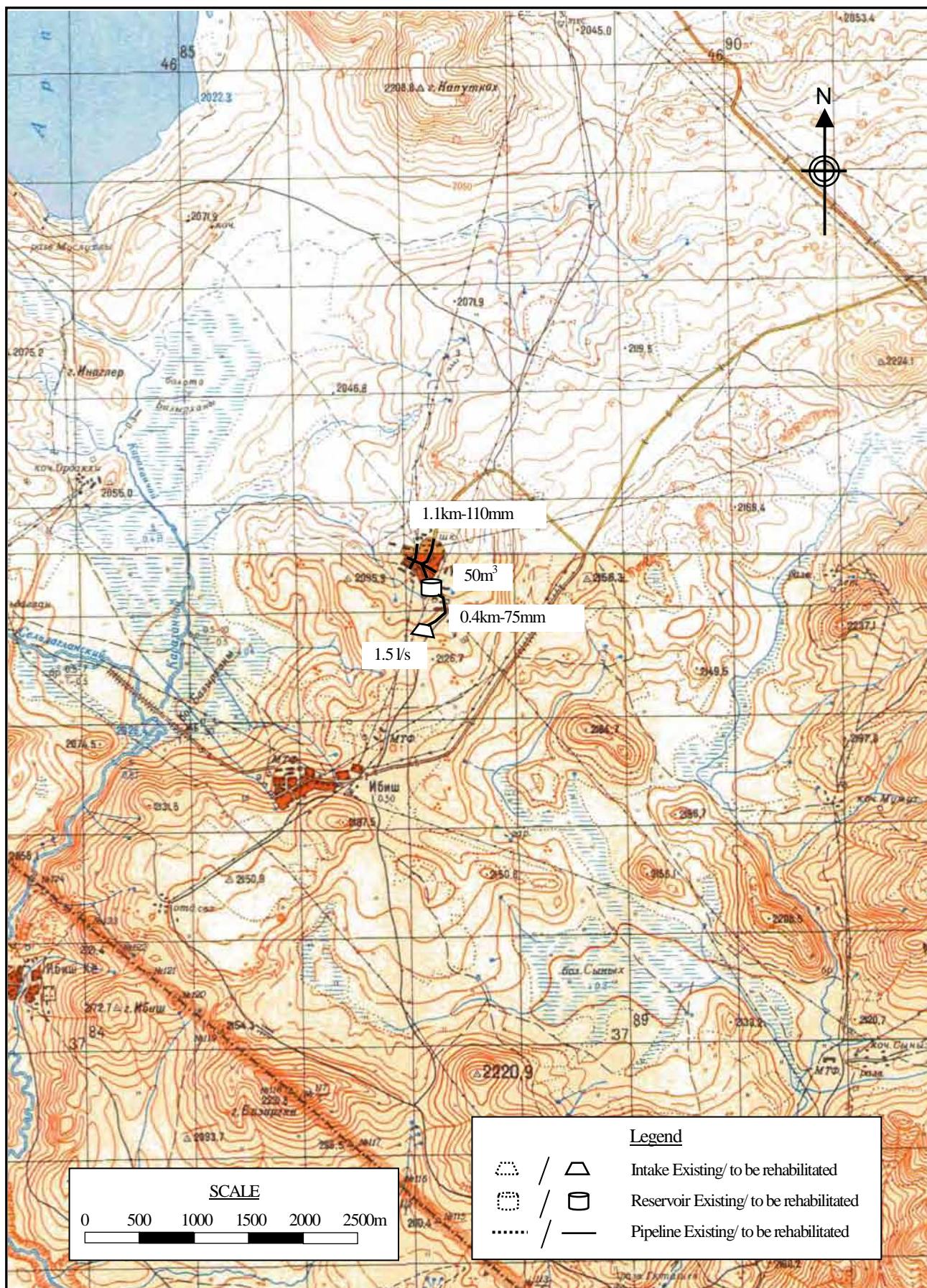
SCALE
0 100 200 300 400 500 m

Shirak Marz		The Study for Improvement of Rural Water Supply and Sewerage Systems in the Republic of Armenia
No.	Community	
09	Zari Shat	JICA STUDY TEAM 2007

Marz : Shirak
Name : Zari Shat

No.9

No.	Item	Quantity	Unit	Water demand (m3/d)
A. WATER DEMAND				
1	Population	114	persons	11.4
2	Factory	-	nos	0.0
3	School (pupils)	12	pupils	0.1
4	Medical Ambulance Station	-	nos	-
5	Policlinic	-	nos	-
7	Livestocks (87lit/household)	21	household	1.8
	Sub-total			13.3
	Unaccounted for water (20%)			2.7
1	Average Daily Water Demand			16.0 m3/day
2	Maximum Daily Water Demand			19.2 m3/day
3	Maximum Hourly Water Demand			4.7 m3/hr
B. WATER SUPPLY PLAN				
	1 Water source type	Nr.	Total vol.	
	a Spring	1	1.5 lit/sec	129.6 m3/day
	^ Total			129.6 m3/day
	2 Required reservoir volume			56 m3
C. WATER SUPPLY FACILITIES REHABILITATION PLAN				
No	Item	Quantity	Unit	
1	Intake			
	1m3	1	nos	
	2m3		nos	
	3m3		nos	
	4m3		nos	
2	Transmission pipe			
	50mm diameter		m	
	75mm diameter	400	m	
	90mm diameter		m	
	110mm diameter		m	
	150mm diameter		m	
	200mm diameter		m	
	250mm diameter		m	
3	Reservoir			
	50m3 capacity	1	nos	
4	Distribution pipe			
	50mm diameter		m	
	75mm diameter		m	
	90mm diameter		m	
	110mm diameter	1,100	m	
	150mm diameter		m	
	200mm diameter		m	
	250mm diameter		m	
5	House connection	21	nos	
6	Water meter installation	21	nos	
7	Public tap	1	nos	
8	Chlorination	1	nos	
9	Pumps	-	nos	



Water Supply Facilities Rehabilitation Plan		The Study for Improvement of Rural Water Supply and Sewage Systems in the Republic of Armenia
Marz	Shirak	
No. 09	Zari Shat	JICA STUDY TEAM

STUDY FOR IMPROVEMENT OF
RURAL WATER SUPPLY AND
SEWAGE SYSTEMS IN RA

Marz : **Shirak**

No. : **9**

Name : **Zari Shat**

No	Item	Specification	Quantity	Unit	Unit Price	Total
1	Intake					
		1m3	1	nos	367,700	367,700
		2m3		nos	545,000	
		3m3		nos	669,100	
		4m3		nos	805,100	
	Sub-total					367,700
2	Transmission Pipe					
		50mm		m	5,520	
		75mm	400	m	7,160	2,864,000
		90mm		m	8,040	
		110mm		m	9,680	
		150mm		m	13,140	
		200mm		m	19,440	
		250mm		m	27,040	
	Sub-total					2,864,000
3	Reservoir					
		50m3	1	nos	8,363,900	8,363,900
		100m3		nos	12,968,300	
		150m3		nos	18,804,500	
		200m3		nos	22,524,600	
		250m3		nos	25,952,800	
		300m3		nos	29,630,400	
		350m3		nos	33,528,700	
		400m3		nos	36,388,000	
		450m3		nos	39,392,500	
		500m3		nos	42,520,900	
	Sub-total					8,363,900
4	Distribution Pipe					
		50mm		m	5,520	
		75mm		m	7,160	
		90mm		m	8,040	
		110mm	1,100	m	9,680	10,648,000
		150mm		m	13,140	
		200mm		m	19,440	
		250mm		m	27,040	
	Sub-total					10,648,000
5	House Connection		21	nos	74,000	1,554,000
6	Water Meter Installation		21	nos	80,000	1,680,000
7	Public Tap		1	nos	90,000	90,000
8	Chlorilation Equipment		1	nos	500,000	500,000
9	Pump Replacement			nos	10,000,000	
10	Drainage and Sewerage concrete surfa		440	m	3,600	1,584,000
Total					AMD	27,651,600
					Equivalent to USD	90,507
					Equivalent to JPY	9,548,454
					AMD	USD
Investment Cost per household				21 HH	1,316,743	4,310
Investment Cost per person				114 persons	242,558	794

SHIRAK MARZ
Amasia District
No 9 Zari Shat

PROJECTED INCOME STATEMENT

Unit: million AMD

PROJECTED CASH FLOW STATEMENT

Unit: million AMD

SHIRAK MARZ
Amasia District
No 9 Zari Shat

FINANCIAL ANALYSIS

A COST RECOVERY ANALYSIS

Item	Million AMD	Rate
1 Revenue		
Water fee revenue	27.09	35.5%
Subsidy	49.22	64.5%
Total	76.31	100.0%
2 Expenditure		
OM cost	22.65	29.7%
Loan repayment	43.46	57.0%
Interest paid	10.20	13.4%
Surplus cash	0.00	0.0%
Total	76.31	100.0%

B. FIRR CALCULATION

Description	Total	Year																																						
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
A COST																																								
1. Investment Cost	39.10	2.30	1.64	2.11	31.58	0.88	0.33	0.26																																
2. Operation and Maintenance Cost																																								
Salary	9.12			0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24				
Chlorine	0.74			0.00	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02			
Electricity	0.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
Maintenance cost	1.85			0.00	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05			
Pump replacement																																								
Sub-total	11.71																																							
Total Outflow	50.81	2.30	1.64	0.24	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31			
B BENEFIT																																								
1. Water Tariff	17.12	0.00	0.00	0.00	0.17	0.17	0.18	0.31	0.32	0.33	0.34	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51		
2. Subsidy	39.02	0.00	0.00	0.24	0.15	0.16	0.16	0.04	0.04	0.04	0.04	1.13	1.15	1.15	1.17	1.17	1.20	1.21	1.21	1.20	1.23	1.23	1.25	1.26	1.27	1.29	1.29	1.30	1.31	1.31	1.34	1.35	1.35	1.36	1.36	1.36	1.36	1.39	1.39	1.40
Total Inflow	56.14	0.00	0.00	0.24	0.32	0.33	0.34	0.35	0.36	0.37	0.38	1.64	1.66	1.66	1.68	1.68	1.71	1.72	1.71	1.74	1.74	1.76	1.77	1.78	1.80	1.80	1.81	1.82	1.82	1.85	1.86	1.86	1.87	1.87	1.87	1.90	1.90	1.91		
NET BENEFIT		5.33	-2.30	-1.64	-2.1	-31.6	-0.9	-0.30	-0.22	0.05	0.06	0.07	1.33	1.35	1.35	1.37	1.37	1.40	1.41	1.41	1.40	1.43	1.43	1.45	1.46	1.47	1.49	1.49	1.50	1.51	1.51	1.54	1.55	1.55	1.56	1.56	1.56	1.59	1.59	1.60

FIRR = 9.59%

C. SENSITIVITY ANALYSIS

No.	Description	PV	1.75%	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1	1 Capital cost 10% up	-11.61		-2.53	-1.80	-2.3	-34.7	-0.9	-0.33	-0.25	0.05	0.06	0.07	1.33	1.35	1.35	1.37	1.37	1.40	1.41	1.41	1.43	1.43	1.45	1.46	1.47	1.49	1.49	1.50	1.51	1.51	1.54	1.55	1.55	1.56	1.56	1.56	1.59	1.59	1.60			
	2 Capital cost 20% up	-15.27		-2.76	-1.97	-2.5	-37.9	-1.0	-0.37	-0.27	0.05	0.06	0.07	1.33	1.35	1.35	1.37	1.37	1.40	1.41	1.41	1.40	1.43	1.43	1.45	1.46	1.47	1.49	1.49	1.50	1.51	1.51	1.54	1.55	1.55	1.56	1.56	1.56	1.59	1.60			
2	1 OM cost 10% up	-8.76		-2.30	-1.64	-2.1	-31.6	-0.9	-0.33	-0.25	0.02	0.03	0.04	1.30	1.32	1.32	1.34	1.34	1.37	1.38	1.38	1.37	1.40	1.40	1.42	1.43	1.44	1.46	1.46	1.47	1.48	1.48	1.51	1.52	1.53	1.53	1.53	1.56	1.56	1.57			
	2 OM cost 20% up	-9.58		-2.30	-1.64	-2.2	-31.6	-0.9	-0.36	-0.28	0.01	0.01	0.01	1.27	1.29	1.29	1.31	1.31	1.34	1.35	1.35	1.37	1.37	1.39	1.40	1.41	1.43	1.43	1.44	1.45	1.45	1.48	1.49	1.49	1.50	1.50	1.50	1.53	1.53	1.54			
3	1 Revenue 10% down	-11.63		-2.30	-1.64	-2.1	-31.6	-0.9	-0.33	-0.26	0.01	0.02	0.03	1.17	1.18	1.18	1.20	1.20	1.23	1.24	1.24	1.26	1.26	1.27	1.28	1.29	1.31	1.31	1.32	1.33	1.33	1.36	1.36	1.37	1.37	1.37	1.40	1.40	1.41				
	2 Revenue 20% down	-15.32		-2.30	-1.64	-2.2	-31.6	-0.9	-0.37	-0.29	-0.02	-0.01	-0.01	1.00	1.02	1.02	1.03	1.03	1.06	1.07	1.07	1.08	1.08	1.10	1.11	1.11	1.13	1.13	1.14	1.15	1.15	1.17	1.18	1.18	1.19	1.19	1.19	1.21	1.21	1.21			

No.	Description	FIRR	Sensitivity indicator	Switching value
1	1 Capital cost 10% up	0.15%	29.73	3.36%
	2 Capital cost 20% up	-0.25%		-2.95%
2	1 OM cost 10% up	0.46%	2.75	36.41%
	2 OM cost 20% up	0.33%		13.08%
3	1 Revenue 10% down	-0.03%	-188.74	-0.53%
	2 Revenue 20% down	-0.72%		-5.51%

No.10 Zorakert + Darik

Information on Existing Water Sources (Shirak)

Study for Improvement of
Rural Water Supply and
Sewage Systems in RA

No.10 Community Zorakert+Darik
District Amasia
Marz Shirak

No	Water source	Latitude			Longitude			Atitude (m)	Yield(L/sec)		
		deg	min	sec	deg	min	sec		Min	Max	At site
1		41	6	41.4	43	41	11.1	2,116	3.0	11.0	8.0
2											
3											
4											
5											
6											
7											
8											
9											
10											

Notes:

Latitude, Longitude, Atitude:	Measured at site
Yield (Min, Max):	Interviewed to the Community
Yield (at site):	Measured / estimated at site in summer of 2007

Users Acceptnace for water quality	Acceptable
Notes	Communitys have separate reservoir.
Alternative sources if any	

No.10 Community Zorakert+Darik
District Amasia
Marz Shirak
Sampling date 20,21/Aug/2007

	Parameters analysed	Units	No.1	Guidelines	
				WHO	Armenia
a	pH		7.3		6.5-8 6.0 - 9.0
b	Temperature	Deg.C	10.3		
c	TDS	Mg/L	74		1000 1000
1	Al:Aluminum	Mg/L	n.d		0.10 0.50
2	B:Boron	Mg/L	n.d		0.70 0.50
3	Cl:Chloride	Mg/L	4		250 350
4	Cr:Chrome	Mg/L	<0.01		0.05 0.05
5	Cu:Copper	Mg/L	n.d		2 1
6	F:Fluoride	Mg/L	0.31		1.50
7	Hardness	Mg/L	170		500 700
8	Fe:Iron	Mg/L	n.d		0.30 0.30
9	Mn:Manganese	Mg/L	n.d		0.40 0.10
10	Mo:Mobdenum	Mg/L	n.d		0.070 0.250
11	Ni:Nickel	Mg/L	n.d		0.020 0.100
12	Nitrate(NO3+)	Mg/L	1.8		50.0 45.0
13	SO4:Sulfate	Mg/L	5.0		250.0 500.0
14	Zn:Zink	Mg/L	n.d		3.0 5.0
15	As:Arsenic	Mg/L	n.d		0.0 0.1
16	Ba:Barium	Mg/L	0.01		0.70 0.10
17	Be:Berillium	Mg/L	0.00009		NA 0.00020
18	Cd:Cadmium	Mg/L	n.d		0.0030 0.0010
19	Pb:Lead	Mg/L	<0.001		0.010 0.030
20	Hg:Mercury	Mg/L	<0.0002		0.00100 0.00050
21	Se:Selenium	Mg/L	n.d		0.010 0.010
22	Sr:Strontium	Mg/L	n.d		NA 7.0
23	CN:Cyanide	Mg/L	n.d		0.070 0.035
24	Coli form bacteria	bacteria per 100 ml		-	0
25	Thermo-tolerant coli form bacteria	bacteria per 100 ml		0	0
26	Total bacteria	bacteria per 1 ml		-	50

Information on Existing Water Sources

Existing Bacteriological Test

Study for Improvement of Rural Water Supply and Sewage Systems in RA

No.10 Community Zorakert+Darik
 District Amasia
 Marz Shirak

No. 10-1 Marz Shirak Community Darik

1. ACCESSIBILITY TO THE SITE

No.	Structures	Access by vehicle	Machine construction	Remarks
1	Intake	Possible	Difficult	
2	Transmission pipeline	impossible	impossible	Difficult to find the pipeline route
3	Reservoir			No reservoir

2. INTAKE STRUCTURE

No.	Water source	N	E	El. (m)	Year	Material	Volume (l/s)	Rehabilitation Necessity (Y/N)
1	Spring	41°06'41,4"	43°41'11,1"	2,116	1989	Steel	8.0	Yes

3. TRANSMISSION PIPELINE

No.	Pipeline length (m)	Pipe diameter	Material	Flow rate (l/s)	Year	Leakage	Rehabilitation Necessity (Y/N)
1	1,500	120	Steel	5.0	1990	Medium	Yes

4. RESERVOIR

No.	N	E	El. (m)	Material	Shape	Dimension (m)	Volume (m3)	Rehabilitation Necessity (Y/N)
1	No							

5. CHLORINATION EQUIPMENT

No.	Existence (Y/N)	Location	Chlorine type	Chlorine duration
1	No			

6. DISTRIBUTION PIPELINE

No.	Pipeline length (m)	Pipe diameter	Material	Year	Leakage	Rehabilitation Necessity (Y/N)
1	No					

7. PUMP STATION

Existence (Y/N)	Power source	Type	Capacity (l/s)	Pump head (m)	Tank cap. (m3)	House size (m)	Rehabilitation Necessity (Y/N)
No							

8. PUBLIC TAPS

No. of taps	Old one (year)	New one (year)	Valves (Y/N)	Valve rate (%)	Rehabilitation Necessity (Y/N)
0				0	

9. DRAINAGE SYSTEM

Existence (Y/N)	Rehabilitation Necessity (Y/N)	Remarks
No	Yes	

No. 10-2 Marz Shirak Community Zorakert

1. ACCESSIBILITY TO THE SITE

No.	Structures	Access by vehicle	Machine construction	Remarks
1	Intake	Possible	Difficult	
2	Transmission pipeline	Possible	Possible	Pipeline is mostly far from the road
3	Reservoir	Possible	Possible	

2. INTAKE STRUCTURE

No.	Water source	N	E	El. (m)	Year	Material	Volume (l/s)	Rehabilitation Necessity (Y/N)
1	Spring	41°06'41,4"	43°41'11,1"	2,116	1989	Steel	8.0	Yes

3. TRANSMISSION PIPELINE

No.	Pipeline length (m)	Pipe diameter	Material	Flow rate (l/s)	Year	Leakage	Rehabilitation Necessity (Y/N)
1	3,000	120	Steel	7.2	1989	Little	Yes

4. RESERVOIR

No.	N	E	El. (m)	Material	Shape	Dimension (m)	Volume (m³)	Rehabilitation Necessity (Y/N)
1	41°05'31,8"	43°39'59,8"	2,072	Steel	Circle	3×d=1m, l=20m	48	Yes

5. CHLORINATION

No.	Existence (Y/N)	Location	Chlorine type	Chlorine duration
1	Yes	Reservoir	Powder	1 per 3month

6. DISTRIBUTION PIPELINE

No.	Pipeline length (m)	Pipe diameter	Material	Year	Leakage	Rehabilitation Necessity (Y/N)
1	6700	120	Steel	1989	no	No

7. PUMP STATION

Existence (Y/N)	Power source	Type	Capacity (l/s)	Pump head (m)	Tank cap. (m³)	House size (m)	Rehabilitation Necessity (Y/N)
No							

8. PUBLIC TAPS

No. of taps	Old one (year)	New one (year)	Valves (Y/N)	Valve rate (%)	Rehabilitation Necessity (Y/N)
3		1989	No	0	Yes

9. DRAINAGE SYSTEM

Existence	Rehabilitation	Remarks
No	Yes	

**Questionnaire on Existing Water Supply Conditions
by Socio-Economic Survey**

Marz	Shirak
Number and Name of Community	No.10 Zorakert + Darik
District	Amasia

No.	Question	Answer
A: Baseline Data		
A1	Actual population in 2001	168
A2	Actual population in 2007	168
A3	Number of households	31
A4.1	Elderly people	7
A4.2	Population in labor force (age from 16 to 62)	127
A4.3	Children	34
A5.1	Pensioners	7
A5.2	Unemployed	0
A5.3	Receiving benefits	1
A6	Average monthly income of household (AMD)	50,000
A7	Number of medical ambulance staion/first and health post	absent
A8	Number of beds in each medical ambulance staion	0
A9	Number of school	1
A10	Number of pupils	31
B: Budget		
B1	Annual Budget of the community 2004, in thousand AMD	2,000
	Annual Budget of the community 2005, in thousand AMD	2,000
	Annual Budget of the community 2006, in thousand AMD	2,500
	Annual Budget of the community 2007, in thousand AMD	1,500
	Annual Budget of the community 2008, in thousand AMD	is not planned
B2	Amount spent in drinking water sector 2004, in thousand AMD	0
	Amount spent in drinking water sector 2005, in thousand AMD	0
	Amount spent in drinking water sector 2006, in thousand AMD	0
	Amount spent in drinking water sector 2007, in thousand AMD	0
	Amount spent in drinking water sector 2008, in thousand AMD	is not planned
C: Socio-Economic Survey		
C1	Major industries of the community:	dairy, meat, potatoes
C2	Is there any community activities carrying out by women? 1-Yes, 2-No	no
D: Water Usage and Water Demand Survey		
D1	Does the community hold water use permit? 1-Yes 2-No	yes
D2	Water use permit number	1071
D3	Date of expiry of water use permit	2006-2009
D4	Planned date of obtaining water use permit	-
D5	Present condition of the water supply volume of Domestic use	sufficient
D6	Present condition of the water supply volume of Irrigation water	absent
D7	Number of house connection to drinking water system	31
D8	How many house connection household set the water meter	0
D9	Number of public taps	0
D10.1	How is the regime of water supply in your community in the dry season?	24 hrs
D10.2	How is the regime of water supply in your community in the wet season?	24 hrs
D11	What time of day water is given?	-
D12	Are you pleased with duration of domestic water supply?	fully pleased
D13	Are hours of water supply convenient?	-
D14.1	How long the taps are open to provide the domestic water (cooking, washing, foodstuffs, dishes, Landry, bathing, etc) of each household a day?	-
D14.2	Estimate quantity of domestic water use of each household (litter per day)	300

No.	Question	Answer
D15.1	How long the taps are open to provide the each household for filling	-
D15.2	Estimate quantity of water for filling containers of each household (litter per	600
D16	Drinking water monthly water fee per household	0
D17	How often do you usually pay water fees?	-
D18	Water fee structure 1Flat rate, 2 Having water tariff	-
D19	Where do you acquire the irrigation water?	absent
D20	Are you satisfied with irrigation water supply volume?	insufficient

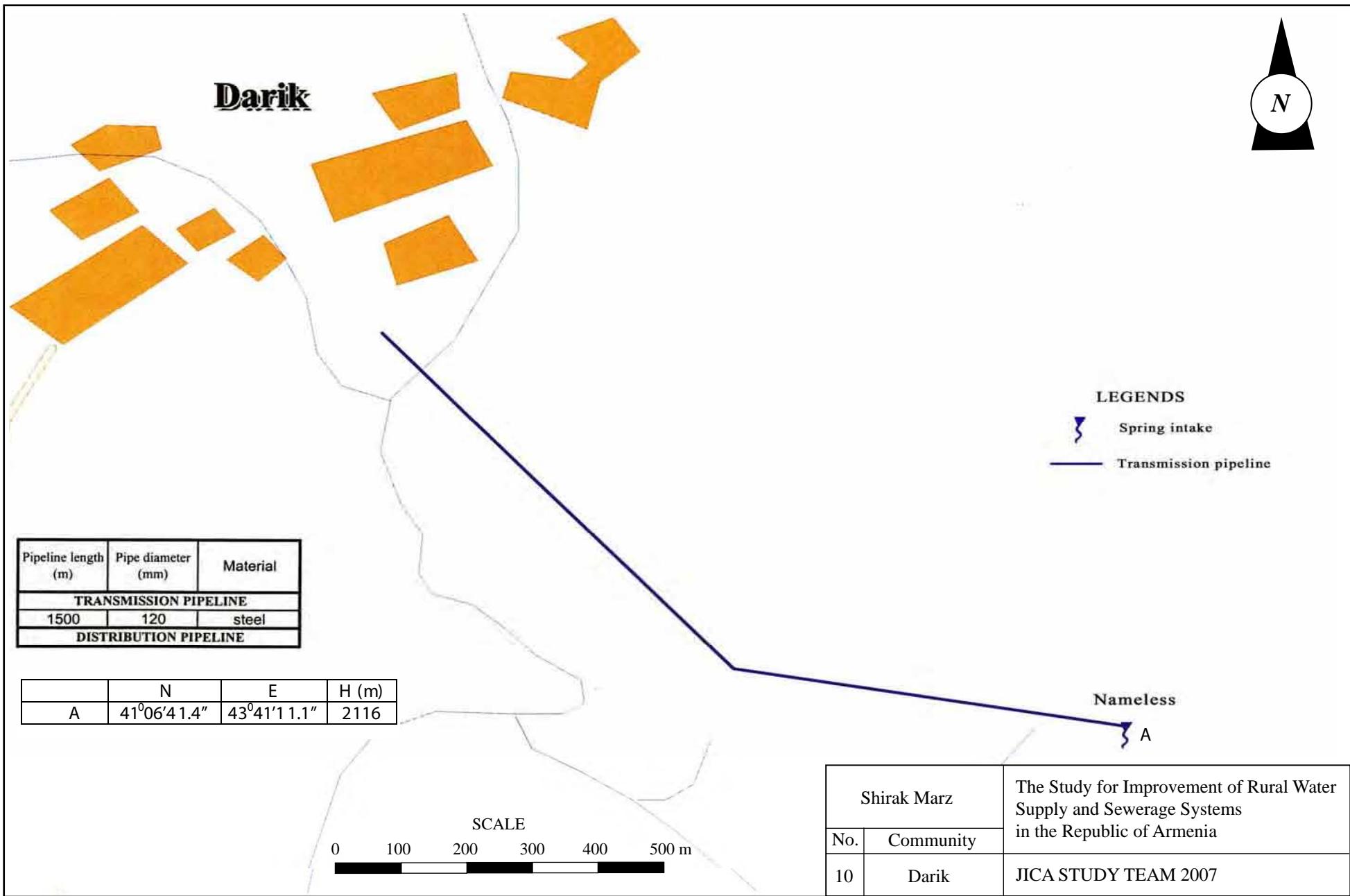
E: Present Operation and Maintenance Works

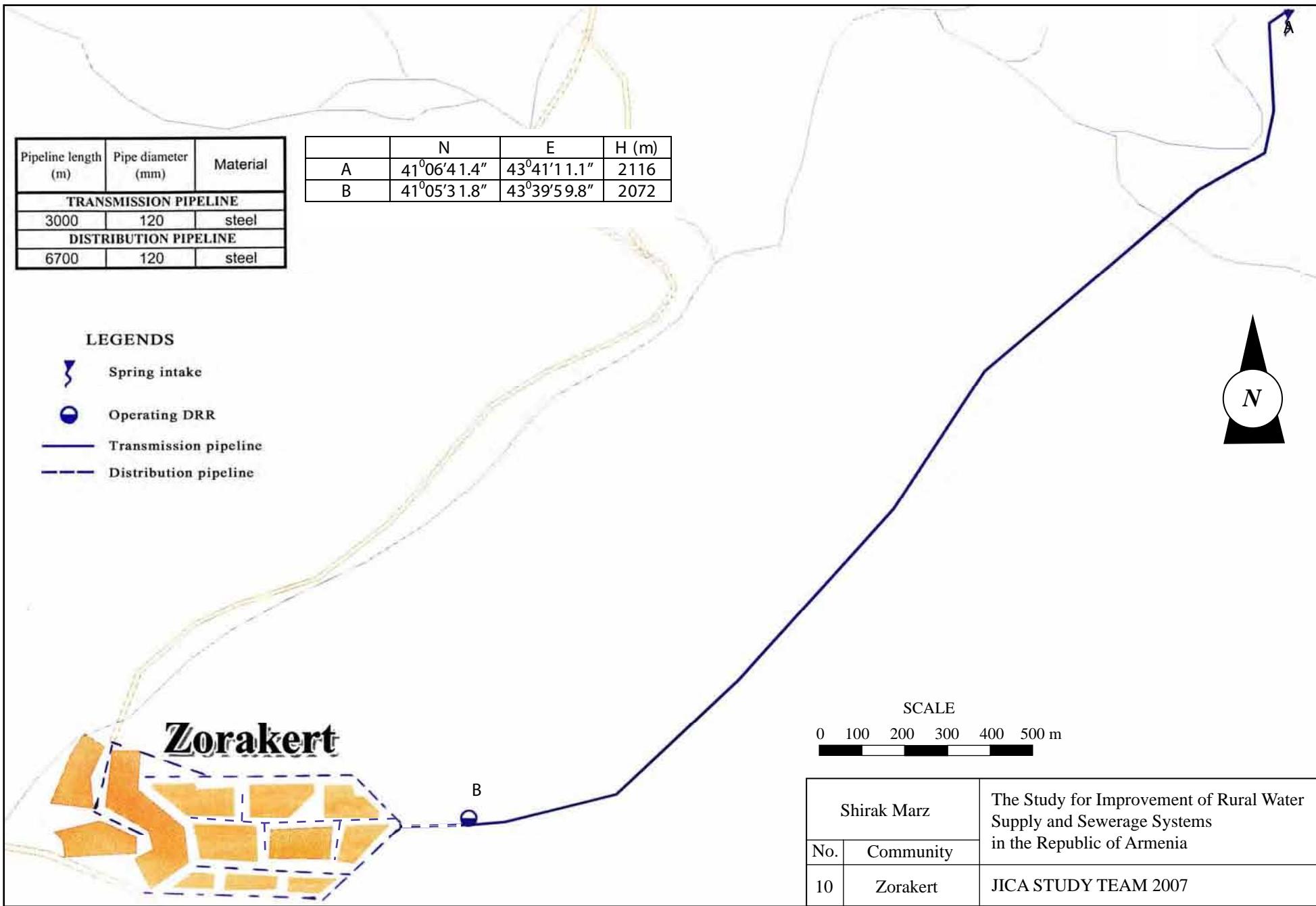
E1	Name of responsible for water supply	nobody
E2	Position	-
E3	Telephone	-
E4	Quantity and present condition of the water supply facilities: spring/ intake	absent
E5	Quantity and present condition of the water supply facilities:	2-partially repaired
E6	Quantity and present condition of the water supply facilities: DRR(Daily Regulatory Reservoir)	3-rehabilitated
E7	Quantity and present condition of the water supply facilities: net/distribution	partially repaired
E8	Quantity and present condition of the water supply facilities: public tap	absent
E9	Quantity and present condition of the water supply facilities: pump	absent
E10	Who is the owner of the water supply facilities?	community
E11	Who is engaged in the water supply facilities repairing works?	nobody
E12	How do you repair the water supply facilities?	no way applied
E13	Who is in charge of the repair work in the community?	absent
E14	How you prepare O&M costs?	no collection
E15	Please indicate the O&M cost breakdown per year for water supply	
	Electricity (AMD)	0
	Labor cost (AMD)	0
	Repair cost(AMD)	0
	Others(AMD)	0
	Total (AMD)	0
E16	Do the residents participate in the O&M works?	no
E17	What kind of OM method is preferable to you?	residents participation

F: Initial Environmental Examination (IEE)

F1	Are any of the following areas located inside or around the project site?	
F1.1	National park, protected area designated by the government (coast line, water lands, reserved are for ethnic or indigenous people, cultural heritage), and areas being considered for national parks or proposed areas.	yes
F1.2	Virgin forests, tropical forests	absent
F1.3	Ecological improvement habits areas (coral reef, mangrove wetland, tidal	yes
F1.4	Habit of valuable species protected by domestic laws or international treaties	absent
F1.5	Likely salts cumulus or soil erosion areas on a massive scale	yes
F1.6	Remarkable desertification trend areas	absent
F1.7	Archaeological historical or cultural valuable areas	absent
F1.8	Living areas of ethic, indigenous people or nomads who have a traditional lifestyle or special socially valuable areas	absent

Shirak
No.10 Zorakert + Darik





Marz : Shirak
Name : Zorakert+Darik

No.10

No.	Item	Quantity	Unit	Water demand (m3/d)
A. WATER DEMAND				
1	Population	168	persons	16.8
2	Factory	-	nos	0.0
3	School (pupils)	31	pupils	0.3
4	Medical Ambulance Station	-	nos	-
5	Policlinic	-	nos	-
6	Livestocks (87lit/household)	31	household	2.7
	Sub-total			19.8
	Unaccounted for water (20%)			4.0
1	Average Daily Water Demand			23.8 m3/day
2	Maximum Daily Water Demand			28.5 m3/day
3	Maximum Hourly Water Demand			6.9 m3/hr
B. WATER SUPPLY PLAN				
	1 Water source type	Nr.	Total vol.	
	a Spring	1	8.0	lit/sec
				691.2 m3/day
	^ Total			691.2 m3/day
	2 Required reservoir volume			83 m3
C. WATER SUPPLY FACILITIES REHABILITATION PLAN				
No	Item	Quantity	Unit	
1	Intake			
	1m3	1	nos	
	2m3		nos	
	3m3		nos	
	4m3		nos	
2	Transmission pipe			
	50mm diameter		m	
	75mm diameter		m	
	90mm diameter		m	
	110mm diameter	4,000	m	
	150mm diameter		m	
	200mm diameter		m	
	250mm diameter		m	
3	Reservoir			
	50m3 capacity	2	nos	For each route
4	Distribution pipe			
	50mm diameter		m	
	75mm diameter		m	
	90mm diameter		m	
	110mm diameter		m	
	150mm diameter		m	
	200mm diameter		m	
	250mm diameter		m	
5	House connection	-	nos	
6	Water meter installation	31	nos	
7	Public tap	1	nos	
8	Chlorination	2	nos	For each reservoir
9	Pumps	-	nos	



Water Supply Facilities Rehabilitation Plan		The Study for Improvement of Rural Water Supply and Sewerage Systems in the Republic of Armenia
Marz	Shirak	JICA STUDY TEAM
No. 10	Zorakert+Darik	

STUDY FOR IMPROVEMENT OF
RURAL WATER SUPPLY AND
SEWAGE SYSTEMS IN RA

Marz : **Shirak**

No. : **10**

Name : **Zorakert+Darik**

No	Item	Specification	Quantity	Unit	Unit Price	Total
1	Intake					
		1m3	1	nos	367,700	367,700
		2m3		nos	545,000	
		3m3		nos	669,100	
		4m3		nos	805,100	
	Sub-total					367,700
2	Transmission Pipe					
		50mm		m	5,520	
		75mm		m	7,160	
		90mm		m	8,040	
		110mm	4,000	m	9,680	38,720,000
		150mm		m	13,140	
		200mm		m	19,440	
		250mm		m	27,040	
	Sub-total					38,720,000
3	Reservoir					
		50m3	2	nos	8,363,900	16,727,800
		100m3		nos	12,968,300	
		150m3		nos	18,804,500	
		200m3		nos	22,524,600	
		250m3		nos	25,952,800	
		300m3		nos	29,630,400	
		350m3		nos	33,528,700	
		400m3		nos	36,388,000	
		450m3		nos	39,392,500	
		500m3		nos	42,520,900	
	Sub-total					16,727,800
4	Distribution Pipe					
		50mm		m	5,520	
		75mm		m	7,160	
		90mm		m	8,040	
		110mm		m	9,680	
		150mm		m	13,140	
		200mm		m	19,440	
		250mm		m	27,040	
	Sub-total					
5	House Connection			nos	74,000	
6	Water Meter Installation		31	nos	80,000	2,480,000
7	Public Tap		1	nos	90,000	90,000
8	Chlorilation Equipment		2	nos	500,000	1,000,000
9	Pump Replacement			nos	10,000,000	
10	Drainage and Sewerage concrete surfa			m	3,600	
Total					AMD	59,385,500
					Equivalent to USD	194,375
					Equivalent to JPY	20,506,580
					AMD	USD
Investment Cost per household				31 HH	1,915,661	6,270
Investment Cost per person				168 persons	353,485	1,157

**SHIRAK MARZ
Amasia District
No 10 Zorakert+Darik**

PROJECTED INCOME STATEMENT

Unit: million AMD

PROJECTED CASH FLOW STATEMENT

Unit: million AMD

SHIRAK MARZ
Amasia District
No 10 Zorakert+Darik

FINANCIAL ANALYSIS

A COST RECOVERY ANALYSIS

Item	Million AMD	Rate
1 Revenue		
Water fee revenue	40.30	27.3%
Subsidy	107.15	72.7%
Total	147.45	100.0%
2 Expenditure		
OM cost	48.01	32.6%
Loan repayment	80.59	54.7%
Interest paid	18.85	12.8%
Surplus cash	0.00	0.0%
Total	147.45	100.0%

B. FIRR CALCULATION

Unit: million AMD

FIRR =

C. SENSITIVITY ANALYSIS

No.	Description	PV	1.75%	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40		
1	1 Capital cost 10% up	-16.85		-2.53	-1.80	-2.3	-70.7	-0.9	-0.30	-0.21	0.11	0.13	0.16	2.51	2.53	2.56	2.59	2.61	2.65	2.67	2.69	2.72	2.76	2.79	2.81	2.85	2.87	2.90	2.95	2.98	3.00	3.04	3.08	3.12	3.15	3.17	3.21	3.24	3.29	3.32	3.35	3.39	3.44		
	2 Capital cost 20% up	-23.56		-2.76	-1.97	-2.5	-77.2	-1.0	-0.34	-0.23	0.11	0.13	0.16	2.51	2.53	2.56	2.59	2.61	2.65	2.67	2.69	2.72	2.76	2.79	2.81	2.85	2.87	2.90	2.95	2.98	3.00	3.04	3.08	3.12	3.15	3.17	3.21	3.24	3.29	3.32	3.35	3.39	3.44		
2	1 OM cost 10% up	-11.84		-2.30	-1.64	-2.1	-64.4	-0.9	-0.34	-0.25	0.04	0.06	0.09	2.44	2.46	2.49	2.52	2.54	2.58	2.60	2.62	2.65	2.69	2.72	2.74	2.78	2.80	2.83	2.88	2.91	2.93	2.97	3.01	3.05	3.08	3.10	3.14	3.17	3.22	3.25	3.32	3.37	3.44		
	2 OM cost 20% up	-13.56		-2.30	-1.64	-2.2	-64.4	-1.0	-0.40	-0.31	-0.02	0.00	0.03	2.38	2.40	2.43	2.46	2.48	2.52	2.54	2.56	2.59	2.63	2.66	2.68	2.72	2.74	2.77	2.82	2.85	2.87	2.91	2.95	2.99	3.02	3.04	3.08	3.11	3.16	3.19	3.22	3.26	3.31	3.35	3.39
3	1 Revenue 10% down	-17.55		-2.30	-1.64	-2.1	-64.4	-0.9	-0.34	-0.25	0.03	0.05	0.08	2.19	2.21	2.24	2.27	2.28	2.32	2.34	2.38	2.42	2.45	2.46	2.50	2.52	2.54	2.59	2.62	2.65	2.67	2.71	2.74	2.77	2.79	2.82	2.85	2.88	2.90	2.92	2.95	2.99	3.03		
	2 Revenue 20% down	-24.98		-2.30	-1.64	-2.2	-64.4	-1.0	-0.41	-0.33	-0.04	-0.03	0.08	1.88	1.89	1.92	1.99	1.98	2.00	2.02	2.04	2.08	2.10	2.12	2.15	2.16	2.19	2.23	2.25	2.27	2.30	2.33	2.36	2.39	2.40	2.44	2.46	2.50	2.52	2.55	2.58	2.62	3.35	3.39	3.44

No.	Description	FIRR	Sensitivity indicator	Switching value
1	1 Capital cost 10% up	0.53%	8.31	12.03%
	2 Capital cost 20% up	0.14%		1.62%
2	1 OM cost 10% up	0.84%	1.63	61.31%
	2 OM cost 20% up	0.70%		25.47%
3	1 Revenue 10% down	0.34%	18.60	5.38%
	2 Revenue 20% down	-0.36%		-2.71%