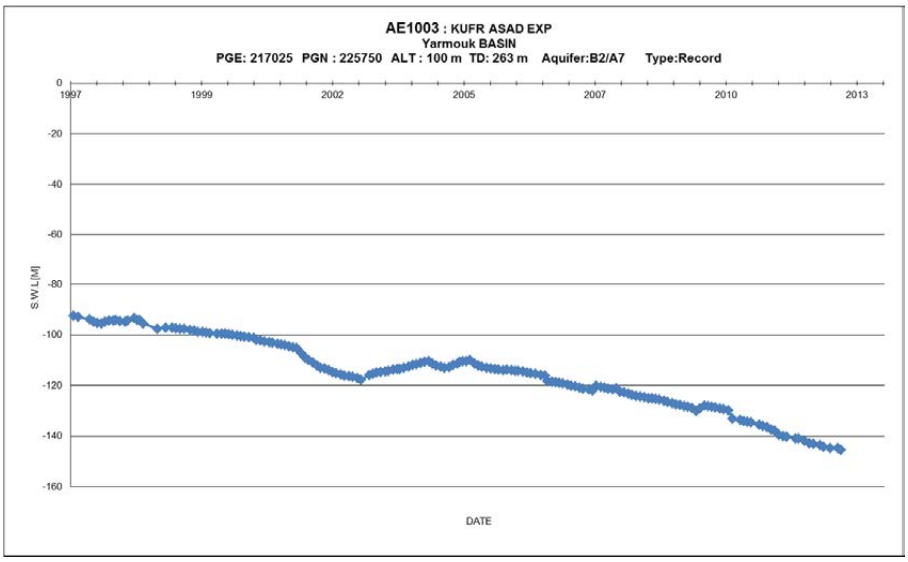
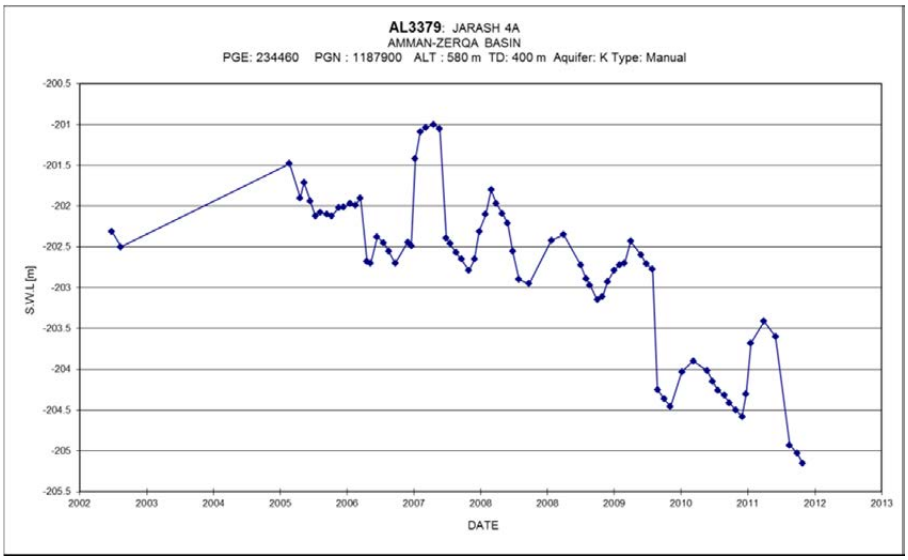
APPENDIX 3C WELLS TABLE CHANGE

The groundwater level changes based on long-term observations of the major well fields are shown below. Groundwater level declines are in progress in almost all well fields. Locations of wells are shown in Chapter 3 of Main Report.

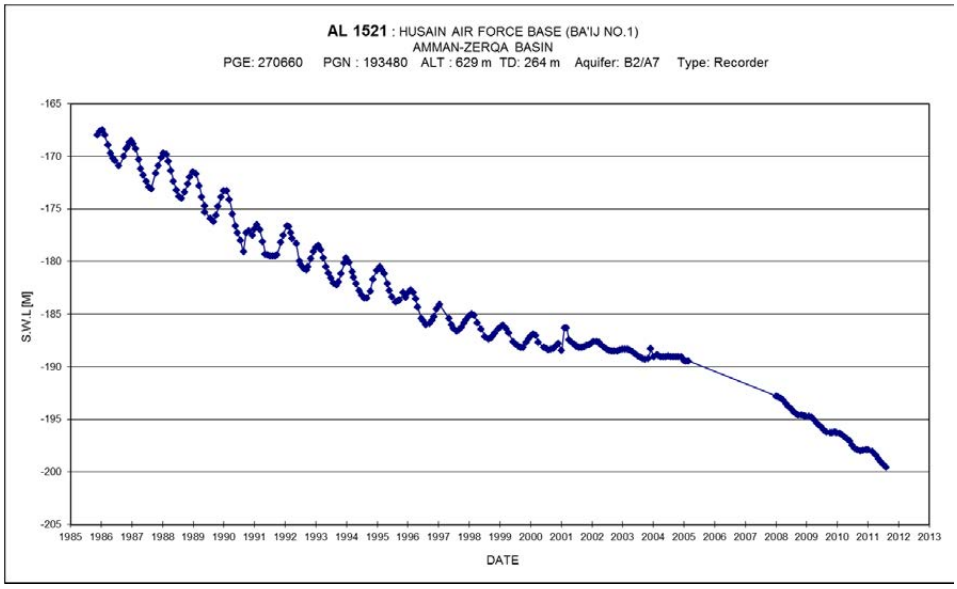
(A) Kufr Asad Well Field AE1003 (Groundwater level observation well 1)



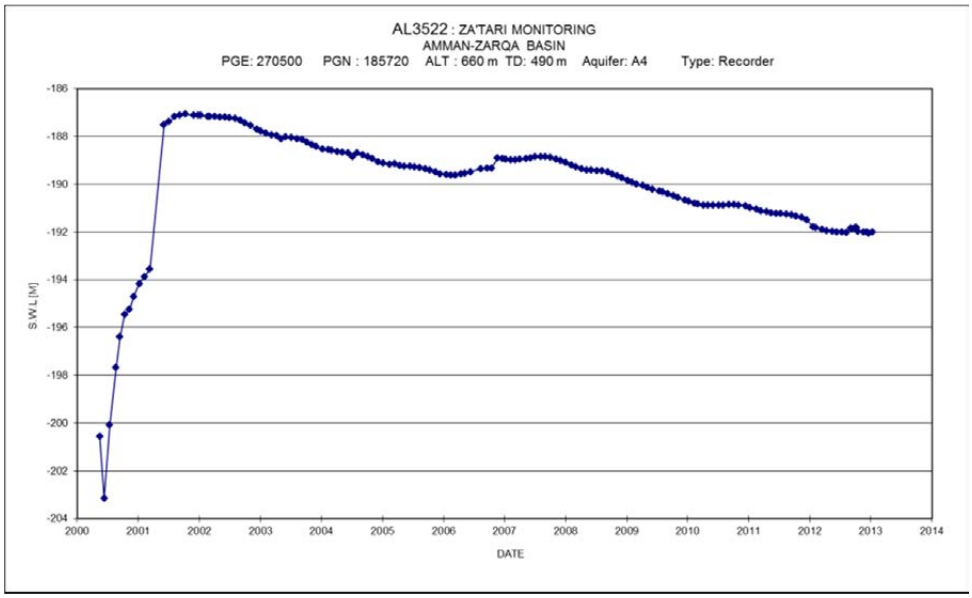
(B) Jerash Well Field AL3379 (Groundwater level observation well 2)



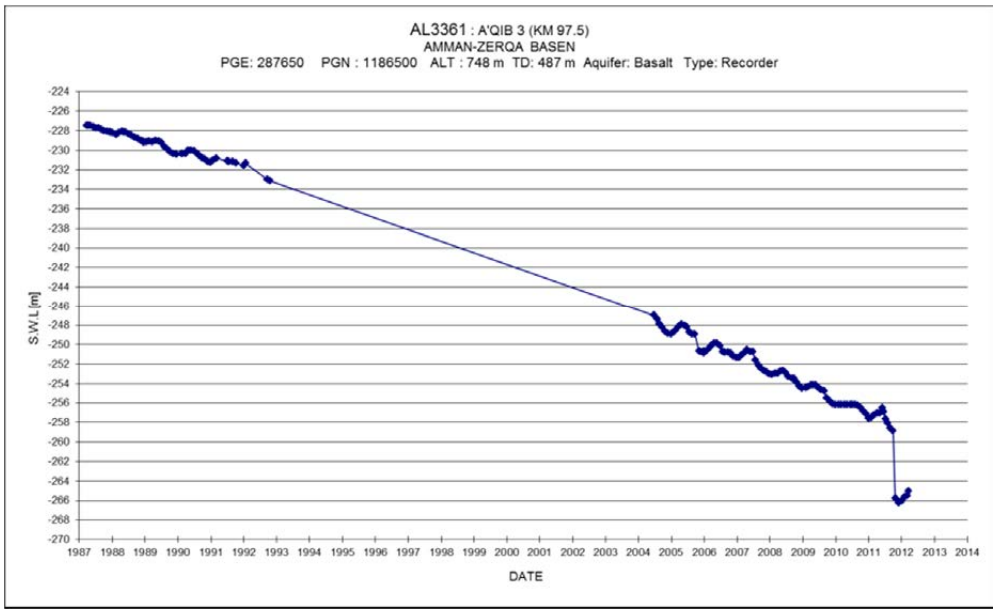
(C) Za'atary Well Field Northwest Side AL1521 (Groundwater level observation well 3)



(D) Za'atary Well Field Southwest Side AL3522 (Groundwater level observation well 4)



(E) Al Aqeb Well Field Central AL3361 (Groundwater level observation well 5)



Source; YWC Well Division data

Figure 17 Long Period Groundwater Level Change

APPENDIX 3D PIPE INFORMATION IN IRBID AND RAMTHA

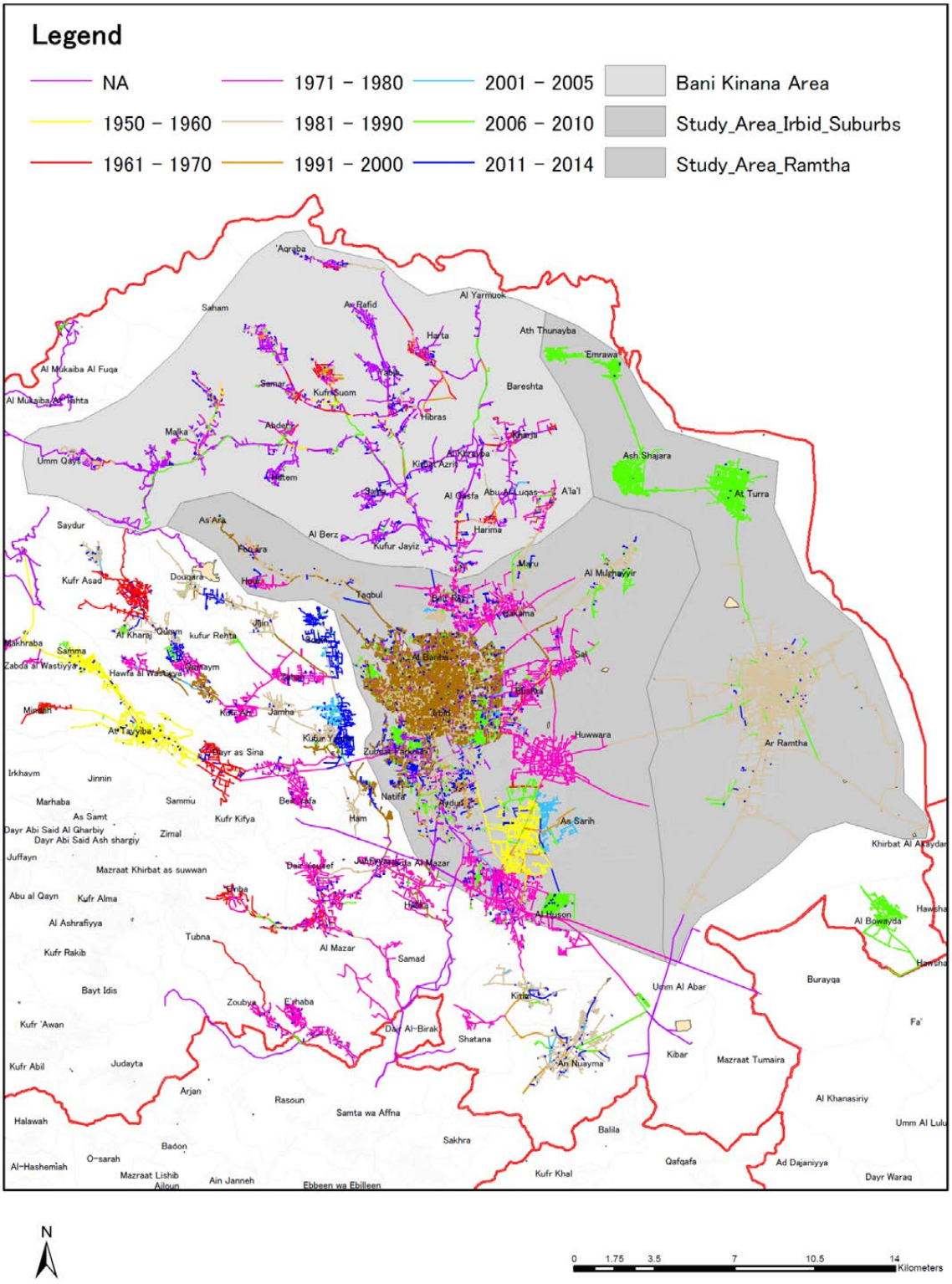
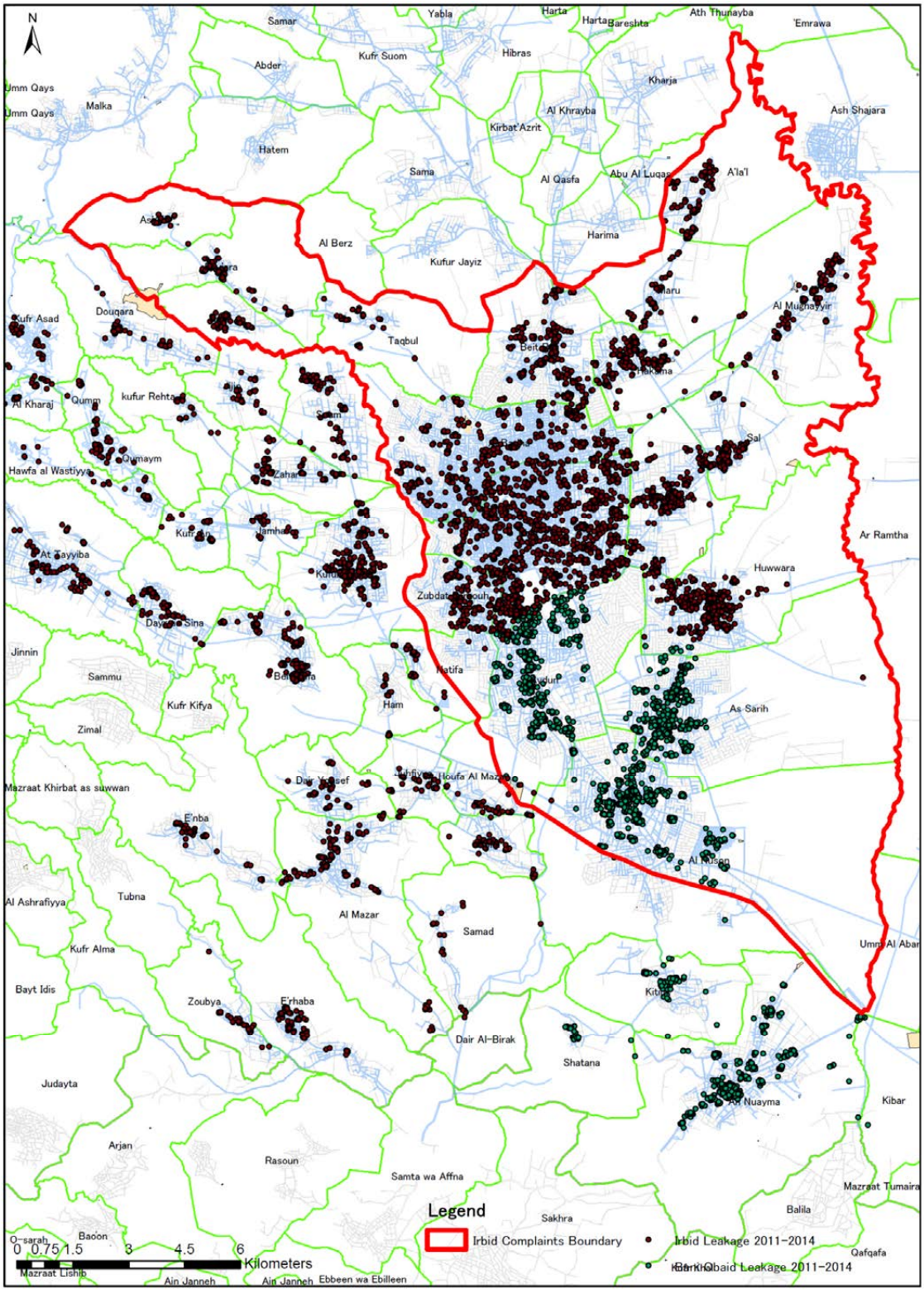


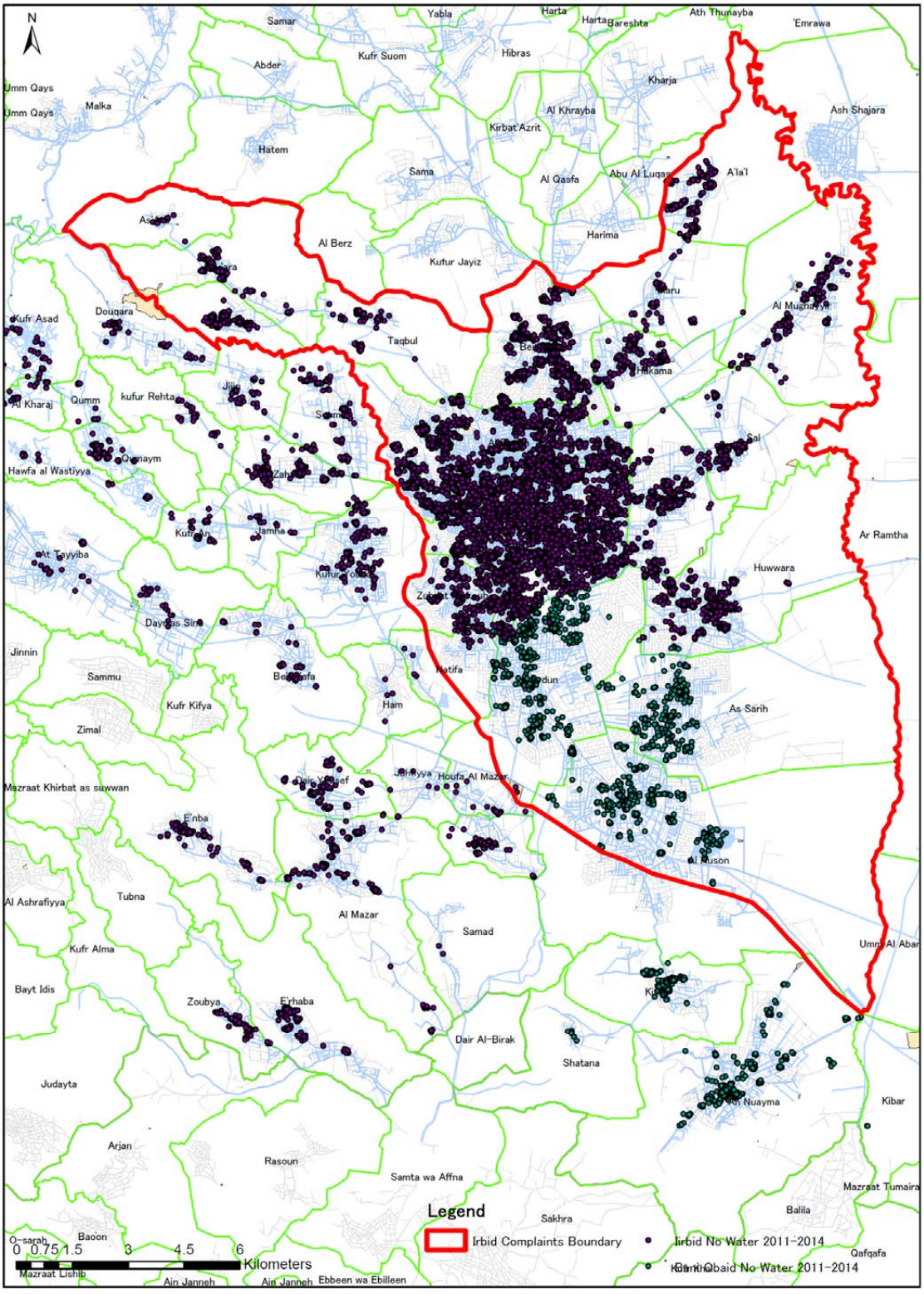
Figure 18 Installation Year of Pipes in Irbid and Ramtha

APPENDIX3E COMPLAINTS RECORD IN IRBID



Source: YWC

Figure 19 Leakage Locations in Irbid and Bani Obaid ROUs during 2011-June 2014



Source: YWC

Figure 20 No Water Locations in Irbid and Bani Obaid ROUs during 2011-June 2014

APPENDIX 3F DATA LOGGERS IN IRBID

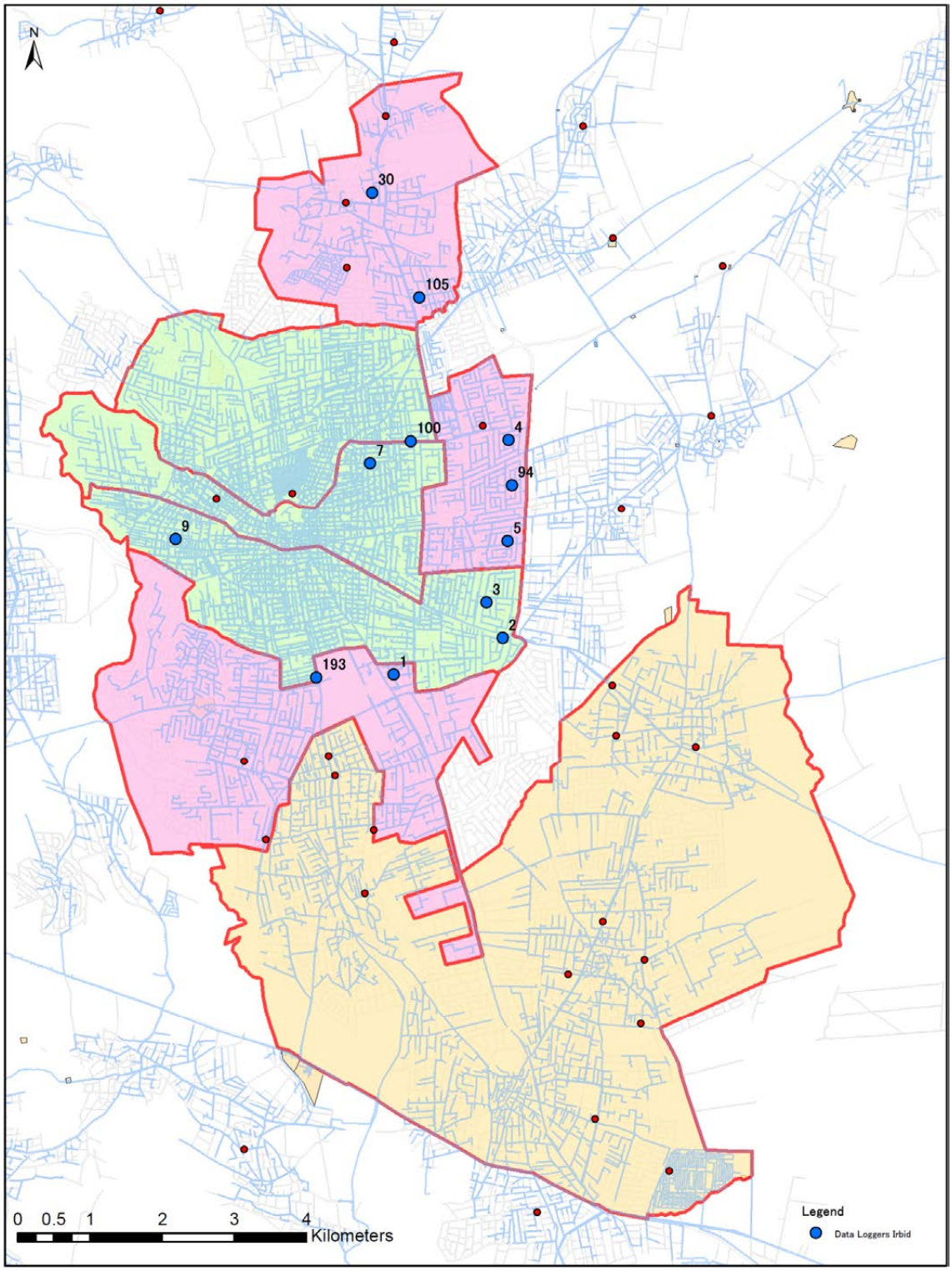


Figure 21 Location of Pressure Data Loggers in Irbid and Its Suburbs

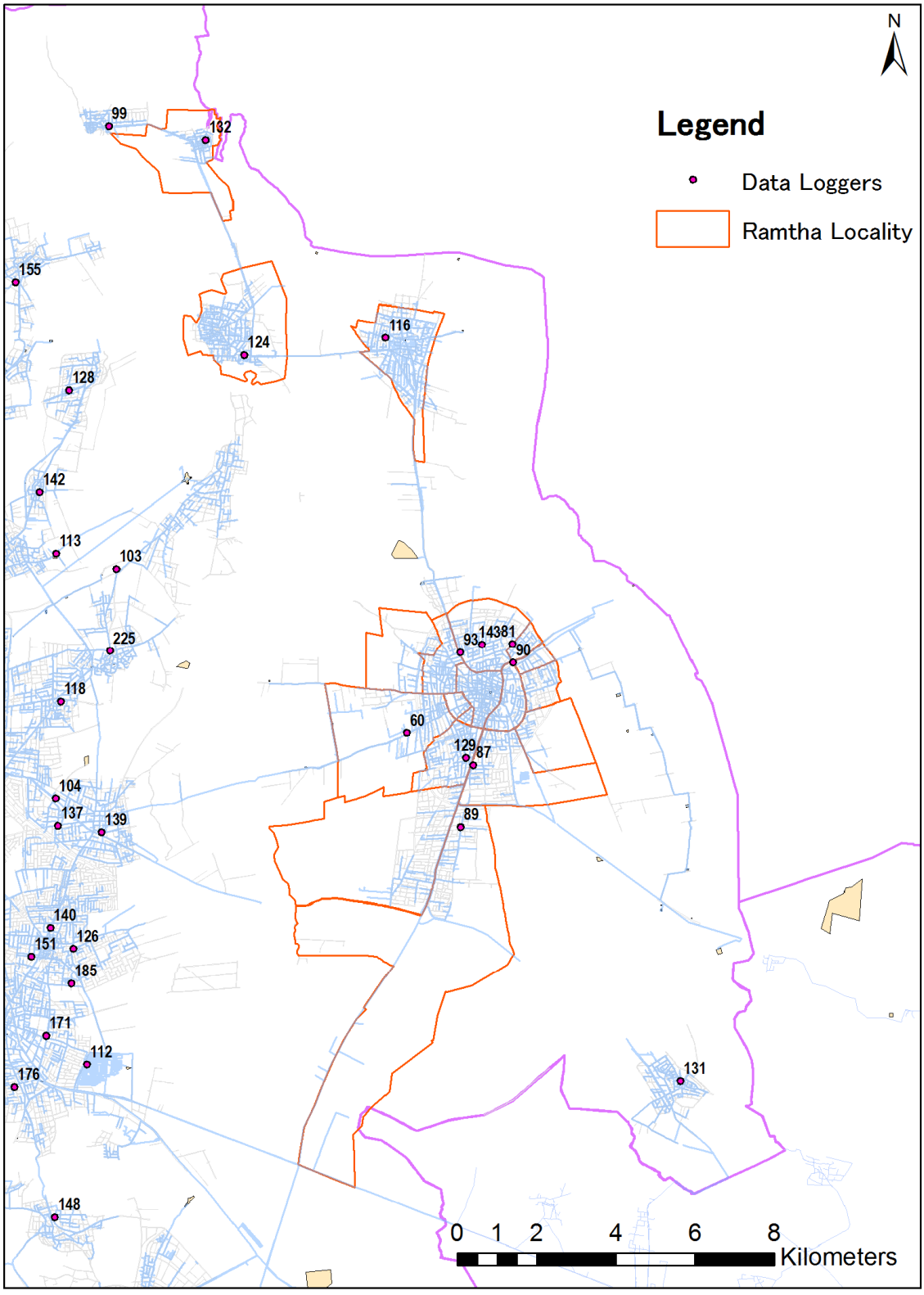


Figure 22 Location of Pressure Data Loggers in Ramtha and Its Suburbs

APPENDIX 3G PIPE INFORMATION IN RAMTHA

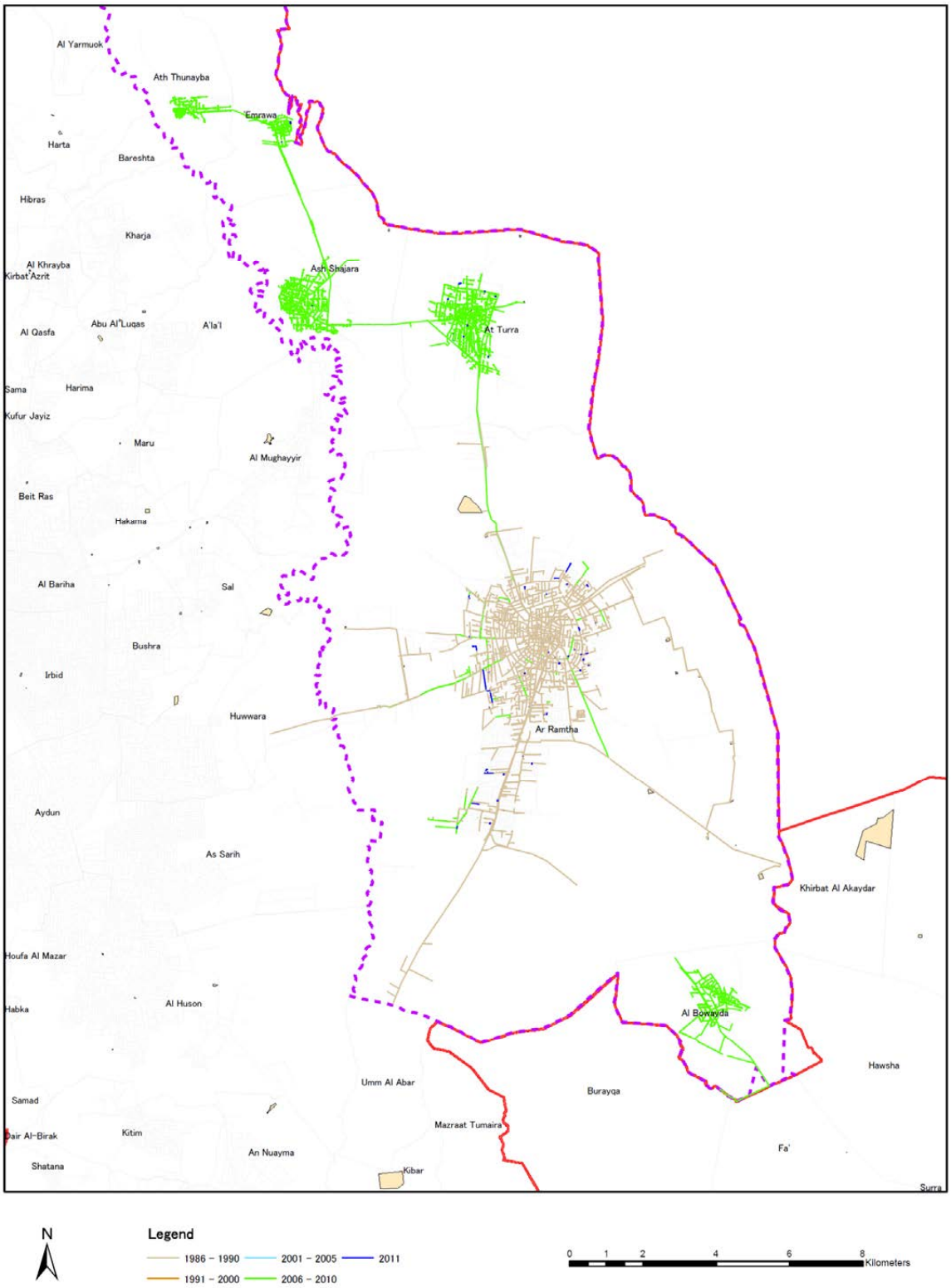


Figure 23 Installation Year of Pipes in Ramtha ROU

APPENDIX5A COST COMPARISON FOR TRANSMISSION AND DISTRIBUTION ZONING SYSTEM

Table 8 Detail of Cost Comparison

Item	Unit	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
1. Water Supply Flow							
Daily max water supply							
from Zebdat to Zebdat gravity zone	m^3/h	3,930	3,930	4,590	4,590	5,006	5,006
from Zebdat to sub-zone 2		1,418	1,418				
from Zebdat to sub-zone 1				758	758		
from Hofa to Hofa gravity zone						342	342
Hourly peak water supply							
from Zebdat to Zebdat gravity zone	m^3/h	7,074	7,074	7,074	7,074	7,074	7,074
from Zebdat to sub-zone 2		2,554	2,554	1187	1187	1187	1187
from Zebdat to sub-zone 1				1,367	1,367	748	748
from Hofa to Hofa gravity zone						619	619
2. Proposed Facilities and Estimated Costs							
Transmission pipe length & Diameter							
Length from PS3 to Zebdat	m	22,680	22,680	22,680	22,680	22,680	22,680
Diameter existing	mm	800	800	800	800	800	800
Length from PS3 to Zebdat	m	22,680	22,680	22,680	22,680	22,680	22,680
Diameter proposed	mm	900	700	800	800	900	800
Capital Cost	million JD	22.68	9.53	13.15	13.15	22.68	13.15
Length from PS3 to Hofa	m		25,150	25,150	25,150	-	25,150
Diameter proposed	mm		600	400	400		300
Capital Cost	million JD		8.80	5.03	5.03		3.40
Length from Zebdat to Hofa	m	6,810		6810		6,810	
Diameter existing	mm	600		600		600	
Diameter proposed	mm						
Capital Cost	million JD						
Transmission pump capacity and electricity cost							
from PS3 to Zebdat proposed	m^3/hr	5,348	3,930	5,348	4,590	5,348	5,006
Capital Cost	million JD	4.09	3.14	3.58	3.58	4.09	3.86
O&M Cost(electricity)	million JD	0.33	0.25	0.29	0.29	0.33	0.33
from PS3 to Hofa proposed	m^3/hr		1,418		758		342
Capital Cost	million JD		1.46		1.02		0.75
O&M Cost(electricity)	million JD		0.16		0.11		0.05
from Zebdat to Hofa existing	m^3/hr					342	
Capital Cost(million JD)	million JD					0.75	
O&M Cost(electricity)	million JD					0.01	
from Zebdat to Hofa proposed	m^3/hr	1,418		758			
Capital Cost	million JD	1.46		1.02			
O&M Cost(electricity)	million JD	0.07		0.03			
Distribution pump capacity and electricity cost							
from Zebdat to P2	m^3/hr			1187	1187	1187	1187
Capital Cost	million JD			1.31	1.31	1.31	1.31
O&M Cost(electricity)	million JD			0.05	0.05	0.05	0.05
from Zebdat to P1	m^3/hr					748	748
Capital Cost	million JD					1.02	1.02
O&M Cost(electricity)	million JD					0.04	0.04
3. Summary of Cost							
Capital Cost	million JD	28.23	22.93	24.10	24.10	29.84	23.48
O&M Cost(electricity)	million JD	0.40	0.42	0.37	0.44	0.43	0.47
Capital Cost+O&M (NPV)	million JD	31.23	26.09	26.89	27.48	33.08	27.02

APPENDIX 5B MONITORING AND CONTROL PLAN (SCADA SYSTEM)

1. Monitoring and Control Plan in Irbid and its Suburbs

Necessity and Purpose of SCADA System

SCADA system is proposed to monitor and control flows and pressures to each distribution sub-zone (DMA) for equitable water distribution/ allocation.

Effect of SCADA System

Subject to the development of appropriate DMA, by introduction of SCADA following effect can be expected.

1) Monitoring for the conditions of the water distribution
   By monitoring flow and pressure at inlet for each DMA and outlet flow of pumping station and reservoir, YWC can understand the conditions of water distribution.
2) Achievement of equivalent water distribution
   To distribute the limited water amount evenly, water flow for each distribution area should be controlled to the appropriate value calculated in advance. By flow control for the inlet valve of DMA, it is possible to carry out the equitable water distribution.
3) Reduction of leakage
   Depending on the location and elevation, some areas have high pressure, which may cause leakage. In such areas, it is possible to reduce water leakage by pressure control through the inlet valve of DMA.
4) Reduction of the labor intensive load of manual valve operation
   To carry out rational water distribution, YWC currently operates manually about 100 valves twice a day in Irbid city. This is a substantial work for YWC. By motorizing valves and using remote control by SCADA system, YWC will be able to operate the valves from SCADA center. This will reduce the load of manual valve operation and achieve rational water distribution.
5) Efficient management of water distribution
   SCADA system is a tool for the comprehensive data acquisition thorough which important decisions for flow and pressure control can be made. SCADA system can collect data on flow, pressure, valve status, pump status, pump energy consumption, etc. After analysis of these gathered data, engineers will be able to improve the operation of the water distribution facilities to achieve an equitable distribution, energy saving, NRW reduction, etc.

Target Area, Facilities and Composition of SCADA

Target Area is Irbid city including suburbs. Main target facilities are Zebdat and Hofa Reservoir for Irbid city and DMA. Well pumps which supply to the distribution area directly are not included in the main distributing line, so well pumps can be out of scope in the SCADA system.

Generally SCADA system is comprised of SCADA center and remote stations. Remote station is placed near the local facilities and handles input signal from process equipment and output the control signal to the local facilities. Therefore, basically remote stations are placed in each DMA and in Zebdat and Hofa Reservoir/pump stations in Irbid. SCADA center should be placed in the office where operation and maintenance crews for the distribution facilities are stationed. Therefore it will be preferable that SCADA center is placed in Irbid ROU of YWC.

Basic Required Function of SCADA System

Basic required functions of SCADA System are described below. However, detailed functions, items and actual objective area should be decided in future study in consideration of the schedule of construction of facilities, budget and other conditions.

1) Measurement at DMA and Reservoirs

   To attain the equitable water distribution, measurement of water flow, pressure and water level at main locations will be necessary as follows.

   - Measurement of flow and Pressure at inlet valve of DMA and sending data to SCADA center
   - Measurement of outlet flow and water Level of Zebdat and Hofa Reservoir for Irbid city and sending data to SCADA center

2) Control at DMA and Pumping Stations

   To reduce the load of valve manual operation for rational distribution, remote control of the local water facilities will be necessary as described below. For these control, motorization of valves and modification of the pump facilities will be needed.

   - Opening/Closing of Inlet Valve at DMA by remote control from SCADA center
   - Flow control of Inlet Valve at DMA at the remote station
   - Pressure control of Inlet Valve at DMA at the remote station for specified DMA
   - Opening/Closing of Outlet Valve at Zebdat and Hofa Reservoir by remote control from SCADA center if necessary

3) Functions of SCADA center

These functions will be proposed for SCADA center.

- SCADA HMI (Human Machine Interface)

  The SCADA HMI shall also have interface activities between an operator and computer system. Interface activities shall be made with tool bar, dialog box and icon operation using a mouse and keyboard through Windows. The graphic supervision shall have the following function;

  - Display of measured data for DMA
  - Operation of DMA valves and pumping stations

- Data Acquisition and Storage

  The measured values and various signals from DMA and the other facilities should be collected and stored in the database for monitoring of real time operation, preparation of trend graph and report, engineering analysis, etc. Operation and failure logs should be indicated in a chronological list in the date and time stamped message.

- Historical Information System

  The monitoring system shall be provided with the capability to generate historical trend graphs and daily, monthly and annual reports. These data will be used to evaluate the water distribution and planning to improve the water distribution system.

- Information service for the upper administrator

  Gathered and stored data in the SCADA system should be made accessible to the upper administrator (WAJ office) by the communication system.

4) Communication system between SCADA center and remote stations

To select the communication system, it is necessary to consider the location of the stations, data volume, access interval, reliability, service area, cost, etc. Furthermore, technology of the communication system and cost is changing rapidly. Therefore, selection of the communication system should be made after setting more detail specification of distribution system at the feasibility study level. In the present stage, it is thought that GSM (Global system for mobile communications) network will be suitable at least as a network for DMA.

System Configuration

Figure 24 shows the conceptual plan of SCADA system configuration for Irbid city and Ramtha city. Actual facilities and DMAs which are objects of SCADA should be decided upon more detailed study.

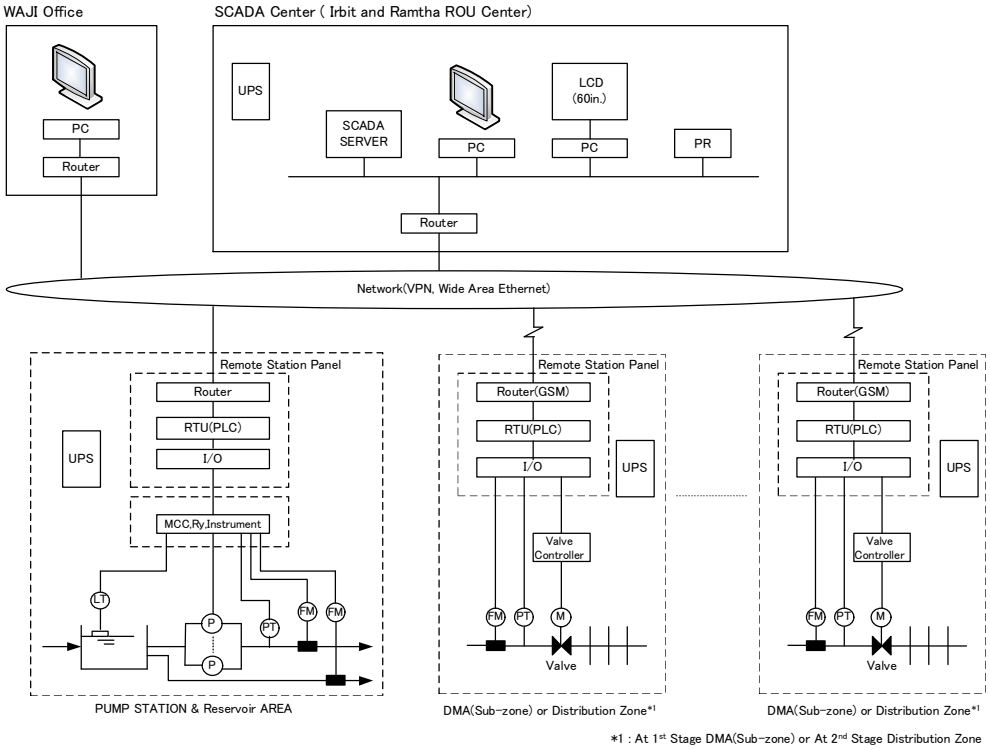


Figure 24 SCADA System Configuration for Irbid City and Ramtha City

Development Plan for SCADA

SCADA should be developed in accordance with the construction of water distribution facilities. However, it needs a lot of time and cost to develop the DMA facilities. Therefore, development plan in two stages as listed below is recommended.

1) 1st Stage

   In 1st Stage, the object of SCADA system is the water distribution zone. The object of monitoring and control will be inlet valve of the water distribution zone. Furthermore, since, pressure is assumed to be uneven in the area, it is necessary to monitor the pressure at two or three points in the area in addition to monitoring the pressure at the inlet valve.

2) 2nd Stage

   In the 2nd Stage, the object of SCADA system is the water distribution sub-zone (DMA). In this stage, SCADA system will achieve the final form and it will be possible to expect the effects of SCADA system.

System Components

Table 9 shows components of SCADA conceptual plan for Irbid city.

Table 9 Components of SCADA Conceptual Plan for Irbid City

Location	Item	Equipment	Nos.	Comment
SCADA Center	SCADA Server	・CPU ・HDD ・CD ・DVD ・OS ・Software	1	
	HMI PC-1	・PC ・22 inch LCD Display ・OS ・Software	1	
	HMI PC-2	・PC ・60 inch LCD Display ・OS ・Software	1	
	Printer	・Laser Printer	1	
	Router	・WAN ・LAN: Ethernet	1	
	UPS	・Inverter ・Battery	1	
WAJ Office	HMI PC-1	・PC ・22 inch LCD Display ・OS ・Software	1	
	Router	・WAN ・LAN: Ethernet	1	
DMA (Distribution Zone)*1	Remote Station Panel	・GSM Router ・RTU (PLC) ・Process I/O ・Control Relay	1 (for each Facility)	Flow controller and Pressure controller are included in RTU (PLC)
	Flow meter	・Flow Sensor ・Flow Transmitter	1 (for each Facility)	
	Pressure Transmitter	・Pressure Sensor ・Transmitter	1 (for each Facility)	
	UPS	・Inverter ・Battery	1 (for each Facility)	
Pumping Station, Reservoir	Remote Station Panel	・Router ・RTU (PLC) ・Process I/O ・Control Relay	1 (for each Facility)	
	UPS	・Inverter ・Battery	1 (for each Facility)	

*1 : For Stage 1, Distribution zone instead of DMA Sub-zone
*2 : For Stage 1, Pressure Transmitter will be necessary 2 or 3 units in the area.

2. Monitoring and Control Plan in Ramtha and its Neighboring Locality

Concepts of monitoring and control plan in Ramtha and its neighboring locality, namely necessity and purpose of SCADA system, effect of SCADA system, basic required function of SCADA system (except a part), and system configuration are similar to the case of Irbid.

Target Area, Target Facilities and Composition of SCADA

Target Area is Ramtha city including suburbs. Main object facilities are DMA, the valve is located on the branch pipe from the main transmission pipe to Ramtha, Hodod and Mahasi pumping stations. Well pumps which supply to the distribution area directly are not included in the main distributing line, so well pumps can be out of scope of the SCADA system.

Remote stations are placed in each DMA and in the valve located on the branch pipe from the main transmission pipe to Ramtha, and Hodod and Mahasi pumping stations in Ramtha. SCADA center should be placed in the office where operation and maintenance crews for the distribution facilities are stationed. Therefore it will be preferable that SCADA center is placed in Ramtha ROU of YWC.

Basic Required Function of SCADA System

For Ramtha and its neighboring locality also, necessity and purpose of SCADA system, effect of SCADA system, basic required function of SCADA system, and system configuration are almost same as in case of Irbid except the points described below.

1) Measuring at DMA and Pumping Stations
   - Measuring of flow and Pressure at the valve located on the branch pipe from the main transmission pipe to Ramtha and sending data to SCADA center
   - Measuring of flow and Pressure at inlet valve of DMAs and sending data to SCADA center
   - Measuring of outlet flow, pressure of Hodod, Mahasi, and Abu Al-Basal PSs for Ramtha city and sending data to SCADA center

2) Control at DMA and Pumping Stations
   - Pump operation of Hodod, Mahasi, and Abu Al-Basal PSs by remote control from SCADA center
   - Opening/Closing of Inlet Valve at DMA by remote control from SCADA center
   - Flow control of Inlet Valve in DMAs at the remote station
   - Pressure control of Inlet Valve in DMAs at the remote station for specified DMA

- Flow and pressure control of the valve located on the branch pipe from the main transmission pipe to Ramtha by remote control from SCADA center

3) Functions of SCADA center
   - Information service for the upper administrator
     Gathered and stored data in the SCADA system should be made accessible to the upper administrator (WAJ office) through the communication system.

Development Plan

SCADA should be developed in accordance with the construction of water distribution facilities. However it needs a lot of time and cost to develop the DMA facilities. Therefore, the development plan in two stages as given below is recommended.

1) 1st Stage
   In the 1st Stage, the target of SCADA system is the water distribution zone (DMA). The object of monitoring and control will be inlet valve of the water distribution zone. Furthermore, since pressure is assumed to be unequal in area, it is necessary to monitor the pressure at two or three points in the area in addition to monitoring the pressure at the inlet valve.
2) 2nd Stage
   In the 2nd Stage, the object of SCADA system is the water distribution zone (DMA). At this stage SCADA system will achieve the final form and it will be possible to expect the effects of SCADA system.

System components

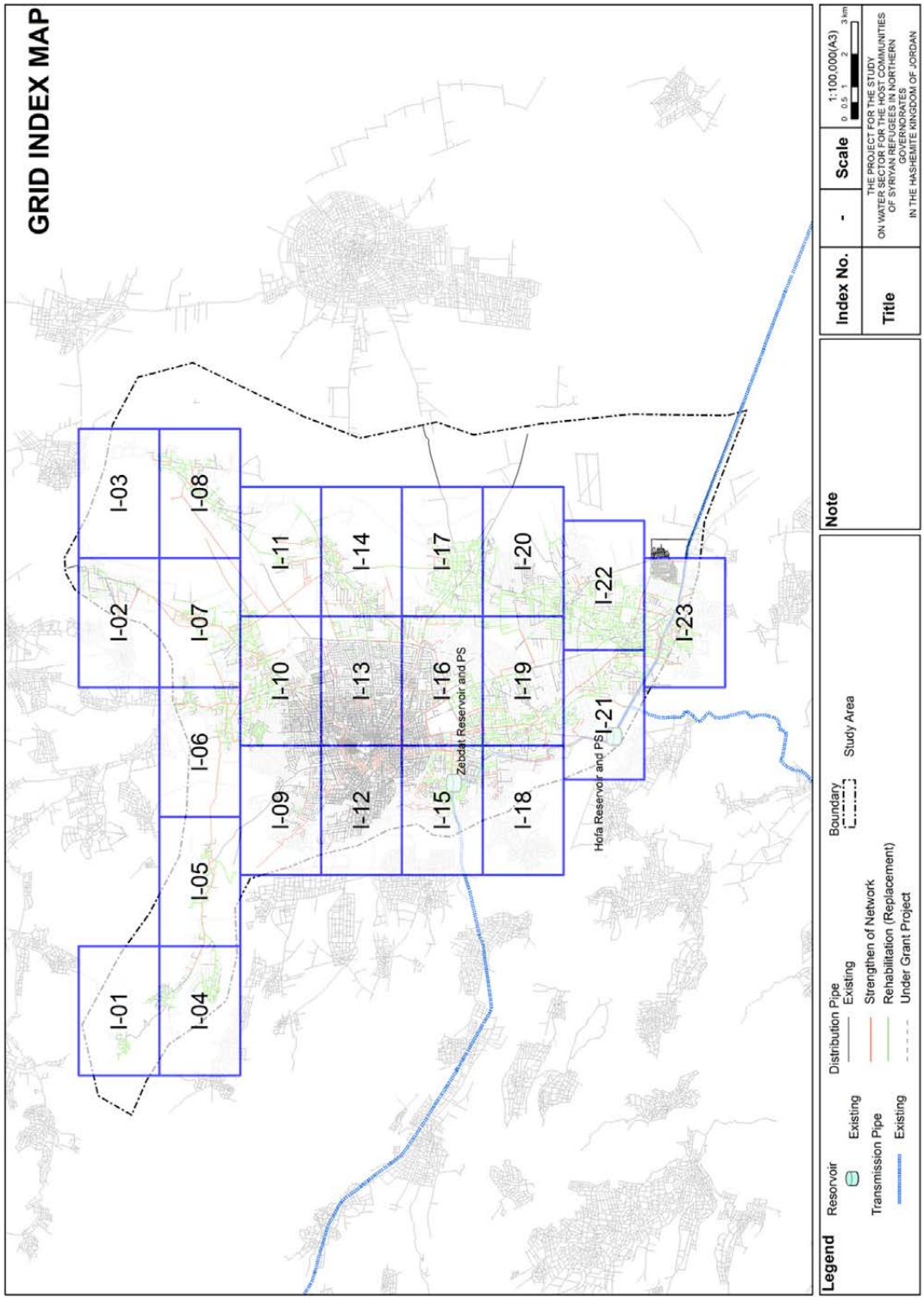
Table 10 shows Components of SCADA conceptual plan for Ramtha city.

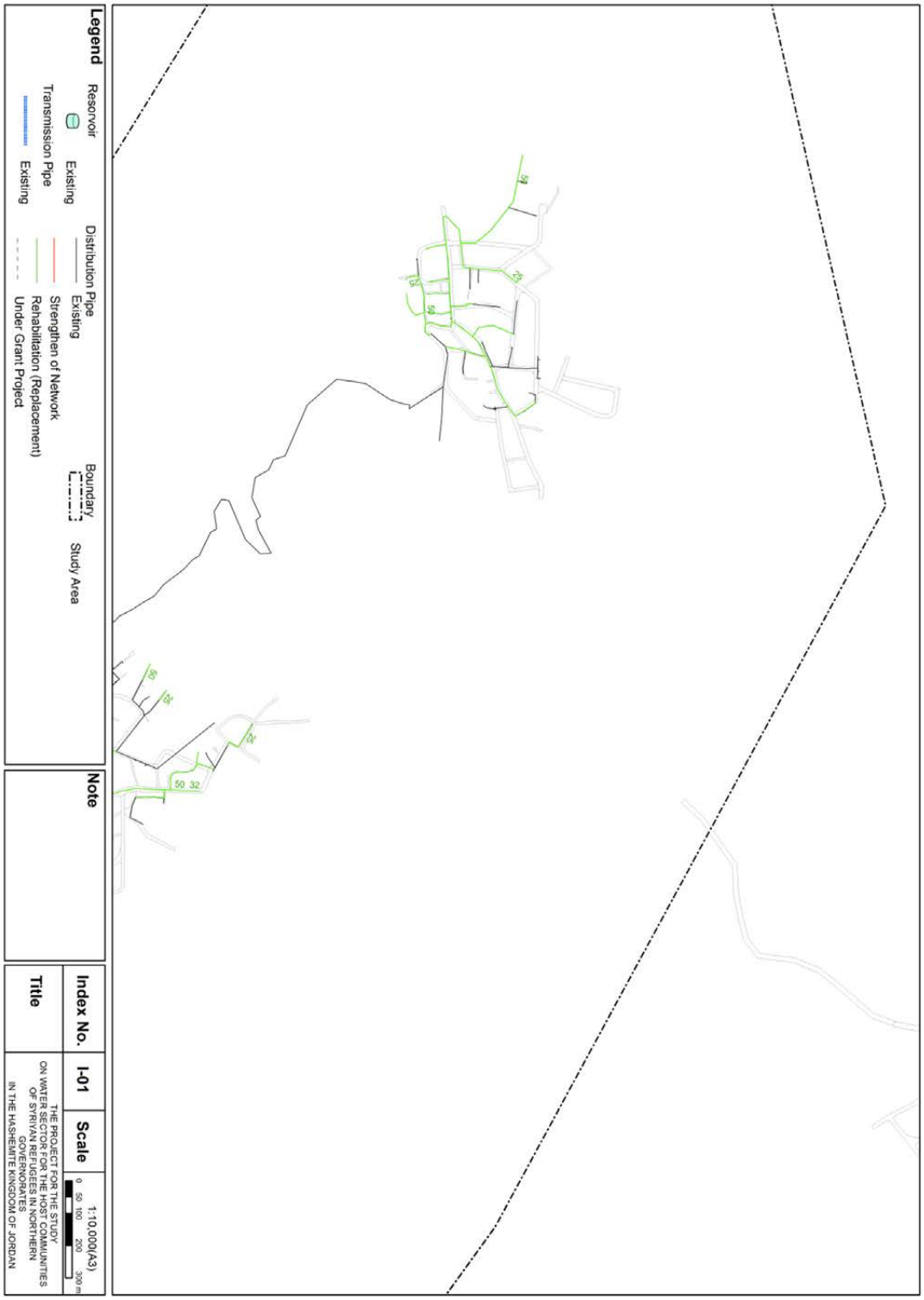
Table 10 Components of SCADA Conceptual Plan for Ramtha City

Location	Item	Equipment	Nos.	Remark
SCADA Center	SCADA Server	・CPU ・HDD ・CD ・DVD ・OS ・Software	1	
	HMI PC-1	・PC ・22 inch LCD Display ・OS ・Software	1	
	HMI PC-2	・PC ・60 inch LCD Display ・OS ・Software	1	
	Printer	・Laser Printer	1	
	Router	・WAN ・LAN: Ethernet	1	
	UPS	・Inverter ・Battery	1	
DMA (Distribution Zone)*1	Remote Station Panel	・GSM Router ・RTU (PLC) ・Process I/O ・Control Relay	1 (for each Facility)	Flow controller and Pressure controller are included in RTU (PLC)
	Flow meter	・Flow Sensor ・Flow Transmitter	1 (for each Facility)	
	Pressure Transmitter	・Pressure Sensor ・Transmitter	1 (for each Facility)	
	UPS	・Inverter ・Battery	1 (for each Facility)	
Remote Station (Pumping Station, Valve is located on the branch pipe from the main transmission pipe to Ramtha)	Remote Station Panel	・Router ・RTU (PLC) ・Process I/O ・Control Relay	1 (for each Facility)	
	UPS	・Inverter ・Battery	1 (for each Facility)	

*1 : For Stage1, Distribution zone instead of DMA
*2 : For Stage1, Pressure Transmitter will be necessary 2 or 3 units in the area.

APPENDIX 5C PROPOSED PIPE IN IRBID




Legend
Reservoir
Existing
Transmission Pipe
Existing
Distribution Pipe
Existing
Strengthen of Network
Rehabilitation (Replacement)
Under Grant Project
Boundary
Study Area
Note
Index No.
I-01
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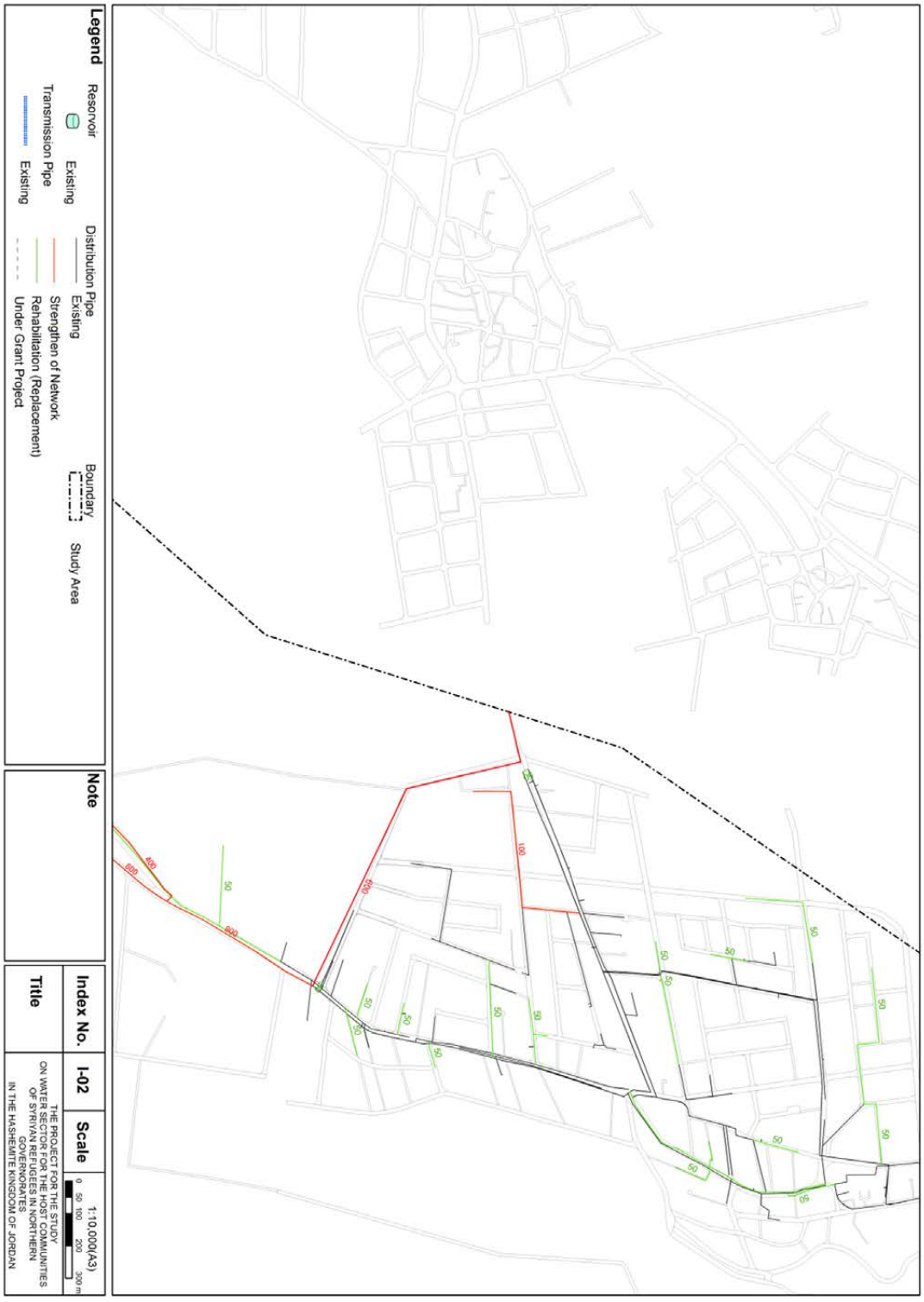
Title
THE PROJECT FOR THE STUDY
ON WATER SECTOR FOR THE HOST COMMUNITIES
OF SYRIAN REFUGEES IN NORTHERN
GOVERNORATES
IN THE HASHEMITE KINGDOM OF JORDAN


Legend
Reservoir
Existing
Transmission Pipe
Existing
Distribution Pipe
Existing
Strengthen of Network
Rehabilitation (Replacement)
Under Grant Project
Boundary
Study Area
Note
Index No.
I-02
Scale
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Title
THE PROJECT FOR THE STUDY ON WATER SECTOR FOR THE HOST COMMUNITIES OF SYRIAN REFUGEES IN NORTHERN GOVERNORATES IN THE HASHEMITE KINGDOM OF JORDAN

Legend

Resorvoir
- Existing

Transmission Pipe
- Existing

Distribution Pipe
- Existing
- Strengthen of Network
- Rehabilitation (Replacement)
- Under Grant Project

Boundary
- Study Area

Note

Index No.	**I-03**	**Scale**	1:10,000(A3) 0 50 100 200 300 m
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Legend
Resorvoir
Existing
Transmission Pipe
Existing
Distribution Pipe
Existing
Strengthen of Network
Rehabilitation (Replacement)
Under Grant Project
Boundary
Study Area
Note
Index No.
I-04
Scale
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Title
THE PROJECT FOR THE STUDY
ON WATER SECTOR FOR THE HOST COMMUNITIES
OF SYRIYAN REFUGEES IN NORTHERN
GOVERNORATES
IN THE HASHEMITE KINGDOM OF JORDAN


Legend
Resorvoir
Existing
Transmission Pipe
Existing
Distribution Pipe
Existing
Strengthen of Network
Rehabilitation (Replacement)
Under Grant Project
Boundary
Study Area
Note
Index No.
I-05
Scale
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Title
THE PROJECT FOR THE STUDY
ON WATER SECTOR FOR THE HOST COMMUNITIES
OF SYRIYAN REFUGEES IN NORTHERN
GOVERNORATES
IN THE HASHEMITE KINGDOM OF JORDAN

Legend
Resorvoir
Existing
Transmission Pipe
Existing
Distribution Pipe
Existing
Strengthen of Network
Rehabilitation (Replacement)
Under Grant Project
Boundary
Study Area
Note
Index No.
I-06
Scale
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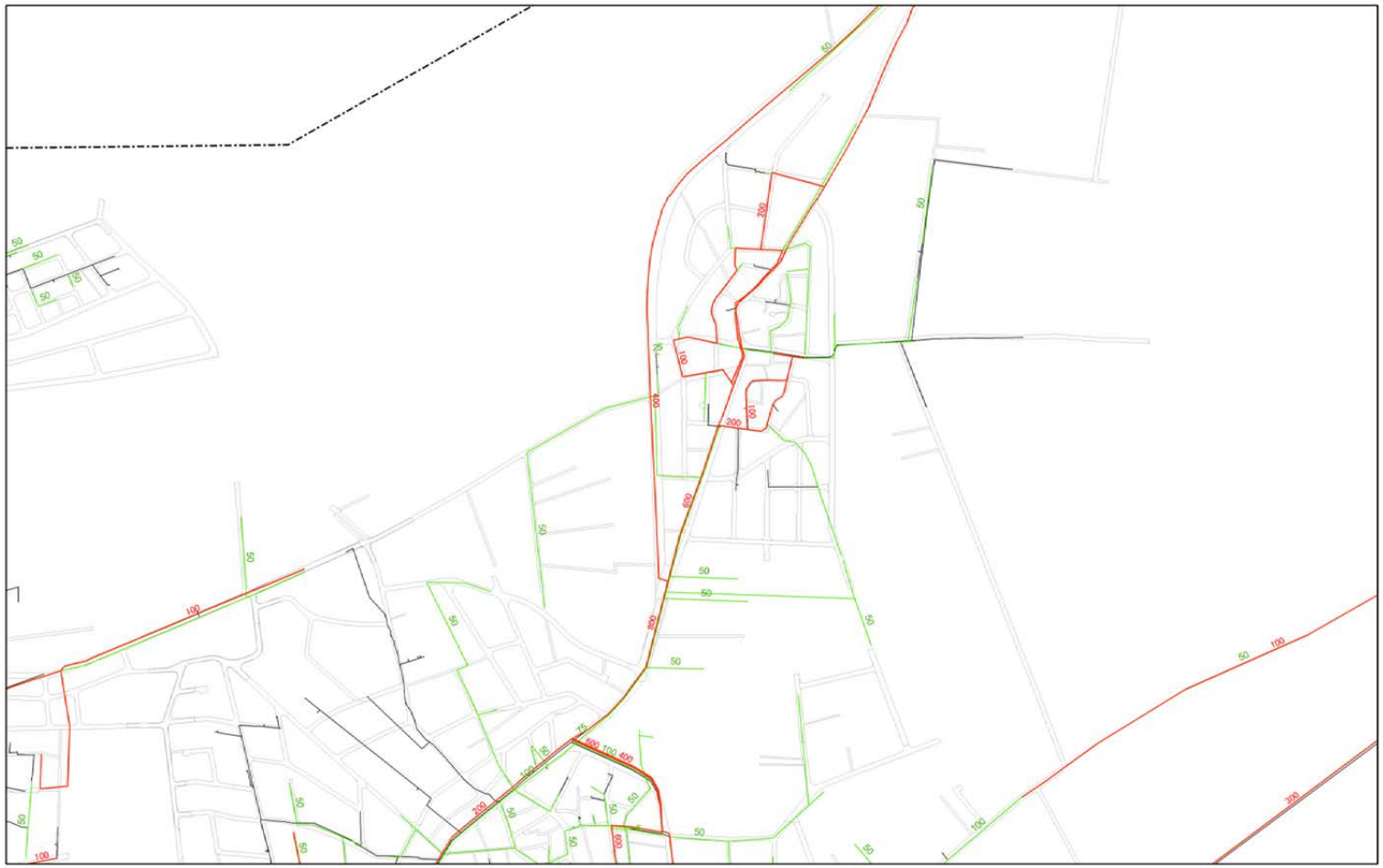
Title
THE PROJECT FOR THE STUDY
ON WATER SECTOR FOR THE HOST COMMUNITIES
OF SYRIYAN REFUGEES IN NORTHERN
GOVERNORATES
IN THE HASHEMITE KINGDOM OF JORDAN



Legend				
Resorvoir	Existing	Distribution Pipe	Existing	Boundary
Transmission Pipe	Existing		Strengthen of Network	Study Area
			Rehabilitation (Replacement)	
			Under Grant Project	

Note	Index No.	I-07	Scale	1:10,000(A3) 0 50 100 200 300 m
	Title	THE PROJECT FOR THE STUDY ON WATER SECTOR FOR THE HOST COMMUNITIES OF SYRIYAN REFUGEES IN NORTHERN GOVERNORATES IN THE HASHEMITE KINGDOM OF JORDAN		

Legend
Resorvoir
Existing
Transmission Pipe
Existing
Distribution Pipe
Existing
Strengthen of Network
Rehabilitation (Replacement)
Under Grant Project
Boundary
Study Area
Note
Index No.
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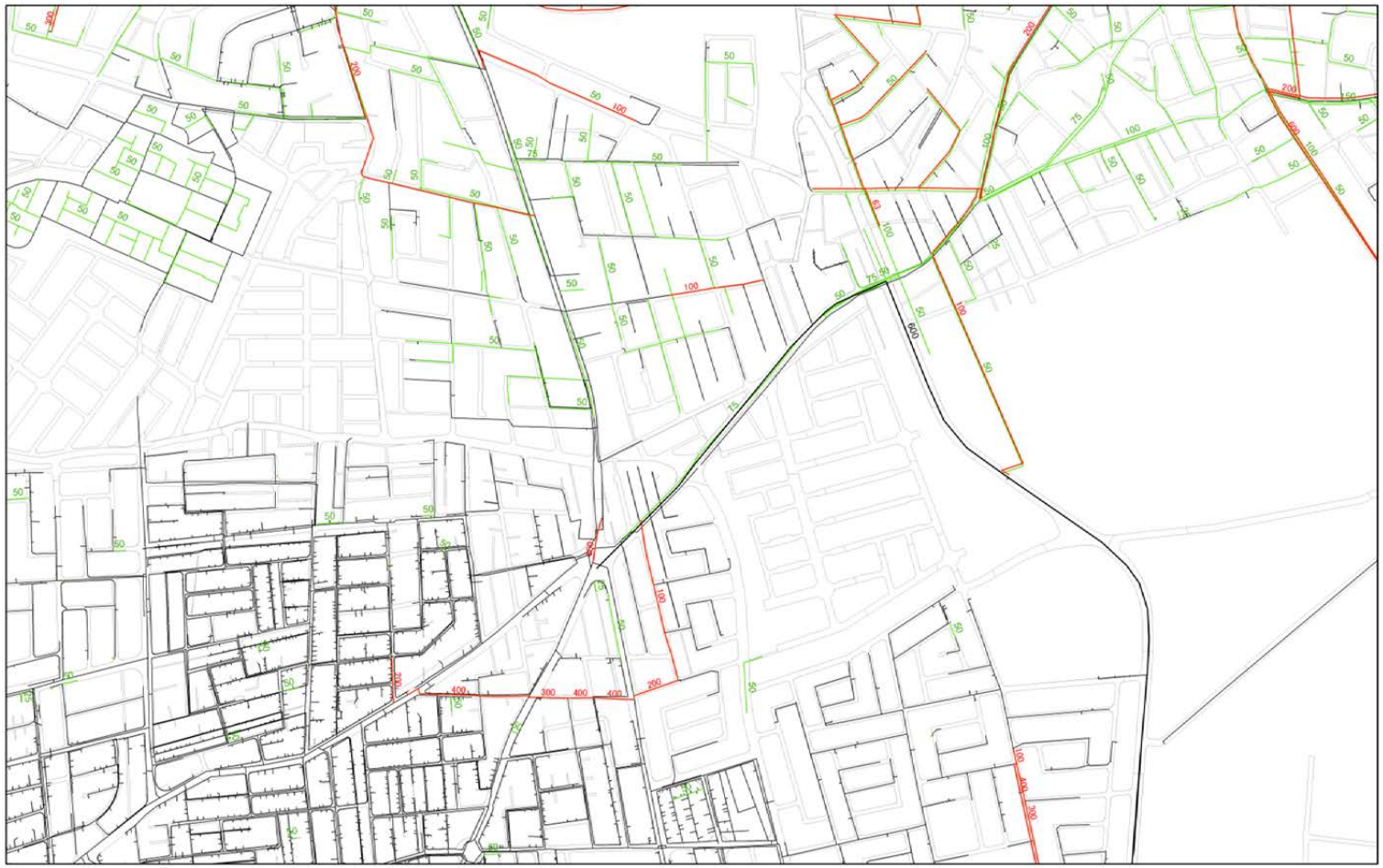
Title
THE PROJECT FOR THE STUDY
ON WATER SECTOR FOR THE HOST COMMUNITIES
OF SYRIYAN REFUGEES IN NORTHERN
GOVERNORATES
IN THE HASHEMITE KINGDOM OF JORDAN


Legend
Resorvoir
Existing
Transmission Pipe
Existing
Distribution Pipe
Existing
Strengthen of Network
Rehabilitation (Replacement)
Under Grant Project
Boundary
Study Area
Note
Index No.
I-09
Scale
1:10,000(A3)
0 50 100 200 300 m
Title
THE PROJECT FOR THE STUDY
ON WATER SECTOR FOR THE HOST COMMUNITIES
OF SYRIYAN REFUGEES IN NORTHERN
GOVERNORATES
IN THE HASHEMITE KINGDOM OF JORDAN

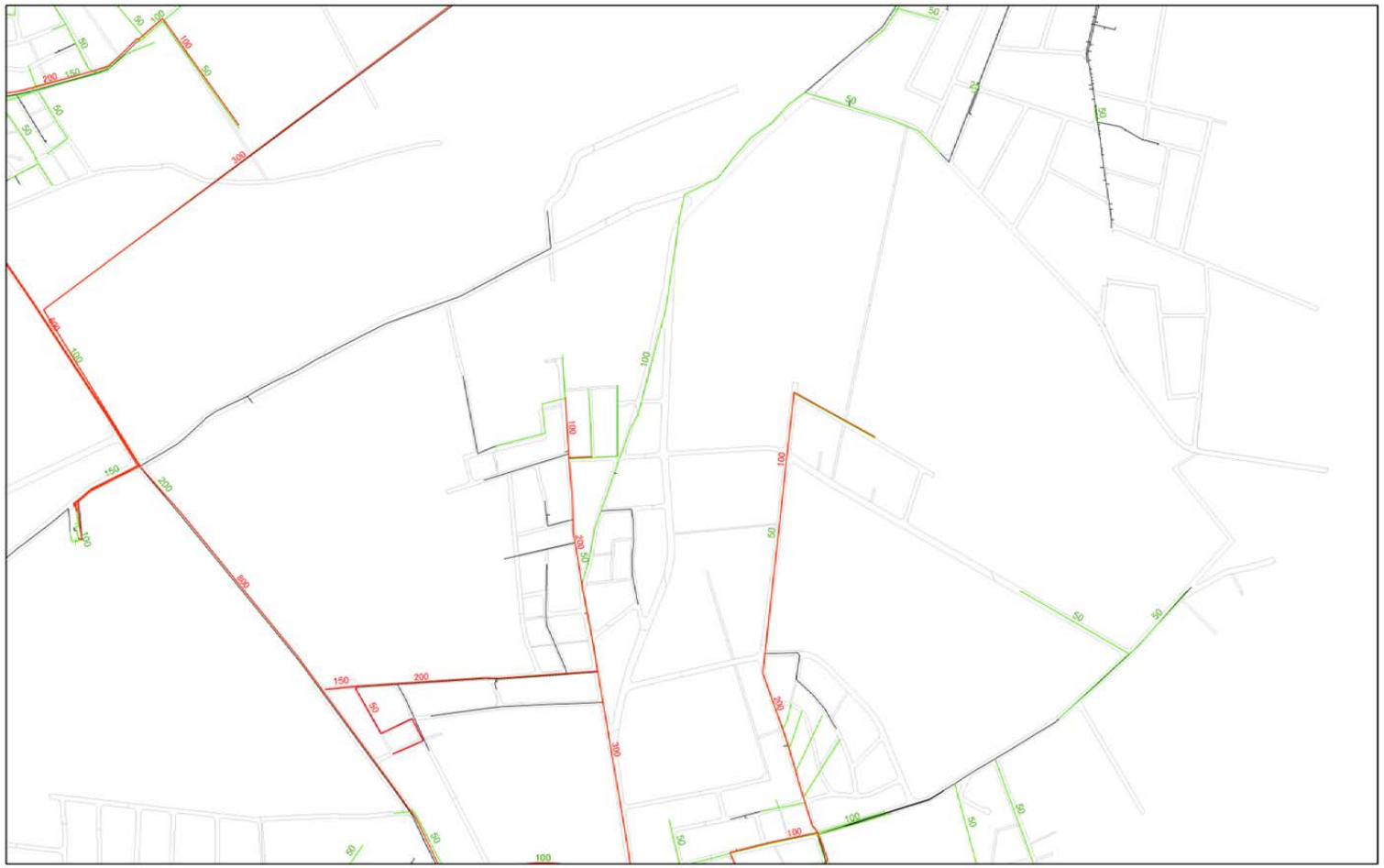


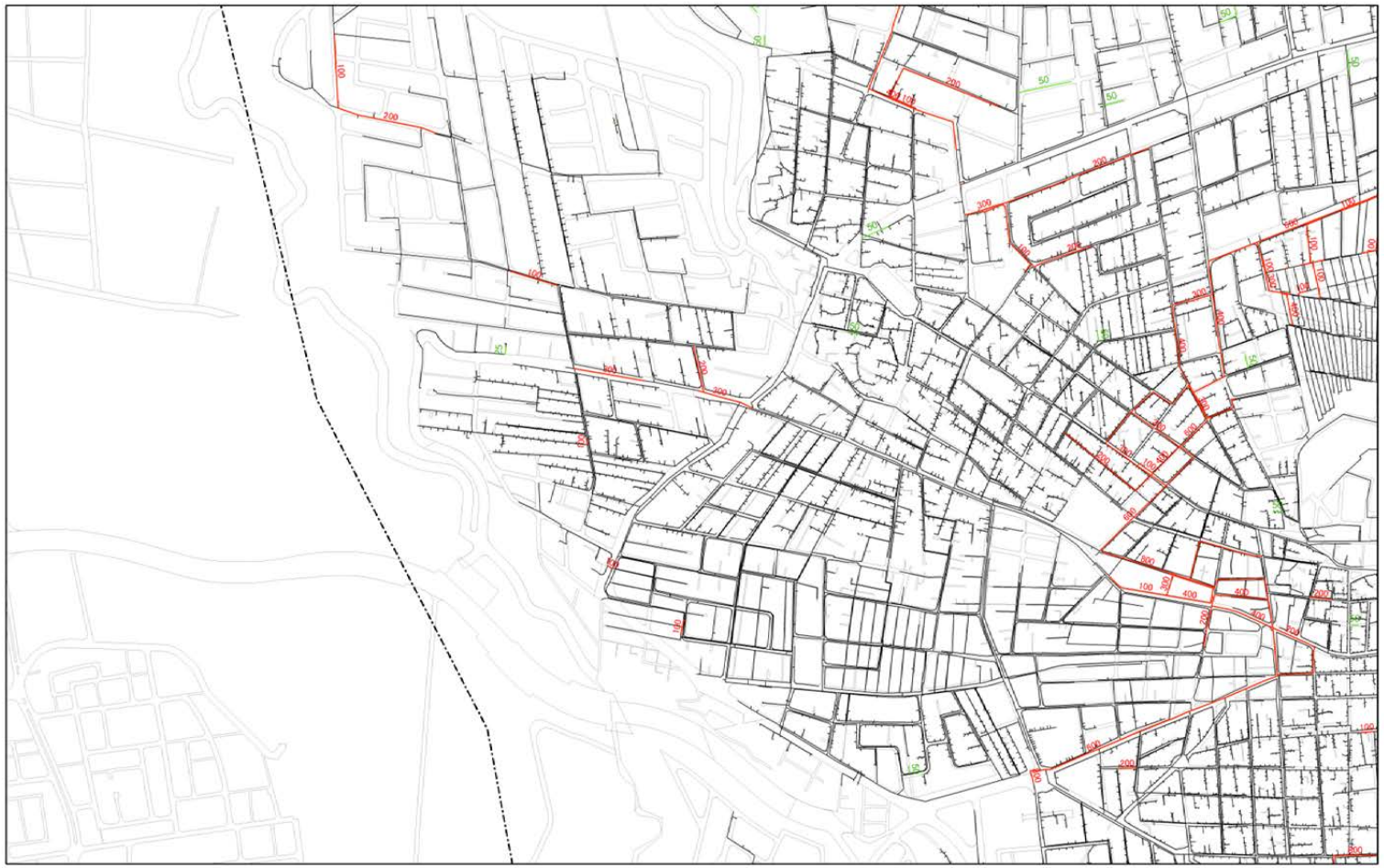
Legend

- Resorvoir
  - Existing
- Transmission Pipe
  - Existing
- Distribution Pipe
  - Existing
  - Strengthen of Network
  - Rehabilitation (Replacement)
  - Under Grant Project
- Boundary
  - Study Area

Note

Index No.	**I-10**	**Scale**	1:10,000(A3) 0 50 100 200 300 m
Title	THE PROJECT FOR THE STUDY ON WATER SECTOR FOR THE HOST COMMUNITIES OF SYRIYAN REFUGEES IN NORTHERN GOVERNORATES IN THE HASHEMITE KINGDOM OF JORDAN		

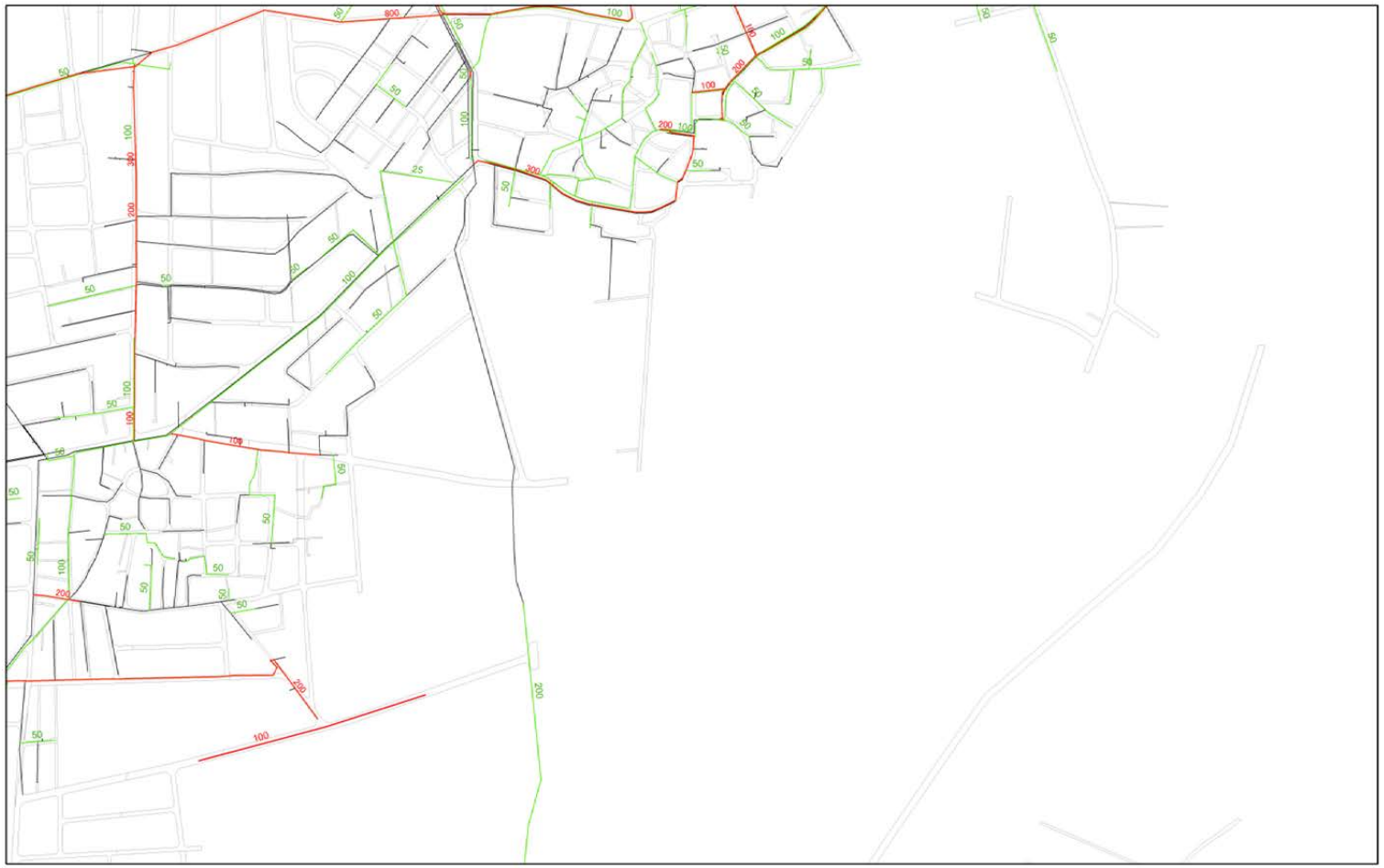

Legend
Resorvoir
Existing
Transmission Pipe
Existing
Distribution Pipe
Existing
Strengthen of Network
Rehabilitation (Replacement)
Under Grant Project
Boundary
Study Area
Note
Index No.
I-11
Scale
1:10,000(A3)
0 50 100 200 300 m
Title
THE PROJECT FOR THE STUDY
ON WATER SECTOR FOR THE HOST COMMUNITIES
OF SYRIYAN REFUGEES IN NORTHERN
GOVERNORATES
IN THE HASHEMITE KINGDOM OF JORDAN



Legend				
Resorvoir	Existing	Distribution Pipe	Existing	Boundary
Transmission Pipe	Existing		Strengthen of Network	Study Area
			Rehabilitation (Replacement)	
			Under Grant Project	

Note	Index No.	I-12	Scale	1:10,000(A3) 0 50 100 200 300 m
	Title	THE PROJECT FOR THE STUDY ON WATER SECTOR FOR THE HOST COMMUNITIES OF SYRIYAN REFUGEES IN NORTHERN GOVERNORATES IN THE HASHEMITE KINGDOM OF JORDAN		


Legend
Reservoir
Existing
Transmission Pipe
Existing
Distribution Pipe
Existing
Strengthen of Network
Rehabilitation (Replacement)
Under Grant Project
Boundary
Study Area
Note
Index No.
I-13
Scale
1:10,000(A3)
0 50 100 200 300 m
Title
THE PROJECT FOR THE STUDY
ON WATER SECTOR FOR THE HOST COMMUNITIES
OF SYRIYAN REFUGEES IN NORTHERN
GOVERNORATES
IN THE HASHEMITE KINGDOM OF JORDAN



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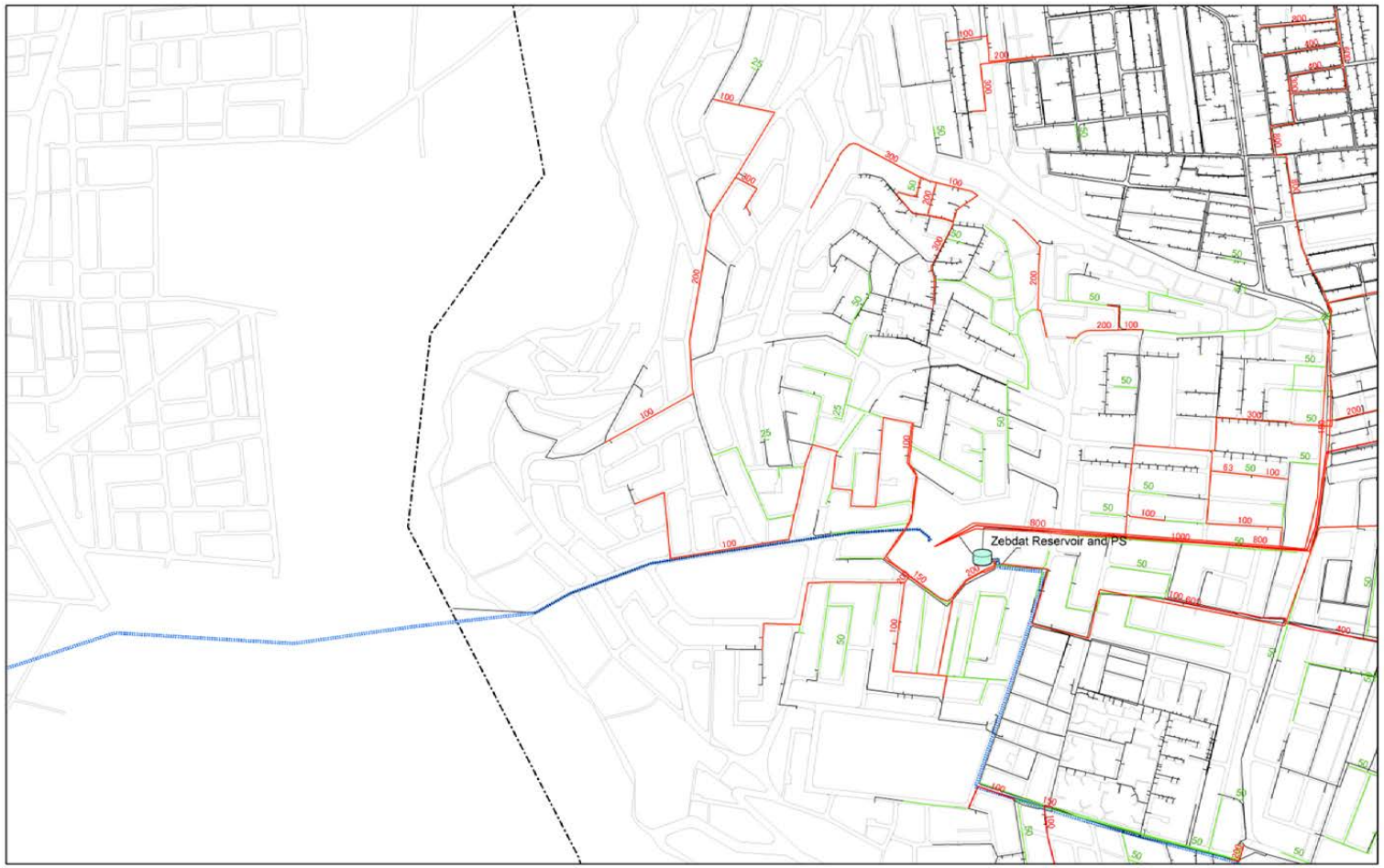
Resorvoir	Existing	Distribution Pipe	Existing					0 50 100 200 300 m
Transmission Pipe	Existing		Strengthen of Network		Title	THE PROJECT FOR THE STUDY ON WATER SECTOR FOR THE HOST COMMUNITIES OF SYRIYAN REFUGEES IN NORTHERN GOVERNORATES IN THE HASHEMITE KINGDOM OF JORDAN		
			Rehabilitation (Replacement)					
			Under Grant Project					
		Boundary	Study Area					



Legend

Reservoir
- Existing

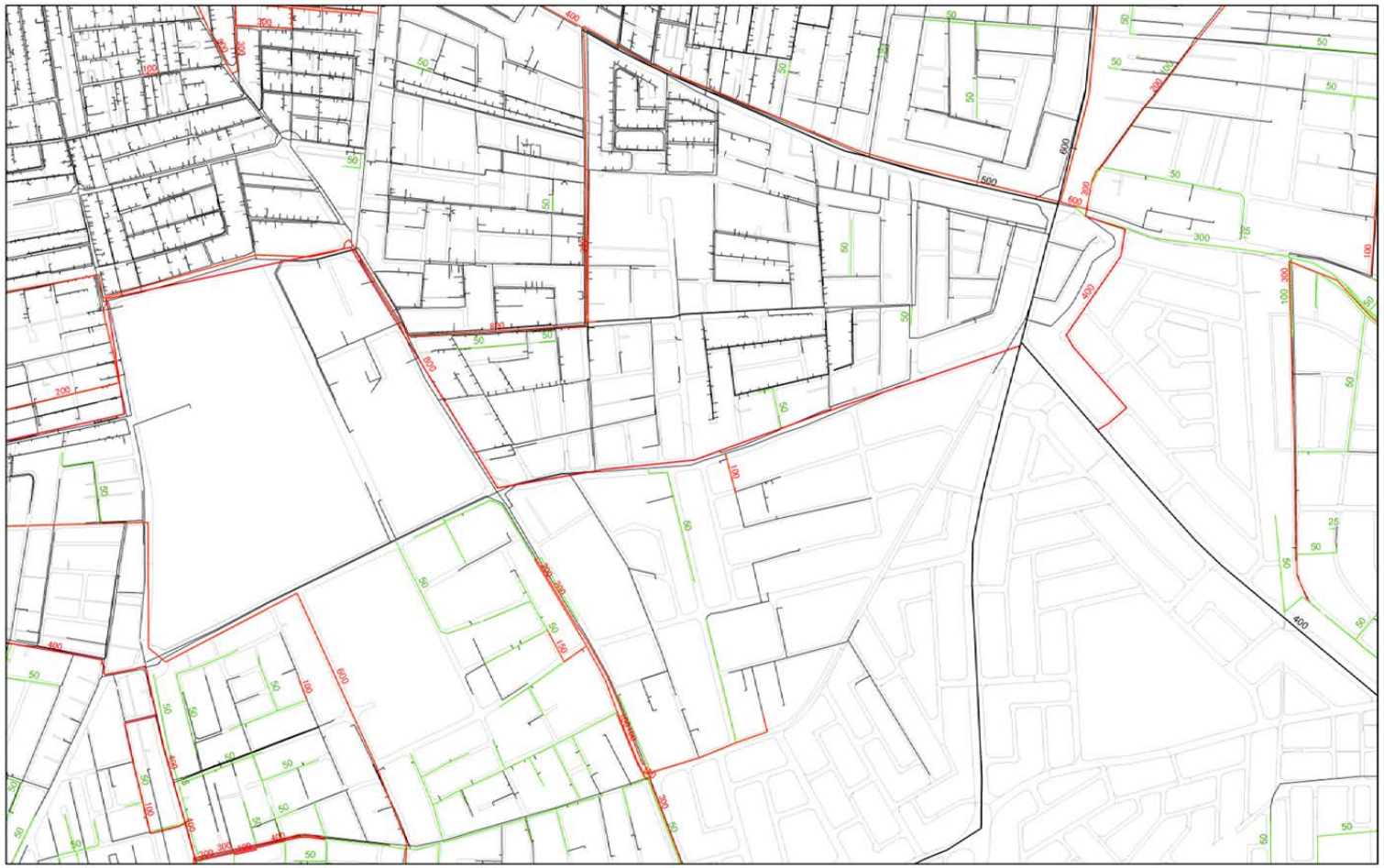
Transmission Pipe
- Existing

Distribution Pipe
- Existing
- Strengthen of Network
- Rehabilitation (Replacement)
- Under Grant Project

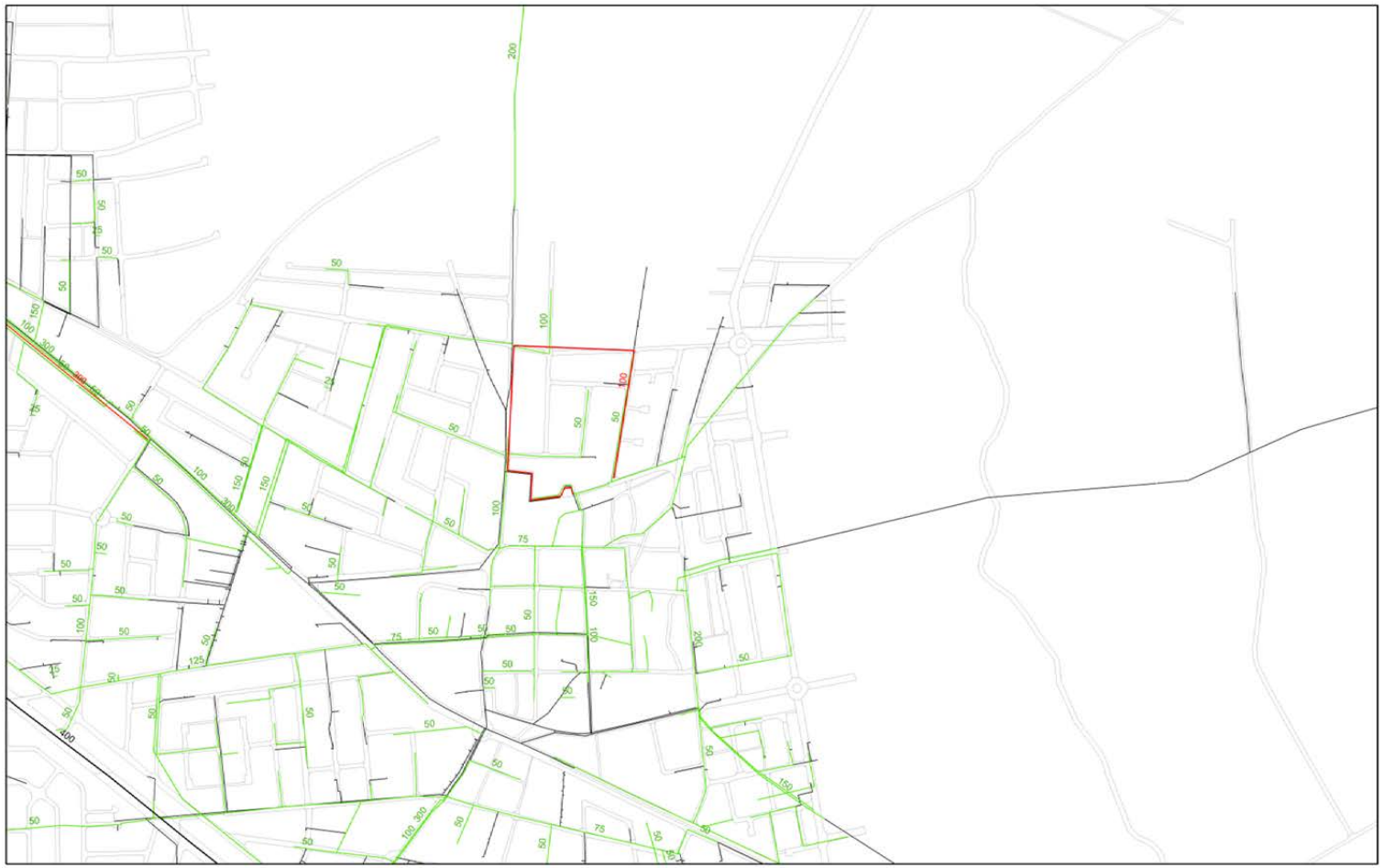
Boundary
- Study Area

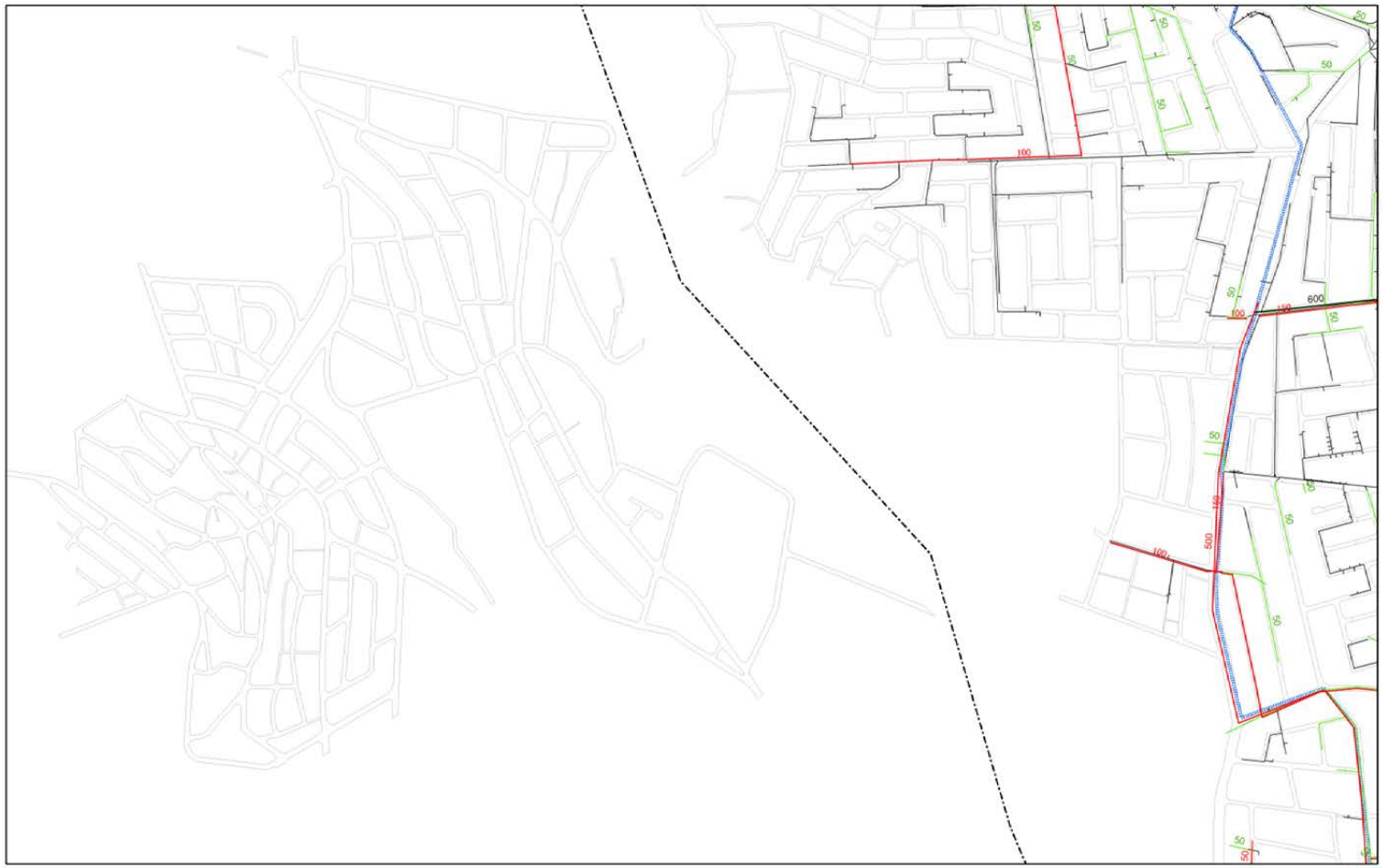
Note

Index No.	I-15	Scale	1:10,000(A3) 0 50 100 200 300 m
Title	THE PROJECT FOR THE STUDY ON WATER SECTOR FOR THE HOST COMMUNITIES OF SYRIYAN REFUGEES IN NORTHERN GOVERNORATES IN THE HASHEMITE KINGDOM OF JORDAN		



Legend				Note	Index No.	I-16	Scale	1:10,000(A3)
Resorvoir	Existing	Distribution Pipe	Existing					0 50 100 200 300 m
Transmission Pipe	Existing		Strengthen of Network		Title	THE PROJECT FOR THE STUDY ON WATER SECTOR FOR THE HOST COMMUNITIES OF SYRIYAN REFUGEES IN NORTHERN GOVERNORATES IN THE HASHEMITE KINGDOM OF JORDAN		
			Rehabilitation (Replacement)					
			Under Grant Project					
		Boundary	Study Area					


Legend
Resorvoir
Existing
Transmission Pipe
Existing
Distribution Pipe
Existing
Strengthen of Network
Rehabilitation (Replacement)
Under Grant Project
Boundary
Study Area
Note
Index No.
I-17
Scale
1:10,000(A3)
0 50 100 200 300 m
Title
THE PROJECT FOR THE STUDY
ON WATER SECTOR FOR THE HOST COMMUNITIES
OF SYRIYAN REFUGEES IN NORTHERN
GOVERNORATES
IN THE HASHEMITE KINGDOM OF JORDAN



Legend

Resorvoir
- Existing

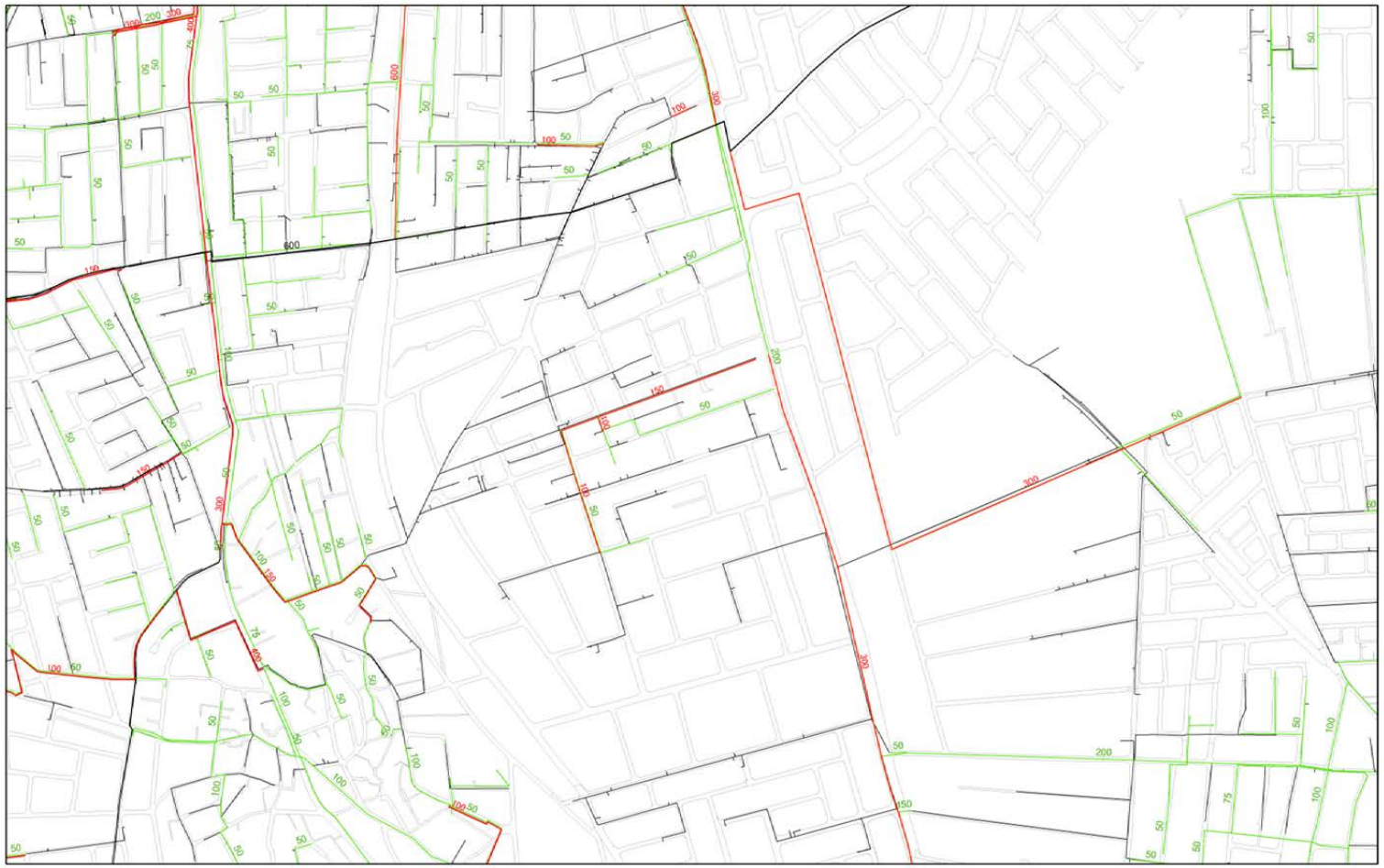
Transmission Pipe
- Existing

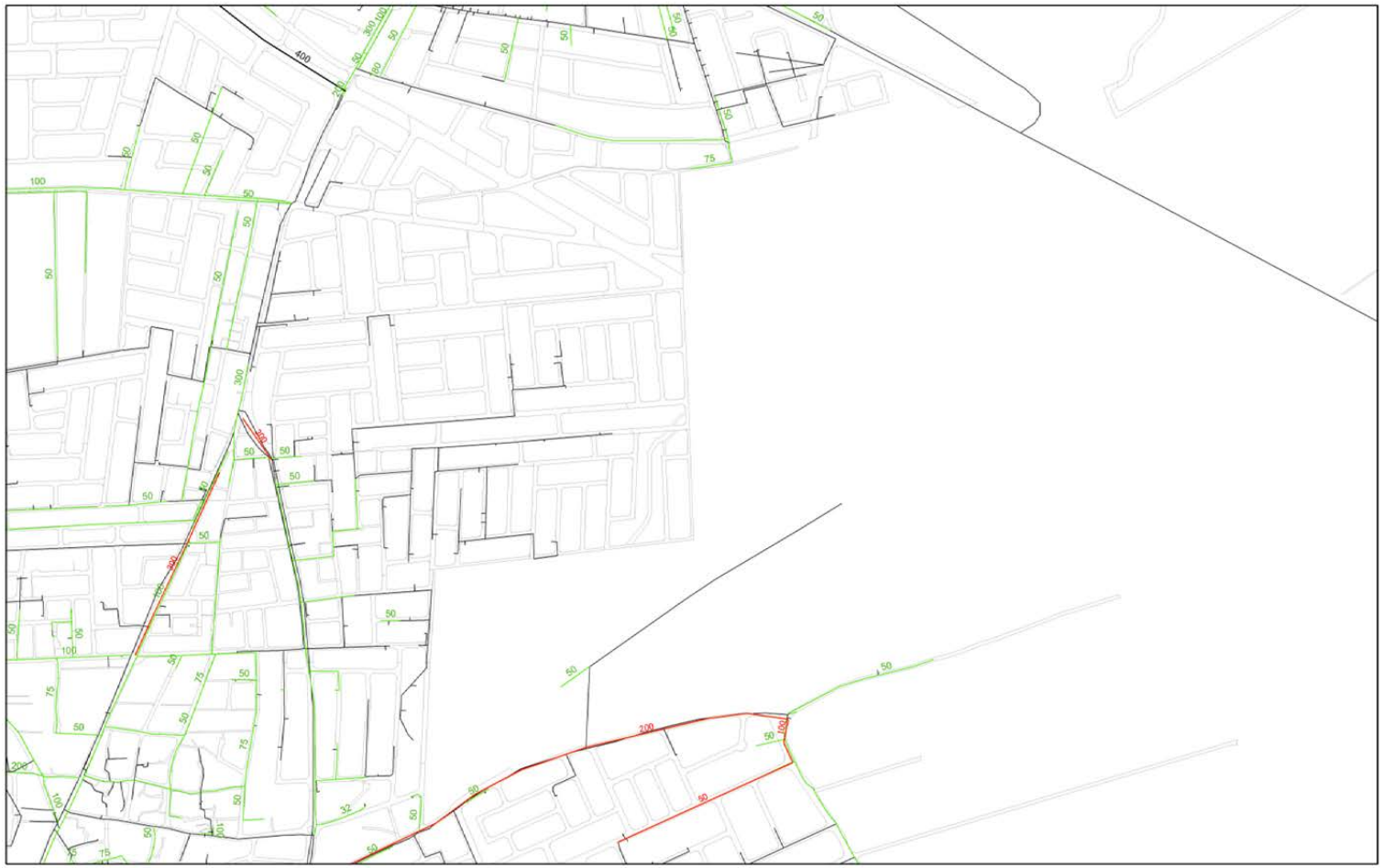
Distribution Pipe
- Existing
- Strengthen of Network
- Rehabilitation (Replacement)
- Under Grant Project

Boundary
- Study Area

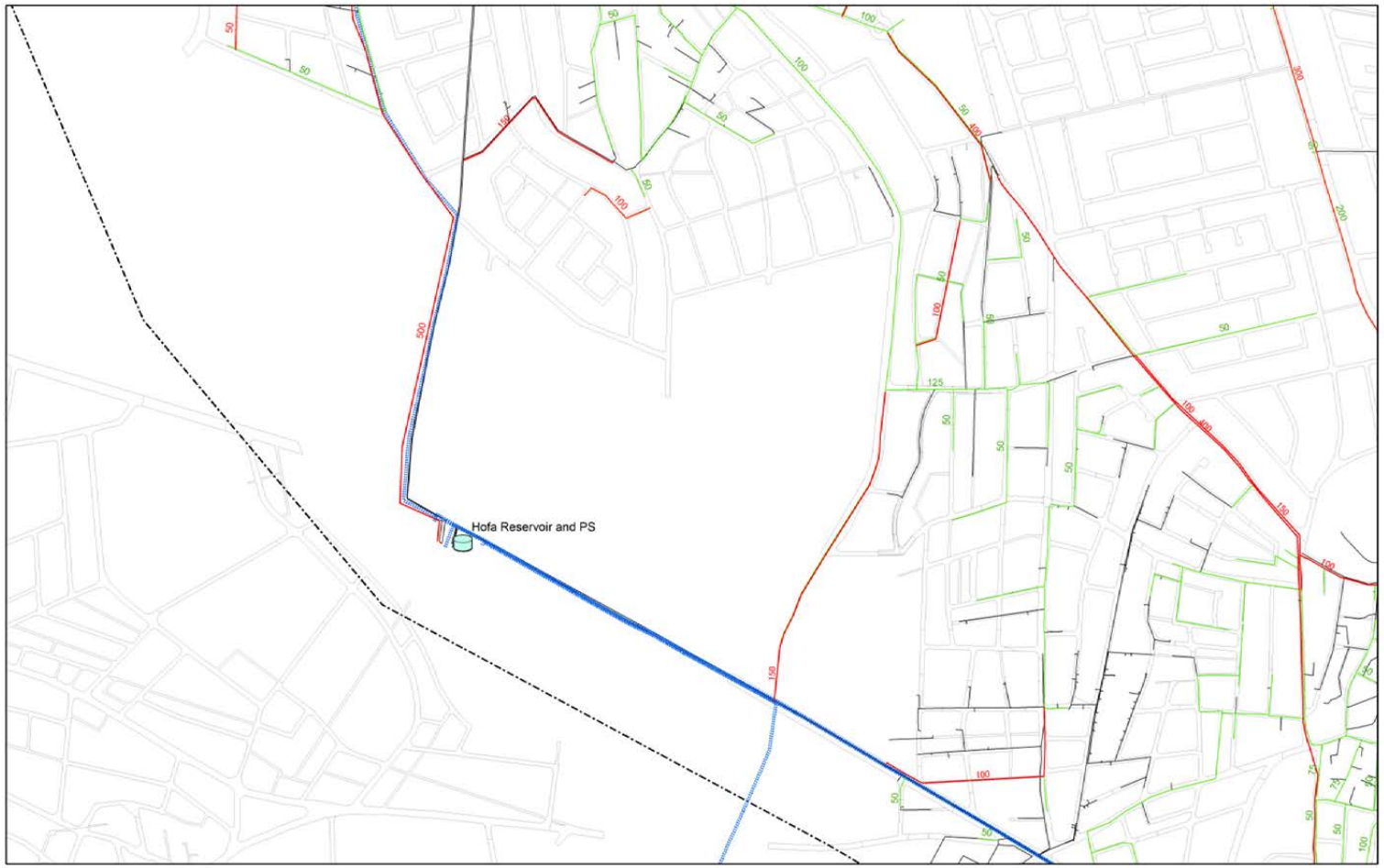
Note

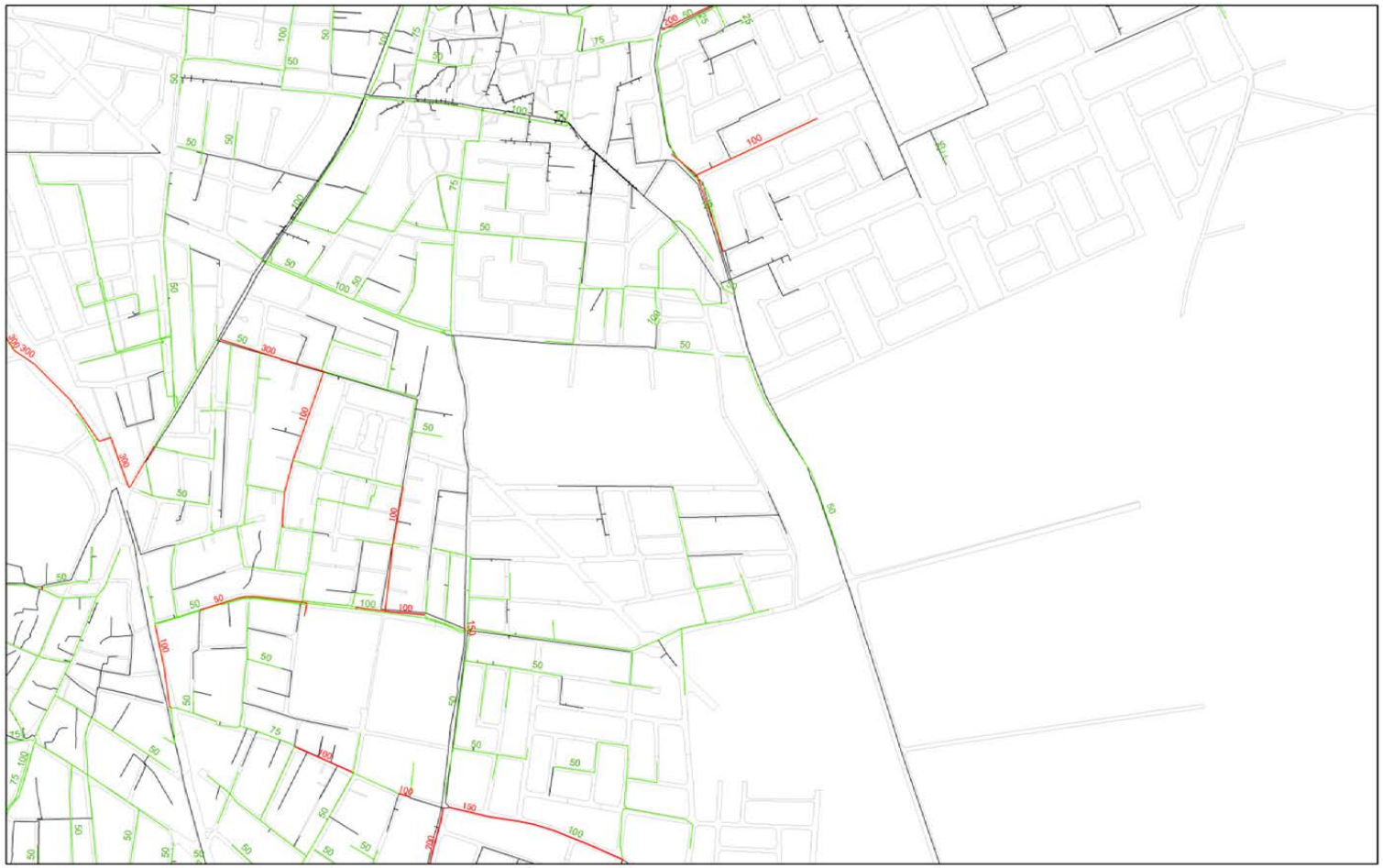
Index No.	I-18	**Scale**	1:10,000(A3) 0 50 100 200 300 m
Title	THE PROJECT FOR THE STUDY ON WATER SECTOR FOR THE HOST COMMUNITIES OF SYRIYAN REFUGEES IN NORTHERN GOVERNORATES IN THE HASHEMITE KINGDOM OF JORDAN		

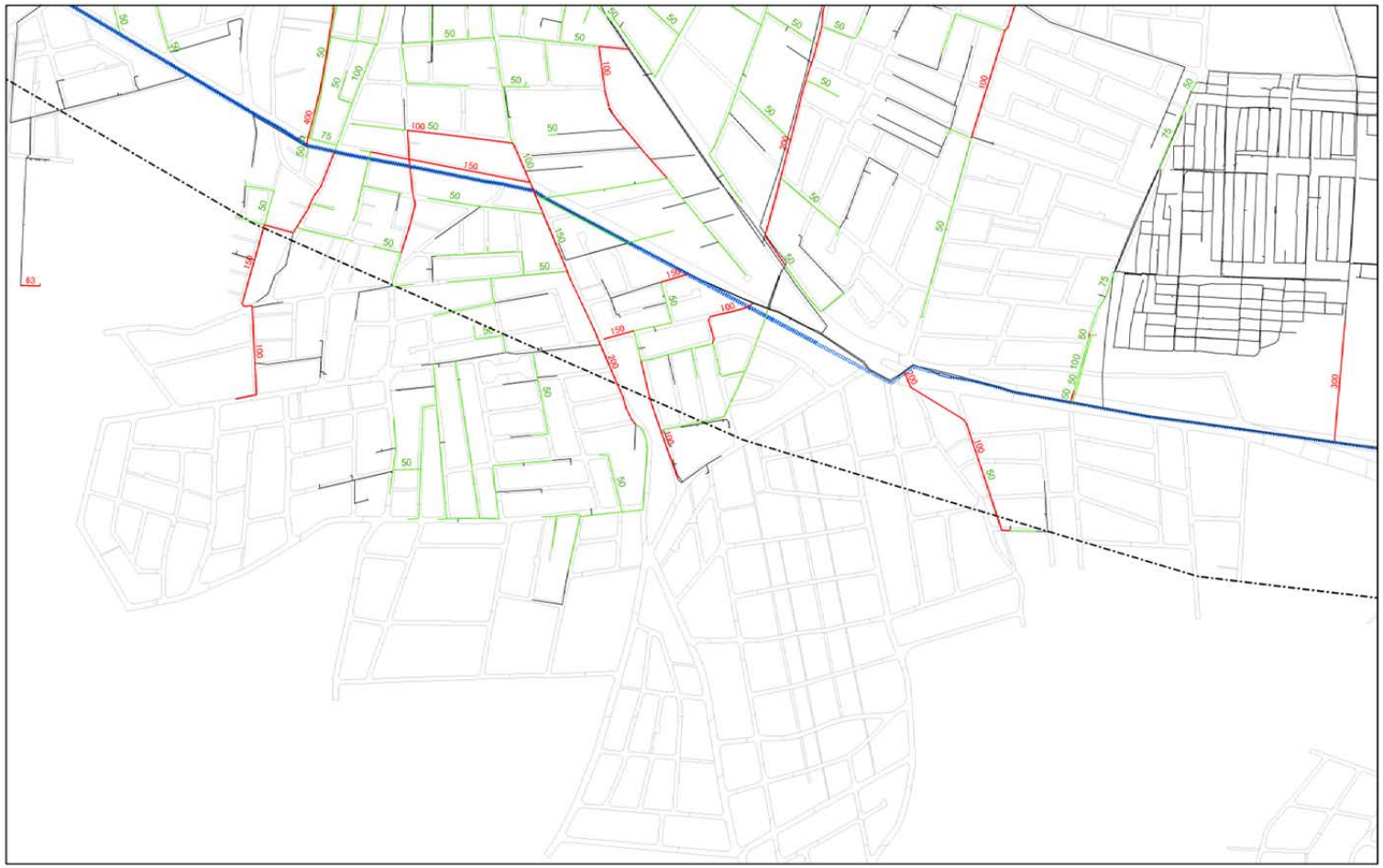

Legend
Resorvoir
Existing
Transmission Pipe
Existing
Distribution Pipe
Existing
Strengthen of Network
Rehabilitation (Replacement)
Under Grant Project
Boundary
Study Area
Note
Index No.
I-19
Scale
1:10,000(A3)
0 50 100 200 300 m
Title
THE PROJECT FOR THE STUDY
ON WATER SECTOR FOR THE HOST COMMUNITIES
OF SYRIYAN REFUGEES IN NORTHERN
GOVERNORATES
IN THE HASHEMITE KINGDOM OF JORDAN



Legend				Note	Index No.	I-20	Scale	1:10,000(A3)
Resorvoir	Distribution Pipe		Boundary					0 50 100 200 300 m
Existing	Existing		Study Area		Title	THE PROJECT FOR THE STUDY ON WATER SECTOR FOR THE HOST COMMUNITIES OF SYRIYAN REFUGEES IN NORTHERN GOVERNORATES IN THE HASHEMITE KINGDOM OF JORDAN		
Transmission Pipe	Strengthen of Network							
Existing	Rehabilitation (Replacement)							
	Under Grant Project							


Hofa Reservoir and PS
Legend
Resorvoir
Existing
Transmission Pipe
Existing
Distribution Pipe
Existing
Strengthen of Network
Rehabilitation (Replacement)
Under Grant Project
Boundary
Study Area
Note
Index No.
I-21
Scale
1:10,000(A3)
0 50 100 200 300 m
Title
THE PROJECT FOR THE STUDY
ON WATER SECTOR FOR THE HOST COMMUNITIES
OF SYRIYAN REFUGEES IN NORTHERN
GOVERNORATES
IN THE HASHEMITE KINGDOM OF JORDAN

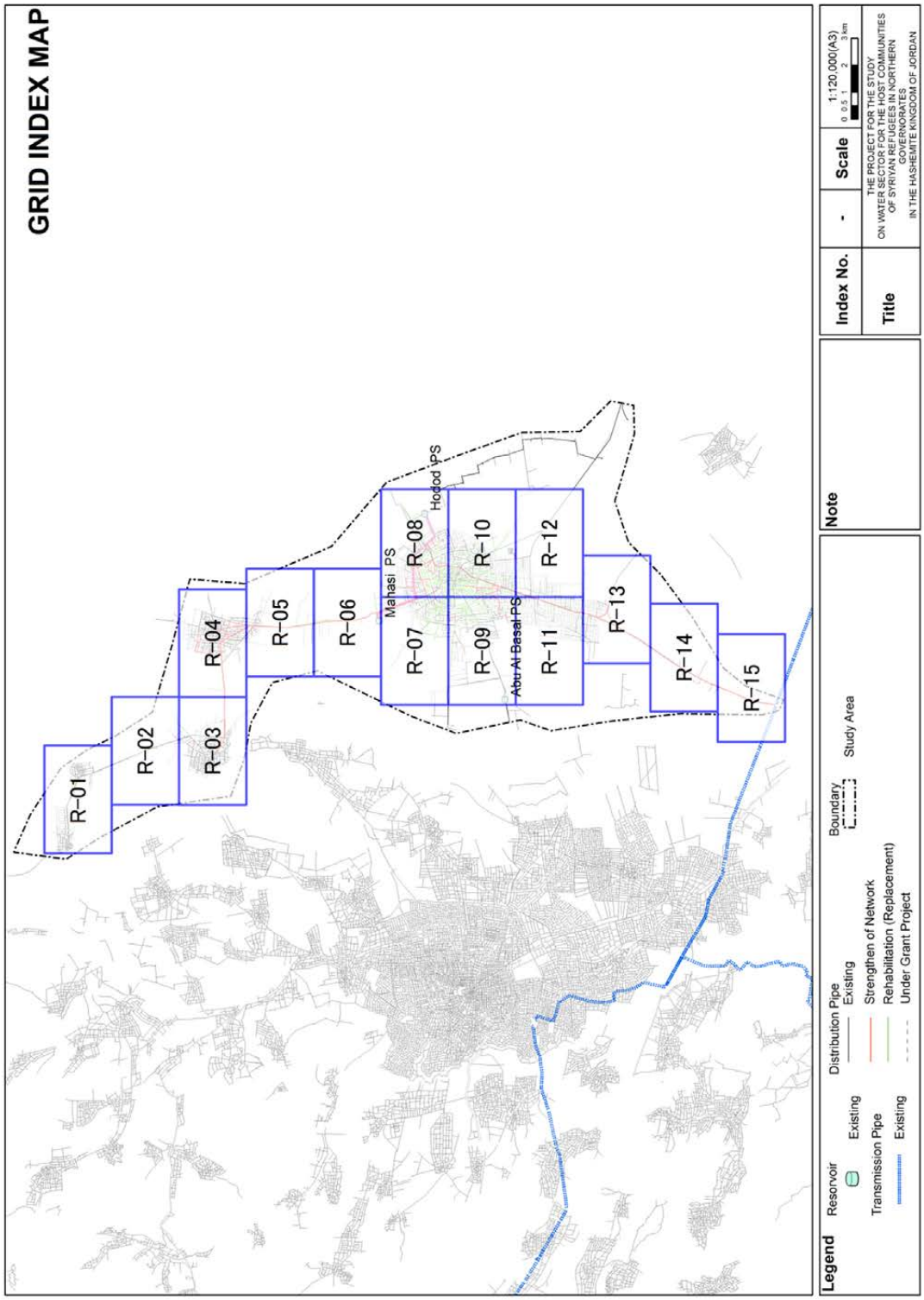

Legend
Resorvoir
Existing
Transmission Pipe
Existing
Distribution Pipe
Existing
Strengthen of Network
Rehabilitation (Replacement)
Under Grant Project
Boundary
Study Area
Note
Index No.
I-22
Scale
1:10,000(A3)
0 50 100 200 300 m
Title
THE PROJECT FOR THE STUDY
ON WATER SECTOR FOR THE HOST COMMUNITIES
OF SYRIYAN REFUGEES IN NORTHERN
GOVERNORATES
IN THE HASHEMITE KINGDOM OF JORDAN



Legend				
Resorvoir		Distribution Pipe		Boundary
	Existing		Existing	Study Area
Transmission Pipe			Strengthen of Network	
	Existing		Rehabilitation (Replacement)	
			Under Grant Project	

Note	Index No.	I-23	Scale	1:10,000(A3) 0 50 100 200 300 m
	Title	THE PROJECT FOR THE STUDY ON WATER SECTOR FOR THE HOST COMMUNITIES OF SYRIYAN REFUGEES IN NORTHERN GOVERNORATES IN THE HASHEMITE KINGDOM OF JORDAN		

APPENDIX6A PROPOSED PIPE IN RAMTHA




Legend
Resorvoir
Existing
Transmission Pipe
Existing
Distribution Pipe
Existing
Strengthen of Network
Rehabilitation (Replacement)
Under Grant Project
Boundary
Study Area
Note
Index No.
R-01
Scale
1:10,000(A3)
0 50 100 200 300 m
Title
THE PROJECT FOR THE STUDY
ON WATER SECTOR FOR THE HOST COMMUNITIES
OF SYRIYAN REFUGEES IN NORTHERN
GOVERNORATES
IN THE HASHEMITE KINGDOM OF JORDAN

100
100
Legend
Resorvoir
Existing
Transmission Pipe
Existing
Distribution Pipe
Existing
Strengthen of Network
Rehabilitation (Replacement)
Under Grant Project
Boundary
Study Area
Note
Index No.
R-02
Scale
1:10,000(A3)
0 50 100 200 300 m
Title
THE PROJECT FOR THE STUDY
ON WATER SECTOR FOR THE HOST COMMUNITIES
OF SYRIYAN REFUGEES IN NORTHERN
GOVERNORATES
IN THE HASHEMITE KINGDOM OF JORDAN

Legend

Resorvoir
- Existing

Transmission Pipe
- Existing

Distribution Pipe
- Existing
- Strengthen of Network
- Rehabilitation (Replacement)
- Under Grant Project

Boundary
- Study Area

Note

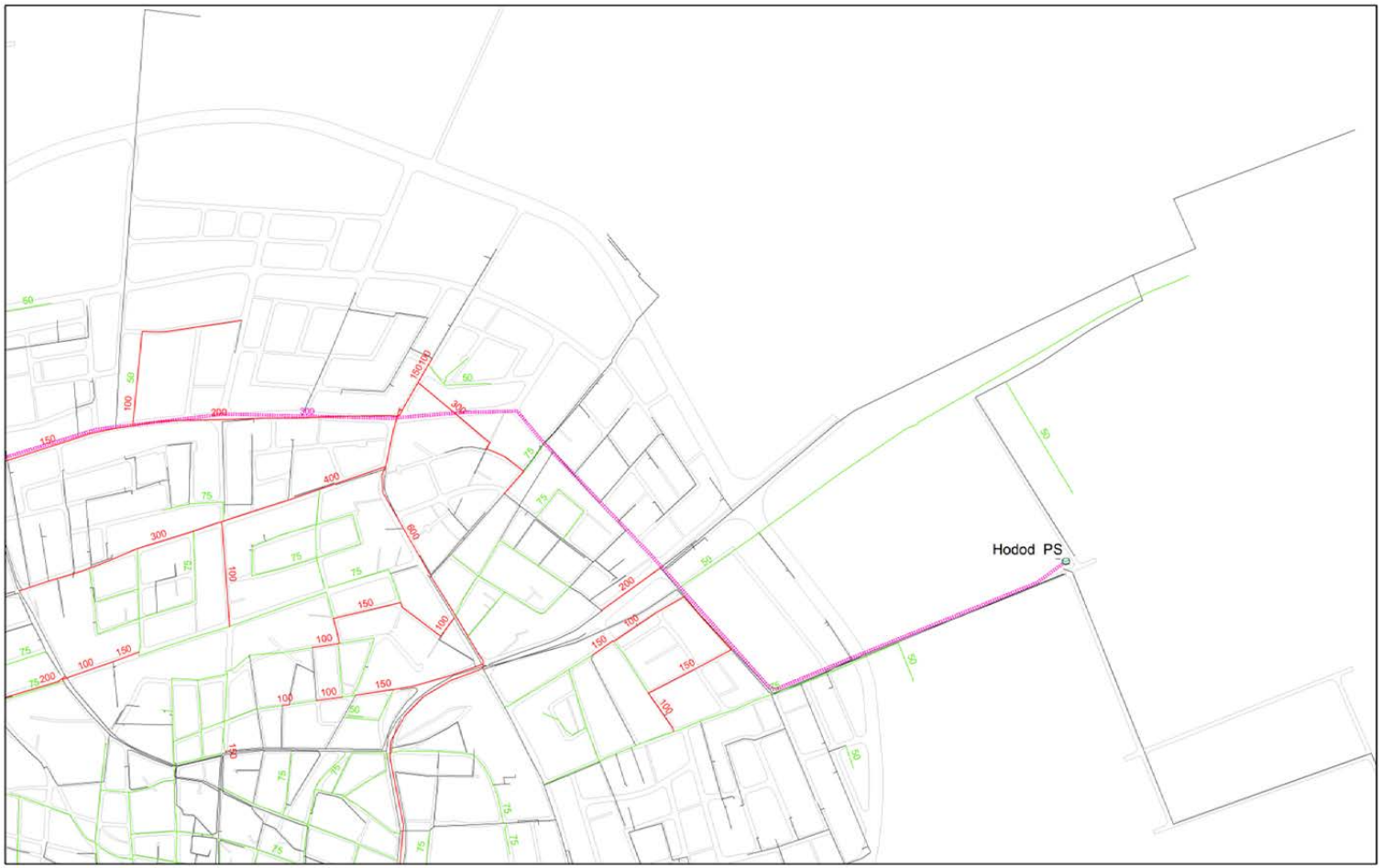
Index No.	**R-03**	**Scale**	1:10,000(A3) 0 50 100 200 300 m
Title	THE PROJECT FOR THE STUDY ON WATER SECTOR FOR THE HOST COMMUNITIES OF SYRIYAN REFUGEES IN NORTHERN GOVERNORATES IN THE HASHEMITE KINGDOM OF JORDAN		


Legend
Resorvoir
Existing
Transmission Pipe
Existing
Distribution Pipe
Existing
Strengthen of Network
Rehabilitation (Replacement)
Under Grant Project
Boundary
Study Area
Note
Index No.
R-04
Scale
1:10,000(A3)
0 50 100 200 300 m
Title
THE PROJECT FOR THE STUDY
ON WATER SECTOR FOR THE HOST COMMUNITIES
OF SYRIYAN REFUGEES IN NORTHERN
GOVERNORATES
IN THE HASHEMITE KINGDOM OF JORDAN

Legend
Resorvoir
Existing
Transmission Pipe
Existing
Distribution Pipe
Existing
Strengthen of Network
Rehabilitation (Replacement)
Under Grant Project
Boundary
Study Area
Note
Index No.
R-05
Scale
1:10,000(A3)
0 50 100 200 300 m
Title
THE PROJECT FOR THE STUDY
ON WATER SECTOR FOR THE HOST COMMUNITIES
OF SYRIYAN REFUGEES IN NORTHERN
GOVERNORATES
IN THE HASHEMITE KINGDOM OF JORDAN

Mahasi PS
600
50
50
50
Legend
Resorvoir
Existing
Transmission Pipe
Existing
Distribution Pipe
Existing
Strengthen of Network
Rehabilitation (Replacement)
Under Grant Project
Boundary
Study Area
Note
Index No.
R-06
Scale
1:10,000(A3)
0 50 100 200 300 m
Title
THE PROJECT FOR THE STUDY
ON WATER SECTOR FOR THE HOST COMMUNITIES
OF SYRIYAN REFUGEES IN NORTHERN
GOVERNORATES
IN THE HASHEMITE KINGDOM OF JORDAN

Legend
Resorvoir
Existing
Transmission Pipe
Existing
Distribution Pipe
Existing
Strengthen of Network
Rehabilitation (Replacement)
Under Grant Project
Boundary
Study Area
Note
Index No.
R-07
Scale
1:10,000(A3)
0 50 100 200 300 m
Title
THE PROJECT FOR THE STUDY
ON WATER SECTOR FOR THE HOST COMMUNITIES
OF SYRIYAN REFUGEES IN NORTHERN
GOVERNORATES
IN THE HASHEMITE KINGDOM OF JORDAN



Legend

Resorvoir
- Existing

Transmission Pipe
- Existing

Distribution Pipe
- Existing
- Strengthen of Network
- Rehabilitation (Replacement)
- Under Grant Project

Boundary
- Study Area

Note

Index No.	**R-08**	**Scale**	1:10,000(A3) 0 50 100 200 300 m
Title	THE PROJECT FOR THE STUDY ON WATER SECTOR FOR THE HOST COMMUNITIES OF SYRIYAN REFUGEES IN NORTHERN GOVERNORATES IN THE HASHEMITE KINGDOM OF JORDAN		

Legend

Resorvoir
- Existing

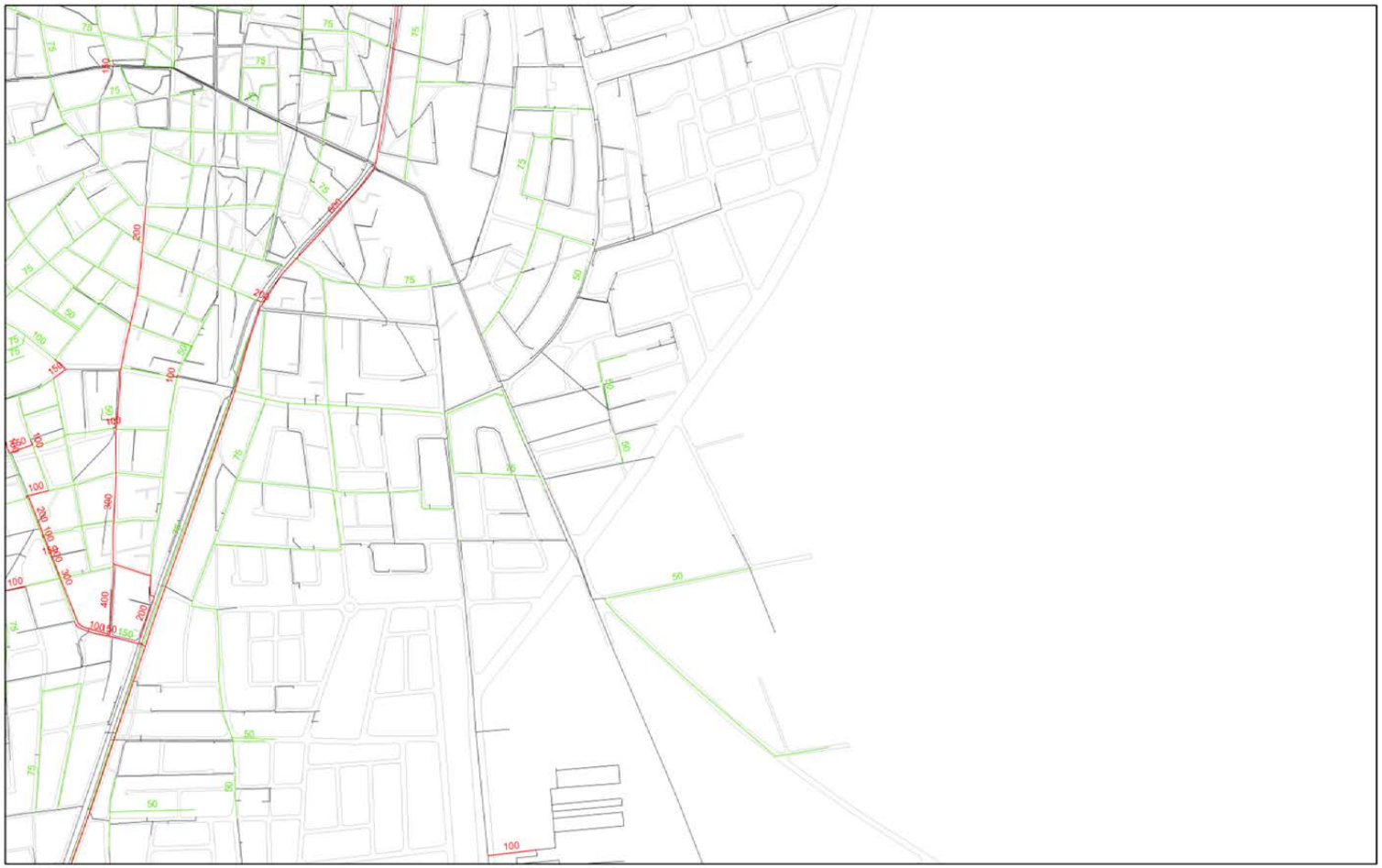
Transmission Pipe
- Existing

Distribution Pipe
- Existing
- Strengthen of Network
- Rehabilitation (Replacement)
- Under Grant Project

Boundary
- Study Area

Note

Index No.	R-09	Scale	1:10,000(A3) 0 50 100 200 300 m
Title	THE PROJECT FOR THE STUDY ON WATER SECTOR FOR THE HOST COMMUNITIES OF SYRIYAN REFUGEES IN NORTHERN GOVERNORATES IN THE HASHEMITE KINGDOM OF JORDAN		



Legend				Note	Index No.	R-10	Scale	1:10,000(A3) 0 50 100 200 300 m
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Transmission Pipe	Existing		Strengthen of Network					
Boundary	Study Area		Rehabilitation (Replacement)					
			Under Grant Project					

Legend
Resorvoir
Existing
Transmission Pipe
Existing
Distribution Pipe
Existing
Strengthen of Network
Rehabilitation (Replacement)
Under Grant Project
Boundary
Study Area
Note
Index No.
R-11
Scale
1:10,000(A3)
0 50 100 200 300 m
Title
THE PROJECT FOR THE STUDY
ON WATER SECTOR FOR THE HOST COMMUNITIES
OF SYRIYAN REFUGEES IN NORTHERN
GOVERNORATES
IN THE HASHEMITE KINGDOM OF JORDAN


Legend
Resorvoir
Existing
Transmission Pipe
Existing
Distribution Pipe
Existing
Strengthen of Network
Rehabilitation (Replacement)
Under Grant Project
Boundary
Study Area
Note
Index No.
R-12
Scale
1:10,000(A3)
0 50 100 200 300 m
Title
THE PROJECT FOR THE STUDY
ON WATER SECTOR FOR THE HOST COMMUNITIES
OF SYRIYAN REFUGEES IN NORTHERN
GOVERNORATES
IN THE HASHEMITE KINGDOM OF JORDAN

100
100
600
Legend
Resorvoir
Existing
Transmission Pipe
Existing
Distribution Pipe
Existing
Strengthen of Network
Rehabilitation (Replacement)
Under Grant Project
Boundary
Study Area
Note
Index No.
R-13
Scale
1:10,000(A3)
0 50 100 200 300 m
Title
THE PROJECT FOR THE STUDY
ON WATER SECTOR FOR THE HOST COMMUNITIES
OF SYRIYAN REFUGEES IN NORTHERN
GOVERNORATES
IN THE HASHEMITE KINGDOM OF JORDAN

Legend
Resorvoir
Existing
Transmission Pipe
Existing
Distribution Pipe
Existing
Strengthen of Network
Rehabilitation (Replacement)
Under Grant Project
Boundary
Study Area
Note
Index No.
R-14
Scale
1:10,000(A3)
0 50 100 200 300 m
Title
THE PROJECT FOR THE STUDY
ON WATER SECTOR FOR THE HOST COMMUNITIES
OF SYRIYAN REFUGEES IN NORTHERN
GOVERNORATES
IN THE HASHEMITE KINGDOM OF JORDAN

Legend
Resorvoir
Existing
Transmission Pipe
Existing
Distribution Pipe
Existing
Strengthen of Network
Rehabilitation (Replacement)
Under Grant Project
Boundary
Study Area
Note
Index No.
R-15
Scale
1:10,000(A3)
0 50 100 200 300 m
Title
THE PROJECT FOR THE STUDY
ON WATER SECTOR FOR THE HOST COMMUNITIES
OF SYRIYAN REFUGEES IN NORTHERN
GOVERNORATES
IN THE HASHEMITE KINGDOM OF JORDAN

APPENDIX 7A JORDANIAN DRINKING WATER STANDARD

No.	Category	Parameters	Symbol	Unit	Standards No. 286
2	Physical property	pH			6.5 to 8.2
2	Physical property	Color	TCU		15
2	Physical property	Taste	-		palatable
2	Physical property	Smell	-		acceptable
2	Physical property	Turbidity	NTU		5
2	Physical property	Temperature		℃	25
3	Palatability	pH			6.5 to 8.2
3	Palatability	Total Dissolved Solids	TDS	mg/L	1000
3	Palatability	Total Hardness	TH	mg/L	500
3	Palatability	Methylene Blue Active Substance	MBAS	mg/L	0.2
3	Palatability	Ammonium	NH_4	mg/L	0.1
3	Palatability	Aluminum	Al	mg/L	0.1
3	Palatability	Iron	Fe	mg/L	1
3	Palatability	Zinc	Zn	mg/L	4
3	Palatability	Sodium	Na	mg/L	200
3	Palatability	Chloride	Cl	mg/L	500
3	Palatability	Sulfate	SO_4	mg/L	500
4	Inorganic	Arsenic	As	mg/L	0.01
4	Inorganic	Lead	Pb	mg/L	0.01
4	Inorganic	Cyanide	CN	mg/L	0.07
4	Inorganic	Cadmium	Cd	mg/L	0.003
4	Inorganic	Total Chromium	Cr	mg/L	0.05
4	Inorganic	Barium	Ba	mg/L	1
4	Inorganic	Selenium	Se	mg/L	0.01
4	Inorganic	Boron	B	mg/L	1
4	Inorganic	Mercury	Hg	mg/L	0.001
4	Inorganic	Silver	Ag	mg/L	0.1
4	Inorganic	Copper	Cu	mg/L	1
4	Inorganic	Manganese	Mn	mg/L	0.1
4	Inorganic	Nickel	Ni	mg/L	0.07
4	Inorganic	Antimony	Sb	mg/L	0.005
4	Inorganic	Fluoride	F	mg/L	1.5
4	Inorganic	Nitrite	NO_2	mg/L	2
4	Inorganic	Molybdenum	Mo	mg/L	0.07
4	Inorganic	Nitrate	NO_3	mg/L	50
5	Pesticide	Endrin		µg/L	2
5	Pesticide	Lindane		µg/L	2
5	Pesticide	Heptachlor Epoxide & Heptachlor		µg/L	0.03
5	Pesticide	Aldrin		µg/L	0.03
5	Pesticide	Dieldrin		µg/L	0.03
5	Pesticide	2,4-Dichloro Phenoxy Acetic Acid	2,4-D	µg/L	90
5	Pesticide	2,4,5-Trichlorobenzenne Phenoxy Acetic	2,4,5-T	µg/L	9
5	Pesticide	Dichlorodiphenyltrichloroethane	DDT	µg/L	2
6	Persistent organic pollutants	Gasoline		µg/L	40
6	Persistent organic pollutants	Mono Ethylene Chloride, Ethylene Chloride		µg/L	40
6	Persistent organic pollutants	Trichloroethylene		µg/L	20
6	Persistent organic pollutants	Athilat Gasoline		µg/L	300
6	Persistent organic pollutants	Xylene Total		µg/L	700
6	Persistent organic pollutants	Toluene		µg/L	300
7	Products of disinfection process	Total Trihalomethanes (TTHMs)		mg/L	0.15
7	Products of disinfection process	Chloride Dioxide		mg/L	0.4
7	Products of disinfection process	Chlorite		mg/L	0.7

APPENDIX9A RESULTS OF ECONOMIC EVALUATION

(1) Improvement Plan in Irbid and Its Suburbs

IRR (Internal Rate of Return)	12.3 %

(JD million)

Year		Cost				Benefit	Net Benefit
		Investment	O&M	Water Purchase	Total		
2016	-1	0.8	0.0	0.0	0.8	0.0	-0.8
2017	0	12.5	0.4	3.6	16.4	9.1	-7.3
2018	1	10.9	0.1	3.7	14.8	9.5	-5.3
2019	2	10.9	0.1	3.8	14.9	9.8	-5.0
2020	3	14.3	0.1	4.2	18.6	10.2	-8.4
2021	4	3.0	0.4	4.5	7.8	10.5	2.7
2022	5	3.0	0.4	4.7	8.1	10.9	2.8
2023	6	3.0	0.4	5.0	8.4	11.3	2.9
2024	7	3.0	0.4	5.3	8.7	11.7	3.0
2025	8	3.0	0.4	5.6	9.0	12.1	3.1
2026	9	2.3	0.4	5.8	8.6	12.5	3.9
2027	10	2.3	0.4	6.1	8.9	12.9	4.0
2028	11	2.3	0.5	6.4	9.2	13.3	4.1
2029	12	2.3	0.5	6.7	9.5	13.7	4.2
2030	13	2.3	0.5	7.0	9.8	14.1	4.3
2031	14	2.3	0.5	7.3	10.1	14.5	4.4
2032	15	2.3	0.5	7.7	10.5	15.0	4.5
2033	16	2.3	0.5	8.0	10.8	15.4	4.6
2034	17	2.3	0.5	8.3	11.1	15.9	4.8
2035	18	2.3	0.5	8.7	11.6	16.5	4.9
2036	19	0.0	0.5	8.7	9.3	16.5	7.2
2037	20	0.0	0.5	8.7	9.3	16.5	7.2
2038	21	0.0	0.5	8.7	9.3	16.5	7.2
2039	22	0.0	0.5	8.7	9.3	16.5	7.2
2040	23	0.0	0.5	8.7	9.3	16.5	7.2
2041	24	0.0	0.5	8.7	9.3	16.5	7.2
2042	25	0.0	0.5	8.7	9.3	16.5	7.2
2043	26	0.0	0.5	8.7	9.3	16.5	7.2
2044	27	0.0	0.5	8.7	9.3	16.5	7.2
2045	28	0.0	0.5	8.7	9.3	16.5	7.2
2046	29	0.0	0.5	8.7	9.3	16.5	7.2
2047	30	-16.4	0.5	8.7	-7.2	16.5	23.7

Note: Salvage value is estimated at 16.4 in 2047.

(2) Improvement Plan in Ramtha and Its Suburbs

IRR (Internal Rate of Return)	10.0 %

(JD million)

Year		Cost				Benefit	Net Benefit
		Investment	O&M	Water Purchase	Total		
2016	-1	0.3	0.0	0.0	0.3	0.0	-0.3
2017	0	3.2	0.1	0.9	4.2	1.9	-2.3
2018	1	3.2	0.1	1.0	4.2	2.0	-2.3
2019	2	3.2	0.1	1.0	4.2	2.0	-2.2
2020	3	4.2	0.1	1.0	5.2	2.1	-3.1
2021	4	0.6	0.1	1.0	1.7	2.2	0.5
2022	5	0.6	0.1	1.0	1.7	2.3	0.6
2023	6	0.6	0.1	1.1	1.8	2.4	0.7
2024	7	0.6	0.1	1.1	1.8	2.5	0.8
2025	8	0.6	0.1	1.1	1.8	2.6	0.8
2026	9	0.6	0.1	1.1	1.8	2.7	1.0
2027	10	0.6	0.1	1.1	1.8	2.9	1.0
2028	11	0.6	0.1	1.2	1.8	3.0	1.1
2029	12	0.6	0.1	1.2	1.9	3.1	1.2
2030	13	0.6	0.1	1.2	1.9	3.2	1.3
2031	14	0.6	0.1	1.2	1.9	3.3	1.4
2032	15	0.6	0.1	1.2	1.9	3.4	1.5
2033	16	0.6	0.1	1.3	2.0	3.6	1.6
2034	17	0.6	0.1	1.3	2.0	3.7	1.7
2035	18	0.6	0.1	1.3	2.0	3.9	1.8
2036	19	0.0	0.1	1.3	1.4	3.9	2.4
2037	20	0.0	0.1	1.3	1.4	3.9	2.4
2038	21	0.0	0.1	1.3	1.4	3.9	2.4
2039	22	0.0	0.1	1.3	1.4	3.9	2.4
2040	23	0.0	0.1	1.3	1.4	3.9	2.4
2041	24	0.0	0.1	1.3	1.4	3.9	2.4
2042	25	0.0	0.1	1.3	1.4	3.9	2.4
2043	26	0.0	0.1	1.3	1.4	3.9	2.4
2044	27	0.0	0.1	1.3	1.4	3.9	2.4
2045	28	0.0	0.1	1.3	1.4	3.9	2.4
2046	29	0.0	0.1	1.3	1.4	3.9	2.4
2047	30	-4.2	0.1	1.3	-2.8	3.9	6.6

Note: Salvage value is estimated at 4.2 in 2047.

(3) Consolidation: Irbid and Ramtha

IRR (Internal Rate of Return)	11.7 %

(JD million)

Year		Cost				Benefit	Net Benefit
		Investment	O&M	Water Purchase	Total		
2016	-1	1.1	0.0	0.0	1.1	0.0	-1.1
2017	0	15.7	0.5	4.5	20.6	11.0	-9.6
2018	1	14.1	0.2	4.7	19.0	11.4	-7.5
2019	2	14.1	0.2	4.8	19.1	11.9	-7.2
2020	3	18.5	0.2	5.2	23.8	12.3	-11.5
2021	4	3.6	0.5	5.5	9.5	12.8	3.3
2022	5	3.6	0.5	5.8	9.8	13.2	3.4
2023	6	3.6	0.5	6.0	10.1	13.7	3.6
2024	7	3.6	0.5	6.3	10.4	14.2	3.8
2025	8	3.6	0.5	6.6	10.8	14.7	3.9
2026	9	2.9	0.5	7.0	10.4	15.2	4.8
2027	10	2.9	0.5	7.3	10.7	15.7	5.0
2028	11	2.9	0.6	7.6	11.0	16.2	5.2
2029	12	2.9	0.6	7.9	11.4	16.8	5.4
2030	13	2.9	0.6	8.2	11.7	17.3	5.6
2031	14	2.9	0.6	8.6	12.1	17.9	5.8
2032	15	2.9	0.6	8.9	12.4	18.4	6.0
2033	16	2.9	0.6	9.2	12.8	19.0	6.2
2034	17	2.9	0.7	9.6	13.1	19.6	6.5
2035	18	2.9	0.7	10.0	13.6	20.4	6.8
2036	19	0.0	0.7	10.0	10.7	20.4	9.7
2037	20	0.0	0.7	10.0	10.7	20.4	9.7
2038	21	0.0	0.7	10.0	10.7	20.4	9.7
2039	22	0.0	0.7	10.0	10.7	20.4	9.7
2040	23	0.0	0.7	10.0	10.7	20.4	9.7
2041	24	0.0	0.7	10.0	10.7	20.4	9.7
2042	25	0.0	0.7	10.0	10.7	20.4	9.7
2043	26	0.0	0.7	10.0	10.7	20.4	9.7
2044	27	0.0	0.7	10.0	10.7	20.4	9.7
2045	28	0.0	0.7	10.0	10.7	20.4	9.7
2046	29	0.0	0.7	10.0	10.7	20.4	9.7
2047	30	-20.6	0.7	10.0	-9.9	20.4	30.3

Note: Salvage value is estimated at 20.6 in 2047.

APPENDIX 10A MONITORING FORM (EXAMPLE)

The latest results of the below monitoring items shall be submitted to the lenders as part of Progress Report throughout the construction phase.

Construction Phase

1. Response/ Actions to Comments and Guidance from Government Authorities and the Public

Monitoring Item	Monitoring Results during Report Period
Number and contents of formal comments made by the public	
Number and contents of responses from Government agencies	

2. Pollution

Air Quality (Ambient Air Quality)

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Standards for Contract	Referred International Standards	Measurement Point	Frequency
Dust	mg/m^3					0.1 (24 hours) 0.2 (1 hour)		Monthly

Water Quality

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Standards for Contract	Referred International Standards	Measurement Point	Frequency
Total coliforms	MPN/100mL			<1.1		0/100mL		
Fecal coliforms	MPN/100mL			0		0/100mL		
pH	-			6.5-8.5		-		
TDS	mg/L			<500-1500		1000		
Chloride	mg/L			200-500		250		3 times / construction section nearby water source
Sodium	mg/L			200-400		200		
Manganese	mg/L			0.1-0.5		0.1-0.5		
Nitrate	mg/L			50-70		50		
Nitrite	mg/L			2		3		
Total hardness	mg/L			100-500		-		
Iron	mg/L			0.3-1.0		0.3		
Copper	mg/L			0.1-1.5		1-2		
Lead	mg/L			0.01		0.01		
Zinc	mg/L			<3.5		3		
Turbidity	NTU			1-5		-		

Note: Drainage is from the sprinkled water for dust control during excavation and washing water for construction machines and vehicles, the used water volume is small, the raw water is well water in the vicinity, and the water use will be saved near the water source well. Although the impact on the water source is considered to be little, for the confirmation, the above water quality analysis will be carried out for water sources nearby construction sites.

Noise

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Standards for Contract	Referred International Standards	Measurement Point	Frequency
Noise Level.	dB			35-55 (night)				Monthly
Vibration Level	dB			55-60 (night)				Monthly

Soil pollution

Monitoring Item	Contents	Monitoring Results during Report Period	Measures to be Taken
Oil leakage condition	Check of oil leakage situation from construction machines and vehicles, and repair situation Confirmation of removal of contaminated soil, and disposal to the specified sites (Weekly)		

3. Social Environment

Monitoring Item	Contents	Monitoring Results during Report Period	Measures to be Taken
Local Economy	Confirmation of securement of approach paths to commercial places during traffic control for construction work		
Cultural Heritage	Confirmation of accurate inspection by MOTA		
Infectious Diseases including HIV/AIDS	Confirmation of education of health management for workers (monthly)		
Work Environment	Confirmation of wearing of specified safety wears for work (weekly)		
Accident	Confirmation of appropriate traffic control and securement of safety for workers (weekly)		

APPENDIX 10B ENVIRONMENTAL CHECK LIST (WATER SUPPLY MASTER PLAN)

Classification	Environmental Item	Major Check Items	Yes: Y No: N	Specific Environmental and Social Considerations (Reason for the Yes / No, basis, mitigation, etc.)
1 Licensing and explanation	(1) EIA and Environmental licensing	(a) Environmental assessment report (EIA report), etc. was created? (b) EIA report was either approved by the country's government? (c) Approved EIA report has collateral condition? If there is a collateral condition, the conditions are satisfied? (d) In the case other than the above, if necessary, environmental licensing from the competent authority of the local was acquired?	(a) N (b) N (c) N (d) N	(a) (b) (c) (d) EIA at the planning stage (MP) is not legalized in Jordan, but SEA was conducted according to JICA's Environmental and Social Consideration Guideline.
	(2) Explanation to local stakeholders	(a) About the impact and the contents of the project, an appropriate description to local stakeholders including information disclosure was carried out, and the understanding was gained? (b) The comments from the residents were reflected on project content ?	(a) Y (b) Y	(a) (b) Stakeholder's meeting as a part of SEA was held, and the opinions and comments from participants were collected to reflect on the finalization of the MP.
	(3) Consideration of alternatives	(a) Multiple alternatives of the project plan (when studying, and including items related to environmental and social) were considered?	(a) Y	(a) Development alternatives at concept level (new water source development or rehabilitation of existing facilities) and component level (land acquisition for new facilities or reinforcement of existing facilities, etc.) were examined in view of environmental and social impacts.
2 Pollution measures	(1) Air quality	(a) Is there the air pollution caused by chlorine from the injection equipment and storage facility for chlorine disinfection? (b) Chlorine in the work environment is consistent with the occupational safety standards of the country?	(a) N/A (b) N/A	(a) (b) Since the components of the MP are rehabilitation of facilities and water supply network, and new construction of reservoir and pump station, chlorine is not used. Measures dust generated during the construction period is planned.
	(2) Water quality	(a) SS, BOD, COD, pH, and the like item of wastewater generated in accordance with the facility operation are consistent with drainage standards of the country?	(a) Y	(a) YWC manages facility operation in accordance with the Jordan Standard.
	(3) Waste	(a) Waste sludge generated in accordance with the facility operation is either treated and disposed of properly in accordance with the provisions of the country?	(a) Y	(a) YWC manages waste sludge generated in accordance with Jordan regulations.
	(4) Noise and vibration	(a) Noise and vibration from the pump facility, etc., are consistent with the standards of the country?	(a) Y	(a) YWC manages noise and vibration from pump facilities in accordance with Jordan Standard.
	(5) Land subsidence	(a) When performing the pumping large amounts of groundwater, is there a possibility that the land subsidence occurs?	(a) N	(a) Since the components of the MP are rehabilitation of facilities and water supply network, and new construction of reservoir and pump station, the project does not concern increase of groundwater intake.
3 Natural	(1) Protected areas	(a) Site is located in protected areas designated by laws of the country or international treaties and conventions? Project affects the protected areas?	(a)N	(a) The project area has more than 10km away from the Reserves the country specify, the impact does not affect.

Classification	Environmental Item	Major Check Items	Yes: Y No: N	Specific Environmental and Social Considerations (Reason for the Yes / No, basis, mitigation, etc.)
3 Natural environment	(2) Ecosystem	(a) Site includes virgin forest, tropical natural forest, habitat ecologically important (coral reefs, mangrove swamps, tidal flats, etc.) ? (b) Site includes the habitats of endangered species required protection by law of the country or international treaties and conventions? (c) If a significant impact on the ecosystem is concerned, measures to reduce the impacts on the ecosystem is conducted? (d) Water intake (surface water, underground water) by the project affects the aquatic environment such as rivers? Measures to reduce the impacts on the aquatic organisms, etc., are carried out?	(a) N/A (b) N/A (c) N/A (d) N/A	(a) (b) (c) (d) The project site locates in urban area and suburb area of Irbid and Ramtha, important species, rare species and endangered critical species of fauna and flora do not exist. In addition, since the components of the MP are rehabilitation of facilities and water supply network, and new construction of reservoir and pump station, the project does not participate in the intake of water sources, the significant impact on the ecosystem is not concerned.
	(3) Hydrology	(a) Water intake (groundwater, surface water) by the project affects an adverse effect on the flow of surface water and ground water?	(a) N	(a) Since the components of the MP are rehabilitation of facilities and water supply network, and new construction of reservoir and pump station, the project does not concern water sources.
4 Social environment	(1) Resettlement	(a) With the implementation of the project, involuntary resettlement occurs ? If that occurs, efforts to minimize the impact of relocation is conducted? (b) For residents to transfer , appropriate description of compensation and life reconstruction measures would be done before the transfer ? (c) Search for residents relocation was carried out, and the resettlement plan including compensation by the replacement cost and the recovery of livelihoods after relocation is conducted ? (d) Payment of compensation is either carried out in the pre-transfer ? (e) Compensation policy has been developed in the document ? (f) The plan, among the relocated residents, in particular for socially vulnerable such as women, children, the elderly, the poor, ethnic minorities, indigenous peoples, etc. has been made with appropriate consideration ? (g) For relocated residents, the pre-transfer agreement can be gotten ? (h) The organizational framework established to properly implement the resettlement is considered ? Enough capacity to implement the plan and budget measures can be secured ? (i) Monitoring for the impacts of resettlement is planned ? (j) System for the complaint process is built ?	(a)N/A (b)N/A (c) N/A (d) N/A (e) N/A (f) N/A (g) N/A (h) N/A (i) N/A (j) N/A	(a) (b) (c) (d) (e) (f) (g) (h) (i) (j) In this project, resettlement does not occur.
	(2) Life and livelihood	(a) Adverse effect results to the life of residents by the project? Adequate measures is considered to reduce the impacts, if necessary? (b) Water intake (surface water, underground water) by the project affects existing water use ?	(a) N (b) N	(a) Since the MP is mainly composed of the rehabilitation of existing water supply facilities and network, adverse effect is not expected. (b) Further water intake is not proposed in the MP.

Classification	Environmental Item	Major Check Items	Yes: Y No: N	Specific Environmental and Social Considerations (Reason for the Yes / No, basis, mitigation, etc.)
4 Social environment	(3) Cultural heritage	(a) Is there risk by the project to heritages and historical sites which are archeologically, historically, culturally, and religiously precious ? In addition, measures that have been stipulated in accordance with the country's laws are taken into account ?	(a) Y	(a) There is a possibility to find archaeological remains during construction. If any, construction activity will be implemented under the supervision of the Ministry of Tourism and Antiquities.
	(4) Landscape	(a) When the landscape to be considered particularly presents, the project adversely affects to it? If it is affected, necessary precautions is taken?	(a) N	(a) Since the MP is composed of the rehabilitation of existing water supply facilities and network, and new construction of reservoir and pump station to be constructed on farmland, adverse effect to landscape is not expected.
	(5) Ethnic minorities, indigenous	(a) Consideration to reduce the impact to minority of the country, indigenous cultures and lifestyle have been made? (b) Rights related to land and resources of ethnic minorities and indigenous people are respected?	(a)N/A (b)N/A	(a) (b) Distinction of ethnic minorities and indigenous peoples is not performed. Original Palestine refugees, Syria refugees in recent years has been living. Discrimination to minorities does not occur through rehabilitation of water supply network.
	(6) Working environment	(a) In the project, the Act on the working environment of the country which must be observed is kept? (b) Safety considerations in in the hard part of the individuals involved in the project such as installation of safety equipment according to industrial accident prevention, management of hazardous substances, etc. are being measures? (c) Support implementation in the soft part of the individuals involved in the project such as the establishment of safety and health plan and safety training for workers (including public health and traffic safety) is planned and implemented? (d) Appropriate measures that security personnel involved in the project make sure not to violate the safety of the project stakeholders and local residents are taken ?	(a) Y (b) Y (c) Y (d) Y	(a) Adhering to the law is stipulated in the contract, and supervision is also carried out. (b) Dress code related to industrial accident prevention, measures for necessary equipment handling safety check or the like are performed. (c) Formulation of safety and health plan, safety training is carried out. (d) Prior guidance and OJT is performed.
5 Others	(1) Impact under construction	(a) Mitigation measures are prepared against pollution during construction (noise, vibration, turbid water, dust, exhaust gas, waste, etc.) ? (b) The construction adversely affects the natural environment (ecosystem) ? In addition, adequate measures considered to reduce impacts is prepared? (c) The construction adversely affects the social environment construction ? In addition, adequate measures considered to reduce impacts is prepared? (d) The construction causes road congestion? Adequate measures considered to reduce impacts are prepared?	(a) Y (b) N (c) Y (d) Y	The following items will be refracted in plan and designs based on the Master Plan, and noise reduction measures to residents of vicinity of pump station in the operation stage will be conducted. (a) Noise and vibration; Construction work is carried out during the day. Dust; Periodical watering will be conducted. Waste is ensured to the disposal site. (b) The construction work is mainly excavation and buried tubing works of water pipes and water supply network in urban and suburban areas and along existing roads with traffic, impact to the natural environment (ecosystem) is very small. (c) During the construction period, approach to commercial facilities such as premises is disturbed, mitigation measures is carried out by ensuring the sidewalk for passers. (d) Consultation with regulators, measures of induction to bypass are taken.

Classification	Environmental Item	Major Check Items	Yes: Y No: N	Specific Environmental and Social Considerations (Reason for the Yes / No, basis, mitigation, etc.)
5 Others	(2) Monitoring	(a) For items that are considered to have potential impacts of the above environment items, monitoring of project operators are planned and implemented? (b) How item of the plan, method, frequency, etc. are determined? (c) Monitoring system of the project operator (Continuity of the organization, personnel, equipment, and adequate budget) or be established? (d) The reporting procedure or the frequency, etc. from the project operator to the competent authority are stipulated?	(a) Y (b) Y (c) Y (d) Y	The following items will be refracted in plan and designs based on the Master Plan (a) Monitoring plan is implemented. (b) The patrol check of working environment, measures for residents, impact for cultural heritage is conducted once a week during construction. (c) Monitoring system is established. (e) Report is done once a month.
6 Points to note	Reference of other checklist	(a) If necessary, it should be evaluated also add the appropriate checks in check list according dam, the river.	(a) N	(a)Unnecessary, because there is no water source development.
	Notes on using environmental checklist	(a) If necessary, check the influence of environmental problems on a global scale or cross-border. (If such an element related to cross-border problems processing of waste, acid rain, ozone layer depletion, global warming can be considered).	(a) N	(a)Unnecessary, there is little impact on the nature ecosystem

Note 1) For the "standard of the country concerned" in the table, when there is a significant deviation as compared to the baseline which is internationally recognized, countermeasures are examined, if necessary. Items, which are not yet to be established in the local environmental regulations of the country, is examined by comparison with appropriate standards other than the country (including experience in Japan).

Note 2) Environmental Checklist is intended only to show the standard environment check items. Depending on the condition of the project and the local, it is necessary to add or delete items.