

Appendices

Appendix- 1 Member List of the Study Team

(Basic Design Study)

Mr. Naoyuki Ochiai	Team Leader	Deputy Resident Representative to Jordan, JICA
Mr. Norihito Yonebayashi	Project Coordinator	Water Resources Development and Environmental Management Team, Project Management Group III, Grant Aid Management Department, JICA
Mr. Hirotaka Sato	Chief Engineer/ Water Supply Planning/ Operation and Management Planning	Tokyo Engineering Consultants Co., Ltd.
Mr. Judo Hagiwara	Pipeline Planning	Tokyo Engineering Consultants Co., Ltd.
Mr. Shunichi Nakatake	Facility Planning	Tokyo Engineering Consultants Co., Ltd. (Aquatech Co., Ltd.)
Mr. Masafumi Miyamoto	Equipment Planning	Tokyo Engineering Consultants Co., Ltd.
Mr. Norio Tanaka	Cost Estimation / Procurement Planning/ Equipment Planning	Tokyo Engineering Consultants Co., Ltd.

(Explanation and Discussion of Draft Final Report)

Mr. Naoyuki Ochiai	Team Leader	Deputy Resident Representative to Jordan, JICA
Mr. Hirotaka Sato	Chief Engineer/ Water Supply Planning/ Operation and Management Planning	Tokyo Engineering Consultants Co., Ltd.
Mr. Judo Hagiwara	Pipeline Planning	Tokyo Engineering Consultants Co., Ltd.

Appendix- 2 Study Schedule

(Basic Design Study)

Day	Date		Stay	Travel	Activities
1	Nov. 18	Fri	On plane	Haneda 20:40(JL1319) Osaka 23:15(JL5099) Dubai arr. 05:10	Consultants (Mr. Sato, Mr. Hagiwara, Mr. Miyamoto, Mr. Nakatake, and Mr. Tanaka) leave Japan
2	19	Sat	Amman	Dubai dept.14:00(EK903) Amman arr.15:25	Consultants (Mr. Sato, Mr. Hagiwara, Mr. Miyamoto, Mr. Nakatake, and Mr. Tanaka) arrive in Amman
3	20	Sun	Amman		Meeting with JICA Courtesy all to WAJ Secretary General Discussion with WAJ Courtesy call to Ministry of Planning Courtesy call to Embassy of Japan
4	21	Mon	Amman		Site survey in Zarqa
5	22	Tue	Amman		Site survey in Zarqa, Data Collection
6	23	Wed	Amman		Site survey in Zarqa, Data Collection
7	24	Thu	Amman		Discussion with WAJ, request for data collection and sub contract work Discussion with GTZ Discussion with WAJ Zarqa Office Site Survey and discussion with WAJ Zarqa
8	25	Fri	Amman	Narita 10:55 (JL717) Bangkok arr.	Mr. Yonebayashi leave Japan
9	26	Sat	Amman	Bangkok dept. 00:15(RJ183) Amman arr.05:00	Mr. Yonebayashi arrive in Amman Site survey in Zarqa
10	27	Sun	Amman		Meeting with JICA Discussion with WAJ on M/D
11	28	Mon	Amman		Discussion with WAJ on M/D
12	29	Tue	Amman		Site survey in Zarqa phase 1 project site (Mr. Ochiai, Mr. Yonebayashi, Ms. Miyahara, Mr. Ushiki, Mr. Hagiwara and Mr. Miyamoto)
13	30	Wed	Amman		Signature on M/D, Courtesy call to Minister of MWI Site survey in Zai water treatment plant Report to Embassy of Japan Report to JICA
14	Dec. 1	Thu	Amman	Amman 00:05 (RJ180) Bangkok arr.13:30 Bangkok dept. 22:30(JL718)	Mr. Yonebayasi leave Amman Discussion with WAJ and Engicon Data collection at ENRUWA and Directorate of Palestine
15	2	Fri	Amman	Narita 06:15	Mr. Yonebayashi arrive in Tokyo
16	3	Sat	Amman		Data collection and cost survey
17	4	Sun	Amman	Amman16:30 (EK904) Dubai arr.21:15	Mr. Miyamoto leave Amman Site survey in Zarqa, data collection, cost survey and data collection in MOE
18	5	Mon	Amman	Dubai dept. 02:50(JL5090) Osaka arr. 16:40 Osaka dept. 18:30(JL1316) Tokyo arr. 19:35	Mr. Miyamoto arrive Tokyo Subcontract work, data collection, cost survey
19	6	Tue	Amman		Site survey in Sukhna city office, Site survey for transmission routes, data collection, cost survey
20	7	Wed	Amman		Data collection, cost survey
21	8	Thu	Amman		Site survey in Zarqa city office, Site survey for distribution main routes, data collection, cost survey
22	9	Fri	Amman		Data analysis
23	10	Sat	Amman		Site survey for distribution main routes, subcontract work, data collection, cost survey
24	11	Sun	Amman		Site survey in Zarqa, data collection, cost survey, data analysis
25	12	Mon	Amman		Subcontract work, site survey in Zarqa, data collection, cost survey, data analysis
26	13	Tue	Amman		Submission of subcontract document to JICA, data collection

Day	Date	Stay	Travel	Activities
				in ministry of Health, Site survey in Zarqa, data collection, cost survey, data analysis
27	14	Wed	Amman	Discussion with WAJ, preparation of field report, data collection WAJ Zarqa office, signature for subcontract work
28	15	Thu	Amman	Start of subcontract work, preparation of field report
29	16	Fri	Amman	Amman 16:30 (EK904) Dubai arr. 21:15 Site survey in Azraq, preparation of field report Mr. Nakatake leave Amman
30	17	Sat	Amman	Dubai dept. 02:50(JL5090) Osaka arr. 16:40 Osaka dept. 18:30(JL1316) Tokyo arr. 19:35 Preparation of field report
31	18	Sun	Amman	Subcontract work (explanation of the sites), discussion with WAJ Zarqa, preparation of field report
32	19	Mon	Amman	Discussion with WAJ, Subcontract work (explanation of the sites)
33	20	Tue	Amman	Workshop in Zarqa on soft component, Site survey in Zarqa
34	21	Wed	Amman	Site survey in Zarqa, preparation of report of site survey results
35	22	Thu	Amman	Report to JICA and Embassy of Japan, site survey in Zarqa, Discussion with WAJ, signature on field report
36	23	Fri	On plane	Amman 16:30(EK904) Dubai arr. 21:15 Mr. Sato, Mr. Hagiwara and Mr. Tanaka leave Amman
37	24	Sat		Dubai dept. 02:50(JL5090) Osaka arr. 16:40 Osaka dept. 18:30(JL1316) Tokyo arr. 19:35 Mr. Sato, Mr. Hagiwara and Mr. Tanaka arrive Tokyo

(Explanation and Discussion of Draft Final Report)

Day	Date	Stay	Travel	Activities
1	Mar. 10	Fri	On plane	Haneda 20:40(JL1319) Osaka 23:15(JL5099) Dubai arr. 05:10 Mr. Sato, Mr. Hagiwara leave Tokyo
2	11	Sat	Amman	Dubai dept. 14:00(EK903) Amman arr. 15:25 Mr. Sato, Mr. Hagiwara arrive in Amman
3	12	Sun	Amman	Discussion with JICA Courtesy call to Ministry of planning and WAJ Submission of draft final report
4	13	Mon	Amman	Discussion with WAJ on land acquisition Courtesy call to Embassy of Japan
5	14	Tue	Amman	Explanation, discussion of the draft final report, discussion on M/D
6	15	Wed	Amman	Discussion on M/D, signature on M/D (JICA and WAJ)
7	16	Thu	Amman	Signature on M/D (Ministry of Planning), report to Embassy of Japan and JICA
8	17	Fri	On plane	Amman 16:30 (EK904) Dubai arr. 21:15
9	18	Sat		Dubai dept. 02:50(JL5090) Osaka arr. 16:40 Osaka dept. 18:30(JL1316) Tokyo arr. 19:35

Appendix- 3 List of Parties Concerned in the Recipient Country

(Basic Design Study)

Agency and Position	Name
Water Authority of Jordan (WAJ), Ministry of Water and Irrigation (MWI)	
Minister	Eng. Mohammed Zafer Alem
Secretary General	Eng. Munther A. Khleifat
Assistant Secretary General	Eng. Khaled Al-Kodah
Planning & Studies Directorate Water Sector	Eng. Nabil Zoubi
Planning & Studies Directorate Water Sector	Eng. Dalal Eliwah
Planning & Studies Directorate Water Sector	Eng. Eng. Aisha
Water Resources and environmental Engineering Water Projects Division	Eng. Saddam H. Ali Khleifat
Director of Planning and Water Resources	Dr. Aeesa Al-Nsour
Planning and Water Resources	Mr. Zakaria Zuhdi Mahmoud
Head Division of Governorate	Mr. Mazan AbuSa'ad
Affairs Central Subscriber Directorate	Mr. Sama Myghrqbi
Director of Treatment Water & Desalination	Eng. Rateb Al- Odoan
Director of water system operation department	Mr. Bassam Mah'd Saleh Alsoghaireen
Manager of Administrative & Finance Affair, Zarqa office	Mr. Aref A. Qudomi
Head Master of Division, Water Control Division and Supply Division	Mr. Musa Asunan
Director NRW & Performance Indicators Initiative, PMU	Eng. Waleed Sukkar
Non-Revenue Water Engineer, PMU	Eng. Louis Musa Qaqish
Leakage Tools Programmer, PMU	Eng. Mohammed Ghnaimat
Administration Manager, WAJ Zarqa Office	Eng. Jabir Hmound
Head of Water Directorate, WAJ Zarqa Office	Eng. Osama Al Hamad
Director, Non-Revenue Water Department, WAJ Zarqa Office	Eng. Isam Hamarsheh
Ministry of Planning	
Director and Advisor, Water and Environment Department	Dr. Kamal Khdir
Water Sector Disk Officer	Ms. Naha AL-Zubi
GTZ	
Team Leader	Dr. Philipp Magiera
Project manager	Ms. Marina Meuss
United Nation Relief and Works, Agency for Palestine in Near East (UNRWA) , Jordan	
Deputy Director	Mr. Roger A. Davies
Department of Palestinian Affairs	
Director General	Eng. Wajeeh Azayzeh
Ministry of Environment	
EIA Directorate	Eng. Izzat Abu-Humra
Government Tenders Directorate	
Bidding Dept.	Eng. Ashraf M. Al-Tarawneh
Ministry of Health	
Director of EHD, Environmental Health Directorate	Eng. Hieari Sala
Assistant Director, Water Monitoring Department	Eng. Shawqi Marzouq
Embassy of Japan in Jordan	
Counselor, Deputy Head of Mission	Mr. Matahiro Yamaguchi
First Secretary, Economic Section	Mr. Takayuki Ikeda
Second Secretary and Economic Attaché	Ms. Fumiko Nohara
JICA Jordan Office	
Resident Representative	Mr. Hideo Morikawa
Deputy Resident Representative	Mr. Naoyuki Ochai
Assistant Resident Representative	Ms. Chie Miyahara
JICA Advisor in MWI	Mr. Hisao Ushiki
Senior Program Officer	Mr. Hani H. Alkudi

(Explanation and Discussion of Draft Final Report)

Agency and Position	Name
Water Authority of Jordan (WAJ) , Ministry of Water and Irrigation(MWI)	
Secretary General	Eng. Munther A. Khleifat
Assistant Secretary General	Eng. Khaled Al-Kodah
Planning & Studies Directorate Water Sector	Eng. Nabil Zoubi
Planning & Studies Directorate Water Sector	Eng. Aisha Tarawneh
Administration Manager, WAJ Zarqa Office	Eng. Jabir Al-hmoud
Director, Non-Revenue Water Department, WAJ Zarqa Office	Eng. Isam Hamarsheh
Head of Water Directorate, WAJ Zarqa Office	Eng. Osama Al Hamad
Ministry of Planning	
Director, Projects Department	Dr. Saleh Al-Kharabsheh
Head of Water and Agriculture Division	Ms. Maha AL-Zu'bi
Zarqa Municipality	
Design Department	Arch. Sahair Nofal
Design Department	Eng. Mohamman Shaheen
Embassy of Japan in Jordan	
Counselor, Deputy Head of Mission	Mr. Matahiro Yamaguchi
First Secretary, Economic Section	Mr. Takayuki Ikeda
JICA Jordan Office	
Resident Representative	Mr. Takeaki Sato
Deputy Resident Representative	Mr. Naoyuki Ochai
Assistant Resident Representative	Ms. Chie Miyahara
JICA Advisor in MWI	Mr. Hisao Ushiki
Senior Program Officer	Mr. Hani H. Alkudi

Appendix- 4 Minutes of Discussions (M/D) on Inception Report

**MINUTES OF DISCUSSIONS
ON
THE BASIC DESIGN STUDY
ON
THE PROJECT FOR IMPROVEMENT OF THE WATER SUPPLY FOR
ZARQA DISTRICT (PHASE II)
IN THE HASHEMITE KINGDOM OF JORDAN**

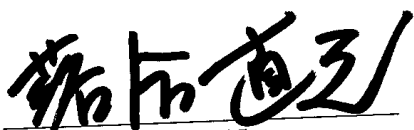
In response to a request from the Government of Hashemite Kingdom of Jordan (hereinafter referred to as "Jordan"), the Government of Japan decided to conduct a Basic Design Study on the Project for Improvement of the Water Supply for Zarqa District Phase II (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to Jordan the Basic Design Study Team (hereinafter referred to as "the Team"), which is headed by Naoyuki OCHIAI, Deputy Resident Representative of JICA Jordan Office, and is scheduled to stay in the country from November 20 to December 23, 2005.

The Team held discussions with the officials concerned of the Government of Jordan and conducted a field survey at the study area.

In the course of discussions and field survey, both parties confirmed the main items described on the attached sheets. The Team will proceed to further works and prepare the Basic Design Study Report.

Amman, November 30, 2005



Mr. Naoyuki OCHIAI
Leader of the Basic Design Study Team
Deputy Resident Representative of Jordan
Office, Japan International Cooperation
Agency (JICA)



Eng. Muthur Khleifat
Secretary General
Water Authority of Jordan (WAJ),
Ministry of Water and Irrigation,
The Hashemite Kingdom of Jordan



Dr. Kamal Khdier
Advisor/Director
Water and Environment Department
Representative of Ministry of Planning and
International Cooperation
The Hashemite Kingdom of Jordan

ATTACHMENT

1. Objective of the Project

The objective of the Project is to improve water supply conditions and reduce water losses in the network in Zarqa, Hashemeyeh and Sukhna municipalities by rehabilitating and upgrading the water supply facilities as a means of contribution to achieving the objectives of the water strategy of Jordan.

2. Project Site and Service Area Covered by the Project

The project site includes Zarqa, Hashemeyeh and Sukhna municipalities, the location of which is shown in the attached ANNEX-I.

3. Responsible and Implementing Agency

3-1) Responsible organization: Ministry of Water and Irrigation

3-2) Implementing organization: Water Authority of Jordan (hereinafter referred to as "WAJ").

3-3) Organization chart of implementing organization:

The organization charts of WAJ and WAJ Zarqa Office are described in ANNEX-II.

4. Items Requested by the Government of Jordan

Jordan side requested two alternatives for the proposed Project described in ANNEX-III, including the project components in the original request. After discussions with the Team, Jordan side agreed that the Team will assess the contents of both alternatives through further study and will propose the appropriate components of the Project based on the both alternatives. Both side agreed that as a result of the further study, the Team and Jordan side would draft appropriate components of the Project and JICA would evaluate and finalize the components, then recommend it to the Government of Japan for approval.

5. Japan's Grant Aid Scheme

5-1) Jordan side understands the Japan's Grant Aid Scheme explained by the Team, as described in ANNEX-IV.

5-2) Jordan side will take the necessary measures, as described in ANNEX-V, for smooth implementation of the Project, as a condition for the Japanese Grant Aid to be implemented.

6. Schedule of the Study

6-1) The consultants will proceed to further studies in Jordan until December 22, 2005.

6-2) JICA will prepare the draft report in English and dispatch a mission in order to explain its contents in March 2006.

6-3) In case that the contents of the report is accepted in principle by the Government of Jordan, JICA will complete the final report and send it to the Government of Jordan by June 2006.

7. Other Relevant Issues

7-1) Target Year

Both sides agreed that the target year of the Project should be 2010.

7-2) Capacity of the Proposed Facilities of the Project

The capacity of the requested facilities was discussed by both sides. Both sides agreed that the



facilities should be planned basically so as to meet the water demand of the Project area in 2010. However, the following planning criteria will be adopted in deciding the capacity of the facilities, considering the year 2015, the target year of the JICA Water Supply Master Plan for Zarqa District prepared in 1996, and feasibility of the construction of additional facilities in the near future.

- a) The capacity of reservoirs shall be planned adopting the water demand in 2010.
- b) The capacity of transmission and distribution pipelines shall be planned adopting the water demand in 2015.
- c) The capacity and number of pumps in pumping stations shall be planned adopting the water demand in 2010 and pump house and electrical equipment shall be planned adopting the water demand in 2015.
- d) Jordan side is considering future expansion of the facilities upto 2025 in their latest plan and will acquire the required land by their own expenses.

In addition, both side agreed that the water demand of the nearby villages outside the project site, which were connected to the existing network in the project site, would be considered in planning the capacity of the facilities if the demand is evaluated as appropriate by the Team.

7-3) Existing Facilities of the Project Site

In the discussion, both sides could not decide the necessity and utilization methods of the existing major facilities such as Batrawi, Zarqa and Hashemeye pumping stations and Sukhna and Hararieh reservoirs after the completion of the Project. However, both sides confirmed to make maximum use of these facilities in the water supply system through further study by the Team.




The existing Khaw pumping station is one of the largest water supply sources for the project site. Therefore, the Team will assess the necessity of additional pumps in the pumping station in order to get maximum benefit of the Project. If the necessity is confirmed, additional pumps will be considered as a component of the Project.

7-4) Existing Water Supply Plan for the Project Site

Both sides agreed that the basic design plan shall be prepared based on the latest water supply plan that are now prepared by WAJ through further evaluation and required modification by the Team in accordance with the JICA grand aid policy. Jordan side agreed to submit all the materials such as study reports, drawings and raw and analyzed data to the Team for detailed study as soon as possible and make necessary coordination with the relevant organizations and authorities involving in preparing the plan.

7-5) Water Resources Development Projects and Water Allocation to the Project Site

Jordan side explained about the current progress and schedule of on-going and expected water resources development projects in Jordan and the detailed water allocation policy including water rights and the amount of water allocated for municipal water supply from 2005 to 2015 for the project site. The Japanese side confirmed the preliminary water allocation for municipal water supply to the project site as attached in ANNEX-VI and Jordan side promised to transmit the stipulated water amount to the project site before the completion of the Project. The Team and WAJ will assess this allocation based on the progress of the water resources projects and update the allocation for a further study.

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7-6) Major Undertakings by Jordan Side

Both sides agreed that the Team would study the components of the Project to be implemented by Jordan side and provide the results to Jordan side in January 2006 and accordingly Jordan side would provide a detailed schedule of implementation and budget arrangement in February 2006 to the Team.

Jordan side agreed to install division valves and supplementary pipes in time for making distribution zones.

7-7) Land Acquisitions for Project Facilities

Jordan side stated that land acquisition has not yet been started. However, Jordan side promised to procure the land for the proposed facilities just after the identification of the sites and the completion of land survey by the Team.

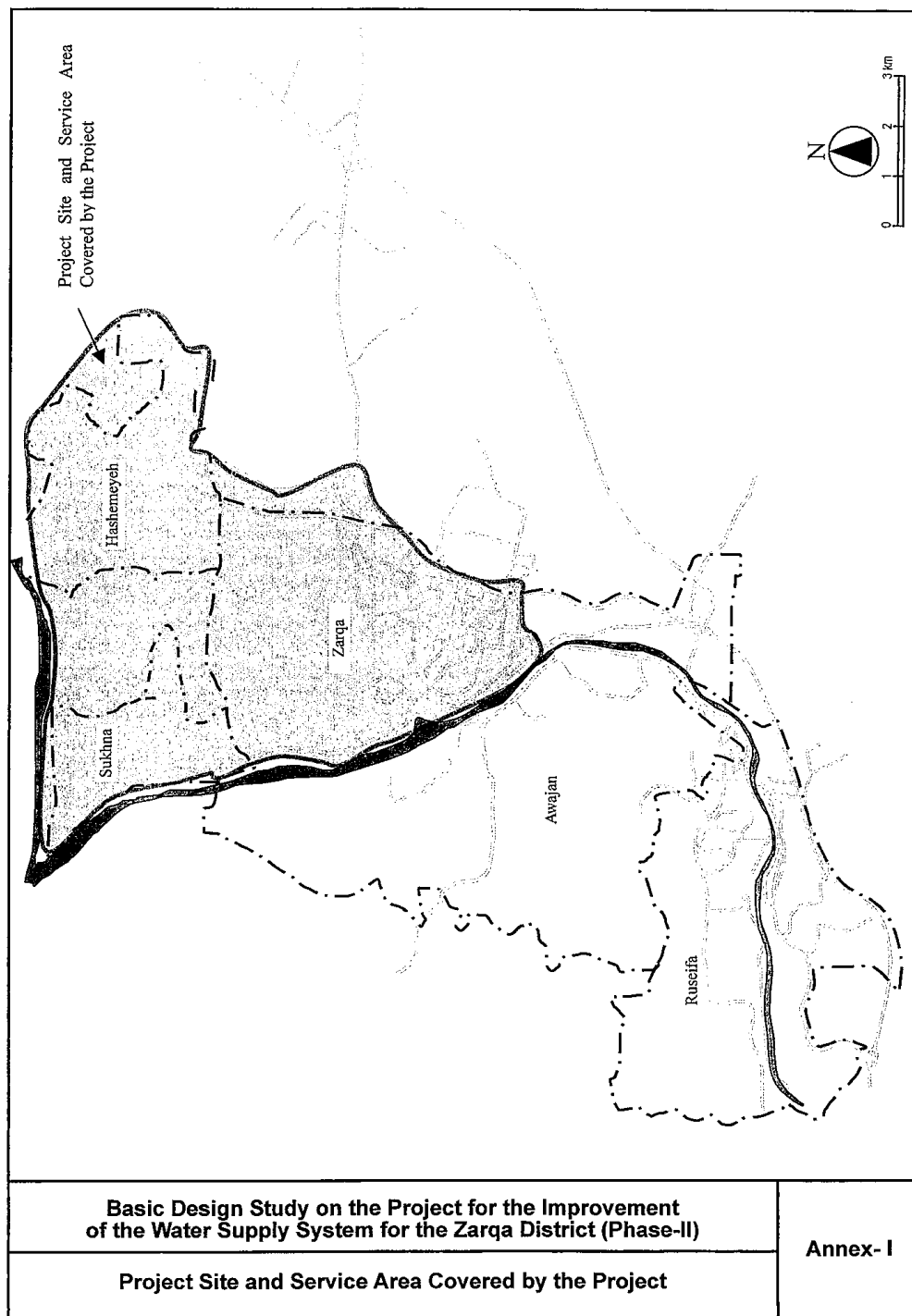
7-8) Technical Assistance

Jordan side requested technical assistance on zoning and control measures of the water distribution network. The Japanese side agreed to study its necessity and, if it was confirmed, the implementation of technical assistance as soft component program would be considered in the Project.

7-9) Environmental Impact Assessment (EIA)

Jordan side explained that EIA was not required for the Project according to the relevant Jordanian laws and guidelines. However, if EIA is required after the result of the field study, Jordan side agreed to complete EIA by the completion of the final report at the latest.





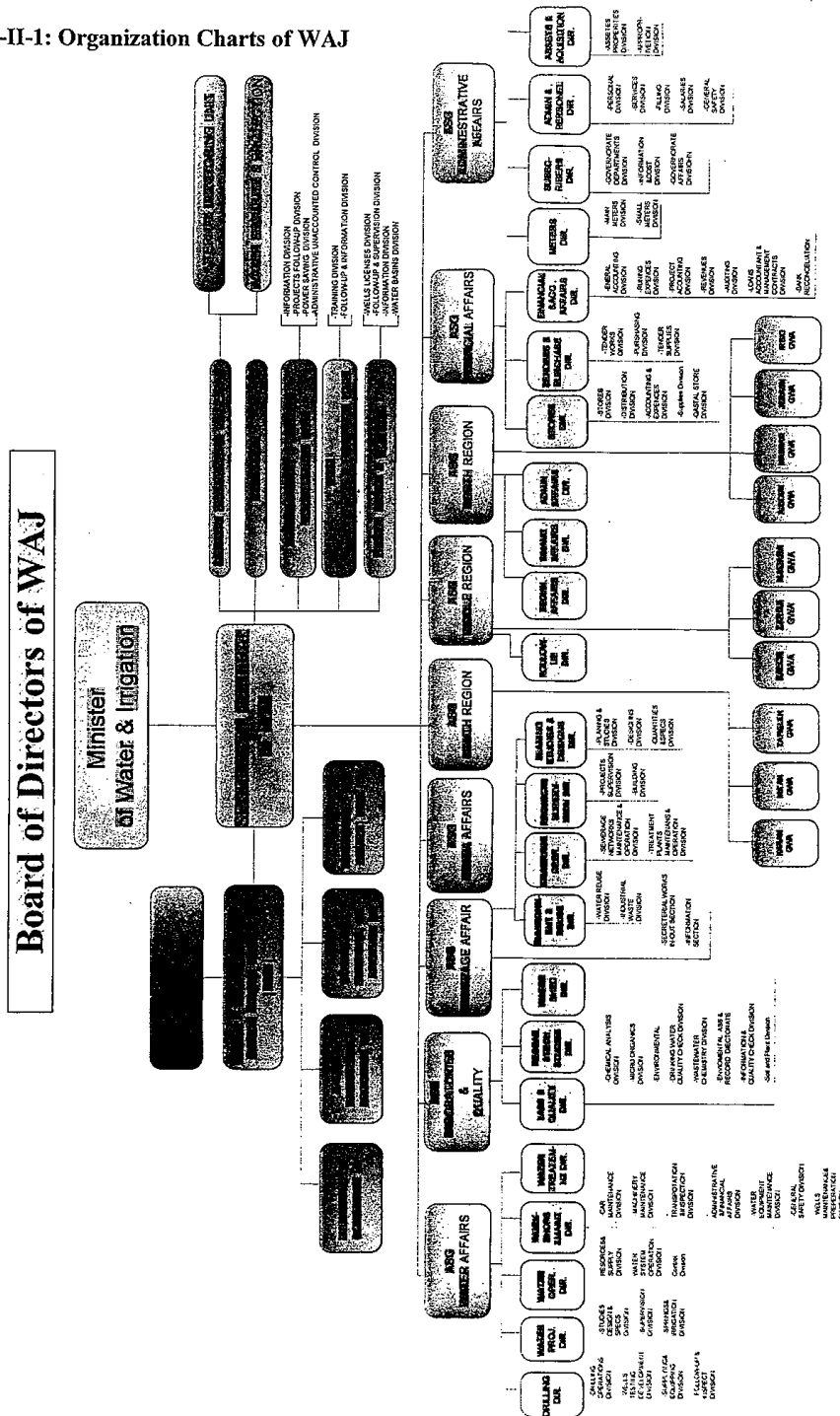
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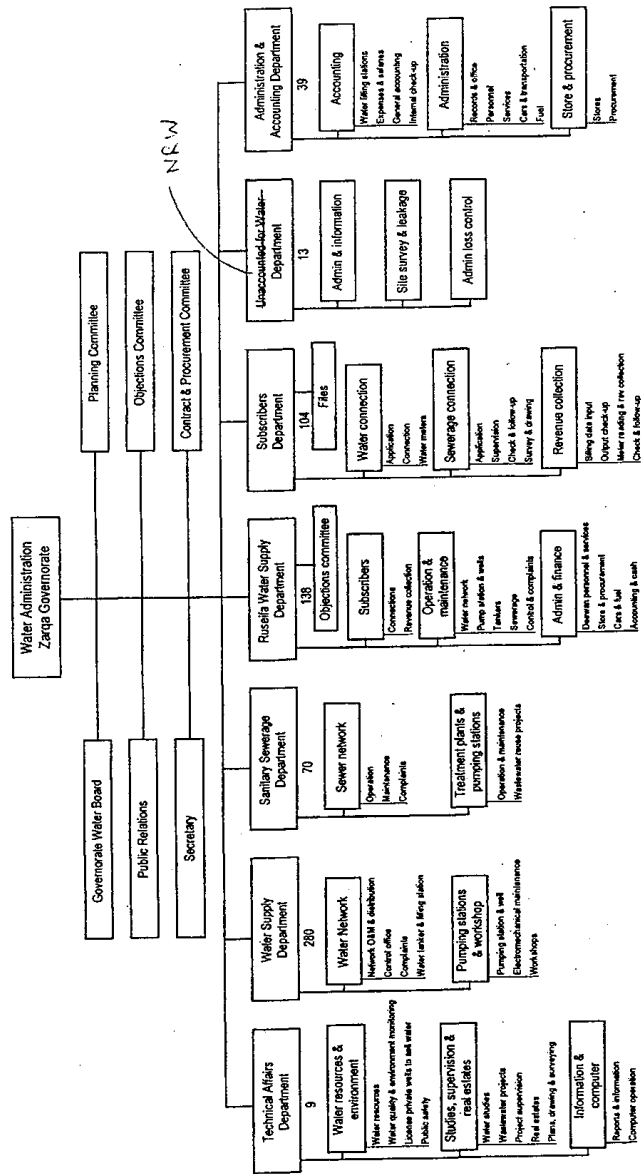
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ANNEX-II-1: Organization Charts of WAJ



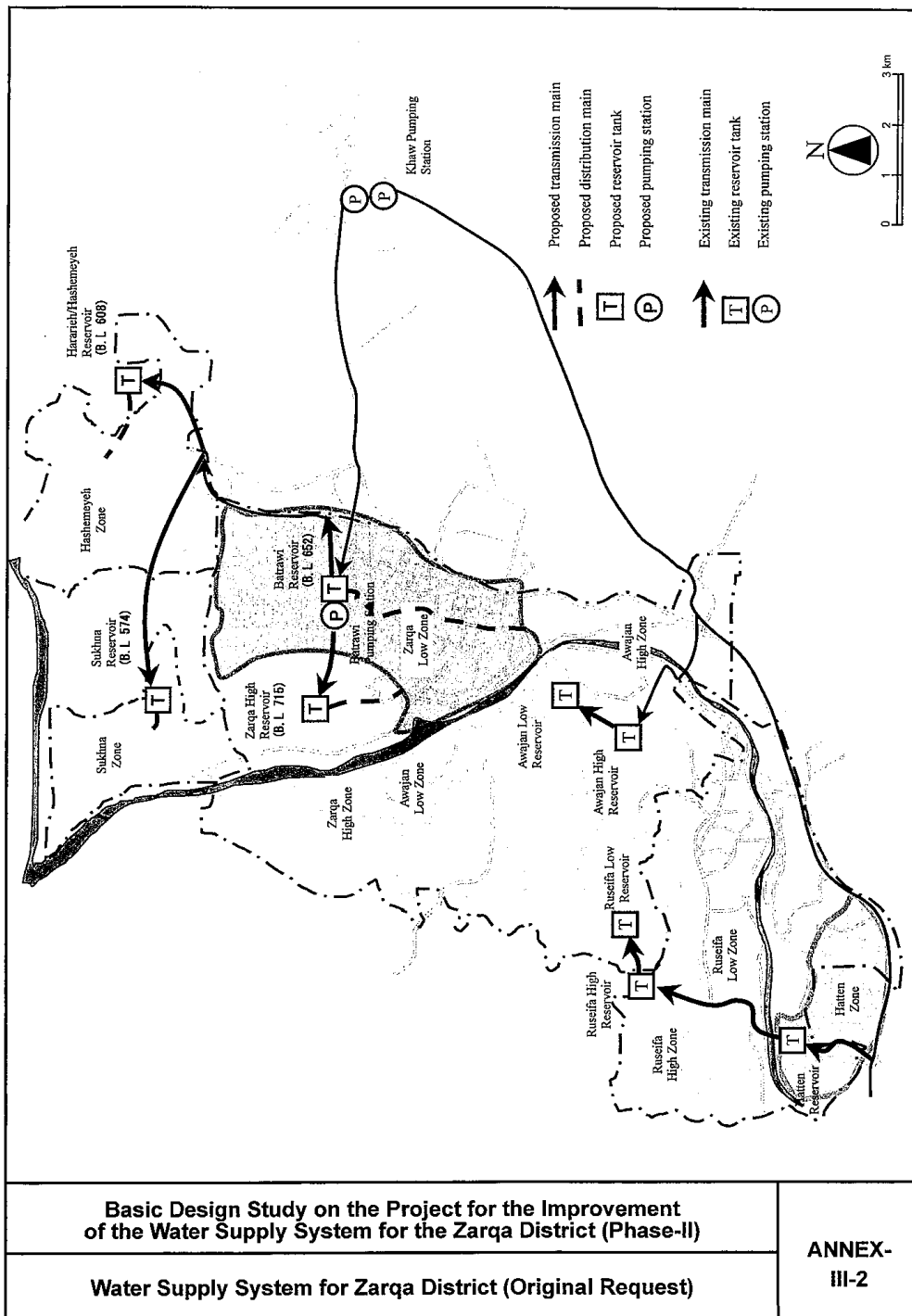
ANNEX-II-2: Organization Charts of WAJ Zarqa Office

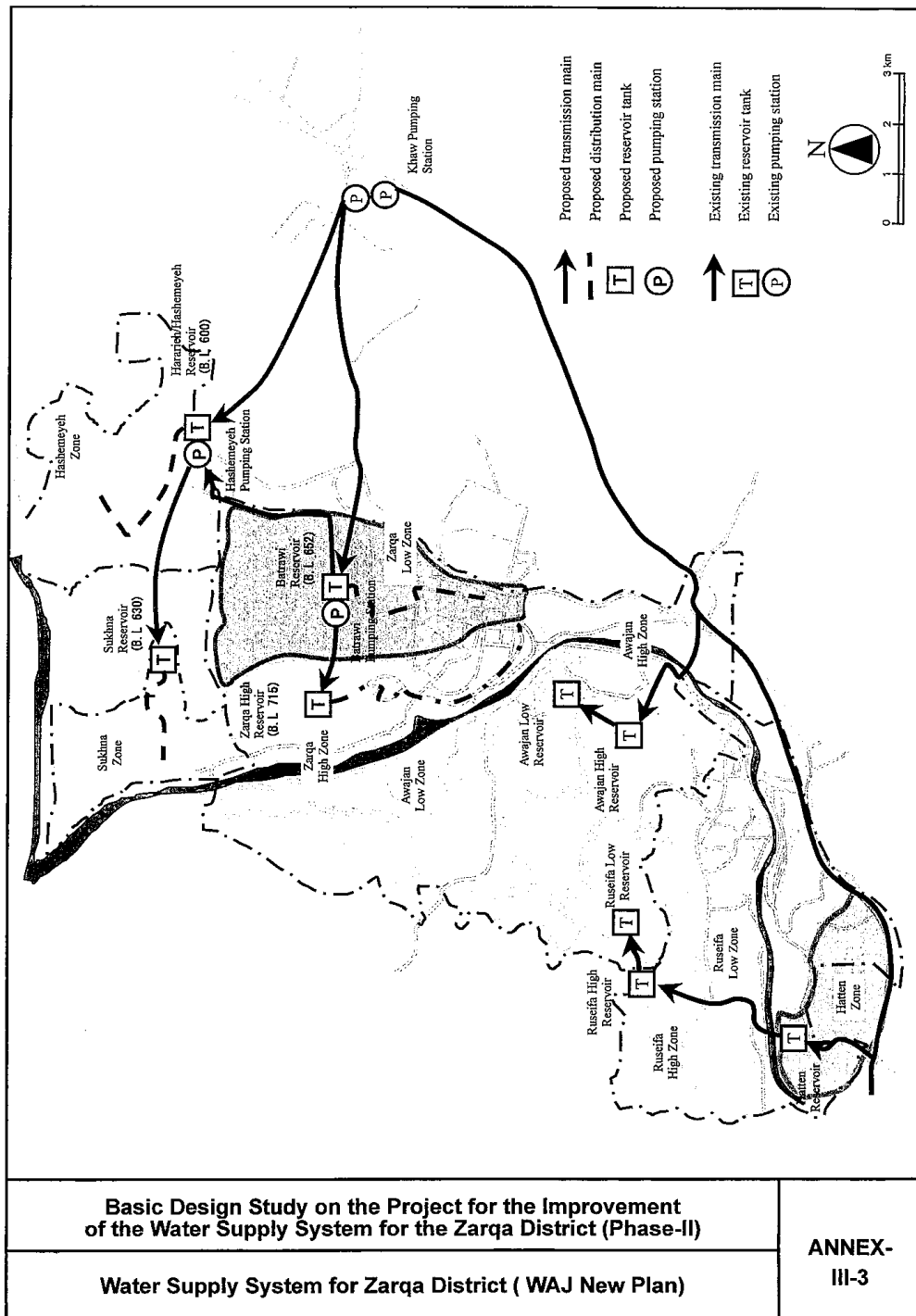


Organization Chart of Water Authority of Jordan, Zarqa Governorate

ANNEX-III-1 Items Requested by Jordan Side (Two Alternatives for the Project Requested by WAJ)

		Facility and Specifications (Capacity, Distance, etc)	
1. Target Year		Original Request	WAJ New Plan
		2015	2025
2. Requested Works			
Construction of Distribution Reservoirs	(1) Zarqa High Zone Service Reservoir (4,000 m ³)	(1) Zarqa High Zone Service Reservoir	(1) Zarqa High Zone Service Reservoir
	(2) Hashemeyeh Service Reservoir (2,000 m ³)	(2) Hashemeyeh Service Reservoir	(2) Hashemeyeh Service Reservoir
	(3) Sukhuna Service Reservoir (1,000 m ³)	(3) Sukhuna Service Reservoir	(3) Sukhuna Service Reservoir
	(4) Batrawi Service Reservoir T650 (12,500 m ³)	(4) Batrawi Service Reservoir	(4) Batrawi Service Reservoir
Construction of Transmission Pipelines	(1) Batrawi Pump Station to Zarqa High Zone Service Reservoir (Dia. 400mm x 2,200 m)	(1) Batrawi Pump Station to Zarqa High Zone Service Reservoir	(1) Batrawi Pump Station to Zarqa High Zone Service Reservoir
	(2) Existing Batrawi Service Reservoir to Hashemeyeh Service Reservoir (A part of existing transmission will be utilized.)	(2) Existing Batrawi Service Reservoir to Hashemeyeh Service Reservoir	(2) Existing Batrawi Service Reservoir to Hashemeyeh Service Reservoir (A complete new line will be installed)
	(3) Branched point to Sukhuna Service Reservoir	(3) Hashemeyeh Pumping Station to Sukhuna Service Reservoir	(3) Hashemeyeh Pumping Station to Sukhuna Service Reservoir
Construction Pump Station with Pump equipment and Substation Equipment	(1) Batrawi Pumping Station	(4) Khaw Pumping Station to Hashemeyeh Service Reservoir	(4) Khaw Pumping Station to Hashemeyeh Service Reservoir
	Pump Room (Reinforced Concrete Structure) Electrical and Mechanical Equipment (2.7m ³ /min x 75kW x 4 pumps)	(1) Batrawi Pumping Station	(1) Batrawi Pumping Station
Construction of Distribution Mains	Dia. 600 mm to 200 mm, L = 15,900 m	(2) Hashemeyeh Pumping Station	(2) Hashemeyeh Pumping Station
3. Undertakings by Jordan Side			
Construction of Distribution Pipe	Dia. 100 mm L = 48,700 m		Dia. 100 mm L = 48,700 m





Handwritten signatures and initials.

ANNEX-IV: The Japan's Grant Aid Scheme

The Grant Aid Program provides a recipient country with non-reimbursable funds to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles in accordance with the relevant laws and regulations of Japan. Grant Aid is not supplied through the donation of materials as such.

(1) Grant Aid Procedure

Japan's Grant Aid Program is executed through the following procedures.

Application	(Request made by a recipient country)
Study	(Basic Design Study conducted by JICA)
Appraisal & Approval	(Appraisal by the Government of Japan and Approval by Cabinet)
Determination of Implementation	(The Notes exchanged between the Governments of Japan and the recipient country)

Firstly, the application or request for a Grant Aid project submitted by a recipient country is examined by the Government of Japan (Ministry of Foreign Affairs) to determine whether or not it is eligible for Grant Aid. If the request is deemed appropriate, the Government of Japan assigns JICA to conduct a study on the request. If necessary, JICA send a Preliminary Study Mission to the recipient country to confirm the contents of the request.

Secondly, JICA conducts the study (Basic Design Study), using Japanese consulting firms.

Thirdly, the Government of Japan appraises the project to see whether or not it is suitable for Japan's Grant Aid Program, based on the Basic Design Study report prepared by JICA, and the results are then submitted to the Cabinet for approval.

Fourthly, the project, once approved by the Cabinet, becomes official with the Exchange of Notes signed by the Governments of Japan and the recipient country.

Finally, for the implementation of the project, JICA assists the recipient country in such matters as preparing tenders, contracts and so on.

(2) Basic Design Study

1) Contents of the Study

The aim of the Basic Design Study (hereinafter referred to as "the Study"), conducted by JICA on a requested project (hereinafter referred to as "the Project"), is to provide a basic document necessary for the appraisal of the Project by the Government of Japan. The contents of the Study are as follows:

- a) confirmation of the background, objectives and benefits of the Project and also institutional capacity of agencies concerned of the recipient country necessary for the Project's implementation;
- b) evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from the technical, social and economic points of view;
- c) confirmation of items agreed on by both parties concerning the basic concept of the Project;
- d) preparation of a basic design of the Project; and
- e) estimation of costs of the Project.

The contents of the original request are not necessarily approved in their initial form as the contents

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of the Grant Aid project. The Basic Design of the Project is confirmed considering the guidelines of Japan's Grant Aid Scheme.

The Government of Japan requests the Government of the recipient country to take whatever measures are necessary to ensure its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country through the Minutes of Discussions.

2) Selection of Consultants

For smooth implementation of the Study, JICA uses a registered consulting firm selected through its own procedure (competitive proposal). The selected firm participates in the Study and prepares for a report based upon the terms of reference set by JICA.

At the beginning of implementation after the Exchange of Notes, for the services of the Detailed Design and Construction Supervision of the Project, JICA recommends the same consulting firm which participated in the Study to the recipient country in order to maintain the technical consistency.

(3) Japan's Grant Aid Scheme

1) Exchange of Notes (E/N)

Japan's Grant Aid is extended in accordance with the Notes exchanged by the two Governments concerned, in which the objectives of the project, period of execution, conditions and amount of the Grant Aid, etc., are confirmed.

2) "The period of the Grant" means the one fiscal year which the Cabinet approves the project for.

Within the fiscal year, all procedure such as exchanging of the Notes, concluding contracts with consulting firms and contractors and final payment to them must be completed.

However, in case of delays in delivery, installation or construction due to unforeseen factors such as weather, the period of the Grant Aid can be further extended for a maximum of one fiscal year at most by mutual agreement between the two Governments.

3) Under the Grant, in principle, Japanese products and services including transport or those of the recipient country are to be purchased.

When the two Governments deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country.

However, the prime contractors, namely consulting, constructing and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality.)

4) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. This "Verification" is deemed necessary to secure accountability to Japanese taxpayers.

5) Undertakings required to the Government of the recipient country

In the implementation of the Grant Aid project, the recipient country is required to undertake such necessary measures as the following:

- a) to secure land necessary for the sites of the Project and to clear, level and reclaim the land prior to commencement of the construction;
- b) to provide facilities for distribution of electricity, water supply and drainage and other incidental facilities in and around the sites;
- c) to ensure all expenses and prompt execution for unloading and customs clearance at ports of disembarkation in the recipient country and internal transportation therein of the products purchased under the Grant Aid;
- d) to exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contracts;
- e) to accord Japanese nationals whose services may be required in connection with the supply of the products and services under the verified contracts such as facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work;

6) "Proper Use"

The recipient country is required to operate and maintain the facilities constructed and equipment purchased under the Grant Aid properly and effectively and to assign the necessary staff for operation and maintenance as well as to bear all the expenses other than those covered by the Grant Aid.

7) "Re-export"


The products purchased under the Grant Aid shall not be re-exported from the recipient country.

8) Banking Arrangement (B/A)

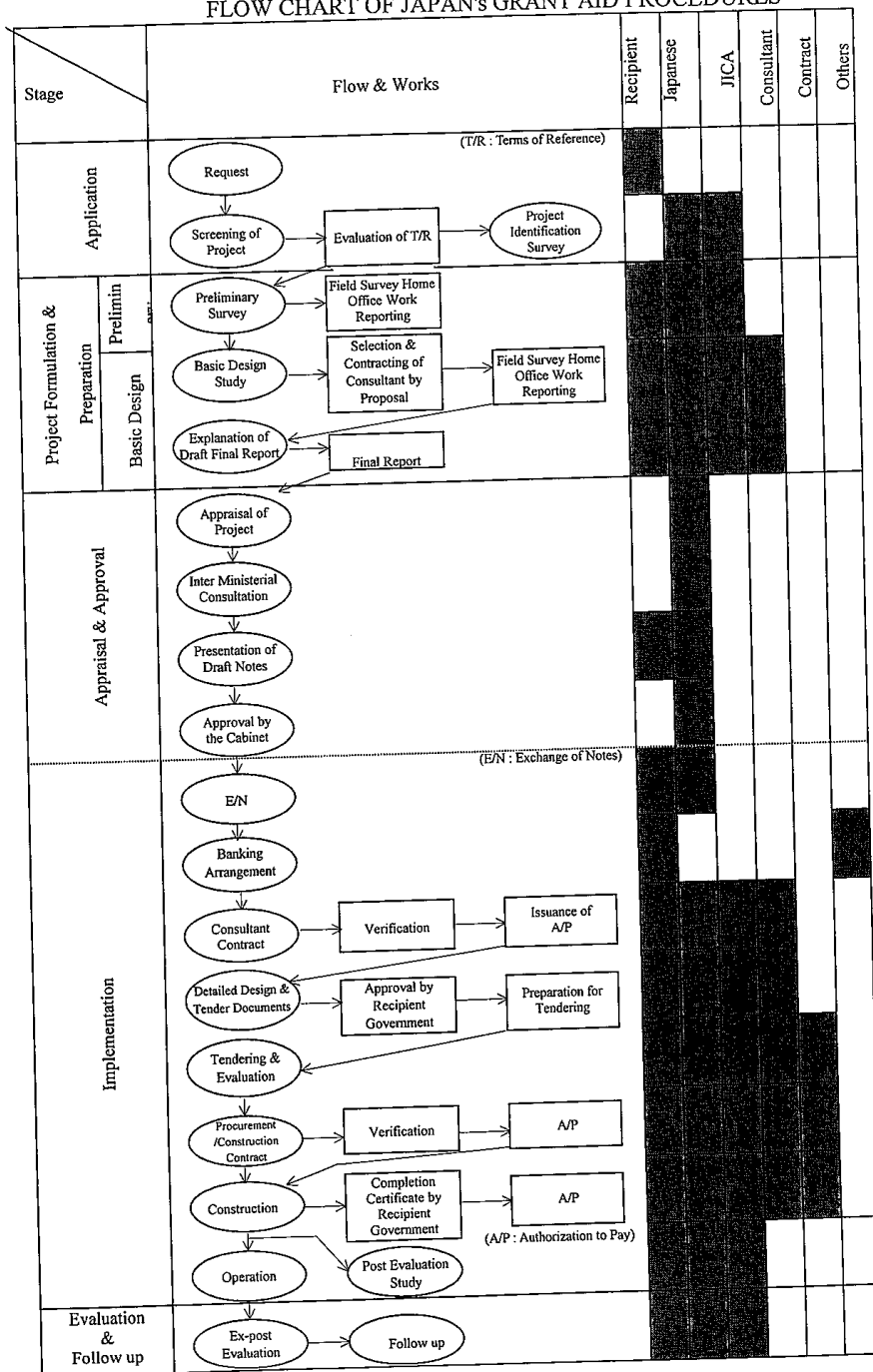
- a) The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the verified contracts.
- b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an Authorization to Pay (A/P) issued by the Government of recipient country or its designated authority.

9) Authorization to Pay (A/P)

The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions to the Bank.



FLOW CHART OF JAPAN's GRANT AID PROCEDURES



Annex-V Major Undertakings to be taken by Each Government

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	To secure land		●
2	To Clear, level and reclaim the site when needed		●
3	To construct gates and fences in and around the site		●
4	To construct the parking lot		●
5	To construct roads		●
	1) Within the site		●
	2) Outside the site		●
6	To construct the buildings	●	
7	To provide facilities for the distribution of electricity, water supply, drainage and other incidental facilities		
	1) Electricity		●
	a. The distributing line to the site	●	
	b. The drop wiring and internal wiring within the site	●	
	c. The main circuit breaker and transformer		
	2) Water supply		—
	a. The city water distribution main to the site	●	
	b. The supply system within the site (receiving and elevated tanks)		
	3) Drainage		●
	a. The city drainage main (for storm, sewer and others) to the site	●	
	b. The drainage system (for toilet sewer, ordinary waste, storm drainage and others) within the site		
	4) Gas supply		●
	a. The city gas main to the site	●	
	b. The gas supply system within the site		
	5) Telephone system		●
	a. The telephone trunk line to the main distribution frame/panel (MDF) of the building	●	
	b. The MDF and the extension after the frame/panel		
	6) Furniture and Equipment		●
	a. General furniture	●	
	b. Project Equipment		
8	To bear the following commissions to a bank in Japan for the banking services based upon the B/A		●
	1) Advising commission of A/P		●
	2) Payment commission		
9	To ensure unloading and customs clearance at port of disembarkation in recipient country	●	
	1) Marine (Air) transportation of the products from Japan to the recipient country		●
	2) Tax exemption and custom clearance of the products at the port of disembarkation	●	
	3) Internal transportation from port of disembarkation to the project site		
10	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.		●
11	To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract.		●
12	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant		●
13	To bear all the expenses , other than those to be borne by the Grant, necessary for construction of the facilities as well as for the transportation and installation of the equipment		●

B/A:Banking Arrangement

A/P:Authorization to Pay

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[Handwritten signatures and initials]

ANNEX-VI: Water Allocation for Municipal Water Use to the Project Sites

Preliminary Municipal Water Allocation Plan for Zarqa Governorate

Source of Supply	Present	2010	2015	2020	2025
Surface Water	0.13	0.70	0.70	0.70	0.70
Groundwater	16.05	22.30	20.70	19.85	19.85
Mafraq	21.18	13.00	16.60	20.00	20.00
Balqa	-	-	-	-	-
Disi	0.00	12.19	13.55	15.47	15.47
Irbid	-	-	-	-	-
Total Supply	37.36	48.19	51.55	56.02	56.02



Appendix- 5 Minutes of Discussions (M/D) on Draft Final Report

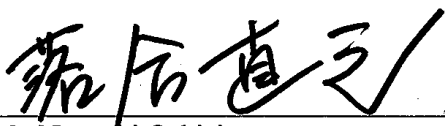
**MINUTES OF DISCUSSIONS
ON
THE BASIC DESIGN STUDY
FOR
THE PROJECT FOR IMPROVEMENT OF THE WATER SUPPLY FOR
ZARQA DISTRICT (PHASE II)
IN THE HASHEMITE KINGDOM OF JORDAN
(EXPLANATION OF DRAFT FINAL REPORT)**

In November and December 2005, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched the Basic Design Study Team on the Project for Improvement of the Water Supply for Zarqa District (Phase II) (hereinafter referred to as "the Project") to the Hashemite Kingdom of Jordan (hereinafter referred to as "Jordan"), and through discussions, field survey, and technical examination of the results in Japan, JICA prepared a draft report on this study.

In order to explain and to consult with the Government of Jordan on the contents of the draft report, JICA sent the Draft Report Explanation Team (hereinafter referred to as "the Team") to Jordan, which is headed by Mr. Naoyuki OCHIAI, Deputy Resident Representative, JICA Jordan Office, from 11 to 17 March, 2006.

As a result of discussions, both parties confirmed the main items described in the attached sheets.

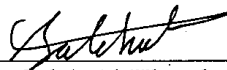
Amman, March 15, 2006



Mr. Naoyuki Ochiai
Leader of the Draft Report Explanation Team
Deputy Resident Representative of Jordan
Office, Japan International Cooperation
Agency (JICA)



Eng. Munther Khleifat
Secretary General
Water Authority of Jordan (WAJ),
Ministry of Water and Irrigation,
The Hashemite Kingdom of Jordan



Dr. Saleh Al-Kharabsheh
Director
Projects Department
Representative of Ministry of Planning and
International Cooperation
The Hashemite Kingdom of Jordan

ATTACHMENT

1. Contents of the Draft Report

The Government of Jordan agreed and accepted in principle the contents of the draft report explained by the Team.

2. Japan's Grant Aid Scheme

The Jordan side understood the Japan's Grant Aid Scheme and the necessary measures to be taken by the Government of Jordan as explained by the Team and described in the Minutes of Discussions signed by both parties on 30th November, 2005, for smooth implementation of the Project, as a condition for the Japan's Grant Aid to be implemented.

3. Schedule of the Study

JICA will complete the final report in accordance with the confirmed items described herein and send it to the Government of Jordan in June 2006.

4. Other Relevant Issues

4-1) Water Allocation to the Project Site

Jordanian side promised to allocate and transmit to the Project site the amount of water that was planned based on the water resources development and allocation scenario made by Jordanian side, as attached in ANNEX-I, before the completion of the Project in 2009.

4-2) Components of the Project

Both parties confirmed that the Project composed of the items listed in ANNEX-II would be implemented in case the Government of Japan finally decides to implement the Project.

In the components, the construction of a chlorination facility at Khaw and installation of stop valves were not included in the original request but has been added upon request of Jordanian side in this study as attached in Annex -III. Japanese side agreed to include these components in the Project as a result of discussions.

Jordanian side promised to confirm by the mid-April 2006 with an official letter issued by the Ministry of Environment whether or not an Environment Impact Assessment (EIA) study is required for these additional components. If EIA is required, Jordan side agreed to complete an EIA study with necessary procedures and obtain approvals from Ministry of Environment for the project implementation before starting the construction work of the first term of this project



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at the latest.

Jordanian side promised to assign staff with appropriate skills to the constructed chlorination facility at Khaw for better operation and maintenance.

Japanese side agreed to delineate water distribution zones by installing stop valves if Jordanian side provides required materials as specified in ANNEX-IV with the Japanese side before the start of the installation work. Jordanian side promised to procure these materials for making distribution zones and changing the existing distribution mains to transmission mains and to provide them to the Japanese contractor for installation.

4-3) Technical Assistance (soft component)

Japanese side confirmed again with Jordanian side the request on technical assistance (soft component), which was officially requested by the Jordanian side in the Minutes of Discussion signed on 30 November 2005 by both parties. Both parties confirmed that soft component described in ANNEX-V would be implemented in case the Government of Japan finally decides to implement the Project. Jordanian side promised to allocate necessary budget, personnel and equipment for this purpose and provide a renovated training room in the WAJ Zarqa workshop, as described in ANNEX-V.

4-4) Major Undertakings by Jordanian Side

Both parties confirmed that the major undertakings by Jordanian side would be implemented according to the schedule shown in ANNEX-VI in case the Government of Japan finally decides to implement the Project. Jordanian side promised to allocate the necessary budget for implementation of these undertakings in time as attached in ANNEX-VII.

Jordanian side promised to operate and maintain the constructed facilities appropriately, especially the reservoirs by routine patrol and monitoring, in which no resident operator will be stationed.

The drain pipe of the existing Batrawi reservoir is not connected to appropriate drainage facility and drained water is being discharged to the residential area. This is causing water-logged problems in the area. Jordanian side promised to fix these problems by installing appropriate drain pipe before starting the construction work of the first term of this project.

Considering the reduction of wastage of precious water and the maximum use of the facilities constructed in this project, the overflow from the constructed reservoirs should not happen. Jordanian side promised to control the level of water in the reservoirs by patrol and stationed monitoring, by which the overflow from the reservoirs does not happen.



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4-5) Land Acquisitions for Project Facilities

The current progress of land acquisition for the proposed construction sites of Zarqa High, Batrawi, Hashemeyeh and Sukhna reservoirs was explained by Jordanian side as attached in ANNEX-VIII. Jordanian side agreed to initiate the procedure of land acquisition as soon as possible and to secure the land before the E/N. Further, Jordanian side will prepare the acquired land for construction before the start of construction, by leveling the land to the design ground levels and constructing necessary access roads.

4-6) Publicity Activities

Jordanian side agreed to conduct publicity activities for the Project in cooperation with Japanese side as described in ANNEX-IX.

4-7) Existing Water Supply Plan for the Project Site

Jordanian side agreed to incorporate the Project facilities in their on-going study on improvement of the water supply system of Zarqa Governorate and to formulate an appropriate improvement plan, in which the Project facilities should be utilized effectively by planning installation of secondary distribution mains and service pipes and rehabilitation of the networks. This plan shall be implemented by Jordanian side.

4-8) Security Arrangements

Jordanian Side promised to make appropriate security arrangements for the Japanese persons involved in this Project. Further, Jordanian side will make appropriate security arrangements for students, who go to the schools nearby the construction sites of Sukhna and Hashemeyeh reservoirs, in cooperation with the Project consultants and contractors.

4-9) Coordination with the Capacity Development Project for Non Revenue Water Reduction

JICA is currently implementing the Capacity Development Project for Non Revenue Water Reduction in Jordan by dispatching experts to WAJ Project Management Unit (PMU). Jordanian side agreed to coordinate between this Project and the Capacity Development Project in order to maximize the benefits of this Project.

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ANNEX-I: Water Allocation for Domestic Water Use to the Project Sites in 2010
(WAJ Zarqa Governorate Water Supply Area)

Item	Water Amount Per Year (MCM/yr)
Water Production	
Water Production in Zarqa Governorate	44.86
Water Amount Coming from Mafraq Governorate	10.46
Total Water Amount in Zarqa Governorate	55.32
Water Amount Going-out from Zarqa Governorate	
To Amman	-6.25
To Balqa and Jerash Governorate (in WAJ Zarqa water supply area)	-0.62
To Mafraq Governorate (in WAJ Zarqa water supply area)	-0.15
To Al-Azraq wetland (non-domestic use in Zarqa Governorate)	-1.07
Total Water Amount Going-out to Other Governorates	-8.09
Net Water Amount for Zarqa Governorate Domestic Water Supply	47.23
New Water Development	
Tamween Wells	3.94
Wadi Al-Halabat Wells	5.26
Disi Fossil Water Resources Development	0
Total New Production	9.20
Total Water Amount for Zarqa Governorate Water Supply Area	56.43
Total Water Amount for WAJ Zarqa Water Supply Area	57.20
Water Amount for the Project Sites	20.48

Note: MCM/yr (Million Cubic Meters per Year)

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ANNEX-II: Items of Facility Construction

1. Construction of Service Reservoirs
 - 1.1 Zarqa High Reservoir (2,500 m³)
 - 1.2 Hashemeyeh Reservoir (1,500 m³)
 - 1.3 Sukhna Reservoir (1,000 m³)
 - 1.4 Batrawi Reservoir Expansion (14,000 m³)
2. Construction of Transmission Mains
 - 2.1 Batrawi Pumping Station to Zarqa High Reservoir (300 mm x 2,080 m)
 - 2.2 Khaw Junction to Hashemeyeh Reservoir (300 mm x 6,150 m)
 - 2.3 Hashemeyeh Reservoir to Sukhna Reservoir (300 mm x 7,800 m)
3. Construction of Distribution Mains
 - 3.1 Hashemeyeh Reservoir to Existing Distribution Mains (300 mm x 1,130 m)
 - 3.2 Sukhna Reservoir to Existing Distribution Mains (200 mm x 730 m)
 - 3.3 Batrawi Reservoir to Existing Distribution Mains (600 mm x 3,080 m and 400 mm x 480 m)
 - 3.4 Zarqa High Reservoir to Existing Distribution Mains (300 mm x 1,580 m)
4. Replacement of Pumps in Batrawi Pumping Station
 - 4.1 Pumps: 5 m³/min x 90 m head x 132 kW x 2 sets (include 1 stand-by)
 - 4.2 Electrical and instrumentation equipment
5. Chlorination Facility in Khaw Pumping Station
 - 5.1 Dosing equipment (16kg/hr x 2 sets)
 - 5.2 Building
6. Installation of 6 stop valves

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ANNEX-III: Official Request by Jordanian Side for Additional Project Components



الجمهورية الأردنية

وزارة المياه والري

سلطة المياه

Ministry of Water & Irrigation
Water Authority



The Hashemite Kingdom
Of Jordan

Ref. WA/72/19714

Date 22/12/2005 التاريخ

الرقم

Mr. Hideo MORIKAWA
Resident Representative, Jordan Office
Japan International Cooperation Agency
P.O. Box 926355 Amman 11190 Jordan
Tel: 06-5858921 /3
Fax: 06-585 8924

Dir Sir,

The Ministry of Water and Irrigation of the Hashemite Kingdom of Jordan presents its compliments to JICA with reference to the Request for Japan's Grant Aid for the Project for the Improvement of the Water Supply System for Zarqa District (Phase II).

This letter is intended to express sincere thanks to Japan for dispatching the Basic Design Study Team for the above - mentioned Project from November to December to clarify the Project components and form appropriate Project components and to express our desire for additional components for the Project.

In the new water supply system in 2010 proposed by JICA Study Team, we realized that a new chlorination facility with a minimum laboratory is required at the existing Khaw pumping station. This facility is essential for the Project to distribute sanitized safe water to the citizen in the service area. We would like to request that the Government of Japan considers constructing this facility and Water Authority of Jordan (WAJ) would supply the needed equipment for chlorination.

According to the application form for Japan's Grant Aid for this Project, we should implement the construction of distribution pipes (diameter 100 mm length = 48,700 m) as Jordanian side's undertakings. WAJ is currently conducting a study, in which a comprehensive plan to upgrade the water supply system in Zarqa will be prepared. This plan would be implemented as undertakings of the Jordanian side.

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هاتف ٥٦٨٠١٠٠ / ٥٦٨٣١٠٠ فاكس ٥٦٧٩١٤٣ ص.ب ٢٤١٢ عمان ١١١٨٣ الأردن أو ص.ب ٥٠١٢ عمان ١١١٨٢ الأردن
Tel.5680100 - 5683100 Fax.5679143 P.O.Box 2412 Amman 11183 Jordan or P.O.Box 5012 Amman 11181 Jordan



الجمهورية الأردنية
وزارة المياه والري
سلطة المياه

Ministry of Water & Irrigation
Water Authority



The Hashemite Kingdom
Of Jordan

Ref.	Date	التاريخ	الرقم
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As for isolation of distribution zones, WAJ would provide the needed valves for isolation and would like to request that the Japanese side shall install them in appropriate locations.

WAJ would like to request the Government of Japan to consider implementing software component program for the Project as technical assistance during the construction stage. We understand from the Phase I Project that software component program is also an essential component for the success of the Phase II Project. Without the program, it would be difficult to realize the full extent of the objectives of the Project.

It would be appreciated very much if JICA would kindly consider our request and desires.

Sincerely Yours,

Secretary General / WAJ
Eng. Munther Khleifat

CC: Deputy Secretary General/WAJ
CC: ASG/Water Affairs
CC: Circulation

هاتف ٥٦٨٠١٠٠ / فاكس ٥٦٨٣١٠٠ ص.ب ٢٤١٢ عمان ١١١٨٣ الأردن أو ص.ب ٥٠١٢ عمان ١١١٨٢ الأردن
Tel.5680100 - 5683100 Fax.5679143 P.O.Box 2412 Amman 11183 Jordan or P.O.Box 5012 Amman 11181 Jordan

ANNEX-IV: Specifications of Valves and Fitting Materials

sluice valve (dia 100mm: PN16)	2 nos.
sluice valve (dia 150mm: PN16)	3 nos.
sluice valve (dia 300mm: PN16)	1 nos.
coupling joint (dia 100mm: PN16)	4 nos.
coupling joint (dia 150mm: PN16)	6 nos.
coupling joint (dia 300mm: PN16)	2 nos.
flange spigot piece (dia 100mm: PN16)	4 nos.
flange spigot piece (dia 150mm: PN16)	6 nos.
flange spigot piece (dia 300mm:PN16)	2 nos.

Note: Coupling joints shall be capable of connecting steel pipe and ductile pipe.

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ANNEX-V: Contents of Technical Assistance (Soft Component)

1. Activities

- 1.1 Preparation of base map by geographical information system
- 1.2 Input of network information/data
- 1.3 Transfer of network mapping technology
- 1.4 Input of water distribution information/data and preparation of input formats
- 1.5 Transfer of interpretation technique of water distribution information/data
- 1.6 Formulation of network analysis model
- 1.7 Simulation of network analysis model
- 1.8 Transfer of network analysis technology
- 1.9 Workshop for integrated technology transfer

2. Undertaking by Jordanian Side

<u>Facility and Equipment</u>	
Computer and OS	:3 sets
MS-Office XP Professional	:3 sets
A4 B&W laser printer + ink	:1 set
A3 Color printer + ink	:1set
A4 Scanner	:1set
Computer desk and chair	:4 sets
Book shelf	:3 sets
White board	:1 set
Table for discussion	:1 no
Air conditioner	:1 set
Renovation for a training room	:1 set
<u>Personnel</u>	
Trainees	6 persons (part-time)
Network operators to understand existing network conditions	2 persons (part-time)
Digital network mapping assistant	1 person (full time)
Training Coordinator	1 person (part-time)

ANNEX-VI: Undertakings of Jordanian Sides

(1) General Items of Major Undertakings to be taken by Each Government

(M/D signed on 30th November 2005)

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	To secure land		●
2	To clear, level and reclaim the site when needed		●
3	To construct gates and fences in and around the site		●
4	To construct the parking lot		●
5	To construct roads		●
	1) Within the site		●
	2) Outside the site		●
6	To construct the buildings	●	
7	To provide facilities for the distribution of electricity, water supply, drainage and other incidental facilities		
	1) Electricity		
	a. The distributing line to the site		●
	b. The drop wiring and internal wiring within the site	●	
	c. The main circuit breaker and transformer	●	
	2) Water supply		
	a. The city water distribution main to the site		—
	b. The supply system within the site (receiving and elevated tanks)	●	
	3) Drainage		
	a. The city drainage main (for storm, sewer and others) to the site		●
	b. The drainage system (for toilet sewer, ordinary waste, storm drainage and others) within the site	●	
	4) Gas supply		
	a. The city gas main to the site		●
	b. The gas supply system within the site	●	
	5) Telephone system		
	a. The telephone trunk line to the main distribution frame/panel (MDF) of the building		●
	b. The MDF and the extension after the frame/panel	●	
	6) Furniture and Equipment		
	a. General furniture		●
	b. Project Equipment	●	
8	To bear the following commissions to a bank in Japan for the banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●
9	To ensure unloading and customs clearance at port of disembarkation in recipient country		
	1) Marine (Air) transportation of the products from Japan to the recipient country	●	
	2) Tax exemption and custom clearance of the products at the port of disembarkation		●
	3) Internal transportation from port of disembarkation to the project site	●	
10	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.		●
11	To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract.		●
12	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant		●
13	To bear all the expenses, other than those to be borne by the Grant, necessary for construction of the facilities as well as for the transportation and installation of the equipment		●

B/A:Banking Arrangement

A/P:Authorization to Pay

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(2) Schedule for Undertakings of Jordanian Side

No.	Items	Schedule
1)	To procure stop valves and fitting materials to divide distribution area and to convert the existing distribution mains to transmission mains	Before the 1 st term project
2)	To provide information and data required for detailed design and soft component	Detailed design stage
3)	To coordinate for required approvals and permissions from relevant authorities to conduct D/D study including trail excavation and topographic survey on the roads	Detailed design stage
4)	To complete an EIA study with necessary procedures and obtain approvals from Ministry of Environment for the project implementation, If EIA is required	Before the start of 1 st term construction
5)	To acquire the land for reservoir construction sites ① Zarqa High Reservoir (WAJ owned land) ② Hashemeyeh and Sukhna Reservoirs (need land acquisition from private) ③ Batrawi Reservoir (need a land transfer from the Zarqa municipality)	Before the E/Ns of each term
6)	To level the land for reservoirs construction and construct access roads	Before inauguration of each term
7)	To provide temporary stock yards for construction materials and machineries and lands for temporary works	During construction stage
8)	To coordinate for required approvals and permissions to implement construction works	As needed
9)	To coordinate with relevant authorities to implement protection works for underground utilities and to visit and confirm the works at sites	As needed
10)	To cooperate in consultation with residents living near the construction sites and to coordinate procedures for traffic control in works with relevant authorities	During construction stage
11)	To provide disposal sites for excavation debris and drains for wastewater from construction works	During construction stage
12)	To procure equipment for implementation of soft component and to provide a room renovated in the WAJ Zarqa workshop for training	Before the start of 2 nd term construction
13)	To select candidates as trainees for the soft component of the Project	Before the start of soft component
14)	To carry out necessary procedures for issue of A/P required for payments to Japanese Consultants and Contractor and to bear the commissions for advising and payment to a bank in Japan for banking services based upon the Banking Arrangement	After signing the contract
15)	To ensure prompt unloading and customs clearance of the goods for the project at the port of disembarkation in Jordan	As needed
16)	To accord Japanese nations whose services may be required in connection with the supply of products and services under the verified contract such facilities as may be necessary for their entry into Jordan and stay there for the performance of their works.	As needed
17)	To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in Jordan with respect to the supply of the products and services under the verified contract. And to take necessary measures for such tax exemption.	As needed
18)	To provide electric power lines, telephone lines and drainages for construction to	During construction stage

No.	Items	Schedule
	construction sites	
19)	To provide electric power supply to the Batrawi pumping station including the acquisition of required permissions from electric power company and installation of a receiving panel and a transformer.	Before the start of the 1 st term
20)	To construct reservoir overflow pipes from the boundary of reservoirs to the nearby existing drain (Japanese side will construct them within the site boundary.)	After construction of reservoirs
21)	To construct appropriate drain pipe from the existing Batrawi reservoir to the nearby drain	Before the start of 1 st term construction
22)	To provide necessary water and chemicals (chlorine) for trial operation of the facilities constructed	As needed
23)	To use, operate and maintain properly the facilities and equipment constructed or procured under the Japan's Grant Aid program.	After construction
24)	To construct fences and gates along the site boundary of reservoirs	After construction of reservoirs
25)	To make continuous rehabilitation works of existing networks to use supplied water effectively	As planned
26)	To implement publicity activities for this project	Entire project period, esp. inauguration and completion
27)	To bear all the expenses, other than to be borne by the grant Aid, necessary for construction of the facilities	As needed
28)	To procure a testing equipment of residual chlorine and testing chemicals in Khaw chlorination facility	Before trial operation of chlorination facility
29)	To assign staff with appropriate skills to the constructed chlorination facility at Khaw for better operation and maintenance	Before trial operation of chlorination facility
30)	To make appropriate security measures for the students, who go to the school nearby the reservoirs, in cooperation with Japanese Side	During the project

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ANNEX-VII: Budget Schedule of Jordanian Side for the Project

Items	Term 1	Term 2	Term 3	Total
(1) Procurement of stop valves and fitting materials to divide the distribution areas and to convert the existing distribution mains to transmission mains	15,550	0	0	15,550
(2) Reclaiming and Leveling the land for reservoirs construction	35,000	152,000	82,000	269,000
(3) Construction of access roads to the reservoir sites	0	23,400	0	23,400
(4) Procurement of equipment for implementation of soft component and provision of a renovated training room in the WAJ Zarqa workshop	8,126	0	0	8,126
(5) Construction of reservoir overflow pipe from the boundary of reservoirs to the nearby existing drain	85,000	170,000	0	255,000
(6) Construction of fences and gates along the site boundary of reservoirs	14,300	27,500	13,100	54,900
(7) Provision of necessary water and chemicals (chlorine) for trial operation of the facilities constructed	8,300	10,800	43,300	62,400
(8) Implementation of publicity activities for this project	1,660	1,660	1,660	4,980
Total	167,936	385,360	140,060	693,356

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ANNEX-VIII: Current Progress of Land Acquisition



وزارة المياه والري
سلطنة المياه

Ministry of Water & Irrigation
Water Authority



The Hashemite Kingdom
Of Jordan

Ref. WA/4/2/3744

Date 15/3/2006

التاريخ

الرقم

Mr. Hirotaka Sato
Project Chief Consultant
Tokyo Engineering Consultants Co., Ltd. (TEC)
3-7-4 kasumigaseki, Chiyoda-Ku, Tokyo 100-0013, Japan
Tel: Tokyo 81-3-3580-2418 Fax: Tokyo 81-3-3591-04

Project : Improvement of the Water Supply System for
Zarqa District (Phase II)
Subject : Current Progress of Land Acquisition

Dear Sir,

Upon your request on the land acquisition Progress, we would like to inform that the progress of land acquisition could start now after receiving the required sites and areas as shown in your draft final design report, Furthermore are the following

1. Zarqa High Reservoir : Land has been acquired by WAJ
2. Batrawi Reservoir : Belong to Zarqa municipality, they have been contacted by WAJ.
3. Hashemeyah Reservoir: The site is within a government land, WAJ will start the process immediately.
4. Sukhna Reservoir: WAJ will start the process immediately.

Best Regards,

Secretary General/ WAJ
Eng. Munther Khleifat

المهندس خالد القضاة
مساعد الأمين العام لشؤون المياه

Cc: ASG/ Water Affairs
Cc: Resident Representative, JICA Jordan Office
Cc: Circulation

هاتف ٥٦٨٠١٠٠ / فاكس ٥٦٨٣١٠٠ ٥٦٧٩١٤٣ من. ب ٢٤١٢ عمان ١١١٨٣ الأردن أو من. ب ٥٠١٢ عمان ١١١٨٢ الأردن
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ANNEX-IX: Publicity Works Undertaken by Jordanian Side

Items	Contents	Schedule
Press-release	<ul style="list-style-type: none"> • Distribution of Pamphlet on Project Contents • Press-release to news paper and other mass media 	For inauguration and completion ceremony
Holding of Contests	<ul style="list-style-type: none"> • Contest of message, essay, picture and painting relating to water supply • Awarding ceremony • (A winning picture and messages will be painted in the reservoirs by Japanese Contractor) • Press-release 	For inauguration
Enlightenment activities	<ul style="list-style-type: none"> • Participation of students (seminar on water supply in schools and tour of inspection in construction sites and completion facility, etc.) • Participation of NGO (holding seminar on water supply) 	During entire project period

- (1) Responsible person: WAJ Zarqa staff
- (2) Supporter: Japanese Consultants and Contractor in charge, JICA and Embassy of Japan (Japanese side)
- (3) Hired Jordanian consultants: An information, education and communication experts (3 months in total) and an assistant (3 months in total)

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Appendix- 6 Reference

Name of Study: The Project for Improvement of the Water Supply System for the Zarqa District (Phase II) in the Hashemite Kingdom of Jordan

No.	Name of reference	Form, book, video, map, photo, etc.	Original/copy	Name of organization collected	Year of publication
1	Geological Map of Jordan (East of the Rift Valley 1/250,000)	Map	Original	W/AJ	1956
2	Geology Series (Sheet 2 AMMAN 1/100,000)	Map	Original	W/AJ	1964
3	Law of Environmental Impact Assessment	Document	Copy	MOE	2003
4	W/AJ financial status	Document	Copy	W/AJ	1999~2004
5	W/AJ operation and maintenance cost	Document	Copy	W/AJ	2000~2004
6	National transfer for W/AJ	Document	Copy	W/AJ	1999~2004
7	W/AJ financial report	Document	Copy	W/AJ	2005
8	Water tariff (2003 modification)	Document	Copy	W/AJ	2003
9	Non-revenue water ratio in Jordan (2002~2004)	Document	Copy	W/AJ	2002~2004
10	Pumping station specification in W/AJ Zarqa	Document	Copy	Zarqa W/AJ	2004
11	Reservoir specification in W/AJ Zarqa	Document	Copy	Zarqa W/AJ	2004
12	W/AJ Zarqa private sub contract document	Document	Copy	Zarqa W/AJ	
13	Statistical Yearbook	CD	Original	Dep. Of Stat.	2004
14	Well yield in W/AJ Zarqa	Document	Copy	Zarqa W/AJ	2001~2004
15	W/AJ Zarqa Revenue	Document	Copy	Zarqa W/AJ	2004
16	W/AJ Zarqa staff number and salary	Document	Copy	Zarqa W/AJ	2004
17	USGS geological map	CD	Copy	USGS	
18	Statistical Yearbook	Document	Original	Department of statistic	2004
19	Household Expenditures and Income Survey	Document	Original	Department of statistic	2002/2003
20	Environmental Statistics	Document	Original	Department of statistic	2003
21	MAP of Zarqa (1/5,000)	Map	Original	Geographic Center	
22	MAP of Zarqa (1/10,000)	Map	Original	Geographic Center	
23	MAP of Zarqa (1/25,000)	Map	Original	Geographic Center	
24	Technical and Feasibility Study and Final Design of the Upgrading and Expansion of Water Facilities in Central Governorates Inception Report	Document	Copy	W/AJ	January 2004

No.	Name of reference	Form, book, video, map, photo, etc.	Original/copy	Name of organization collected	Year of publication
25	Water Resources and Demand Assessment Report	Document	Copy	W/AJ	June 2004
26	Site Investigation Report, Volume 1: Main Report –Final-	Document	Copy	W/AJ	October 2004
27	Network Analysis Report: Main Report	Document	Copy	W/AJ	March 2005
28	Hydraulic Network Analysis Report, Volume 1: Main Report	Document	Copy	W/AJ	March 2005
29	Hydraulic Network Analysis Report, Volume 2A: Model Results – Zarqa Governorate - Final -	Document	Copy	W/AJ	March 2005
30	Feasibility Study Report - Final -	Document	Copy	W/AJ	April 2005
31	Water Systems Facilities Vol. 1A Main Report – Zarqa Governorate - Final -	Document	Copy	W/AJ	April 2005
32	Water Systems Facilities Vol. 2A Maps – Zarqa Governorate - Final -	Document	Copy	W/AJ	April 2005
33	Drawings for Zarqa (hard copy; existing only)	Drawings	Copy	W/AJ	
34	Electrical copy drawings for Zarqa (land plots, roads, exiting & proposed pipelines)	CD	Copy	W/AJ	

Annexure

Annex- 1 Prediction of Future Population Distribution in the Target Area

The population distribution in the target area in the future is predicted as follows:

- Predicted population in each census unit and target area is shown as follows. Population distribution in Zarqa is predicted by the following methods.
- Saturated population (700 persons/ha) is set based on the population density of 1994 population census.
- Predicted population of total area is distributed to each unit according to the unit population in 1994 and population growth rate. If unit population is already more than the set value of saturated population, population in that unit will not increase but be distributed to other units supposed to have housing development in the future.
- Population distribution from 2005 to 2025 is predicted as per the above methods.

Census Unit	Area (1,000 m ²)	Area	Project 2 (after adjustment)					Population density of Project 2					Saturated pop density	Saturated pop	
			1994	2005	2010	2015	2020	2025	2005	2010	2015	2020			2025
														600	
1	212Z		1,600	2348	2657	2977	3303	3629	111	125	140	156	171	600	12,720
2	407Z		3,793	5567	6299	7057	7830	8603	137	155	173	192	211	600	24,420
3	269Z		2,926	4295	4859	5444	6040	6636	160	181	202	225	247	600	16,140
4	331Z		2,611	3832	4336	4858	5390	5922	116	131	147	163	179	600	19,860
5	2,708Z		11,444	17205	20028	23459	27193	31086	64	74	87	100	115	600	162,480
6	226Z		3,271	4801	5432	6086	6752	7418	212	240	269	299	328	600	13,560
7	446Z		10,173	14931	16893	18927	21000	23072	335	379	424	471	517	600	26,760
8	240Z		4,179	6134	6940	7776	8627	9478	256	289	324	359	395	600	14,400
9	228Z		4,143	6081	6880	7708	8552	9396	267	302	338	375	412	600	13,680
10	810Z		2,844	4296	5028	5939	6938	7984	53	62	73	86	99	600	48,600
11	234Z		8,242	12097	13687	14040	14040	14040	517	585	600	600	600	600	14,040
12	350Z		13,358	19606	21000	21000	21000	21000	560	600	600	600	600	600	21,000
13	188Z		5,960	8748	9898	11090	11280	11280	465	526	590	600	600	600	11,280
14	434Z		7,534	11058	12511	14017	15552	17087	255	288	323	358	394	600	26,040
15	123Z		5,877	7380	7380	7380	7380	7380	600	600	600	600	600	600	7,380
16	160Z		6,992	9600	9600	9600	9600	9600	600	600	600	600	600	600	9,600
17	185Z		9,444	11100	11100	11100	11100	11100	600	600	600	600	600	600	11,100
18	101Z		2,957	4340	4910	5501	6060	6060	430	486	545	600	600	600	6,060
19	140Z		4,910	7207	8154	8400	8400	8400	515	582	600	600	600	600	8,400
20	225Z		8,751	12844	13500	13500	13500	13500	571	600	600	600	600	600	13,500
21	114Z		2,055	3016	3412	3823	4242	4661	265	299	335	372	409	600	6,840
22	161Z		4,656	6834	7732	8663	9612	9660	424	480	538	597	600	600	9,660
23	142Z		6,984	8520	8520	8520	8520	8520	600	600	600	600	600	600	8,520
24	828Z		11,076	16257	18393	20608	22865	25121	196	222	249	276	303	600	49,680
25	122Z		2,432	3570	4039	4525	5021	5516	293	331	371	412	452	600	7,320
26	145Z		4,460	6546	7406	8298	8700	8700	451	511	572	600	600	600	8,700
27	249Z		8,355	12263	13874	14940	14940	14940	492	557	600	600	600	600	14,940
28	106Z		3,071	4507	5099	5713	6339	6360	425	481	539	598	600	600	6,360
29	246Z		9,555	14024	14760	14760	14760	14760	570	600	600	600	600	600	14,760
30	260Z		2,520	3699	4185	4689	5202	5715	142	161	180	200	220	600	15,600
31	147Z		2,100	3082	3487	3907	4335	4763	210	237	266	295	324	600	8,820
32	155Z		6,472	9300	9300	9300	9300	9300	600	600	600	600	600	600	9,300
33	631Z		7,592	11143	12607	14125	15672	17219	177	200	224	248	273	600	37,860
34	441Z		7,608	11167	12634	14155	15705	17255	253	286	321	356	391	600	26,460
35	500Z		17,658	25917	29323	30000	30000	30000	518	586	600	600	600	600	30,000
36	738Z		10,222	15003	16975	19019	21102	23184	203	230	258	286	314	600	44,280
37	1,169Z		6,382	9543	11040	12809	14715	16689	82	94	110	126	143	600	70,140
38	1,966Z		6,015	9124	10732	12764	15007	17366	46	55	65	76	88	600	117,960
39	589Z		12,751	18715	21174	23724	26322	28919	318	359	403	447	491	600	35,340
40	1,529Z		17,151	25173	28481	31910	35404	38898	165	186	209	232	254	600	91,740
41	2,530Z		5,984	9164	10894	13158	15688	18366	36	43	52	62	73	600	151,800
42	1,765Z		19,036	27941	31611	35419	39295	43174	158	179	201	223	245	600	105,900
43	1,829Z		14,408	21423	24618	28271	32153	36143	117	135	155	176	198	600	109,740
44	3,132Z		2,405	4002	5179	6981	9093	11389	13	17	22	29	36	600	187,920
45	3,307Z		6,012	9322	11235	13832	16770	19902	28	34	42	51	60	600	198,420
46	454Z		10,354	15197	17194	19264	21373	23482	335	379	424	471	517	600	27,240
47	2,820Z		6,378	9786	11658	14123	16882	19807	35	41	50	60	70	600	169,200
48	6,242Z		1,190	2688	4338	7210	10685	14528	4	7	12	17	23	600	374,520
49	5,200Z		0	784	1967	4161	6854	9853	2	4	8	13	19	600	312,000
50	5,223Z		2,234	4066	5685	8336	11496	14963	8	11	16	22	29	600	313,380
51	3,136Z		1,482	2648	3647	5266	7192	9303	8	12	17	23	30	600	188,160
52	4,959Z		654	1707	2962	5185	7886	10879	3	6	10	16	22	600	297,540
53	3,649R		19,133	36170	40923	45948	52843	60043	99	112	126	145	165	600	218,940
54	1,153R		15,210	28753	32531	36448	40439	44429	249	282	316	351	385	600	69,180
55	985R		8,878	16783	18988	21274	23604	25933	170	193	216	240	263	600	59,100
56	463R		11,162	21101	23874	26749	27780	27780	456	516	578	600	600	600	27,780
57	837R		13,275	25096	28394	31813	35297	38780	300	339	380	422	463	600	50,220
58	777R		8,139	15386	17408	19504	21640	23775	198	224	251	279	306	600	46,620
59	926R		6,016	11373	12868	14417	15996	17574	123	139	156	173	190	600	55,560
60	667R		16,842	31829	36011	40020	40020	40020	477	540	600	600	600	600	40,020
61	834R		10,731	20286	22952	25716	28532	31348	243	275	308	342	376	600	50,040
62	1,716R		1,327	2509	2839	3227	4456	5829	15	17	19	26	34	600	102,960
66	6,933R		23,782	44958	50866	57175	66976	77358	65	73	82	97	112	600	415,980
64	6,161H		13,936	18,754	21,218	23,773	26,376	28,979	30	34	39	43	47	600	369,660
65	5,595S		9,764	13,609	15,397	17,251	19,140	21,029	24	28	31	34	38	600	335,700
67	917Sh		36,218	50,973	57,671	64,615	71,691	78,765	556	629	705	782	859	600	55,020
Total	90,465		534,674	837,181	947,193	1,061,247	1,177,457	1,293,648	93	105	117	130	143		
Develop lot	45,031Z														
Develop lot	12,298R														
Zarqa	58,852Z		340,261	499,601	565,253	633,317	702,667	772,006	85	96	108	119	131		
Hashemeyeh	6,161H		13,936	18,754	21,218	23,773	26,376	28,979	30	34	39	43	47		
Sukhna	5,595S		9,764	13,609	15,397	17,251	19,140	21,029	24	28	31	34	38		
Ruseifa	18,940R		134,495	254,244	287,654	322,291	357,583	392,869	134	152	170	189	207		
Hutten	917Sh		36,218	50,973	57,671	64,615	71,691	78,765	556	629	705	782	859		
Total	90,465		534,674	837,181	947,193	1,061,247	1,177,457	1,293,648	93	105	117	130	143		

	2005	2010	2015	2020	2025
Zarqa District	837,181	947,193	1,061,247	1,177,457	1,293,648
Other areas in Zarqa Gov	73,590	83,260	93,286	103,502	113,715
Total of Zarqa Gov	910,771	1,030,453	1,154,533	1,280,959	1,407,363
Maftaq village	2,533	2,866	3,210	3,561	3,913
Balqa villages	9,762	11,045	12,375	13,729	15,084
Total Zarqa Govt Service Area	923,066	1,044,364	1,170,118	1,298,249	1,426,360

Annex- 2 Prediction of Planned Population and Planned Average Daily Demand

Distribution Area	Planned Population					Planned Average Daily Demand (m ³ /day)				
	1994	2005	2010	2015	2025	1994	2005	2010	2015	2025
Zarqa low area	188,295	270,315	297,236	320,299	358,948	20,500	32,400	44,600	50,000	54,900
Zarqa high area	21,964	33,587	39,860	48,028	66,775	2,400	4,000	6,000	7,500	10,200
Hashemeyeh Distribution area	13,936	18,754	21,218	23,773	28,979	1,500	2,300	3,200	3,700	4,400
Sukhna Distribution area	9,764	13,609	15,397	17,251	21,029	1,100	1,600	2,300	2,700	3,200
Awajan low area	24,890	37,373	43,440	50,768	67,004	2,700	4,500	6,500	7,900	10,300
Awajan high area	144,803	234,534	269,150	305,361	377,334	15,800	28,100	40,400	47,600	57,700
Ruseifa low area	74,731	140,041	160,130	182,547	229,300	8,100	16,800	24,000	28,500	35,100
Ruseifa high area	20,074	37,997	43,093	48,608	65,516	2,200	4,600	6,500	7,600	10,000
Hutten Distribution area	36,218	50,973	57,671	64,615	78,765	3,900	6,100	8,700	10,100	12,100
Zarqa area	534,675	837,183	947,195	1,061,250	1,293,650	58,200	100,400	142,200	165,600	197,900
Project	233,959	336,265	373,711	409,351	475,731	25,500	40,300	56,100	63,900	72,700
Whole area in Zarqa		910,771	1,030,453	1,154,533	1,407,363		109,300	154,600	180,100	215,300
Mafrqa villages		2,533	2,866	3,210	3,913		300	400	500	600
Balqa villages		9,762	11,045	12,375	15,084		1,200	1,700	1,900	2,300
Service area of WAJ Zarqa		923,066	1,044,364	1,170,118	1,426,360		110,800	156,700	182,500	218,200

Annual demand (MCM/Y)	40.44	57.20	66.61	79.64
Targets in this project (MCM/Y)	14.71	20.48	23.32	26.54

No.	Month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
	Description													
1	Al-Azrq Well	1,317,711	1,166,173	1,306,672	1,366,628	1,507,690	1,498,190	1,521,910	1,517,170	1,410,590	1,466,210	1,388,120	1,244,360	16,711,424
2	Al-Hashimia Well (2)	43,100	39,700	42,910	29,420	11,870	41,650	41,980	42,550	40,720	40,000	42,000	42,000	457,900
3	Al-Hashimia Well (3)	135,080	119,600	129,540	127,320	135,750	129,710	136,080	126,770	121,770	137,660	131,210	131,160	1,561,650
4	Al-Hashimia Well (5)	84,370	88,600	96,550	67,260	69,510	69,140	96,470	96,190	91,670	96,200	90,520	91,300	1,037,780
5	Awajan well (21)	74,700	69,800	62,270	58,980	62,780	72,540	91,720	89,180	85,800	89,740	78,010	84,120	919,640
6	Awajan well (22)	36,698	34,800	37,300	35,960	36,390	36,050	36,610	36,650	33,640	35,040	30,250	32,210	421,598
7	Awajan well (23)	161,290	114,040	153,300	150,840	155,270	148,790	150,190	151,650	147,510	152,340	137,320	144,450	1,766,990
8	Alhallabat Wells	200,240	189,180	270,950	253,880	242,520	224,380	235,200	222,900	208,910	206,410	173,470	213,440	2,641,480
9	Zarqa wells and desalination station	338,800	296,000	330,990	300,120	383,600	412,700	336,510	343,510	302,880	314,250	307,090	324,980	3,991,430
10	Marhb wells	93,900	88,000	93,290	88,190	88,300	84,780	86,770	81,770	81,230	82,170	77,840	80,270	1,026,510
11	Om-Rumana well	0	0	0	0	0	9,700	15,002	14,740	8,930	3,760	3,810	2,830	58,772
12	Beren well No.(2)	2,109	0	25,318	27,831	30,243	27,835	27,387	26,730	29,550	23,710	21,250	20,980	262,943
13	Beren well No.(3)	13,532	15,417	5,703	17,529	17,118	16,740	16,721	16,510	16,980	14,650	13,760	4,560	169,220
14	Altamwen well No.(3+4+5)	106,516	58,834	55,208	54,875	74,220	93,526	109,494	104,060	80,550	51,840	49,650	48,110	886,883
15	Sarout Spring	4,506	4,950	6,020	6,280	6,730	5,700	5,000	6,140	6,470	4,350	5,000	5,000	66,146
16	Alok Spring	2,780	2,988	3,215	4,650	4,740	5,170	5,590	4,060	4,400	4,620	2,620	3,000	47,833
17	Al-Qinnia Spring	31,557	27,184	27,200	24,365	26,465	25,075	26,470	29,610	24,520	27,250	24,590	28,270	322,556
18	Al-Rusayfa Well NO.(18)	0	0	0	17,165	29,916	26,565	31,202	29,915	29,230	30,552	10,520	0	205,065
19	Al-Basatine Well No. (1)	0	0	28,280	63,440	55,880	58,720	58,540	59,150	56,570	57,750	36,700	0	475,030
20	Al-Basatine Well No. (1)	0	0	19,260	44,450	39,520	41,720	40,570	41,660	39,980	42,060	38,390	47,210	394,820
21	Mokhaym-Hetten Well No.(1)	0	0	0	0	3,648	1,134	71	0	0	0	0	0	4,853
22	Phosphate Deep Well	0	0	0	2,000	41,384	45,312	32,511	40,325	40,521	43,878	29,184	0	275,115
23	Al-Rusayfa Well NO.(18)	66,042	74,556	108,652	107,818	112,890	117,180	112,190	111,600	104,090	98,550	78,750	67,660	1,159,978
24	Phosphate Well (2)	35,270	31,318	36,147	35,051	32,169	30,066	28,915	29,848	29,867	26,840	31,527	33,714	380,732
25	Phosphate Well (5)	47,081	66,950	79,077	77,670	72,213	66,970	57,292	64,865	64,572	43,893	51,623	73,463	765,669
26	Al-Qwardour	799,560	750,241	708,898	777,630	728,520	790,769	785,824	673,200	697,680	734,878	664,985	717,479	8,829,664
	Total	3,594,842	3,238,331	3,626,750	3,739,352	3,969,336	4,080,112	4,086,219	3,960,753	3,758,630	3,828,601	3,518,189	3,440,566	44,841,681

Net Water Supply= (1+2)-(3)													
Monthly Total Product(1)	3,594,842	3,238,331	3,626,750	3,739,352	3,969,336	4,080,112	4,086,219	3,960,753	3,758,630	3,828,601	3,518,189	3,440,566	44,841,681
Total Amount of Incoming Water to Governorate													
From the Capital Governorate	0	0	0	0	0	0	0	0	0	0	0	0	0
From the Al-Mafraq Governorate	1,010,280	930,343	1,001,100	964,820	904,410	878,875	880,045	797,550	742,480	755,092	752,208	845,878	10,463,081
Total.....(2)	1,010,280	930,343	1,001,100	964,820	904,410	878,875	880,045	797,550	742,480	755,092	752,208	845,878	10,463,081
Total Amount of outgoing Water to Governorate													
To the Capital Governorate	1,570,304	1,221,386	1,390,706	1,318,335	1,432,108	1,458,426	1,486,142	1,416,358	1,345,550	1,318,038	1,233,590	1,242,538	16,433,481
To Balqa and Jerash Governorate	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	240,000
To Mafraq Governorate	11,100	11,910	13,130	11,040	10,190	10,570	10,090	12,380	11,320	10,240	11,160	12,070	135,200
To Al-Azraq Pool	80,150	58,379	200,045	218,925	83,700	71,870	71,590	68,720	39,490	35,530	51,530	86,880	1,066,809
Total.....(3)	1,681,554	1,311,675	1,623,881	1,568,300	1,545,998	1,560,866	1,587,822	1,517,458	1,416,360	1,383,808	1,316,280	1,361,488	17,875,490
Net Water Production (*)	2,923,568	2,856,999	3,003,969	3,135,872	3,327,748	3,398,121	3,378,442	3,240,845	3,084,750	3,199,885	2,954,117	2,924,956	37,429,272

Month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Average
DAYILY AVERAGE OF NET WATER PRO	94,309	102,036	96,902	104,529	107,347	113,271	108,982	104,543	102,825	103,222	98,471	94,353	102,566
DAILY COEFFICENT	0.92	0.99	0.94	1.02	1.05	1.10	1.06	1.02	1.00	1.01	0.96	0.92	

Implemen- -tation Possibility	Title	Project Descriptions and Components	Water Supply (MCM/yr)	Approx. Capital Cost	Schedule (Current status and expected completion date)
Will be completed soon	Tamween wells water project in Zarqa	Al-Tamween wells with production of 450 m ³ / hour will be developed and the exploited water will be conveyed to Khaw - Amman pipeline through proposed pumping station. <u>Project contents:</u> <ul style="list-style-type: none"> • Well development (well numbers 6,7,8,9,10,11) • Water tank with 1000 m³ capacity • Water pipes with different diameters (400 mm, 300 mm, 250 mm, 200 mm and 100 mm) with total 7800 m • Pumping station • Operating rooms • Electro-mechanical works • Chlorine room • External works 	4	817,644.5 JOD (Original agreement value)	The works will be completed during this year (2005).
Will be completed	Mujib, Zara and Ma'en Water Desalination and Conveyance Project	Due to the increased water demand in Amman area, this project was developed to utilize the Wadi Zara, Ma'in and Mujib Water (45 MCM/yr) by treatment and pumping from the Dead Sea area to Al-Muntazah pumping station. This water will be transmitted to the existing Dabouq pipeline and then distributed in Amman. The project consists of: <ul style="list-style-type: none"> • Construction of treatment plant with 55 MCM/yr. • Construction of 41 km of conveyance pipeline 1,000 mm diameter. • Construction of 6 pumping stations • Construction of storage reservoirs and pumping stations • A complete SCADA System 	45	125 million USD DBO USAID & Govt of Jordan	About 54% of the works have been completed; works are in progress on the pipelines, treatment plant, pumping station and all other activities. The works will be completed in July 2006.
Will be completed	Utilization and conveyance of Wadi Al-Halabat Wells	Six wells have been dug in Wadi-Halabat area. The production of these wells is about 600 m ³ /hr (5 MCM), which will be utilized by installing a transmission and collection pipes to convey the water from the well fields to Al-Hahabat pump station. The water will then be used to improve the supply for both Zarqa and Amman Governorates through the existing pump station and networks.	5	1.5 million JOD	Design was completed in July 2005, construction works were awarded and will be completed within one year, i.e. in 2006.
Searching funds	Disi- Amman Water Conveyor (BOT)	Although its capacity might eventually be increased, the project will initially produce and transport to Amman on average 100 MCM of high quality water per year, with the minimum flow being 80 MCM/yr during winter months and the maximum flow being 120 MCM/yr during summer months. Facilities to built include: <ul style="list-style-type: none"> • Well field consisting of new boreholes (65 wells) • Well fields collector, 250 mm–1600 mm dia steel and/or DI pipes of 260 km length. 	100	625 million USD 1996 prices Private contractor	Not yet started.

Implement-tation Possibility	Title	Project Descriptions and Components	Water Supply (MCM/yr)	Approx. Capital Cost	Schedule (Current status and expected completion date)
		<ul style="list-style-type: none"> • One collector reservoir (8,500 m³) • Main pumping station • Regulating tank (85,000 m³) and flow control stations • Chlorination units • Conveyance pipeline to Amman (325 km), 1800 mm-dia steel pipes, 2000 mm dia steel pipe and 1000 mm dia steel pipes • Terminal reservoir at Amman 			
Waiting funds	Northern Governorate Water Supply System (East System)	<p>The main objective of this project is to improve water supply system in the Northern Governorates. The East System will supply water to the following subsystem:</p> <ul style="list-style-type: none"> • Sumaya-Zaatary Khadyeh subsystem • Upper Aqed Mafrq subsystem • Um-El-Lulu Subsystem <p>The eastern transmission system starts from Hofa pumping station, through Zaatary and Um-Lulu pumping stations. The main water sources are Aqeb Wells, Zaatary Wells, Sumaya Wells and the Corridor Wells which will be introduced after Disi water reaches Amman. The components are:</p> <ul style="list-style-type: none"> • 1000 mm pipe, 48 km • Pumping station in Zaatary 	-	28 Million USD	Waiting funds from USAID WAJ has been instructed CDM to conduct the detailed study The proposed date for implementation is 2006 – 2009.
Nearly completed	Al-Waheda Dam	The dam will give Jordan the ability to store about 225 MCM from the flows of the Yarmouk river with an average incremental yield of 108 MCM per year. The dam will help satisfy both municipal and agricultural demands as well as produce electricity. Providing the Amman and Zarqa area with 50 MCM annually for domestic and industrial uses.	-	145 Million JOD, Arab fund for economic social development, Islamic bank for Development and Abu Dhabi Fund for Development	Implemented by JVA and nearly completed.
Waiting Funds	Al-Waheda Dam Water Supply Project/Irbid	<p>Water supply for Irbid, Jerash and Ajloun is now about 60 MCM/yr and water demand is about 124 MCM/yr. This project increases the water supply in two stages. At the 1st stage 30 MCM/yr will be secured from Al-Waheda Dam to terminal reservoir in Irbid. The project mainly consist of the following three parts:</p> <ul style="list-style-type: none"> • Intake facilities and transmission pumping stations (PS0, PS1 and PS2) • Water treatment plant • Transmission pipeline (ø1100 mm x 30 km) 		50.4 Million USD	Requesting to Japan and waiting fro approval from Japanese government. Feasibility study has been completed.

Implement- -tation Possibility	Title	Project Descriptions and Components	Water Supply (MCM/yr)	Approx. Capital Cost	Schedule (Current status and expected completion date)
Cancelled	Desalination Conveyor to Urban Jordan (50+10 MCM)	This project had come about a result of the Peace treaty between the Jordan and Israel, The aim of this project was to desalinate brackish spring water that is currently being diverted into the Jordan River by Israel, for the purposes of providing Jordan with the 50+10 MCM per year of water of potable standards. This project consisted of pipelines of different diameters, pumping stations, chlorinating units and telemetry system. According to the Jordanian plans, the construction of the project should have started in 2006 and completed in three years.	60 MCM	100 Million JOD	Cancelled because the water resources in Jordan will meet the water demand.
Completed	Desalination of Deir Alla Brackish Water	WAJ started the implementation of Deir Alla-Dabouq pipeline project which was financed by the KfW and JICA in order to pump 90 MCM/yr from KAC to Dabouq Reservoir through Zai Water treatment Plant to supply Amman and Balqa Governorates with the urgently needed municipal water and decrease the deficit of water requirements. In order to increase the resources MWI planned to execute this project. The project was divided to the following three packages. <ul style="list-style-type: none"> • Drilling and equipping wells • Connection pipelines to connect the wells with the proposed RO unit • Design and build a RO unit to desalinate 2500 m³/hr in addition to the pre-treatment filters. The RO unit will be connected to Deir All-Dabouq system to increase water availability.	Supply increased from 45 MCM to 90 MCM	5 Million JOD Govt of Jordan	Completed
Completed	Zai-Dabouq Water Supply	The main objective of the project was to provide Greater Amman with additional water to partially bridge the ever-increasing gap between supply and demand through increasing the scheme supply capacity from 45 MCM/yr to 90 MCM/yr. The project consisted of the following components. <ul style="list-style-type: none"> • Expansion of pumping station #5 • Expansion of the Intake pump station and sedimentation basin in KAC • A 1200 mm pipeline of 600 m length from station #4 to station #5 • A 1200 mm pipeline of 17 km length from Zai treatment plant to Dabouq reservoir. 	Same as above	KFW 15 Million JOD & Govt of Jordan 5 Million JOD	Completed.

Source: WAJ

Annex- 5 Planned Capacity of Transmission Pipes

1. Conditions for Calculation (With service population of 100%)

(1) Water Demand

	Maximum Water Demand (m ³ /day)			
	2005	2010	2015	2025
Zarqa Low	38,900	53,500	59,900	66,000
Zarqa High	4,800	7,200	9,000	12,300
Hashemeyeh	2,700	3,800	4,400	5,300
Sukhna	2,000	2,800	3,200	3,900

: Target year 2015

: Maximum Daily Demand is considered for the calculation of transmission pipeline capacity

(2) Length and Diameters of Pipes

	Pipeline	Length (m)	Diameter (mm)
<input type="checkbox"/>	Khaw Pumping Station – Junction	4,600	Existing 700
<input type="checkbox"/>	Junction – Batrawi Reservoir	4,450	Existing 700
<input type="checkbox"/>	Junction – Hashemeyeh Reservoir	6,200	300 mm/400
<input type="checkbox"/>	Hashemeyeh Reservoir – Sukhna Reservoir	7,700	300
<input type="checkbox"/>	Batrawi Reservoir – Zarqa High Reservoir	1,600	300

: ☐ ☐ Adopted from as-built drawing of Corridor well development project

(3) Water Level of Reservoirs

	High water level (m)	Low water level (m)
Khaw Reservoir	605	600
Batrawi	654	645
Zarqa High	715	710
Hashemeyeh	630	625
Sukhna	590	585

(4) Calculation Methods

Software of Calculation	EPANET2 (U.S. Environmental Protection Agency)
Flow Formula	Hazen-Williams $H = 10.666 C^{-1.85} D^{-4.87} Q^{1.85} \cdot L$ H: friction loss (m) Q: flow rate (m ³ /sec) D: diameter of pipe (m) L: length of pipe (m) C: Hazen-Williams Coefficient (=110)

(5) Capacity of Pumps

(Existing Khaw PS to Zarqa PS)

	Capacity (m ³ /hour)	Total Head (m)
No.1 Pump	500	150
No.2 Pump	500	150
No.3 Pump	500	150
No.4 Pump	500	150
No.5 Pump	300	150
No.6 Pump	500	150

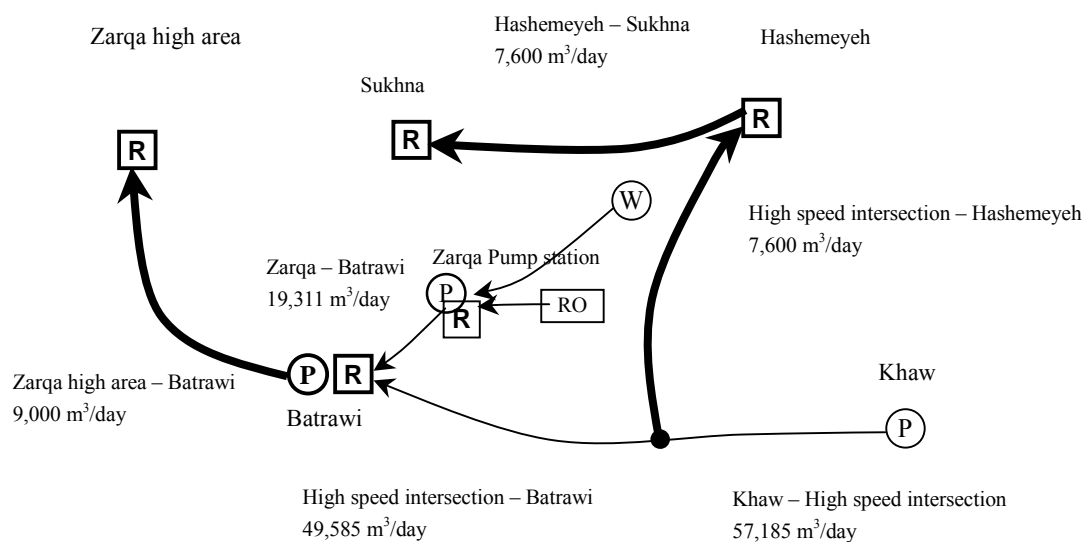
(Batrawi PS to Zarqa High)

	Capacity (m ³ /hour)	Total Head (m)	
No.1 Pump	300	90	1 duty
No.2 Pump	300 r	90	1 stand-by

2. Alternations of Water Sources

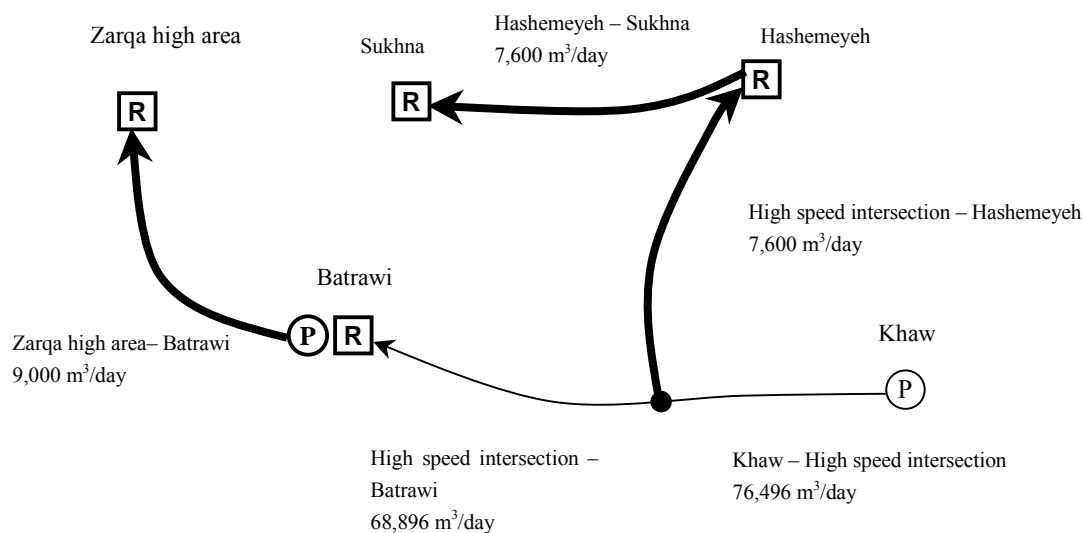
(1) Case 1

Water source: Existing wells (wells in Zarqa and Hashemeyeh) and pumps in Khaw



(2) Case2

Water source: Only using water from Khaw



3. Results of Analysis

(1) Case 1

No.	Number of duty pump at Khaw PS	Residual pressure at reservoir (m)		Judgment
		Batrawi	Hashemeyeh	
1	500m ³ /h×4 300m ³ /h×2	66	63	OK
2	500m ³ /h×4 300m ³ /h×1	54	51	OK
3	500m ³ /h×4 300m ³ /h×0	37	34	OK
4	500m ³ /h×3 300m ³ /h×2	44	40	OK
5	500m ³ /h×3 300m ³ /h×1	20	18	OK

Reservoir	Duty pump/gravity flow	Residual pressure at reservoir (m)
Zarqa High	300 m ³ /h flow rate, 90 m head	3
Sukhna	Gravity flow from Hashemeyeh reservoir	19

Route	Diameter (mm)	Velocity (m/s)	Unit Head Loss (m/km)
1 Khaw – Junction	700	1.72	4.7
2 Junction – Batrawi	700	1.49	3.6
3 Junction – Hashemeyeh	300	1.24	6.9
4 Hashemeyeh – Sukhna	300	0.52	1.4
5 Batrawi – Zarqa High	300	1.47	9.6

(2) Case 2

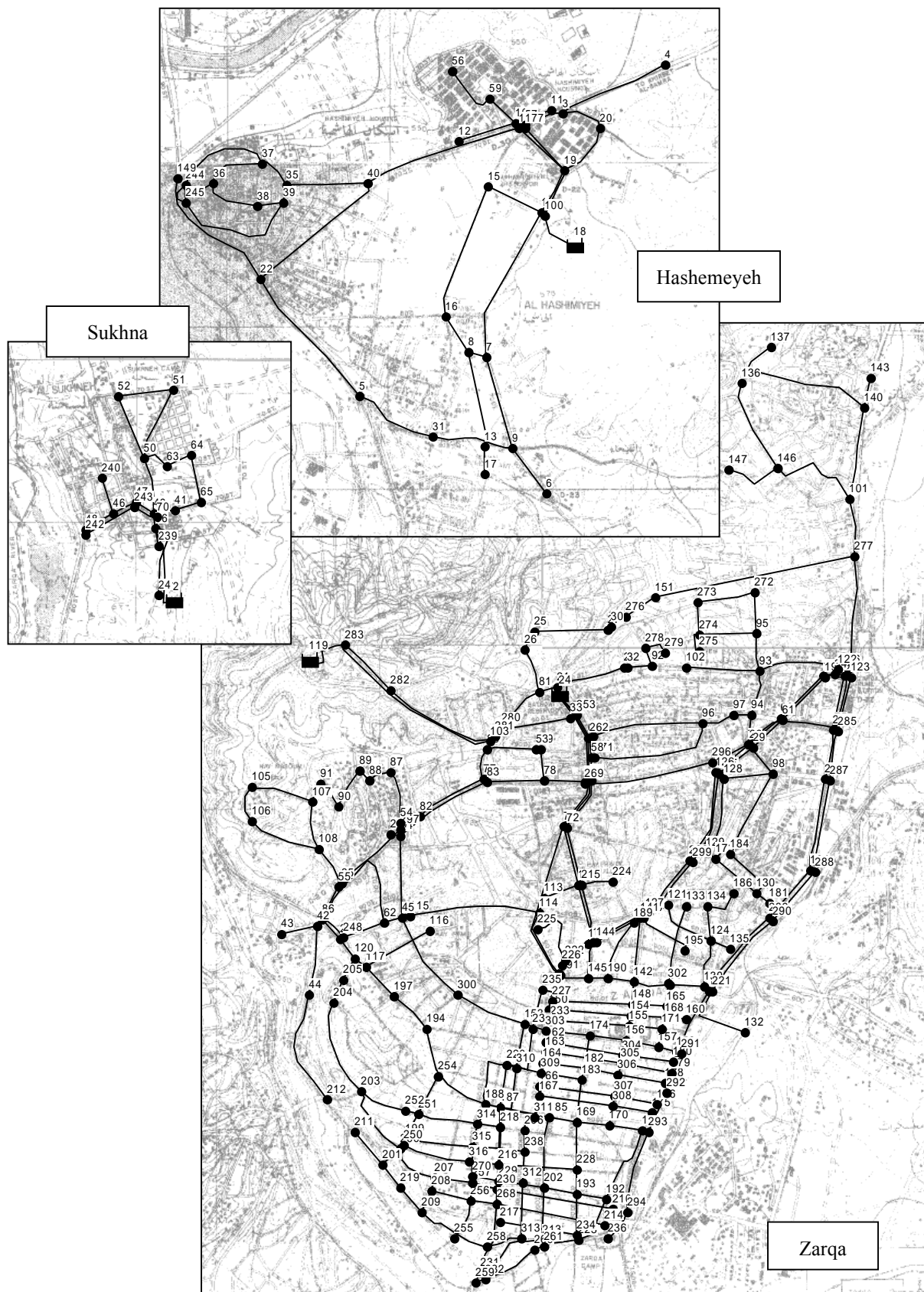
Number of duty pump at Khaw PS	Residual pressure at reservoir (m)		Evaluation
	Batrawi	Hashemeyeh	
500m ³ /h×4 300m ³ /h×2	4	14	OK

Reservoir	Duty pump/gravity flow	Residual pressure at reservoir (m)
Zarqa High	300 m ³ /day flow rate, 90 m head	3
Sukhna	Gravity flow from Hashemeyeh reservoir	19

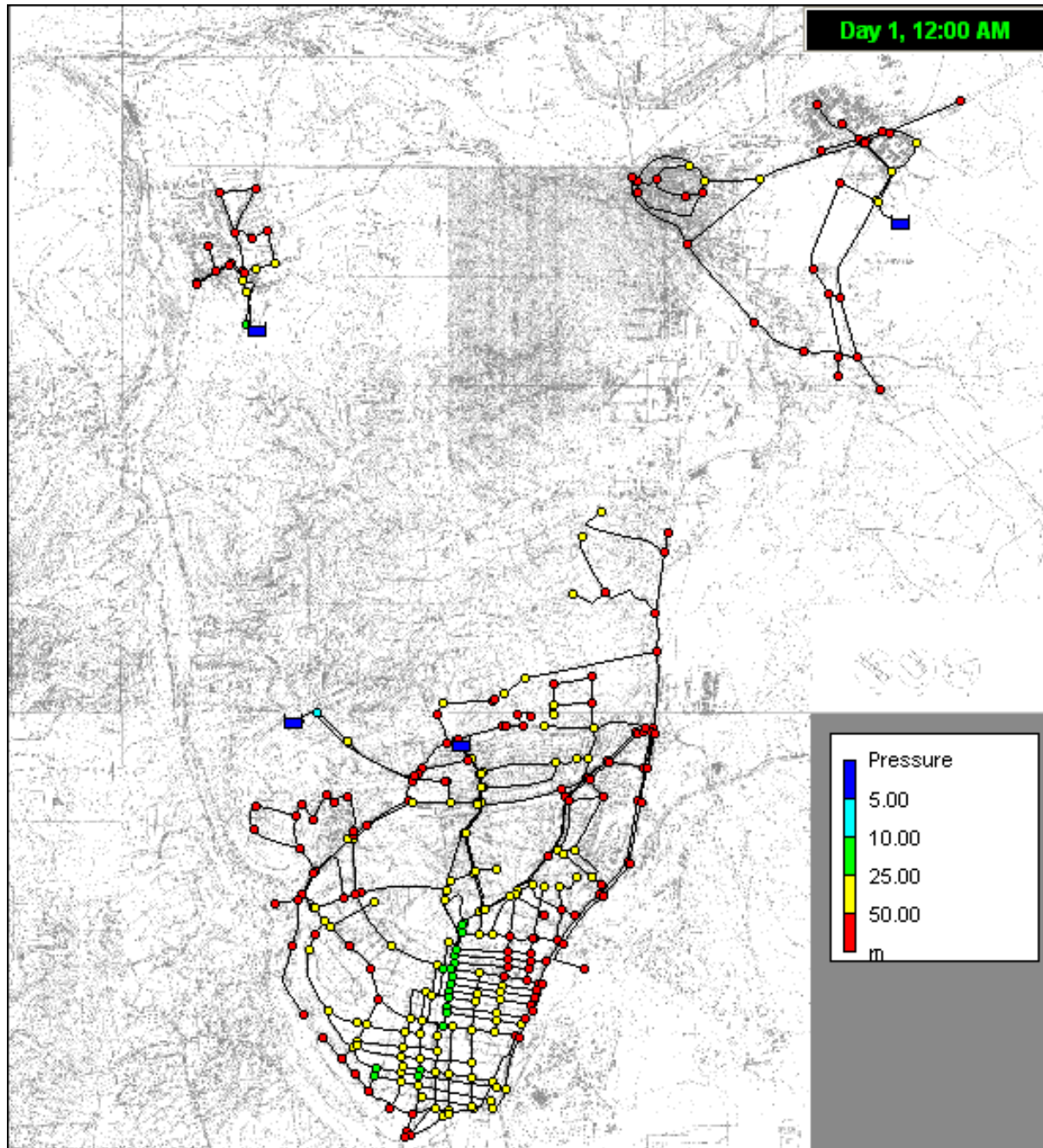
Route	Diameter (mm)	Velocity (m/s)	Unit head loss (m/km)
1 Khaw – Junction	700	2.30	8.0
2 Junction – Batrawi	700	2.07	6.6
2-1 Junction – Hashemeyeh	300	1.24	6.9
2-2 Junction – Hashemeyeh	400	0.70	1.7
3 Hashemeyeh – Sukhna	300	0.52	1.4
3 Batrawi – Zarqa High	300	1.47	9.6

Annex- 6 Results of Pipe Network Simulations

(1) Networks



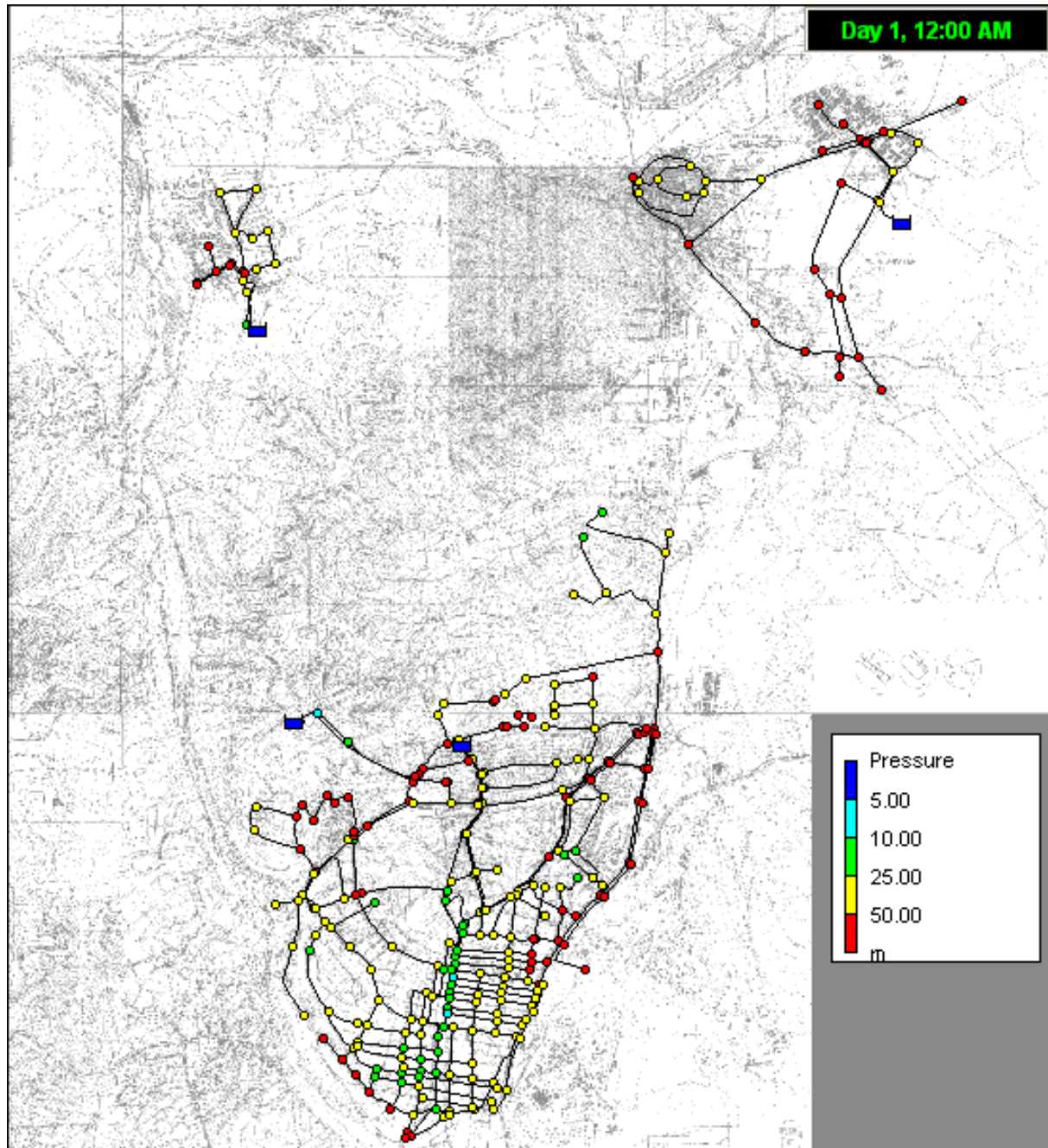
(2) Network Analysis Result in Max. Daily Demand (2015)



(3) Data of Network Analysis Result in Max. Daily Demand (2015)

NetworkTable-Nodes																			
NodeID	Elevation m	Demand CMD	Head m	Pressure m	NodeID	Elevation m	Demand CMD	Head m	Pressure m	NodeID	Elevation m	Demand CMD	Head m	Pressure m	NodeID	Elevation m	Demand CMD	Head m	Pressure m
June 10	565	129.78	623.79	58.79	June 127	598	457.18	638.38	40.38	June 244	540	159.7	602.93	62.93	June 137	575	151.41	617.85	42.85
June 11	560	33.48	623.78	63.78	June 128	580	349.63	630.18	50.18	June 245	540	158.81	602.93	62.93	June 140	550	269.33	617.98	67.98
June 12	565	54.22	623.74	58.74	June 129	578	367.78	627.65	49.65	June 42	537	420.74	608.29	71.29	June 143	550	28.15	617.98	67.98
June 14	565	204.15	611.69	46.69	June 130	585	423.41	627.3	42.3	June 43	555	134.81	608.28	53.28	June 146	565	244.44	617.63	52.63
June 15	570	179.56	623.55	53.55	June 133	597	308.15	636.25	39.25	June 44	550	678.81	607.69	57.69	June 147	570	57.19	617.62	47.62
June 16	570	163.26	622.79	52.79	June 134	593	273.33	636.16	43.16	June 45	567	699.78	631.94	64.94	June 149	530	127.7	607.19	77.19
June 22	525	400.59	607.28	82.28	June 135	570	82.67	636.35	66.35	June 62	565	925.04	617.29	52.29	June 1	590	98.37	624.02	34.02
June 31	540	153.19	613.44	73.44	June 138	572	476.89	636.03	64.03	June 246	562	210.52	611.76	49.76	June 3	565	179.85	619.04	54.04
June 35	560	122.07	604.48	44.48	June 139	572	237.18	636.4	64.4	June 247	600	47.26	637.95	37.95	June 4	550	103.41	618.68	68.68
June 36	550	132.74	603.01	53.01	June 141	600	392.07	637.08	37.08	June 248	562	819.85	611.85	49.85	June 5	535	218.96	610.56	75.56
June 37	560	176	603.23	43.23	June 142	585	408.81	636.98	51.98	June 250	590	293.63	633.79	43.79	June 6	545	52.15	616.83	71.83
June 38	545	74.37	603.23	58.23	June 144	605	147.11	637.71	32.71	June 251	585	780	632.43	47.43	June 7	570	102.81	622.51	52.51
June 39	550	158.22	603.49	53.49	June 145	606	212.3	637.45	31.45	June 252	584	74.81	631.71	47.71	June 8	570	144	622.63	52.63
June 40	565	355.26	606.77	41.77	June 148	584	335.56	636.96	52.96	June 254	578	206.67	632.37	54.37	June 9	545	210.67	616.84	71.84
June 41	530	108.15	578.29	48.29	June 150	620	419.11	637.61	17.61	June 255	570	249.33	634.39	64.39	June 13	545	113.19	622.61	77.61
June 46	500	210.07	578.46	78.46	June 153	606	564.89	637.3	31.3	June 256	606	325.93	634.49	28.49	June 17	545	25.19	622.61	77.61
June 47	515	101.63	578.57	63.57	June 154	586	312.15	636.96	50.96	June 257	605	239.56	634.68	29.68	June 19	580	153.48	614.31	34.31
June 48	490	71.7	578.45	88.45	June 155	586	317.04	636.95	50.95	June 258	580	607.93	630.46	50.46	June 20	575	94.81	616.53	41.53
June 49	518	301.04	578.72	60.72	June 156	585	405.18	636.95	51.95	June 259	560	112	636.63	76.63	June 21	650	148.81	702.71	52.71
June 50	520	498.96	570.7	50.7	June 157	584	145.78	636.9	52.9	June 260	595	50.67	636.65	41.65	June 23	625	117.93	702.57	77.57
June 51	518	284.15	569.34	51.34	June 158	580	37.48	636.9	56.9	June 261	595	39.11	636.65	41.65	June 25	655	148.74	700.61	45.61
June 52	512	266.96	569.35	57.35	June 160	576	41.48	636.81	60.81	June 268	605	409.33	636.63	31.63	June 26	645	105.48	701.04	56.04
June 56	562	50.37	623.57	61.57	June 161	625	209.11	637.46	12.46	June 270	602	290.81	634.91	32.91	June 27	625	116.44	700.19	75.19
June 59	563	82.96	623.61	60.61	June 162	623	357.04	636.48	13.48	June 192	590	223.56	636.67	46.67	June 28	578	103.85	637.17	59.17
June 67	600	166.96	643.54	43.54	June 163	618	354.22	635.93	17.93	June 193	594	228.89	636.66	42.66	June 29	578	104.37	636.6	58.6
June 68	600	184.44	633.88	33.88	June 164	617	277.78	635.54	18.54	June 202	601	438.96	636.66	35.66	June 221	572	491.11	635.54	63.54
June 69	600	196.37	642.36	42.36	June 166	615	342.96	633.86	18.86	June 210	590	88.59	636.37	46.37	June 284	570	103.85	636.28	66.28
June 71	600	299.7	640.71	40.71	June 167	615	336.15	633.41	18.41	June 214	592	82.67	636.4	44.4	June 285	570	103.41	636.1	66.1
June 72	600	297.04	641.49	41.49	June 169	593	464.22	636.84	43.84	June 216	606	324.44	636.65	30.65	June 286	575	289.18	636.21	61.21
June 73	600	171.78	642.73	42.73	June 170	587	345.93	636.84	49.84	June 217	600	73.19	636.53	36.53	June 287	575	290.96	635.92	60.92
June 74	578	253.56	634.27	56.27	June 172	584	211.85	636.73	52.73	June 218	602	362.81	636.8	34.8	June 288	567	432	635.68	68.68
June 75	570	152.44	634.61	64.61	June 174	598	292	637.09	39.09	June 219	565	364.15	630.11	65.11	June 289	575	528.89	636.06	61.06
June 76	570	151.56	634.93	64.93	June 175	582	71.41	630.98	48.98	June 220	598	780	637.1	39.1	June 290	575	529.63	635.59	60.59
June 77	613	195.11	699.02	86.02	June 176	581	78.52	631.15	50.15	June 165	578	128.3	636.77	58.77	June 291	580	256.59	636.02	56.02
June 78	608	168.59	642.24	34.24	June 178	580	109.04	636.11	56.11	June 168	578	147.85	636.81	58.81	June 292	581	177.04	636.01	55.01
June 79	610	34.37	642.23	32.23	June 179	580	118.52	632.45	52.45	June 171	578	120.3	636.87	58.87	June 293	584	240	636.01	52.01
June 80	630	172.67	702.08	72.08	June 180	580	118.52	632.91	52.91	June 173	590	286.96	627.47	37.47	June 294	590	88.89	636.01	46.01
June 81	645	159.85	702.77	57.77	June 182	602	307.85	636.14	34.14	June 181	575	44.44	627.3	52.3	June 296	580	466.3	635.73	55.73
June 82	630	221.63	698.24	68.24	June 183	600	280.15	636.53	36.53	June 184	595	469.33	627.37	32.37	June 297	610	334.07	698.01	88.01
June 83	613	278.44	642.12	29.12	June 185	600	513.33	636.88	36.88	June 186	606	143.7	635.95	29.95	June 298	580	846.96	638.26	58.26
June 84	610	590.96	637.95	27.95	June 187	600	894.96	637.05	37.05	June 189	598	194.81	636.44	38.44	June 299	580	855.11	636.95	56.95
June 85	590	437.48	693.3	103.3	June 188	588	1265.04	634.77	46.77	June 190	594	278.22	637.08	43.08	June 300	590	654.3	631.75	41.75
June 86	556	255.26	608.9	52.9	June 194	572	720.44	626.07	54.07	June 191	620	304.67	637.95	17.95	June 301	578	204.89	636.58	58.58
June 87	620	230.22	694.73	74.73	June 197	565	335.56	623.48	58.48	June 195	585	223.7	636.26	51.26	June 302	578	297.48	636.51	58.51
June 88	610	112.3	693.88	83.88	June 199	590	398.22	633.34	43.34	June 196	570	40.3	636.46	66.46	June 303	615	144.3	637.46	22.46
June 89	620	168.89	693.42	73.42	June 200	590	493.33	629.65	39.65	June 198	570	40	636.39	66.39	June 304	590	311.41	633.12	43.12
June 90	600	211.85	692.49	92.49	June 201	564	561.04	628.81	64.81	June 215	606	518.07	640.21	34.21	June 305	592	308.59	632.66	40.66
June 91	600	146.07	692.1	92.1	June 203	580	602	629.38	49.38	June 222	625	277.93	638.08	13.08	June 306	590	199.7	636.11	46.11
June 92	620	254.96	702.54	82.54	June 204	570	452.44	615.22	45.22	June 224	605	107.41	640.2	35.2	June 307	592	303.56	631.23	39.23
June 93	600	340.67	634.4	34.4	June 205	563	179.85	614.43	51.43	June 225	610	209.48	637.3	27.3	June 308	590	291.56	631.04	41.04
June 94	585	126.89	634.26	49.26	June 206	603	175.19	632.26	29.26	June 226	620	139.85	637.98	17.98	June 309	615	262.15	636.77	21.77
June 95	578	131.56	634.15	56.15	June 207	607	341.93	631.06	24.06	June 227	620	404.3	637.5	17.5	June 310	600	380.44	637.16	37.16
June 96	595	566.96	633.91	38.91	June 208	607	211.56	630.92	23.92	June 233	620	328.44	637.45	17.45	June 311	613	149.63	632.81	19.81
June 97	585	105.93	634.13	49.13	June 209	567	772	630.26	63.26	June 235	606	232.89	637.72	31.72	June 312	604	156.07	631.41	27.41
June 98	580	363.41	632.97	52.97	June 211	555	247.11	628.15	73.15	June 237	615	410.67	637.46	22.46	June 313	597	77.19	630.81	33.81
June 99	570	54.07	636.36	66.36	June 212	550	422.81	607.01	57.01	June 253	615	93.33	644.36	29.36	June 314	603	246.07	635.29	32.29
June 101	550	241.78	618.14	68.14	June 213	595	101.04	636.65	41.65	June 262	600	81.33	643.73	43.73	June 315	600	354.81	631.8	31.8
June 104	567	430.22	636.11	69.11	June 223	598	71.11	636.66	38.66	June 267	600	102	642.35	42.35	June 316	602	292.59	635.64	33.64
June 105	638	303.11	690.26	52.26	June 228	597	414.67	636.65	39.65	June 269	600	263.48	642.22	42.22	June 30	610	27.56	700.19	90.19
June 106	635	339.26	690.25	55.25	June 229	617	141.04	636.66	19.66										

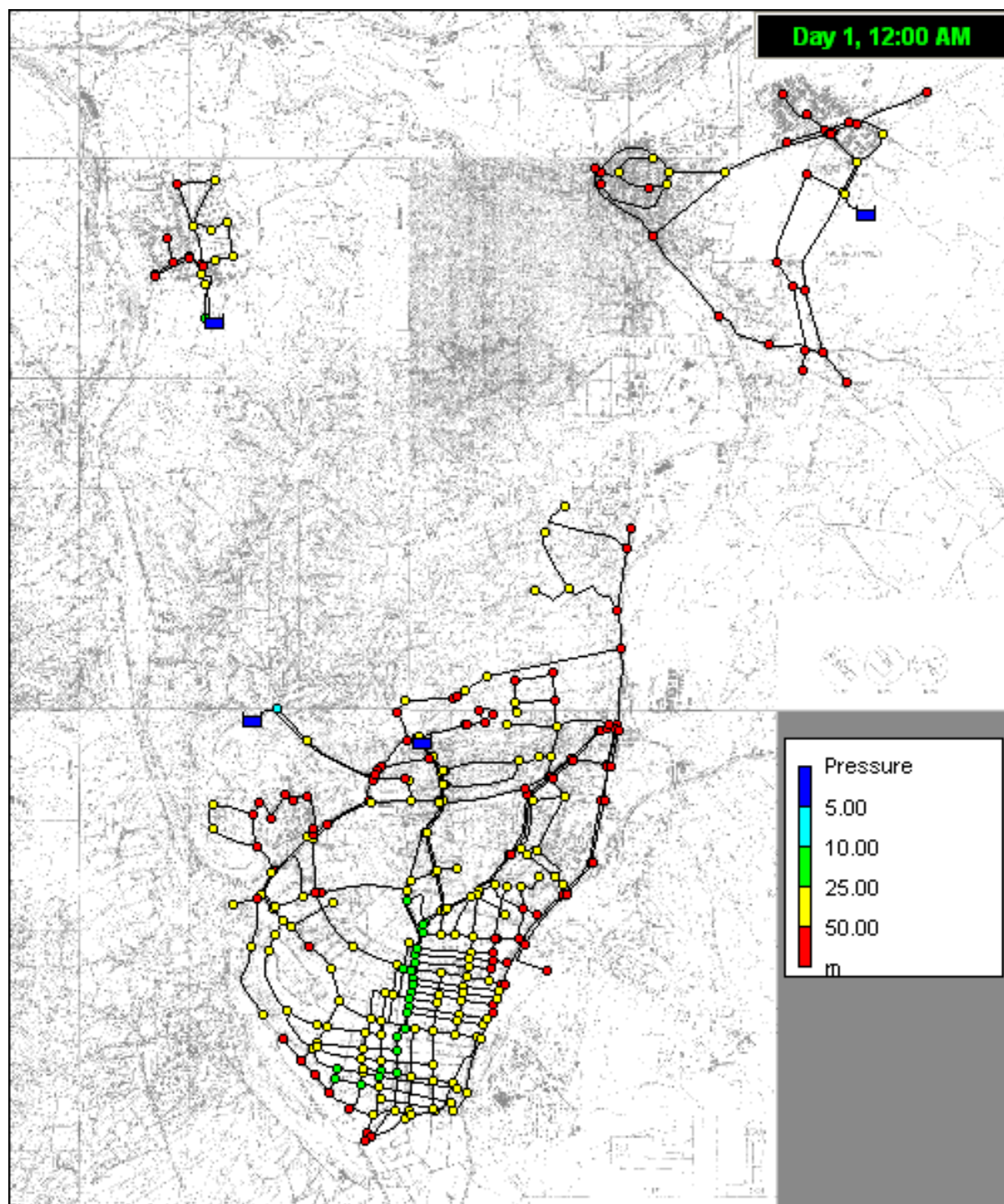
(4) Network Analysis Result in Max. Hourly Demand (2015)



(5) Data of Network Analysis Result in Max. Hourly Demand (2015)

NetworkTable-Nodes																							
Elevation Demand				Head Pressure				Elevation Demand				Head Pressure				Elevation Demand				Head Pressure			
NodeID	m	CMD		m	m	NodeID	m	CMD		m	m	NodeID	m	CMD		m	m	NodeID	m	CMD		m	m
June 10	565	175.2	622.9	57.9	June 127	598	617.2	633.46	35.46	June 244	540	215.6	586.53	46.53	June 137	575	204.4	597.66	22.66				
June 11	560	45.2	622.87	62.87	June 128	580	472	619.17	39.17	June 245	540	214.4	586.52	46.52	June 140	550	363.6	597.9	47.9				
June 12	565	73.2	622.8	57.8	June 129	578	496.5	614.75	36.75	June 42	537	568	581	44	June 143	550	38	597.9	47.9				
June 14	565	275.6	601.79	36.79	June 130	585	571.6	614.15	29.15	June 43	555	182	580.99	25.99	June 146	565	330	597.28	32.28				
June 15	570	242.4	622.47	52.47	June 133	597	416	629.74	32.74	June 44	550	916.4	579.96	29.96	June 147	570	77.2	597.27	27.27				
June 16	570	220.4	621.14	51.14	June 134	593	369	629.59	36.59	June 45	567	944.7	622.23	55.23	June 149	530	172.4	593.95	63.95				
June 22	525	540.8	594.11	69.11	June 135	570	111.6	629.93	59.93	June 62	565	1248.8	596.7	31.7	June 1	590	132.8	623.3	33.3				
June 31	540	206.8	604.85	64.85	June 138	572	643.8	629.36	57.36	June 246	562	284.2	587.06	25.06	June 3	565	242.8	614.61	49.61				
June 35	560	164.8	589.23	29.23	June 139	572	320.2	630.01	58.01	June 247	600	63.8	632.71	32.71	June 4	550	139.6	613.99	63.99				
June 36	550	179.2	586.67	36.67	June 141	600	529.3	631.19	31.19	June 248	562	1106.8	587.2	25.2	June 5	535	295.6	599.82	64.82				
June 37	560	237.6	587.04	27.04	June 142	585	551.9	631.03	46.03	June 250	590	396.4	625.45	35.45	June 6	545	70.4	610.76	65.76				
June 38	545	100.4	587.05	42.05	June 144	605	198.6	632.29	27.29	June 251	585	1053	623.09	38.09	June 7	570	138.8	620.66	50.66				
June 39	550	213.6	587.5	37.5	June 145	606	286.6	631.83	25.83	June 252	584	101	621.83	37.83	June 8	570	194.4	620.86	50.86				
June 40	565	479.6	593.21	28.21	June 148	584	453	630.99	46.99	June 254	578	279	622.98	44.98	June 9	545	284.4	610.77	65.77				
June 41	530	146	573.3	43.3	June 150	620	565.8	632.12	12.12	June 255	570	336.6	626.51	56.51	June 13	545	152.8	620.83	75.83				
June 46	500	283.6	573.59	73.59	June 153	606	762.6	631.57	25.57	June 256	606	440	626.68	20.68	June 17	545	34	620.83	75.83				
June 47	515	137.2	573.79	58.79	June 154	586	421.4	630.98	44.98	June 257	605	323.4	627	22	June 19	580	207.2	606.36	26.36				
June 48	490	96.8	573.58	83.58	June 155	586	428	630.97	44.97	June 258	580	820.7	619.65	39.65	June 20	575	128	610.23	35.23				
June 49	518	406.4	574.05	56.05	June 156	585	547	630.96	45.96	June 259	560	151.2	630.41	70.41	June 21	650	200.9	697.3	47.3				
June 50	520	673.6	560.06	40.06	June 157	584	196.8	630.88	46.88	June 260	595	68.4	630.45	35.45	June 23	625	159.2	697.04	72.04				
June 51	518	383.6	557.71	39.71	June 158	580	50.6	630.88	50.88	June 261	595	52.8	630.45	35.45	June 25	655	200.8	693.63	38.63				
June 52	512	360.4	557.72	45.72	June 160	576	56	630.71	54.71	June 268	605	552.6	630.41	25.41	June 26	645	142.4	694.38	49.38				
June 56	562	68	622.5	60.5	June 161	625	282.3	631.85	6.85	June 270	602	392.6	627.42	25.42	June 27	625	157.2	692.9	67.9				
June 59	563	112	622.58	59.58	June 162	623	482	630.14	7.14	June 192	590	301.8	630.48	40.48	June 28	578	140.2	631.34	53.34				
June 67	600	225.4	642.45	42.45	June 163	618	478.2	629.18	11.18	June 193	594	309	630.46	36.46	June 29	578	140.9	630.36	52.36				
June 68	600	249	625.61	25.61	June 164	617	375	628.51	11.51	June 202	601	592.6	630.46	29.46	June 221	572	663	628.51	56.51				
June 69	600	265.1	640.41	40.41	June 166	615	463	625.59	10.59	June 210	590	119.6	629.96	39.96	June 284	570	140.2	629.79	59.79				
June 71	600	404.6	637.52	37.52	June 167	615	453.8	624.8	9.8	June 214	592	111.6	630.01	38.01	June 285	570	139.6	629.48	59.48				
June 72	600	401	638.88	38.88	June 169	593	626.7	630.77	37.77	June 216	606	438	630.45	24.45	June 286	575	390.4	629.68	54.68				
June 73	600	231.9	641.04	41.04	June 170	587	467	630.77	43.77	June 217	600	98.8	630.23	30.23	June 287	575	392.8	629.17	54.17				
June 74	578	342.3	626.29	48.29	June 172	584	286	630.58	46.58	June 218	602	489.8	630.71	28.71	June 288	567	583.2	628.76	61.76				
June 75	570	205.8	626.89	56.89	June 174	598	394.2	631.2	33.2	June 219	565	491.6	619.04	54.04	June 289	575	714	629.42	54.42				
June 76	570	204.6	627.45	57.45	June 175	582	96.4	620.56	38.56	June 220	598	1053	631.23	33.23	June 290	575	715	628.6	53.6				
June 77	613	263.4	690.86	77.86	June 176	581	106	620.85	39.85	June 165	578	173.2	630.65	52.65	June 291	580	346.4	629.34	49.34				
June 78	608	227.6	640.19	32.19	June 178	580	147.2	629.5	49.5	June 168	578	199.6	630.72	52.72	June 292	581	239	629.34	48.34				
June 79	610	46.4	640.17	30.17	June 179	580	160	623.12	43.12	June 171	578	162.4	630.82	52.82	June 293	584	324	629.33	45.33				
June 80	630	233.1	696.19	66.19	June 180	580	160	623.92	43.92	June 173	590	387.4	614.43	24.43	June 294	590	120	629.33	39.33				
June 81	645	215.8	697.4	52.4	June 182	602	415.6	629.56	27.56	June 181	575	60	614.15	39.15	June 296	580	629.5	628.85	48.85				
June 82	630	299.2	689.5	59.5	June 183	600	378.2	630.23	30.23	June 184	595	633.6	614.27	19.27	June 297	610	451	689.1	79.1				
June 83	613	375.9	639.98	26.98	June 185	600	693	630.84	30.84	June 186	606	194	629.22	23.22	June 298	580	1143.4	633.25	53.25				
June 84	610	797.8	632.71	22.71	June 187	600	1208.2	631.15	31.15	June 189	598	263	630.08	32.08	June 299	580	1154.4	630.97	50.97				
June 85	590	590.6	680.89	90.89	June 188	588	1707.8	627.17	39.17	June 190	594	375.6	631.18	37.18	June 300	590	883.3	621.91	31.91				
June 86	556	344.6	582.06	26.06	June 194	572	972.6	611.99	39.99	June 191	620	411.3	632.71	12.71	June 301	578	276.6	630.32	52.32				
June 87	620	310.8	683.38	63.38	June 197	565	453	607.48	42.48	June 195	585	302	629.76	44.76	June 302	578	401.6	630.19	52.19				
June 88	610	151.6	681.89	71.89	June 199	590	537.6	624.68	34.68	June 196	570	54.4	630.1	60.1	June 303	615	194.8	631.85	16.85				
June 89	620	228	681.1	61.1	June 200	590	666	618.23	28.23	June 198	570	54	630	60	June 304	590	420.4	624.28	34.28				
June 90	600	286	679.47	79.47	June 201	564	757.4	616.78	52.78	June 215	606	699.4	636.64	30.64	June 305	592	416.6	623.48	31.48				
June 91	600	197.2	678.8	78.8	June 203	580	812.7	617.77	37.77	June 222	625	375.2	632.94	7.94	June 306	590	269.6	629.51	39.51				
June 92	620	344.2	696.99	76.99	June 204	570	610.8	593.09	23.09	June 224	605	145	636.64	31.64	June 307	592	409.8	620.99	28.99				

(6) Network Analysis Result in Max. Hourly Demand (2010)



(7) Data of Network Analysis Result in Max. Hourly Demand (2010)

NetworkTable-Nodes																																		
Elevation Demand				Head Pressure				Elevation Demand				Head Pressure				Elevation Demand				Head Pressure														
NodeID	m	CMD		m	NodeID	m	CMD		m	NodeID	m	CMD		m	NodeID	m	CMD		m	NodeID	m	CMD		m	NodeID	m	CMD		m	NodeID	m	CMD		m
Jun 10	565	154.12	623.34	58.34	Jun 127	598	542.95	635.9	37.9	Jun 244	540	189.66	594.66	54.66	Jun 137	575	179.81	607.67	32.67															
Jun 11	560	39.76	623.32	63.32	Jun 128	580	415.22	624.63	44.63	Jun 245	540	188.61	594.65	54.65	Jun 140	550	319.86	607.86	57.86															
Jun 12	565	64.39	623.26	58.26	Jun 129	578	436.77	621.14	43.14	Jun 42	537	499.67	594.53	57.53	Jun 143	550	33.43	607.86	57.86															
Jun 14	565	242.45	606.69	41.69	Jun 130	585	502.84	620.67	35.67	Jun 43	555	160.11	594.52	39.52	Jun 146	565	290.3	607.36	42.36															
Jun 15	570	213.24	623.01	53.01	Jun 133	597	365.96	632.96	35.96	Jun 44	550	806.16	593.7	43.7	Jun 147	570	67.91	607.35	37.35															
Jun 16	570	193.89	621.96	51.96	Jun 134	593	324.61	632.85	39.85	Jun 45	567	831.05	627.04	60.04	Jun 149	530	151.66	600.51	70.51															
Jun 22	525	475.74	600.64	75.64	Jun 135	570	98.17	633.11	63.11	Jun 62	565	1098.57	606.9	41.9	Jun 1	590	116.82	623.66	33.66															
Jun 31	540	181.92	609.11	69.11	Jun 138	572	566.35	632.66	60.66	Jun 246	562	250.01	599.3	37.3	Jun 3	565	213.59	616.81	51.81															
Jun 35	560	144.97	596.78	36.78	Jun 139	572	281.68	633.18	61.18	Jun 247	600	56.12	635.31	35.31	Jun 4	550	122.81	616.31	66.31															
Jun 36	550	157.64	594.77	44.77	Jun 141	600	465.63	634.11	34.11	Jun 248	562	973.65	599.42	37.42	Jun 5	535	260.04	605.14	70.14															
Jun 37	560	209.02	595.06	35.06	Jun 142	585	485.51	633.98	48.98	Jun 250	590	348.71	629.58	39.58	Jun 6	545	61.93	613.77	68.77															
Jun 38	545	88.32	595.07	50.07	Jun 144	605	174.71	634.98	29.98	Jun 251	585	926.32	627.72	42.72	Jun 7	570	122.1	621.58	51.58															
Jun 39	550	187.9	595.42	45.42	Jun 145	606	252.12	634.62	28.62	Jun 252	584	88.85	626.73	42.73	Jun 8	570	171.01	621.74	51.74															
Jun 40	565	421.9	599.93	34.93	Jun 148	584	398.5	633.95	49.95	Jun 254	578	245.44	627.63	49.63	Jun 9	545	250.19	613.78	68.78															
Jun 41	530	128.44	575.77	45.77	Jun 150	620	497.73	634.84	14.84	Jun 255	570	296.11	630.42	60.42	Jun 13	545	134.42	621.71	76.71															
Jun 46	500	249.48	576	76	Jun 153	606	670.86	634.41	28.41	Jun 256	606	387.07	630.55	24.55	Jun 17	545	29.91	621.71	76.71															
Jun 47	515	120.69	576.16	61.16	Jun 154	586	370.71	633.94	47.94	Jun 257	605	284.49	630.81	25.81	Jun 19	580	182.27	610.3	30.3															
Jun 48	490	85.15	575.99	85.99	Jun 155	586	376.51	633.94	47.94	Jun 258	580	721.97	625	45	Jun 20	575	112.6	613.35	38.35															
Jun 49	518	357.51	576.36	58.36	Jun 156	585	481.2	633.93	48.93	Jun 259	560	133.01	633.49	73.49	Jun 21	650	176.73	699.98	49.98															
Jun 50	520	592.57	565.33	45.33	Jun 157	584	173.12	633.87	49.87	Jun 260	595	60.17	633.52	38.52	Jun 23	625	140.05	699.78	74.78															
Jun 51	518	337.45	563.47	45.47	Jun 158	580	44.51	633.87	53.87	Jun 261	595	46.45	633.53	38.53	Jun 25	655	176.64	697.09	42.09															
Jun 52	512	317.04	563.48	51.48	Jun 160	576	49.26	633.73	57.73	Jun 268	605	486.12	633.49	28.49	Jun 26	645	125.27	697.68	52.68															
Jun 56	562	59.82	623.03	61.03	Jun 161	625	248.34	634.63	9.63	Jun 270	602	345.37	631.13	29.13	Jun 27	625	138.29	696.51	71.51															
Jun 59	563	98.53	623.09	60.09	Jun 162	623	424.02	633.28	10.28	Jun 192	590	265.49	633.55	43.55	Jun 28	578	123.33	634.23	56.23															
Jun 67	600	198.28	642.99	42.99	Jun 163	618	420.67	632.53	14.53	Jun 193	594	271.83	633.53	39.53	Jun 29	578	123.95	633.45	55.45															
Jun 68	600	219.05	629.71	29.71	Jun 164	617	329.89	631.99	14.99	Jun 202	601	521.31	633.53	32.53	Jun 221	572	583.24	631.99	59.99															
Jun 69	600	233.21	641.38	41.38	Jun 166	615	407.3	629.69	14.69	Jun 210	590	105.21	633.14	43.14	Jun 284	570	123.33	633.01	63.01															
Jun 71	600	355.93	639.1	39.1	Jun 167	615	399.21	629.07	14.07	Jun 214	592	98.17	633.18	41.18	Jun 285	570	122.81	632.76	62.76															
Jun 72	600	352.76	640.18	40.18	Jun 169	593	551.31	633.78	40.78	Jun 216	606	385.31	633.52	27.52	Jun 286	575	343.43	632.91	57.91															
Jun 73	600	204	641.87	41.87	Jun 170	587	410.82	633.78	46.78	Jun 217	600	86.91	633.35	33.35	Jun 287	575	345.55	632.52	57.52															
Jun 74	578	301.12	630.24	52.24	Jun 172	584	251.59	633.63	49.63	Jun 218	602	430.88	633.73	31.73	Jun 288	567	513.04	632.19	65.19															
Jun 75	570	181.04	630.72	60.72	Jun 174	598	346.78	634.12	36.12	Jun 219	565	432.46	624.53	59.53	Jun 289	575	628.11	632.71	57.71															
Jun 76	570	179.99	631.16	61.16	Jun 175	582	84.8	625.72	43.72	Jun 220	598	926.32	634.14	36.14	Jun 290	575	628.99	632.06	57.06															
Jun 77	613	231.71	694.9	81.9	Jun 176	581	93.25	625.95	44.95	Jun 165	578	152.36	633.68	55.68	Jun 291	580	304.73	632.65	52.65															
Jun 78	608	200.22	641.21	33.21	Jun 178	580	129.49	627.77	52.77	Jun 168	578	175.59	633.74	55.74	Jun 292	581	210.25	632.65	51.65															
Jun 79	610	40.82	641.19	31.19	Jun 179	580	140.75	627.74	47.74	Jun 171	578	142.86	633.82	55.82	Jun 293	584	285.02	632.64	48.64															
Jun 80	630	205.06	699.1	69.1	Jun 180	580	140.75	628.37	48.37	Jun 173	590	340.8	620.89	30.89	Jun 294	590	105.56	632.64	42.64															
Jun 81	645	189.84	700.07	55.07	Jun 182	602	365.6	632.82	30.82	Jun 181	575	52.78	620.67	45.67	Jun 296	580	553.77	632.26	52.26															
Jun 82	630	263.21	693.83	63.83	Jun 183	600	332.7	633.35	33.35	Jun 184	595	557.38	620.76	25.76	Jun 297	610	396.74	693.52	83.52															
Jun 83	613	330.68	641.04	28.04	Jun 185	600	609.63	633.83	33.83	Jun 186	606	170.66	632.56	26.56	Jun 298	580	1005.85	635.73	55.73															
Jun 84	610	701.82	635.31	25.31	Jun 187	600	1062.85	634.07	34.07	Jun 189	598	231.36	633.23	35.23																				

Annex- 7 Study on the Effect Indices in this Project

Effects on leakage reduction and pressure stability through this project are evaluated in the cases of with and without the project. The major difference between both cases is pumping flow without the project and gravity flow from reservoirs with the project. The estimation was conducted using network analysis software, EPANET2.

(1) Conditions of Evaluation

- 1) Evaluation year: 2010 (target year of this project)
- 2) Project: No (water supply by pumps) / Yes (gravity flow from reservoirs)
- 3) Condition values:
 - Water consumption per person per day excluding leakage
 - Default leakage ratio
 - Population
 - Average daily demand

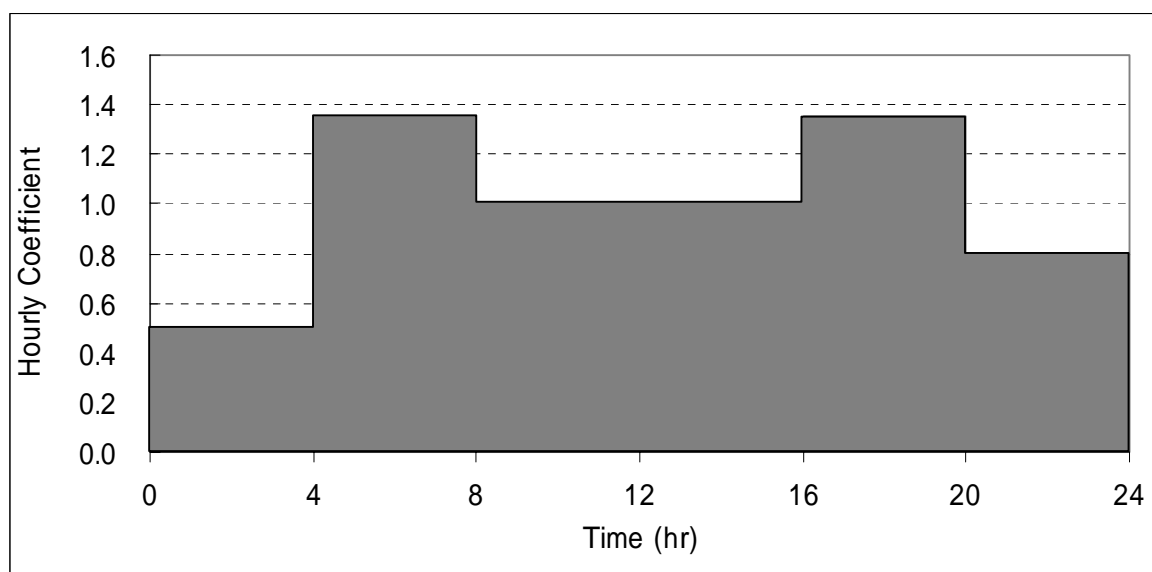
	Unit	2005	2010
Water consumption per person per day excluding leakage	Lpcd	90	108
Initial set leakage ratio	%	31	28
Planned population		336,265	373,711
Average daily supply	m ³ /d	43,700	56,100

	Population			Average daily demand (m ³ /d)		
	2005	2010	2015	2005	2010	2015
Distribution Area						
Zarqa Low	270,315	297,236	320,299	35,100	44,600	50,000
Zarqa High	33,587	39,860	48,028	4,400	6,000	7,500
Hashemeyeh	18,754	21,218	23,773	2,400	3,200	3,700
Sukhna	13,609	15,397	17,251	1,800	2,300	2,700
Total	336,265	373,711	409,351	43,700	56,100	63,900

4) Hourly Change Patterns of Water Demand

Hourly change patterns of water demand are set as follows. Furthermore, since water is continually stored in tanks even at night, the value of night flow is set a little higher.

Hours	0-4	4-8	8-12	12-16	16-20	20-24
Hourly coefficient	0.5	1.35	1	1	1.35	0.8



5) Pump Operation Patterns

a) Distribution pump operation patterns without project implement

Efficient pump operation patterns (units control) in accordance with water demand are set as followings:

No	Pump Stations	Pump No.	Pump No. EPANET2	Pump Curve No. EPANET2	Capacity m ³ /day	Total head (m)	Capacity (m ³ /h)	Operation (hours)					
	Hours							0-4	4-8	8-12	12-16	16-20	20-24
1	Khaw P.S. Amman To Amman	1			12000	350	500	-	-	-	-	-	-
		2			7200	360	300	-	-	-	-	-	-
		3			9120	380	380	-	-	-	-	-	-
		4			9120	380	380	-	-	-	-	-	-
		5			7200	350	300	-	-	-	-	-	-
		6			9120	380	380	-	-	-	-	-	-
		7			12000	350	500	-	-	-	-	-	-
		8			12000	350	500	-	-	-	-	-	-
		9			7200	350	300	-	-	-	-	-	-
		10			12000	350	500	-	-	-	-	-	-
	Khaw P.S. - Zarqa To Zarqa P.S . Al Hashmiyah P.S . and Al Batrawi P.S.	1	247	2	12000	150	500	X	X	X	X	X	X
		2	246	2	12000	150	500	X	X	X	X	X	X
		3	237	2	12000	150	500	X	X	X	X	X	X
		4	278	1	7200	150	300	X	X	X	X	X	X
		5	195	1	7200	150	300	X	X	X	X	X	X
		6	248	2	12000	150	500	X	X	X	X	X	X
2	Zarqa P.S. Inside To Zarqa, Batrawi and Al Balad	1	306	3	7200	100	300	O	O	O	O	O	O
		2	302	3	7200	100	300	O	O	O	O	O	O
		3	301	3	7200	100	300	O	O	O	O	O	O
		4	300	4	7200	120	300	X	O	O	O	O	O
	Zarqa P.S. Outside To Ruseifa , Ma'asoom , Al Hashimiyeh Al Janoubiyeh , Al Batrawi and Zarqa Al Balad	5	282	5	12000	250	500	X	X	X	X	X	X
		6	252	5	12000	250	500	X	X	X	X	X	X
		7	251	6	7200	250	300	X	X	X	X	X	X
		8	289	7	12000	230	500	X	X	X	X	X	X
		9	307	8	7200	275	300	X	X	X	X	X	X
		10	308	4	6000	170	250	X	O	X	X	O	X
		11	309	3	7200	100	300	X	O	O	O	O	O
3	Al-Hashemeyeh Station To Hashimiyeh city To Sukhna city	1	80	9	3600	150	150	X	O	X	X	O	X
		2	52	9	3600	150	150	X	O	O	O	O	X
		3	255	10	2880	125	120	O	X	X	X	X	O
		4	85	11	1920	120	80	O	X	O	O	X	O
4	Al Sukhna Booster To Bany Hashem Villeges	1			1200	200	50	-	-	-	-	-	-
		2			1800	132	75	-	-	-	-	-	-
5	Al Batrawi P.S. To Zarqa	1	295	12	3600	100	150	O	O	O	O	O	O
		2	192	12	3600	100	150	X	O	O	O	O	X
6	Zarqa desalination plant P.S. To Zarqa P.S.	1			9600	50	400	-	-	-	-	-	-
		2			14400	50	600	-	-	-	-	-	-
		3			10800	50	450	-	-	-	-	-	-

O : On

X : Off

b) Distribution pump operation patterns with project implement

In the case of project implementation, gravity flow from reservoirs makes pump operation unnecessary. Pressures from reservoirs are set as following. As the variation of water level in reservoirs is small, it was not considered for calculation.

Reservoirs	Low water level in reservoir (m)
Zarqa Low	645
Zarqa High	710
Hashemeyeh	620
Sukhna	585

(2) Effects on Leakage Reduction and the Improvement of Water Pressure (2010)

1) Estimation Methods

Based on above conditions, pipe network simulations (EPANET 2) were executed in two scenarios; project implementation and no implementation, and the pressure change according to average daily demand was assumed. Afterwards, based on the results of pressure change in the two cases, change in leakage reduction was calculated by the following leakage volume conversion formula.

$$Q = Q_0 \times (P / P_0)^N$$

Where,

Q: Leakage volume after the project (project implementation scenario)

Q₀: Leakage volume before the project (no project implementation scenario)

N: Index (=1) (Value of N varies from about 0.5 to more than 1.5 depending upon the pipe material in the network and the shape of leakage holes. The N value is lowest for rigid pipes such as metal pipes and higher for flexible pipes such as PE or PVC pipes. For mixed pipe conditions such as encountered in Zarqa, a N value of 1 is recommended)

P₀: Water pressure before the project

P: Water pressure after the project

2) Results of Estimation

a) Estimated Results of Hourly Pressure Change

The following table shows estimated average hourly water pressure in service areas in a day of daily average water supply. The average water pressure will reduce to 54 m above the ground with the project from 66 m without the project.

Average Hourly Pressure in Service Areas (m)

Time	0-4	4-8	8-12	12-16	16-20	20-24	Average
Without Project	90	40	68	68	40	90	66
With Project	59	49	54	54	49	56	54

b) Estimated Water Supply and Leakage

Description	Unit	Without the project	With the project
Total population	-	373,711	373,711
Total water supply	m ³ /d	56,100	56,100
Estimated average water pressure (calculated by pipe network analysis)	m	66	54
Estimated leakage ratio	-	0.31 (Current estimate)	0.25 (Calculated with above formula)
Estimated total water consumption	m ³ /d	38,709	42,075
Estimated total leakage volume	m ³ /d	17,391	14,025
Estimated water consumption per person per day	L/person/d	104	113

c) Percentage of Undesirably Low Water Pressure

Hours	0-4	4-8	8-12	12-16	16-20	20-24
Without the project						
Nodes of good pressure	297	207	294	294	207	297
Nodes of undesirably low pressure*1	0	90	3	3	90	0
Percentage of undesirably low pressure (%)	0	30	1	1	30	0
Trial calculation*2 - Percentage of undesirably low pressure at daily Max. demand (%)	0	70	36	36	70	0
With the project						
Nodes of good pressure	297	297	297	297	297	297
Nodes of undesirably low pressure*1	0	0	0	0	0	0
Percentage of undesirably low pressure (%)	0	0	0	0	0	0
Trial calculation*2 - Percentage of undesirably low pressure at daily Max. demand (%)	0	0	0	0	0	0

Notes *1: Undesirably low pressure: Pressure below 10 m

*2: Pump operation was assumed at average daily demand

d) Conclusions

The calculation shows that after the project the leakage ratio will decrease to 25% from 31%. For the beneficiary population of 374,000, actual available water per person per day will increase from 104 liters to 113 liters, an increase of about 9%. Moreover, in the case of without the project, when water consumption peaks during daytime, pressure is less than 10 m in up to 30% of the areas (equal to 112,000 people) but after the project, all the areas will have more than 10 m pressure. Furthermore, when the water demand is more than average daily demand, percentage of undesirably low pressure area increases and at maximum daily demand percentage of undesirably low pressure areas reaches 36% to 70% depending on the time. However, after the project, no area will have pressure lower than 10 m even during the time of maximum daily demand.

Once distribution zones have been established clearly and water is supplied to each zone directly from reservoirs by gravity, there will be less fluctuation of water pressure in the network and also the number of pipe bursts in service and distribution pipes will decrease drastically in comparison to present situation. Therefore, a significant decrease in leakage could be expected. Other benefits include the followings.

- Decrease in pipe break accidents
- Lower investment and less effort required for leakage control
- Easy maintenance could be expected once pumping supply has been changed to gravity flow
- Easy pump operation
- Cost down on pump operation (electricity fee)
- Easy management of water supply (while using pumps, pressure management is difficult)
- Pipe break accidents occurring at high-pressure pipes around pumping stations will decrease.

Suspension of water supply due to pipe breaks will decrease. Leakage control strategies will become easier.

- Establishment of sub-blocks in distribution zones and the implementation of leakage reduction strategies will become easier (leakage control strategies will be improved by skills acquired through “the Capacity Development Project for NRW Reduction” implemented by JICA)
- In areas with undesirably low water pressure, people receive water from tankers operated by WAJ or private companies. This situation will improve.

As mentioned above, effects on leakage reduction, equitable water supply as well as easier facility maintenance could be expected.

e) To reduce leakage ratio further down

After the establishment of distribution zones, leakage ratio is supposed to be reduced to about 15% through the following strategies.

Strategies		Implementation
(1)	Establishment of sub-distribution zones and implementation of planned leakage control works as envisaged by the Capacity Development Project for NRW Reduction	to be implemented by WAJ.
(2)	Replacement of galvanized steel service pipes by HDPE pipes	to be implemented by WAJ
(3)	Improvement in the installation method of service pipes	need to be highlighted by the Capacity Development Project for NRW Reduction and to be implemented by WAJ.
(4)	Replacement of aging steel pipes	to be implemented by WAJ.

Annex- 8 Environmental and Social Impacts of the Project implementation

(1) Evaluation System of Environmental Impact in Jordan

Administration for the evaluation of environmental impact in JORDAN is undertaken by the Environmental Impact Assessment Directorate in the Ministry of Environment. Evaluation of environmental impact is prescribed in EIA Bylaw No. 37/2005. Procedures of EIA are as following.

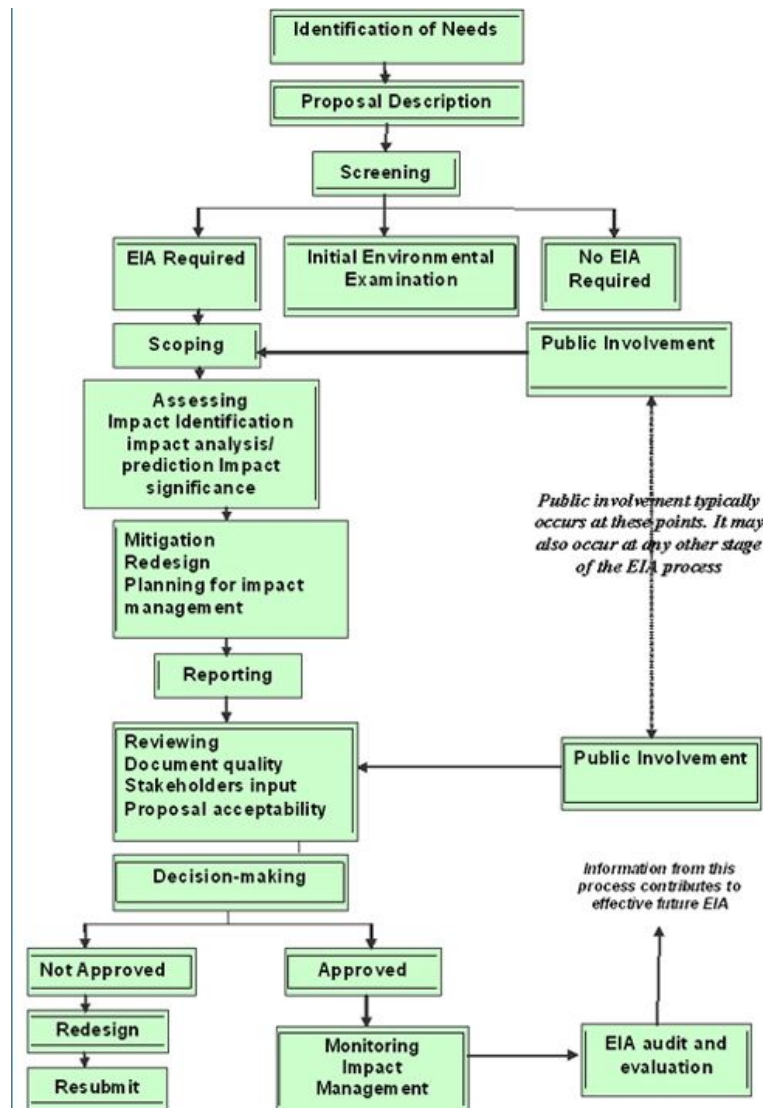
Main procedures of EIA

- If proposed project is a project requiring EIA, the responsible party will be notified and requested to invite qualified consultants to draw up TOR (draft).
- Date and place of scope sessions should be decided under the participation of the party and stakeholders.
- In scope sessions, considerations and worries of stakeholders as well as comments from the technical committee in the Ministry of Environment should be obtained. The results of sessions should be included in drawing up TOR.
- EIA study according to the approved TOR commences at this stage.
- For the approval of technical committee, EIA report (draft) is submitted to EIA bureau.
- If the contents of the EIA study are not in accordance with the approved TOR, the responsible party should revise, change or re-study.
- If EIA study conforms to the approved TOR, the study report will be accepted and project will be implemented.

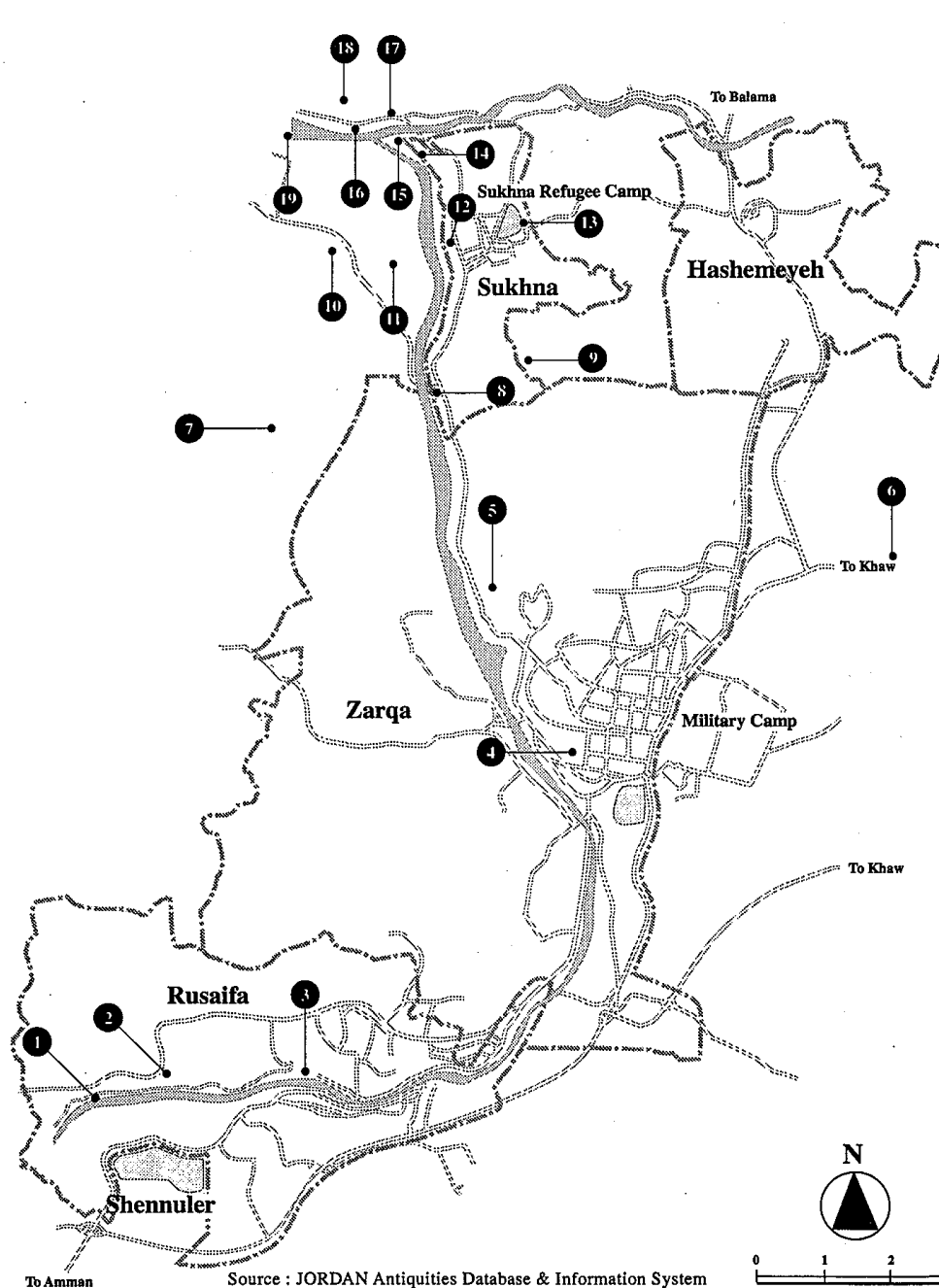
(2) Environmental Affects of the Project

Environmental affects related to this project are as follows.

	Items	Descriptions
1)	Historic spots	About 19 historic spots are specified in the target area by the archeology and anthropology agency (see the drawing). However, the level of culture heritage is low and none of these historic spots is in the scheduled construction sites.
2)	Ground water	As this project does not consist of ground water extraction, ground water level will not drop down.
3)	Resident relocation	There is no house in the construction sites of reservoirs. In addition, planned pipes are buried in public compounds. Thus, resident relocation will not be required.
4)	Land acquisition	As construction sites of reservoirs in Hashemeyeh and Sukhna are private land, land acquisition is required. It is necessary to follow the land acquisition procedures of MWI to acquire land properly.
5)	Landscape	Landscape changes because of the constructions of reservoirs. However, no information shows there is any specified landscape reserve area. It is evaluated that there will be no effect from the project.
6)	Noises	Construction noises will occur. However, noises are from general construction machineries, and it will occur temporarily only during construction. Additionally, planned pump facilities are supposed to be put inside the buildings and the noises and vibrations are low, which will not make any problem to the public.



A Flow Chart Depicting the Process for Environmental Impact Assessment in Jordan



Source: JICA's Development Study 「 Study on the Water Supply Improvement Project in Zarqa Area in JORDAN (1996) 」

(3) Confirmation of the Requirement of EIA

Regarding the land acquisition for reservoirs, pump stations, and transmission routes under this project, it is confirmed that EIA is not required under the laws in JORDAN.

Under EIA institution, committee meeting is held once a week to screen the requirement of EIA. The Study Team attached the results of IEE made by its own and submitted along with the facility components of this project for approval. The committee meeting was held in Dec. 2005 and the Study Team was notified of the results in January 2006. The letter received by the Study Team from the Ministry of Environment mentioned that this project was an infrastructure project requiring a comprehensive EIA as per EIA Bylaw No 37 /2005. However, upon further review and consideration of the nature of this project, the earlier decision was revised and

the project has been exempted from a comprehensive EIA requirement. An official letter from the Ministry of Environment has been obtained by the Study Team in this regard. A scanned copy of this letter has been included in the following sections.

(4) Confirmation Letter for the Requirement of EIA

2005/12/14

Our Ref No: Jordan-Zarqa2-03

Subject: Request for Review for EIA

To: Ministry of Environment

Dear Sir,

The major components of the Project for the Improvement of the Water Supply System for the Zarqa District (Phase II) are shown in the attachment.

Please kindly review the project components and provide us with your valuable comments from the social and environmental aspects and the necessity of Environmental Impact Assessment (EIA) for the Project. We would highly appreciate if you give us a letter that includes the results of your review, i.e., the necessity of EIA and your valuable comments.

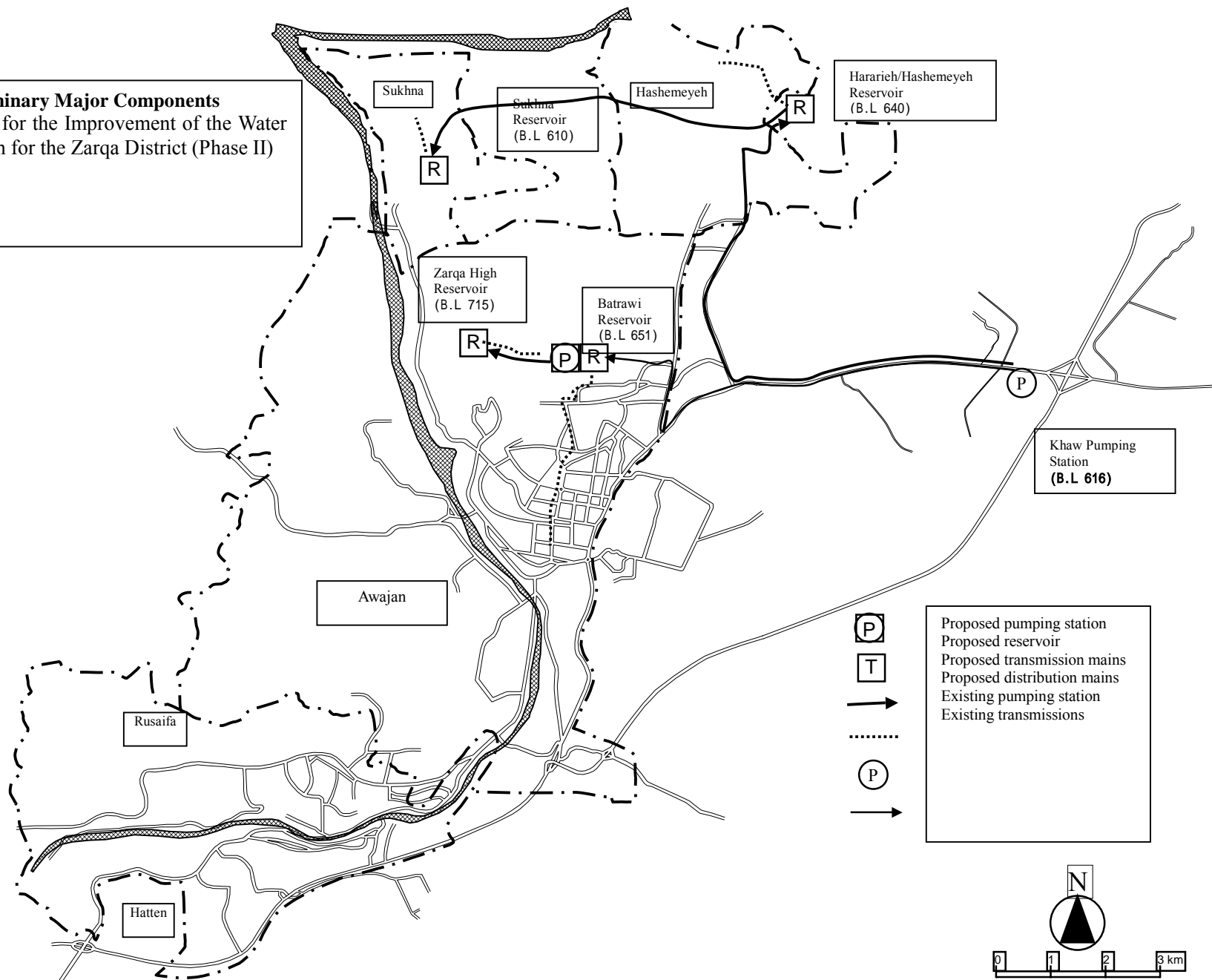
Yours sincerely,

Hiroataka Sato
Chief Consultant
JICA Study Team

**Preliminary Major Components of
Project for the Improvement of the Water Supply System for the Zarqa District (Phase II)**

Work items	Project Components	Specification	Remarks
Construction of Distribution Reservoirs	(1) Zarqa High Zone Service Reservoir	2000 - 3000 m ³	The land is vacant lot.
	(2) Hashemeyeh Service Reservoir	1000 - 2000 m ³	The land is vacant lot.
	(3) Sukhna Service Reservoir	Approx 1000 m ³	The land is vacant lot.
	(4) Batrawi Service Reservoir	10,000 – 15,000 m ³	WAJ land.
Construction of Transmission Pipelines	(1) Batrawi Pump Station to Zarqa High Zone Service Reservoir	Approx 2 km	All pipes will be installed under the rights of way.
	(2) Khaw Pumping Station to Hashemeyeh Service Reservoir	Approx 10 km	
	(3) Hashemeyeh Pumping Station to Sukhna Service Reservoir	Approx 8 km	
Construction Pump Station with Pump equipment and Substation Equipment	(1) Batrawi Pumping Station		The proposed site is WAJ owned land.
Construction of Distribution Mains		Dia. 500 mm to 200 mm L = Approx 10 km	All pipes will be installed under the rights of way.

Preliminary Major Components
of the Project for the Improvement of the Water
Supply System for the Zarqa District (Phase II)



(5) Results of EIA Screening (Initial Letter from the Ministry of Environment)

04/01/2006 07:38 88962-6-5527989 AHMAD QATARNE

بسم الله الرحمن الرحيم

المملكة الأردنية الهاشمية
وزارة البيئة
عمان

THE HASHEMITE KINGDOM OF JORDAN
Ministry of Environment
AMMAN

Ref: 13.4.8
Date: 2.1.2006

السرفم
التاريخ
الموافق

Att. Rasha Dababneh

Mr. Hirotaka Sato
Chief Consultant
JICA Study Team

Subject: Project of the Improvement of Water Supply System for Zarqa District (Phase II)- EIA

Dear Mr. Sato,

With reference to your letter of Ref. No. Jordan – Zarqa 2-03, dated on Dec. 8, 2005, I would like to thank you for your efforts and support.

I would like to inform you, based on the EIA Bylaw No. 37 / 2005, a decision has been made by the National Technical Committee for EIA Study Review, that the above mentioned project is considered as an infrastructure project which requires a comprehensive EIA study.

However, for more details and information, you can contact our staff at the ministry.

Best regards.

Sincerely yours

Khalid Anis Irani
Minister of Environment

هاتف ٥٥٦٠١١٣ - فاكس ٥٥٦٠٢٨٨ - ص.ب ١٤٠٨ عمان - ١١٩٤١ - الأردن
Tel. 5560113 - Fax 5560288 - P.O. Box 1408 Amman - 11941 - Jordan
E-mail: moenv@moenv.gov.jo
Web site: www.moenv.gov.jo

(6) Official Letter Mentioning Non-requirement of EIA from the Ministry of Environment

15/02/06 17:13 FAX 0096265858924

JICA JORDAN OFFICE
MINS ENV

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002
PAGE 01/01

بسم الله الرحمن الرحيم

JD/64-033J 2/2

THE HASHEMITE KINGDOM OF JORDAN
Ministry of Environment
AMMAN



المملكة الأردنية الهاشمية
وزارة البيئة
عمان

Ref: 47467
Date: 13/2/2006

رقم	تاريخ	الموافق
13/2/2006		

الرقم
التاريخ
الموافق

Mr. Hirotataka Sato
Project Chief Consultant
JICA Study Team

Subject: Project of the Improvement of Water Supply System for Zarqa District (Phase II) - EIA

Dear Mr. Sato,

With reference to your letter no. Jordan - Zarqa 3-11 dated on January 12, 2006 regarding the above-mentioned subject, I would like to inform you that the National Committee for EIA Study Review has reassessed the need for a comprehensive EIA study for the stated project, considering the following justifications:

1. The project aim is to rehabilitate and improve the existing water supply system in Zarqa District, not to initiate a new project.
2. Only one phase of the project (construction phase) may have some environmental impacts. However, this phase is still a contemporary one, with time limit.

Consequently, the final decision taken is that: EIA study is not needed for the project, although some precautions and mitigation measures should be taken into consideration, in order to protect the various environmental elements in the project area.

Sincerely Yours,

Khaled Anis Irani

Minister of Environment

CC: Eng. Khaled Al-Kodab, Assistant Secretary General, WAJ, MWI

12/2/06

م. ٥٥٦٠١١٣ - فاكس ٥٥٦٠٢٨٨ - ص.ب ١٤٠٨ عمان - ١١٩٤١ - الأردن

Tel. 5560113 - Fax 5560288 - P.O. Box 1408 Amman - 11941 - Jordan

E-mail: moenv@moenv.gov.jo

Web site: www.moenv.gov.jo

(7) Official Letter Mentioning Non-requirement of EIA from the Ministry of Water and Irrigation (The letter from MOE in the next page was attached.)



الجمهورية الأردنية

وزارة المياه والري

سلطة المياه

Ministry of Water & Irrigation
Water Authority



The Hashemite Kingdom
Of Jordan

Ref. No. A/7/2/ 2661 Date 27/2/2006

التاريخ

الرقم

JICA study Team

Japan International Cooperation Agency (JICA)

Tokyo Engineering Consultants Co., Ltd. (TEC)

3-7-4 kasumigaseki, Chiyoda-Ku, Tokyo 100-0013, Japan

Tel: Tokyo 81-3-3580-2418 Fax: Tokyo 81-3-3591-04

Subject: Project of the Improvement of Water Supply System for
Zarqa District (Phase II) - EIA

Dear Sir,

Please be informed that Ministry of Environment has Exempted this project from comprehensive EIA study. Attached is the Ministry of Environment letter No 4/7/468 dated February 13, 2006

For your kind information and necessary action

Best Regards,

Secretary General/ WAJ

Eng. Munther Khleifat

المهندس خالد القضاة

مساعد الأمين العام لشؤون المياه

Cc: ASG/ Water Affairs

Cc: Resident Representative, JICA Jordan Office

Cc: Circulation

Ast JICA

هاتف ٥٦٨٠١٠٠ / ٥٦٨٣١٠٠ فاكس ٥٦٧٩١٤٣ ص.ب ٢٤١٢ عمان ١١١٨٣ الأردن أو ص.ب ٥٠١٢ عمان ١١١٨١ الأردن
Tel.5680100 - 5683100 Fax.5679143 P.O.Box 2412 Amman 11183 Jordan or P.O.Box 5012 Amman 11181 Jordan

(8) Official Letter Mentioning Non-requirement of EIA from MOE

٢٨٢
THE HASHEMITE KINGDOM OF JORDAN
Ministry of Environment
AMMAN

بسم الله الرحمن الرحيم



مملكة الأردنية الهاشمية
وزارة البيئة
عمان

Ref. :
Date :

المرفق :
التاريخ :
الموافق :

عطوفة أمين عام سلطة المياه

إشارة إلى كتابكم رقم س م/٢٧/١٢٥٩ تاريخ ٢٠٠٩/٢/١ بخصوص دراسة تقييم
الأثر البيئي لمشروع إعادة تأهيل شبكة المياه في الزرقاء.

أرجو عطوفتكم التكرم بالعلم بأن الموضوع قد أعيدت دراسته من قبل اللجنة الفنية
لمراجعة دراسات تقييم الأثر البيئي في ضوء الحثيات والأنشبات الواردة في كتابكم أعلاه.
واستنادا إلى توصية اللجنة بهذا الخصوص أقرر إعفاء المشروع من دراسة تقييم الأثر
البيئي.
راجيا عطوفتكم التكرم بالإيعاز لمن يلزم بإيلاء موضوع المحافظة على البيئة
الأهمية القصوى، واتخاذ الإجراءات الكفيلة بالحد من الأثر البيئية السلبية الناجمة عن
تنفيذ المشروع.

واقبلوا فائق الاحترام،،،

/المهندس خالد أنيس الإيراني

وزير البيئة

المهندس أحمد الخطيب

مساعد الأمين العام

نسخة/ مدير تقييم الأثر البيئي
نسخة/ الملف

هاتف ٥٥٦٠١١٣ - فاكس ٥٥٦٠٢٨٨ - ص.ب ١٤٠٨ عمان - ١١٩٤١ - الأردن
Tel. 5560113 - Fax 5560288 - P.O. Box 1408 Amman - 11941 - Jordan
E-mail: moenv@moenv.gov.jo
Web site : www.moenv.gov.jo

Annex- 9 Projects Underway in WAJ

WAJ has been commissioning a local engineering consultant to draw up improvement projects for the distribution pipe networks in 3 central Governorates, Zarqa, Madaba and Balqa from Jan. 2004. Target areas of this project are all included in Zarqa Governorate. Objectives of this project are: a) establishment of pipe network simulation model, b) basic design for the expansion and replacement of transmission pipes and distribution systems, c) drawing up of detailed design and tender documents for part of target area. The study period has been divided into feasibility study (including items a and b) and detailed design (item c) periods. At present, Dec. 2005, pipe network simulation based on the prediction of demand has been finished.

As target year is 2025, water demand at that time is assumed, and planning frame such as population prediction and water production are based on NWMP (National Water Master Plan). The target year is longer than that in NWMP. Thus, water production under this project is supposed to be the same even in 2025 or 2020. While assuming the water demand, it is supposed that the projects for the development of water resources, water transmission, and leakage reduction planned by NWMP will have been achieved. Domestic demand per person in 2025 is assumed to be 130 liters, which is close to the national target of 150 liters.

The main objective of this project is to control water pressure and reduce leakage as well as non-revenue water by changing pumping water supply to gravity flow and installing pressure regulating devices. Project components consist of transmission pipes, distribution pipes, pumping stations, reservoirs, and valves. Estimated cost for projects till 2005 is shown as below.

Cost of Projects (JOD)

Areas	Material cost for pipes, valves and other accessories	Construction cost	Machinery and electricity cost	Total
Zarqa Area	8,299,500	1,665,000	2,495,000	12,459,500
Ruseifa Area	5,457,000	435,000	625,000	6,517,000
Total	13,756,500	2,100,000	3,120,000	18,976,500

Notes: The following costs are excluded

- Technical fee and allowances

- Repairing of service pipes

- Replacement of distribution mains

- Facilities for water transmission from other Governorates (out of scope of this project: implemented under the National Water Supply Scheme)

- Development of water resources (out of scope of this project: implemented under the National Water Supply Scheme)

- Water treatment for low quality water resources

Planned reservoirs in Sukhna, Hashemeyeh and Zarqa high area and part of transmission pipes are to be constructed by Japanese Grant Aid and included in the project.

The study is still underway. The planned project is supposed to commence after the Grant Aid Project. This project should consider the facilities included in the Grant Aid Project.

Upon completion, the Grant Aid Project will produce intended results of improvement in service and reduction in leakage irrespective of the progress of other projects. However, much better results in leakage reduction can be realized if the repairing of service pipes, replacement of distribution mains and installation of pressure regulating devices etc. are included and executed in the planned project.

Annex- 10 Water Quality Data (Zarqa WAJ Office)

(1) Chemical parameters

Chemical tests results (WAJ laboratory)

Area: Zarqa

Month: June 2004

No.	Sample site	Date	E.C.	T.D.S	pH	NO ₃	Ca	Mg	Na	K	Cl	SO ₄	HCO ₃
1	Zarqa PS	6/1	1376	880.64	7.84	26.04							
2	Zarqa-Hashemeyeh line	6/1	3360	2150.4	7.5	56.03							
3	Zarqa-Khaw line	6/1	744	476.1	8.19	10.68							
4	Zarqa treatment station	6/1	2590	1657.6		66.35							
5	Zarqa well 14	6/1	3310	2118.4	7.6	73.98							
6	Zarqa well 14A	6/1	3110	1990.4	7.7	69.28							
7	Zarqa well 16	6/1	3370	2156.8	7.55	69.75							
8	Hashemeyeh well 2	6/1	3510	2246.4	7.56	56.88							
9	Hashemeyeh well 3	6/3	3410	2182.4	7.26	59.13							
10	Hashemeyeh well 5	6/3	3500	2240	7.3	58.03							
11	Hashemeyeh booster	6/3	1640	1049.6	7.35	25.21							
12	Qunia PS	6/6	854	546.56	7.4	44.68							
13	Sarut PS	6/6	1157	740.48	7.73	41.53							
14	Alouq PS	6/6	1356	867.84	7.43	49.09							
15	Bereen well 2	6/6	1174	751.36	7.82	41.59							
16	Bereen well 3	6/6	1130	723.2	7.67	43.86							
17	Zarqa PS	6/6	1440	921.6	7.86	24.98							
18	Zarqa treatment station	6/6	2780	1779.2	7.68	66.85							
19	Um-Rumanh booster PS	6/6	1132	724.48	7.78	41.18							
20	Hashemeyeh University Tank	6/8	1824	1167.4	8.08	36.66							
21	Khaw PS	6/8	1000	640	7.97	5.92							
22	Khaw-Hashemeyeh line	6/8	475	304	8.4	9.5							
23	Khaw-Azraq line	6/8	971	621.44	8.29	5.83							
24	Khaw-Zaatri line	6/8	1130	723.2	8	20.61							
25	Merhab PS	6/8	891	570.24	8.13	13.52							
26	Tamween well 3	6/8	1129	722.56	7.79	2.57							
27	Tamween well 4	6/8	960	614.4	7.74	0.58							
28	Tamween well 5	6/8	1073	686.72	7.63	2.85							
29	Hemor well	6/8	817	522.88	7.95	17.62	58.32	42.8	42.1	3.56	85.2	30.8	289.8
30	Um-Rumanh well	6/11	1077	689.28	7.86	3.6	72.54	53.63		7.82	110.05	128.16	333.94
31	Zarqa treatment station	6/14											
32	Um-Ramah well	6/14	1185	758.4	7.78	2.32							
33	M. Abu Khorma well	6/10				8.93							
34	Hemor well	6/10	817	522.88	7.95	17.62	58.32	42.8	42.09	1.56	85.2	30.72	289.75
35	Mofeed house	6/16	1435	918.9	7.98	44.84							
36	Mofeed house	6/16											
37	Basateen PS	6/20	1360	870.4	7.64	46.9							
38	Awajan reservoir	6/20	1428	913.9	8.02	36.68							
39	Awajan well 21	6/20	1881	1203.8	7.51	63.9							
40	Awajan well 22	6/20	1865	1193.6	7.64	65.82							
41	Awajan well 23	6/20	1530	979.2	7.59	60.43							
42	Zarqa treatment station	6/20	2540	1625.6	7.6	70.45							
43	Azraq PS	6/21	835	534.4	8	6.5							
44	Halabat PS	6/21	428	273.9	8.16	9.41							
45	Zarqa PS	6/23	1361	871.04	7.72	29.47							
46	Zarqa treatment station	6/23											
47	Zarqa treatment station	6/23											
48	Zarqa treatment station	6/23											
49	Basateen PS	6/23	1300	832	7.49	45.45							
50	Zarqa treatment station	6/27	2820	1806.8	7.89	74.18							
51	Zarqa treatment station	6/27	1420	908	8.03	29.18							
52	Abu-Nadi well	6/30	2080	1331.2	8.04	39.56	98.4	44.02	250.7	9.78	450.14	226.1	96.4
53	Abu-Nadi well	6/30	Mn<0.05, Cu=<0.01, Cr=<0.05, Pb=<0.01, Ni=<0.01, Cd=<0.003, Fe=0.04, Zn=0.03										

(2) Biological parameters

Biological tests results (WAJ laboratory)

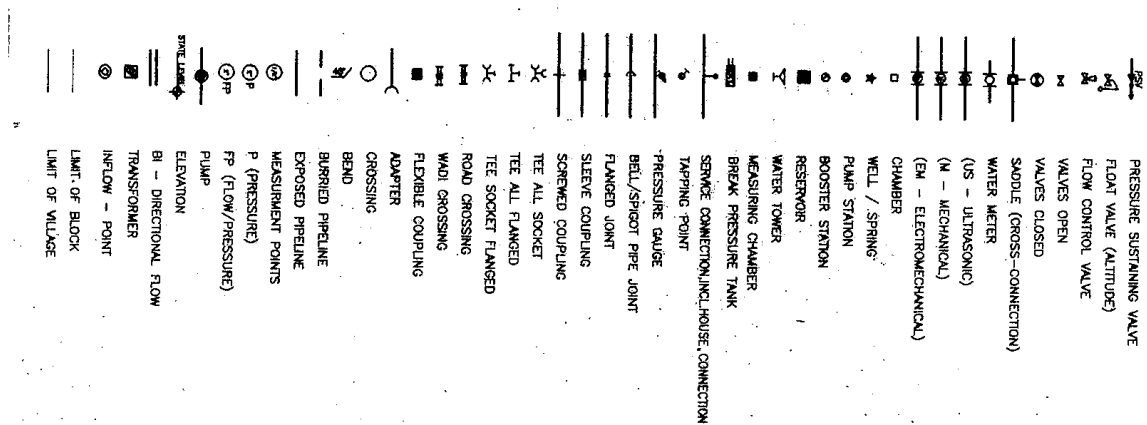
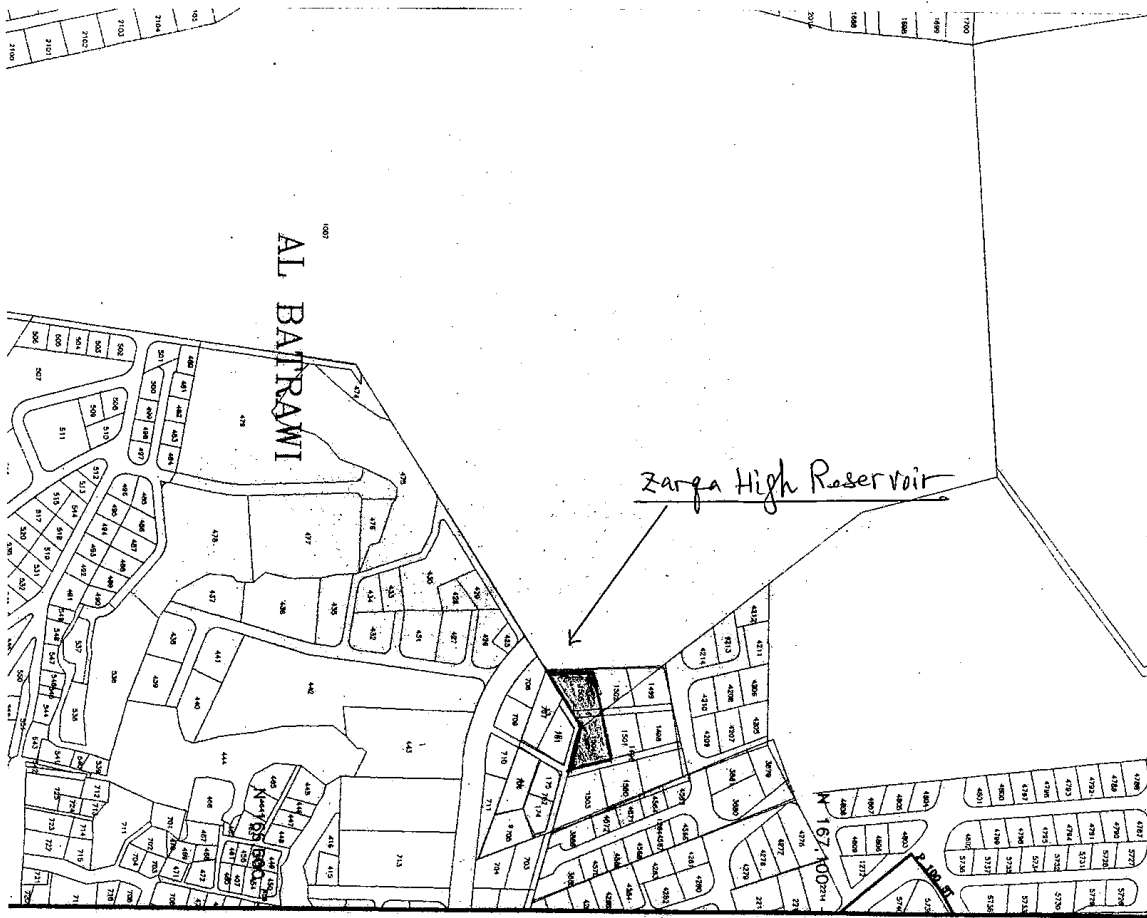
Area: Zarqa

Month: June 2004

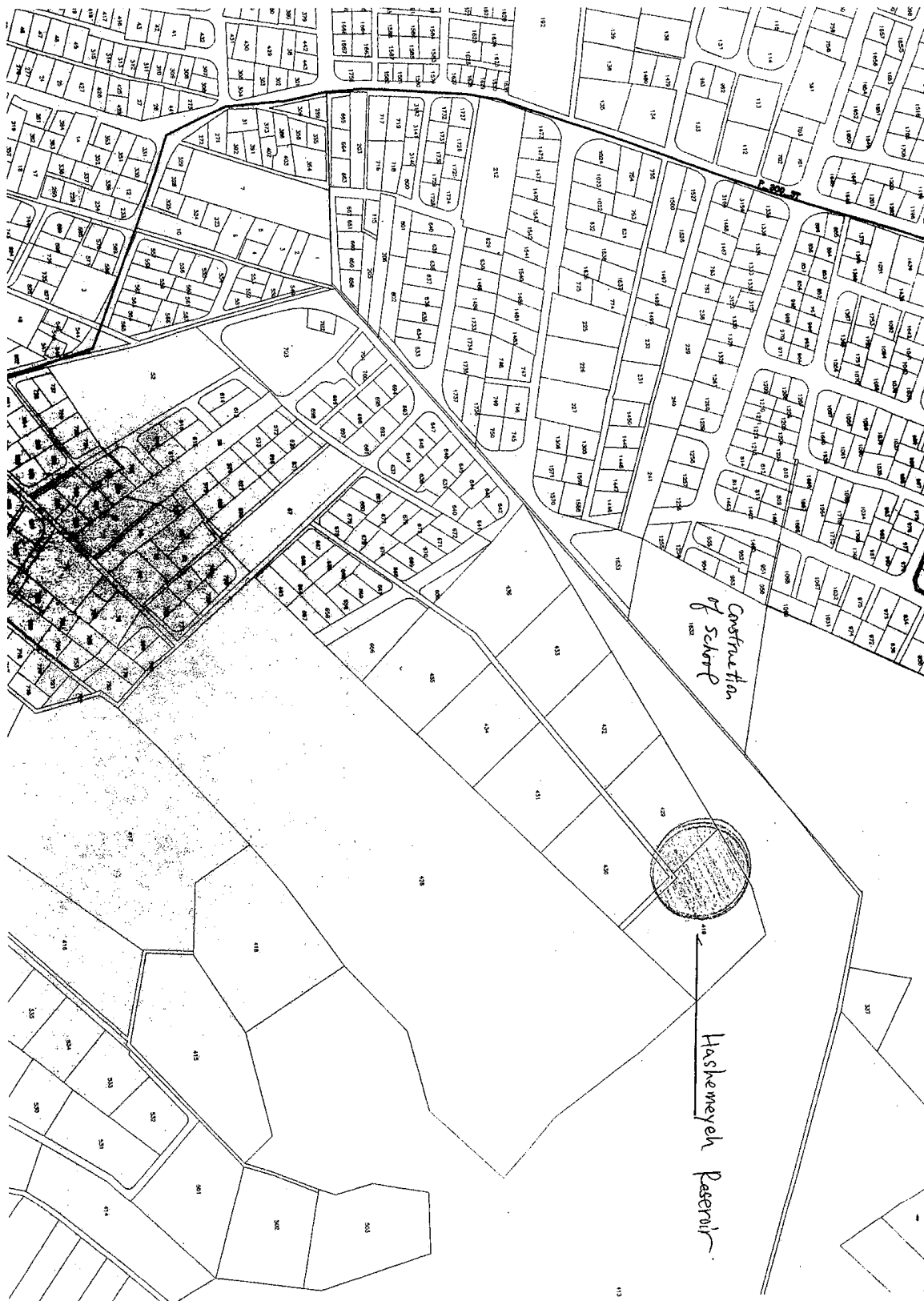
	Sample site	Date	T.Coli	E.Coli	F.Coli	Residual Cl2
1	Zarqa PS	6/1	<1.1			1.5
2	Zarqa treatment plant	6/1	<1.1			1.5
3	Hashemeyeh well 5	6/3	50	<2		none
4	Hashemeyeh well 5	6/3	1	9		none
5	Hashemeyeh booster	6/3	<1.1			1.2
6	Hashemeyeh well 5	6/4	23	<2		none
7	Hashemeyeh well 5	6/4	30	2		none
8	Hashemeyeh well 5	6/5	23	<2		none
9	Hashemeyeh well 5	6/5	50	2		none
10	Qunia PS	6/6	<1.1			1.5
11	Qunia Treatment station	6/6	7	<2		none
12	Quina spring s(1)	6/6	300	80		none
13	Quina spring s(2)	6/6	240	30		none
14	Sarut PS	6/6	<1.1			1.5
15	Al-Alog PS	6/6	<1.1			1.5
16	Zaatri PS	6/6	<1.1			1.2
17	Zarqa treatment plant	6/6	<1.1			1.5
18	Um-Rumanh booster	6/6	<1.1			1.5
19	Hashemeyeh university tank	6/8	<1.1			0.6
20	Khaw PS	6/8	<1.1			1.5
21	Merheb PS	6/8	<1.1			1.5
22	Hermor well s(1)	6/8	<2			none
23	Hermor well s(2)	6/8	<2			none
24	Hermor well s(3)	6/8	<1.1			1.5?
25	Um-Rumanh well s(1)	6/11	23	<2		none
26	Um-Rumanh well s(2)	6/11	50	<2		none
27	Mofeed AzizHouse	6/16	<1.1			0.1
28	Basateen PS	6/20	<1.1			1.5
29	Awajan reservoir	6/20	<1.1			1.5
30	Awajan well (21)	6/20	<1.1			1.5
31	Awajan well (22)	6/20	<1.1			1.5
32	Awajan well (23)	6/20	<1.1			1.5
33	Zarqa treatment station	6/20	<1.1			1.2
34	Zarqa PS	6/20	<1.1			1.5
35	Azraq PS	6/21	<1.1			1.5
36	Al-Halabat PS	6/21	<1.1			1.5
37	Haramen Resturant/Azraq	6/21	<1.1			0.6
38	Post office /Azraq	6/21	<1.1			0.8
39	Zarqa PS	6/23	<1.1			1.5
40	Zarqa treatment plant	6/23	<1.1			1.2
41	Basateen PS	6/23	<1.1			1.5
42	Zarqa Ttreatment plant	6/27	<1.1			1.2
43	Zarqa PS	6/27	<1.1			1.5
44	Mahmood restaurant	6/27	<1.1			1
45	Demasq restaurant	6/27	<1.1			1
46	Electricity company	6/27	<1.1			0.8
47	Zarqa treatment plant	6/28	<1.1			1.2
48	Huseen house	6/28	<1.1			0.8
49	Asi Hadide house	6/28	<1.1			0.8
50	Ruseifa municipality	6/28	<1.1			0.6
51	Abu-Aeman house	6/28	<1.1			0.8
52	Al-Batrawi reservoir	6/28	<1.1			1.5
53	Abu-Nadi well	6/30	2	<2		none
54	Abu-Nadi well	6/30	4	<2		none
55	Abu-Nadi well	6/30	<1.1			1.5
56	Zarqa PS	6/30	<1.1			1.5

Annex- 11 Registration of Proposed Sites for Distribution Reservoirs

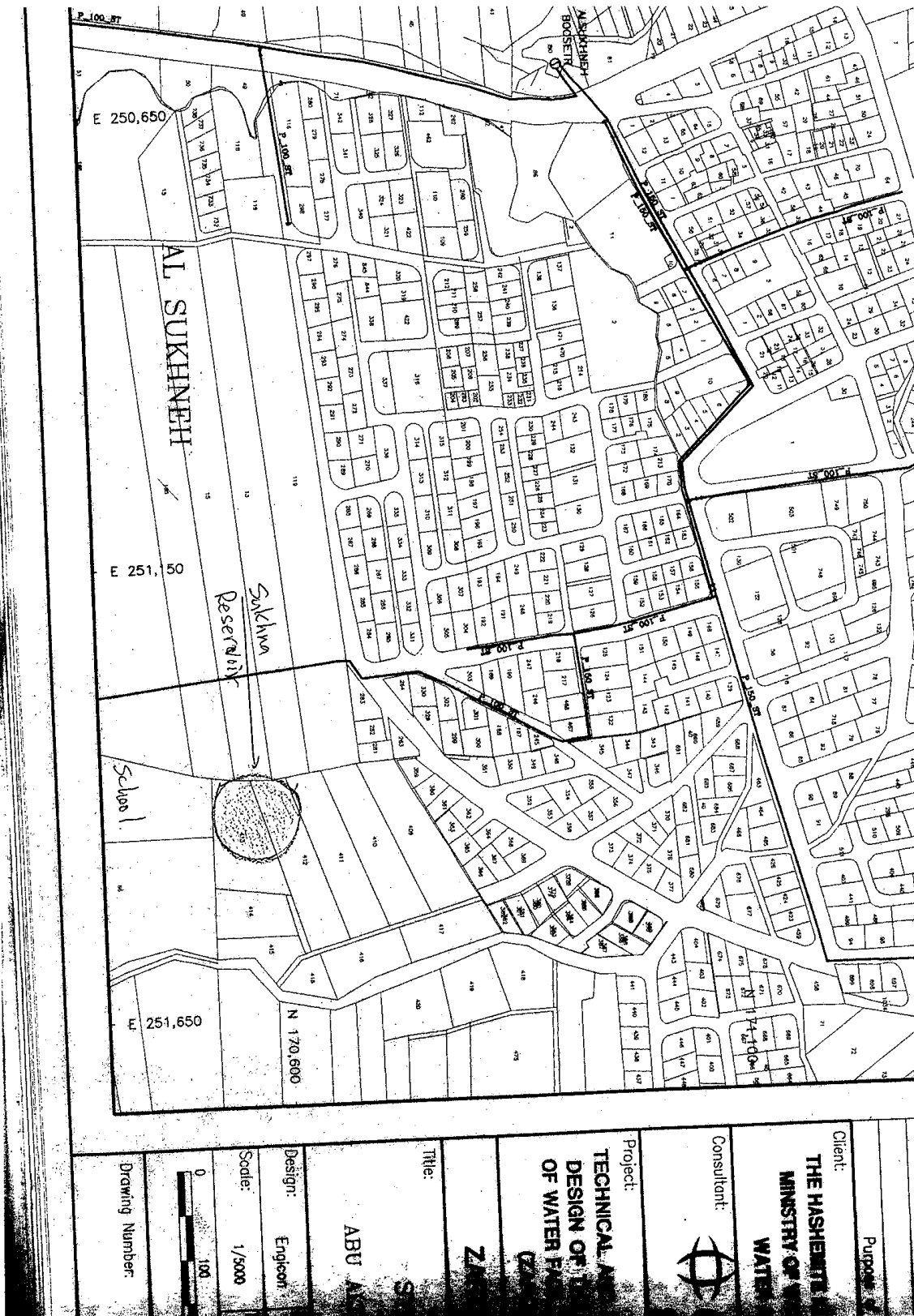
Zarqa high Reservoir



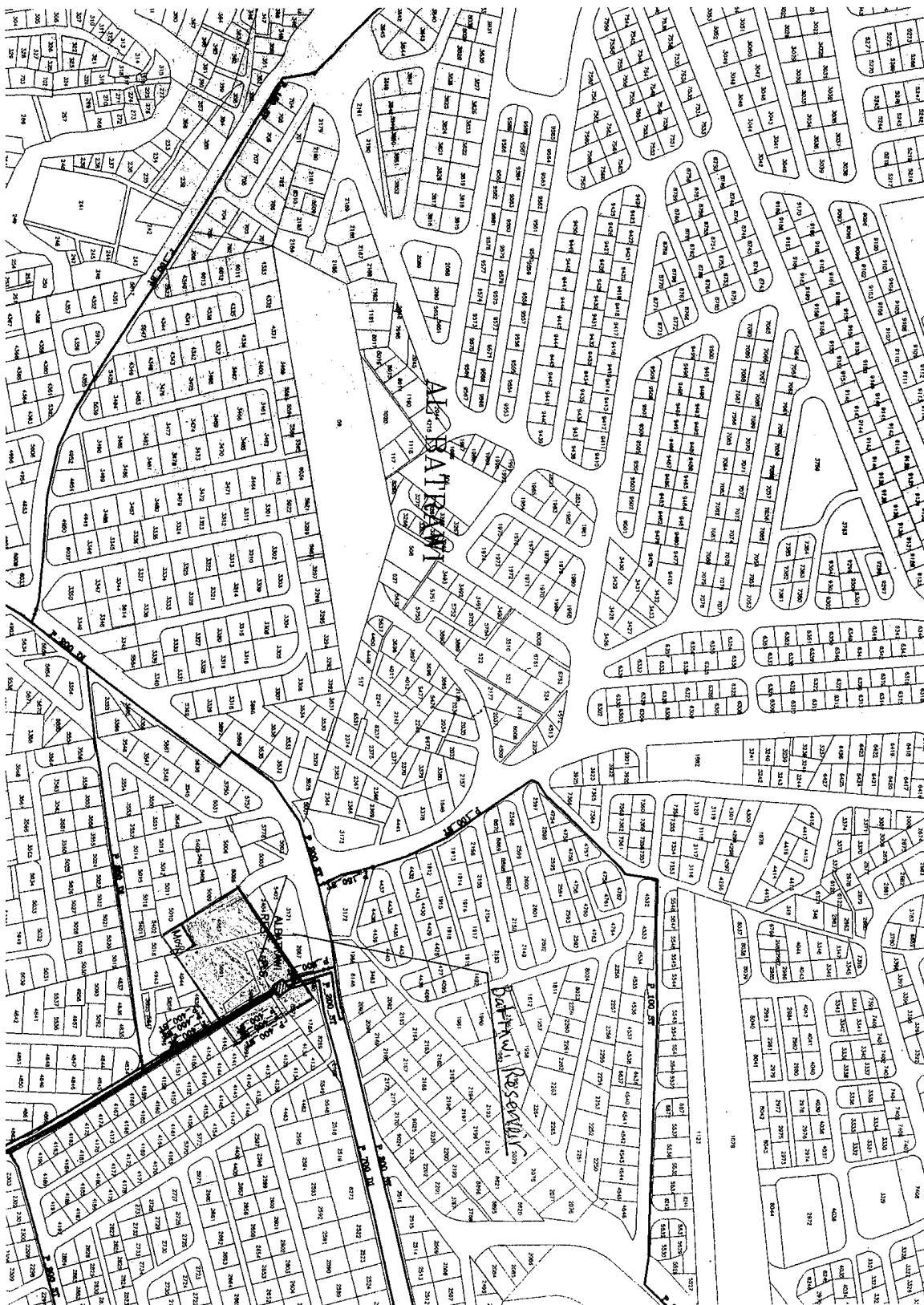
Hashemeyeh Reservoir



Sukhna Reservoir



Batrawi Reservoir



Annex- 12 Cost Estimation Borne by Jordanian Side

Items	Specifications	Quantity	Unit cost (JOD)	Total (JOD)	Term 1	Term 2	Term 3
(1) Procurement of sluice valves and fitting materials to divide the distribution areas and to convert the existing distribution mains to transmission mains (Note: Coupling joints shall be capable of connecting steel pipe and ductile pipe.)	sluice valve (dia 100mm: PN16)	2 nos.	640	1,280	1,280		
	sluice valve (dia 150mm: PN16)	3 nos.	1,110	3,330	3,330		
	sluice valve (dia 300mm: PN16)	1 nos.	3,740	3,740	3,740		
	coupling joint (dia 100mm: PN16)	4 nos.	240	960	960		
	coupling joint (dia 150mm: PN16)	6 nos.	540	3,240	3,240		
	coupling joint (dia 300mm: PN16)	2 nos.	920	1,840	1,840		
	flange spigot piece (dia 100mm: PN16)	4 nos.	60	240	240		
	flange spigot piece (dia 150mm: PN16)	6 nos.	100	600	600		
	flange spigot piece (dia 300mm:PN16)	2 nos.	160	320	320		
Sub-total				15,550	15,550		
(2) Reclaiming and Leveling the land for reservoirs construction	Zarqa High Reservoir	-	35,000	35,000	35,000		
	Hashemeyeh Reservoir	-	128,000	128,000		128,000	
	Sukhna Reservoir	-	24,000	24,000		24,000	
	Batrawi Reservoir	-	82,000	82,000			82,000
Sub-total				269,000	35,000	152,000	82,000
(3) Construction of access roads to the reservoir sites	Hashemeyeh Reservoir	-	18,700	18,700		18,700	
	Sukhna Reservoir	-	4,700	4,700		4,700	
Sub-total				23,400		23,400	
(4) Procurement of equipment for implementation of soft component and provision of a renovated training room in the WAJ Zarqa workshop	Computer with OS	3 nos.	910	2,730		2,730	
	Office XP professional	3 nos.	300	900		900	
	A4B&W Laser Printer	1 no.	166	166		166	
	A3 Color Printer	1 no.	395	395		395	
	A4 Scanner	1 no.	35	35		35	
	Computer desk and chair	4 sets	150	600		600	
	Book shelf	3 nos.	150	450		450	
	White board	1 no.	40	40		40	
	Table for Discussion	1 no.	270	270		270	
	Air Conditioner	1 no.	540	540		540	
	Renovation of a room for training	-	2,000	2,000		2,000	
Sub-total				8,126	8,126		
(5) Construction of reservoir overflow pipe from the boundary of reservoirs to the nearby existing drain	Zarqa High Reservoir	100 m	85	85,000	85,000		
	Hashemeyeh Reservoir	100 m	85	85,000		85,000	
	Sukhna Reservoir	100 m	85	85,000		85,000	
Sub-total				255,000	85,000	170,000	
(6) Construction of fences and gates along the site boundary of reservoirs	Zarqa High Reservoir	-	14,300	14,300	14,300		
	Hashemeyeh Reservoir	-	15,000	15,000		15,000	
	Sukhna Reservoir	-	12,500	12,500		12,500	
	Batrawi Reservoir	-	13,100	13,100			13,100
Sub-total				54,900	14,300	27,500	13,100
(7) Provision of necessary water and chemicals (chlorine) for trial operation	Filling water test for reservoirs	m ³	57,000	57,000	7,500	7,500	42,000
	Filling water test for pipelines	m ³	5,400	5,400	800	3,300	1,300
Sub-total				62,400	8,300	10,800	43,300
(8) Implementation of publicity activities for this project (Hiring local consultants)	IEC expert	3 MM	1,080	3,240	1080	1080	1080
	Assistant	3 MM	280	840	280	280	280
	other expenses	-	-	900	300	300	300
Sub-total				4,980	1,660	1,660	1,660
Total				693,356	167,936	385,360	140,060

