

資 料



資料 - 1 調査団員・氏名

基本設計調査

氏名	担当業務	現職
落合 直之	総括	独立行政法人 国際協力機構 ヨルダン事務所 次長
米林 徳人	計画管理	独立行政法人 国際協力機構 無償資金協力部 業務第3グループ 水資源・環境チ ーム
佐藤 弘孝	業務主任/上水道計画 /運営維持管理計画	(株)東京設計事務所
萩原 充道	管路計画 / 積算	(株)東京設計事務所
宮本 正史	設備計画	(株)東京設計事務所
中武 俊一	施設計画	(株)東京設計事務所 (補強: (株)アクアテック)
田中 規夫	施工計画/積算/設備 計画	(株)東京設計事務所

基本設計概要説明調査

氏名	担当業務	現職
落合 直之	総括	独立行政法人 国際協力機構 ヨルダン事務所 次長
佐藤 弘孝	業務主任/上水道計画 /運営維持管理計画	(株)東京設計事務所
萩原 充道	管路計画 / 積算	(株)東京設計事務所

資料 - 2 調査行程

基本設計調査

日 順	日付		宿泊 地	移動	活動内容
1	11月 18日	金	機内	羽田 20:40(JL1319) 大阪 23:15(JL5099) ドバイ着 05:10	コンサルタント団員（佐藤、萩原、宮本、田中、中武）東京発
2	19日	土	アンマン	ドバイ発 14:00(EK903) アンマン着 15:25	佐藤、萩原、宮本、田中、中武アンマン着
3	20日	日	アンマン		JICA ヨルダン事務所打合せ WAJ 総裁表敬訪問 WAJ スタッフとインセプションレポート説明・協議 計画省表敬訪問 日本大使館表敬訪問
4	21日	月	アンマン		プロジェクトサイト現地踏査
5	22日	火	アンマン		データ収集、現場踏査準備
6	23日	水	アンマン		データ収集、現場踏査準備
7	24日	木	アンマン		カウンターパート打合、データ収集依頼、再委託協議 GTZ 訪問 WAJ ザルカ支所打合せ 現場踏査及びプロジェクトコンポーネント協議
8	25日	金	アンマン	成田 10:55(JL717) バンコク着	休日、米林官団員発
9	26日	土	アンマン	バンコク 00:15(RJ183) アンマン着 05:00	米林官団員到着 ザルカプロジェクトサイト現場踏査
10	27日	日	アンマン		JICA ヨルダン事務所にて打合せ ヨルダン側と M/D の協議
11	28日	月	アンマン		M/D 協議及び作成
12	29日	火	アンマン		ザルカ第 1 次事業の現場踏査（団長、米林、宮原、牛木、萩原、宮本）
13	30日	水	アンマン		M/D サイン、MWI 大臣表敬 ザイ浄水場視察 日本大使館報告 JICA ヨルダン事務所報告
14	12月 1日	木	アンマン	アンマン 00:05 (RJ180) バンコク 13:30 バンコク 22:30(JL718)	米林官団員出発 WAJ、Engicon と計画の協議 ENRUWA 及びパレスチナ局データ収集
15	2日	金	アンマン	成田着 06:15	休日、米林官団員到着
16	3日	土	アンマン		データ収集、積算調査
17	4日	日	アンマン	アンマン 16:30(EK904) ドバイ 21:15	宮本発、ザルカ現地踏査、データ収集、積算調査、環境省データ収集
18	5日	月	アンマン	ドバイ 02:50(JL5090) 大阪 16:40 大阪 18:30(JL1316) 東京着 19:35	宮本着、再委託見積もり収集、データ収集、積算調査
19	6日	火	アンマン		スフナ市役所、ザルカ現地踏査（送水施設）データ収集、積算調査
20	7日	水	アンマン		データ収集、積算調査
21	8日	木	アンマン		ザルカ市役所、ザルカ現地踏査（配水施設）データ収集、積算調査
22	9日	金	アンマン		資料整理
23	10日	土	アンマン		ザルカ現地踏査（配水施設）再委託見積もり収集、データ収集、積算調査
24	11日	日	アンマン		ザルカ現地踏査、データ収集、積算調査、データ解析
25	12日	月	アンマン		再委託見積り資料作成、ザルカ現地踏査、データ収集、

日 順	日付		宿泊 地	移動	活動内容
					積算調査、データ解析
26	13日	火	アマン		再委託見積り資料 JICA 提出、保健省にてデータ収集、ザルカ現地踏査、データ収集、積算調査、データ解析
27	14日	水	アマン		WAJ 協議、フィールドレポート作成、WAJ ザルカデータ収集、再委託調印
28	15日	木	アマン		測量開始、フィールドレポート作成
29	16日	金	アマン	アマン 16:30(EK904) ドバイ 21:15	アズラック水源踏査、フィールドレポート作成、中武発
30	17日	土	アマン	ドバイ 02:50(JL5090) 大阪 16:40 大阪 18:30(JL1316) 東京着 19:35	フィールドレポート作成、中武着
31	18日	日	アマン		再委託先への現場説明、ザルカ支所にて協議、フィールドレポート作成
32	19日	月	アマン		WAJ と協議、再委託先への現場説明
33	20日	火	アマン		ワークショップ(ソフトコンポーネント) ザルカ補足調査
34	21日	水	アマン		ザルカ補足調査、現地調査結果報告書作成
35	22日	木	アマン		JICA ヨルダン事務所及び大使館報告、ザルカ補足調査、WAJ 本庁協議・フィールドレポート署名
36	23日	金	機内	アマン 16:30(EK904) ドバイ 21:15	佐藤、萩原、田中発
37	24日	土		ドバイ 02:50(JL5090) 大阪 16:40 大阪 18:30(JL1316) 東京着 19:35	佐藤、萩原、田中着

#### 基本設計概要説明調査

日 順	日付		宿泊 地	移動	活動内容
1	3月 10日	金	機内	羽田 20:40(JL1319) 大阪 23:15(JL5099) ドバイ着 05:10	コンサルタント団員(佐藤、萩原)東京発
2	11日	土	アマン	ドバイ発 14:00(EK903) アマン着 15:25	コンサルタント団員到着
3	12日	日	アマン		JICA ヨルダン事務所打合せ、計画省表敬訪問、WAJ 表敬訪問・報告書提出
4	13日	月	アマン		WAJ 本庁打合せ(土地収用等) 日本大使館表敬訪問
5	14日	火	アマン		報告書説明・協議、討議録(M/D)協議
6	15日	水	アマン		M/D 協議、M/D 署名(WAJ 及び JICA)
7	16日	木	アマン		M/D 署名(計画省) ザルカ現地調査、日本大使館報告、JICA ヨルダン事務所報告
8	17日	金	機内	アマン 16:30(EK904) ドバイ 21:15	
9	18日	土		ドバイ 02:50(JL5090) 大阪 16:40 大阪 18:30(JL1316) 東京着 19:35	

資料 - 3 関係者（面会者）リスト

基本設計調査

機関・所属	氏名
<b>Water Authority of Jordan(WAJ), Ministry of Water and Irrigation (MWI)</b>	
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 Alsoghairien
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
<b>Ministry of Planning</b>	
Director and Advisor, Water and Environment Department	Dr. Kamal Khdier
Water Sector Disk Officer	Naha AL-Zubi
<b>GTZ</b>	
Team Leader	Dr. Philipp Magiera
Project manager	Ms. Marina Meuss
<b>United Nation Relief and Works, Agency for Palestine in Near East (UNRWA) ,Jordan</b>	
Deputy Director	Mr. Roger A. Davies
<b>Department of Palestinian Affairs</b>	
Director General	Eng. Wajeeh Azayzeh
<b>Ministry of Environment</b>	
EIA Directorate	Eng. Izzat Abu-Humra
<b>Government Tenders Directorate</b>	
Bidding Dept.	Eng. Ashraf M. Al-Tarawneh
<b>Ministry of Health</b>	
Director of EHD, Environmental Health Directorate	Eng. Hieari Sala
Assistant Director, Water Monitoring Department	Eng. Shawqi Marzouq
<b>Embassy of Japan in Jordan</b>	
公使 (Councillor, Depty Head of Mission)	山口 又宏
一等書記官 (First Secretary, Economic Section)	池田 敬之
二等書記官 (Second Secretary and Economic Attache)	Fumiko Nohara
<b>JICA Jordan Office</b>	
所長 (Resident Representative)	森川 秀夫
次長 (Deputy Resident Representative)	落合 直之
所員 (Assistant Resident Representative)	宮原 千絵
専門家 (JICA Advisor in MWI)	牛木 久雄
Senior Program Officer	Hani H.Alkudi

基本設計概要説明調査

所属・地位	氏名
<b>Water Authority of Jordan (WAJ), Ministry of Water and Irrigation(MWI)</b>	
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
<b>Ministry of Planning</b>	
Director, Projects Department	Dr. Saleh Al-Kharabsheh
Head of Water and Agriculture Division	Ms. Maha AL-Zu bi
<b>Zarqa Municipality</b>	
Design Department	Arch. Sahair Nofal
Design Department	Eng. Mohamman Shaheen
<b>Embassy of Japan in Jordan</b>	
Councillor, Depty Head of Mission	山口 又宏
First Secretary, Economic Section	池田 敬之
<b>JICA Jordan Office</b>	
所長 (Resident Representative)	佐藤 武明
次長 (Deputy Resident Representative)	落合 直之
所員 (Assistant Resident Representative)	宮原 千絵
専門家 (JICA Advisor in MWI)	牛木 久雄
Senior Program Officer	Hani H.Alkudi

**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**

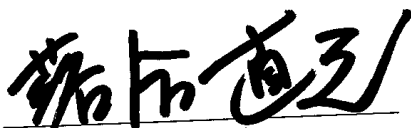
In response to a request from the Government of Hashemite Kingdom of Jordan (hereinafter referred to as "Jordan"), the Government of Japan decided to conduct a Basic Design Study on the Project for Improvement of the Water Supply for Zarqa District Phase II (hereinafter referred to as "the Project")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

#### 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

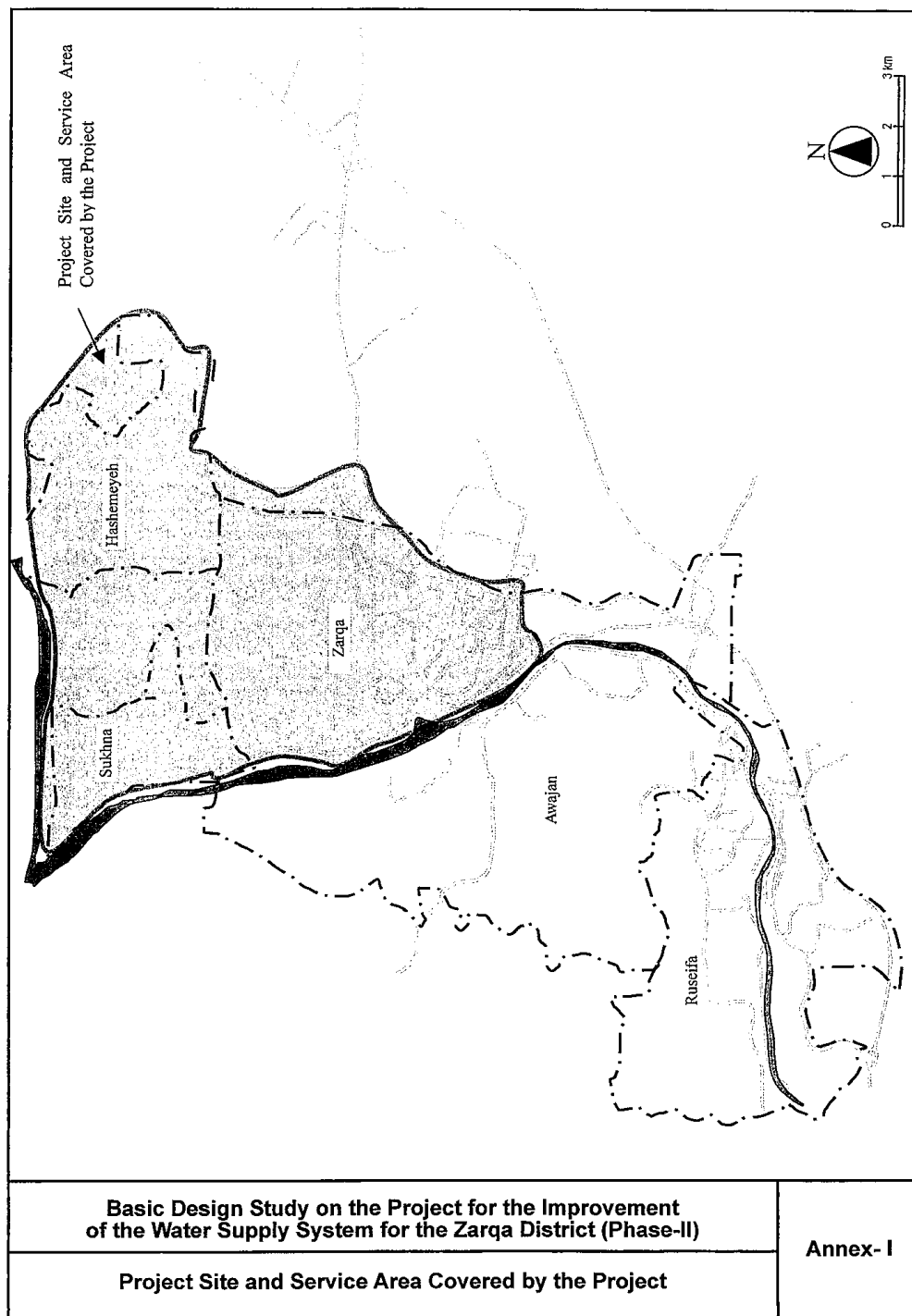
Jordan side stated that land acquisition has not yet been started. However, Jordan side promised to procure the land for the proposed facilities just after the identification of the sites and the completion of land survey by the Team.

#### 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.



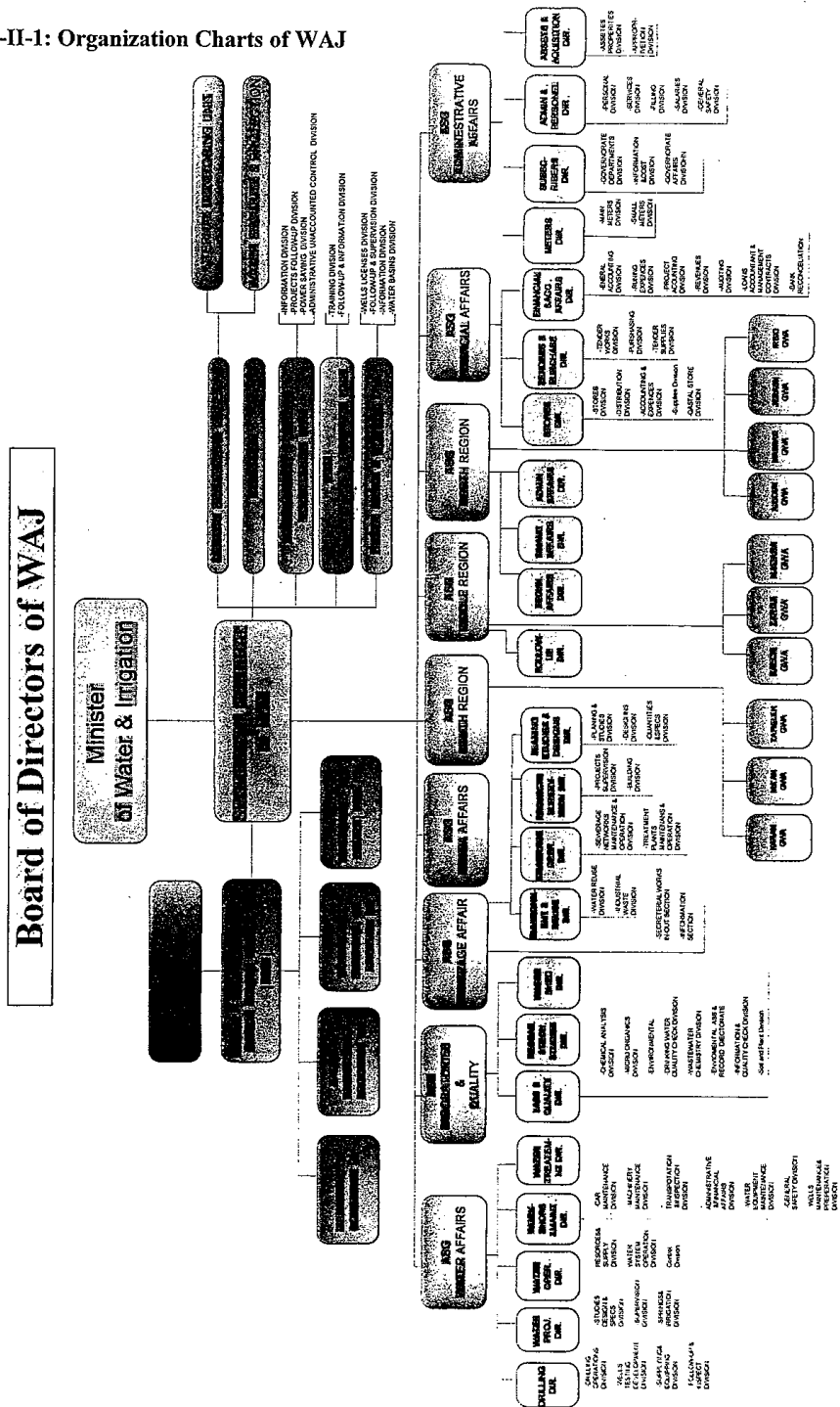
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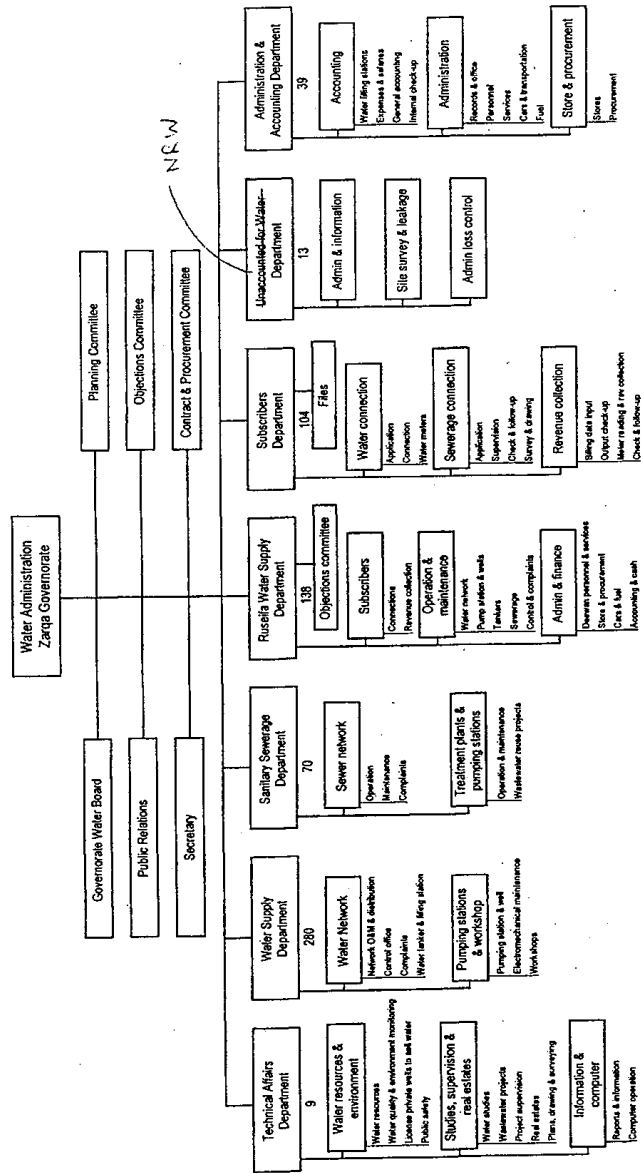
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## ANNEX-II-1: Organization Charts of WAJ



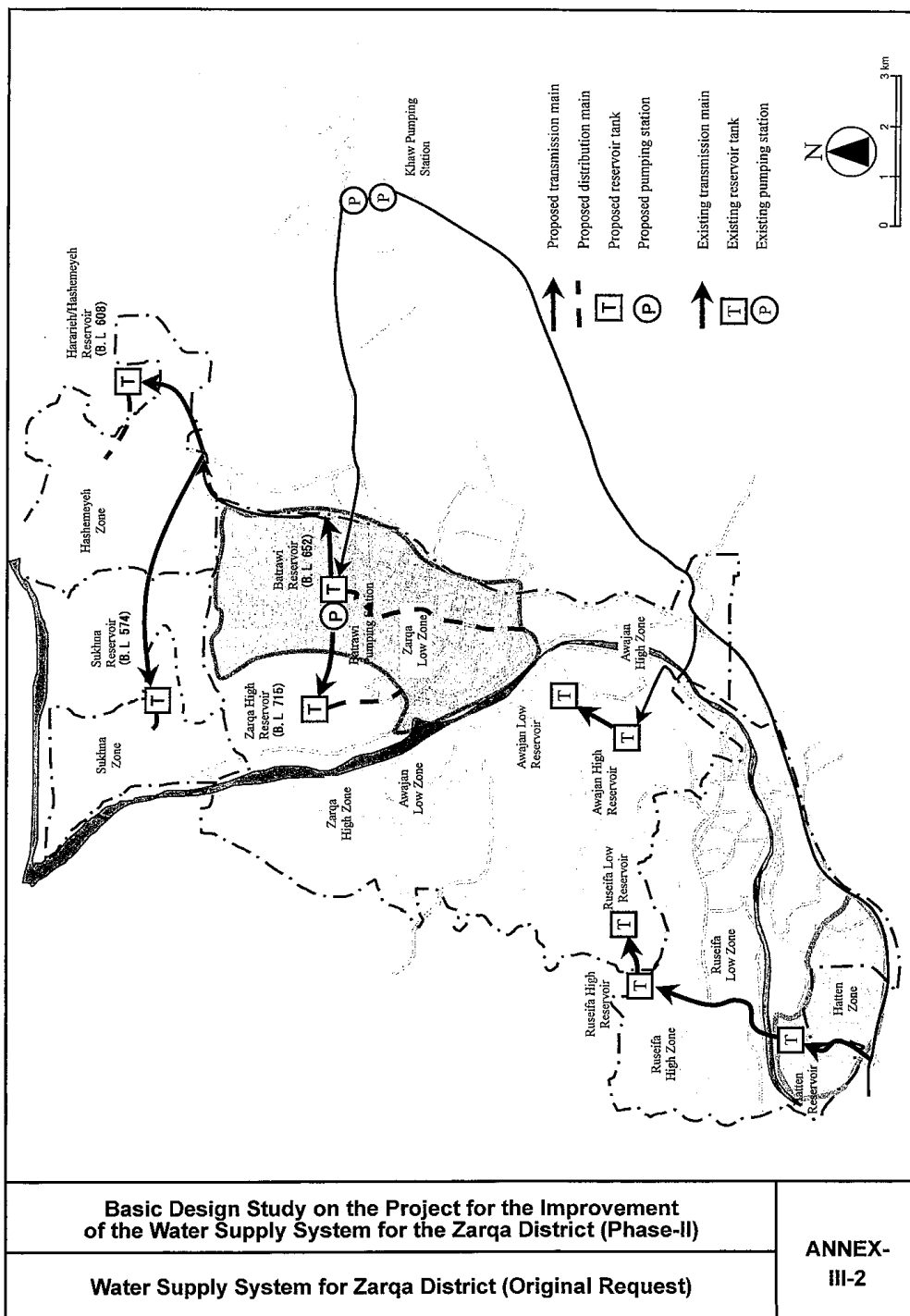
## ANNEX-II-2: Organization Charts of WAJ Zarqa Office



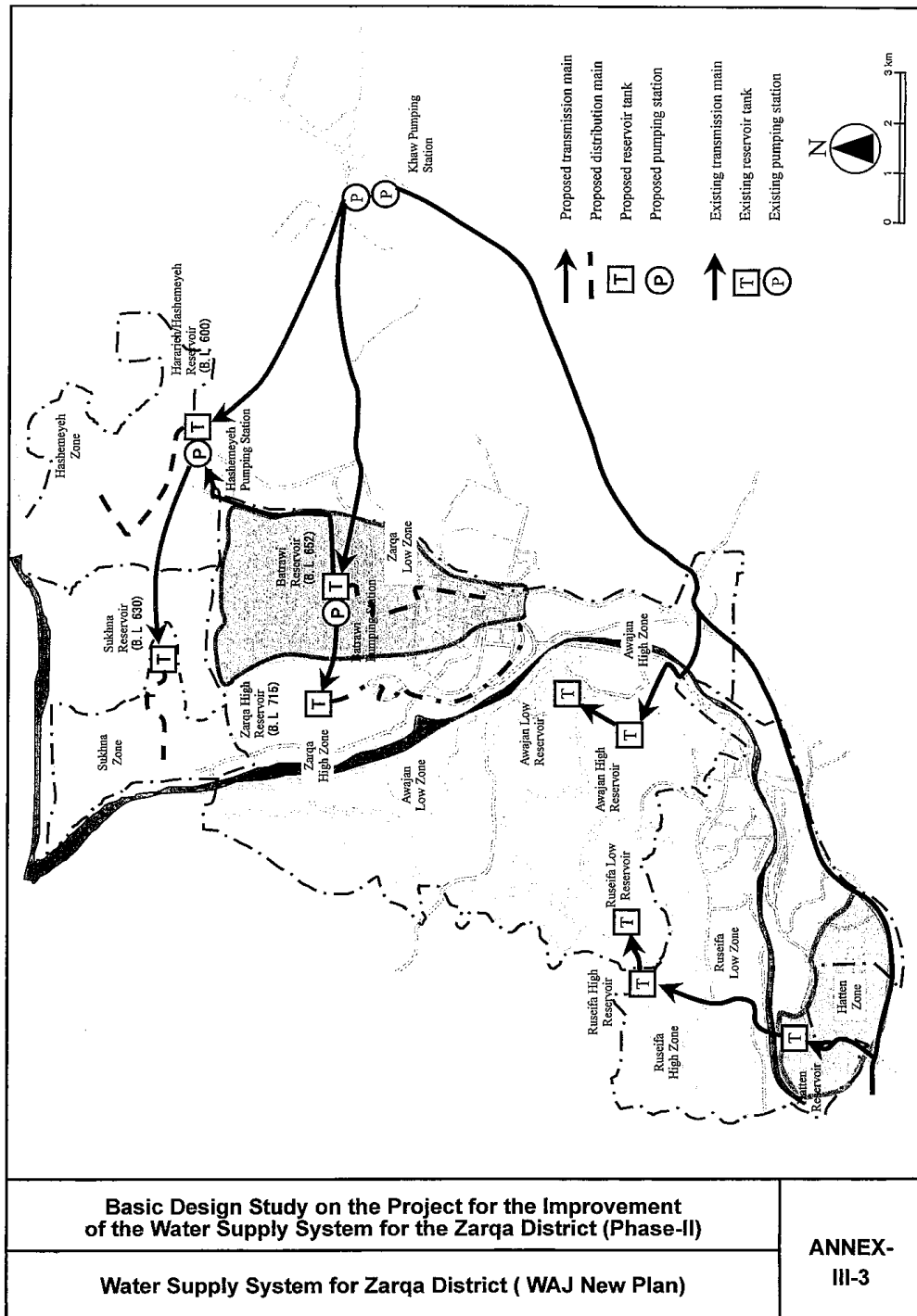
Organization Chart of Water Authority of Jordan, Zarqa Governorate

**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 2015	WAJ New Plan 2025
2. Requested Works		
Construction of Distribution Reservoirs	(1) Zarqa High Zone Service Reservoir (4,000 m <sup>3</sup> )	(1) Zarqa High Zone Service Reservoir
	(2) Hashemeyeh Service Reservoir (2,000 m <sup>3</sup> )	(2) Hashemeyeh Service
	(3) Sukhuna Service Reservoir (1,000 m <sup>3</sup> )	(3) Sukhuna Service Reservoir
	(4) Batrawi Service Reservoir T650 (12,500 m <sup>3</sup> )	(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
	(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 (A complete new line will be installed)
	(3) Branched point 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 Pump Room (Reinforced Concrete Structure) Electrical and Mechanical Equipment (2.7m <sup>3</sup> /min x 75kW x 4 pumps)	(4) Khaw Pumping Station to Hashemeyeh Service Reservoir  (1) Batrawi Pumping Station
	Construction of Distribution Mains Dia. 600 mm to 200 mm, L = 15,900 m	(2) Hashemeyeh Pumping Station Dia. 600 mm to 200 mm, L = 15,900 m
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



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)

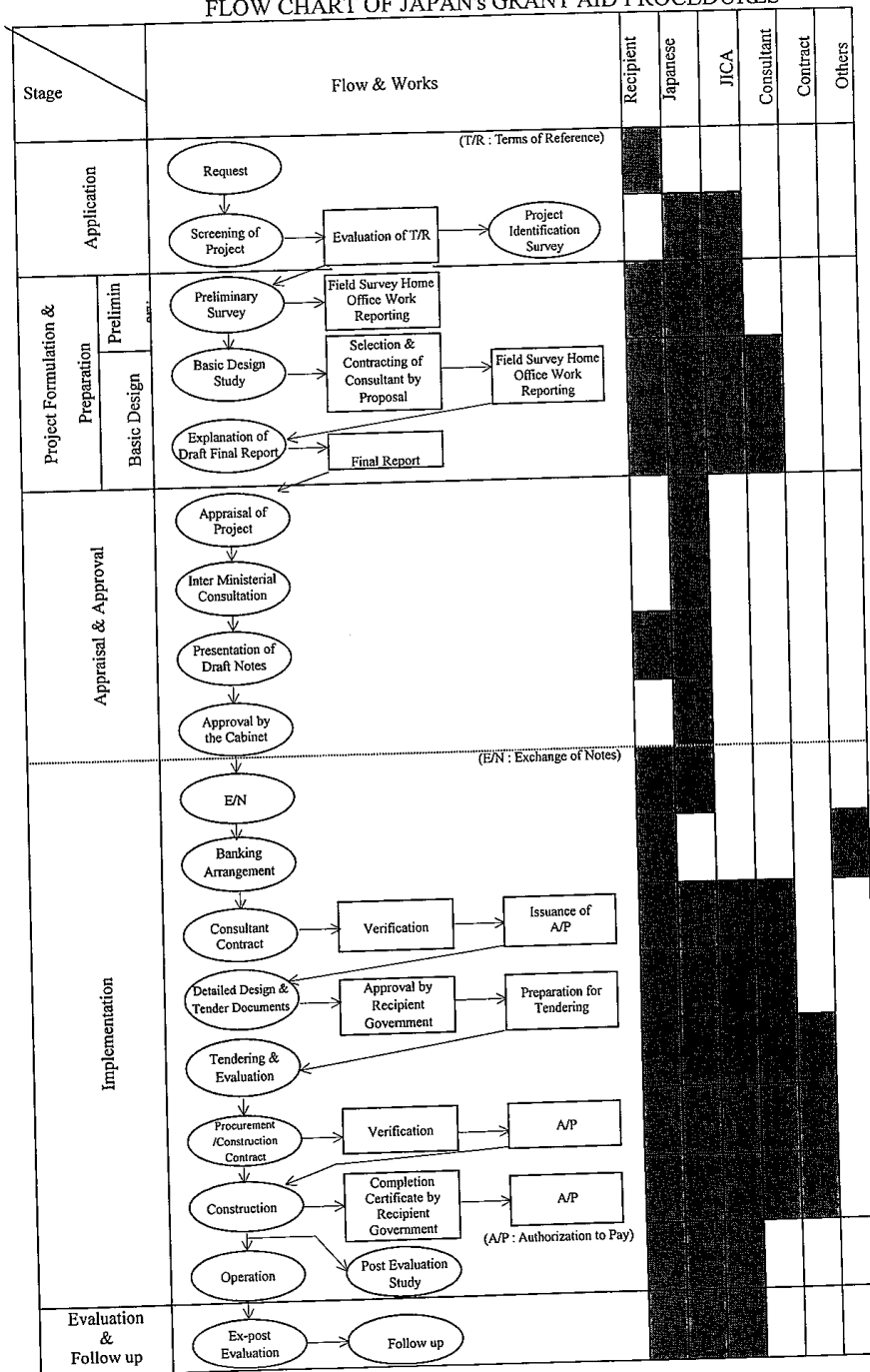
- a) The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover 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
Mafrq	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




**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.

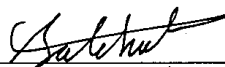
Amman, March 15, 2006



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 30<sup>th</sup> 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)
<b>Water Production</b>	
Water Production in Zarqa Governorate	44.86
Water Amount Coming from Mafraq Governorate	10.46
<b>Total Water Amount in Zarqa Governorate</b>	<b>55.32</b>
<b>Water Amount Going-out from Zarqa Governorate</b>	
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
<b>Total Water Amount Going-out to Other Governorates</b>	<b>-8.09</b>
<b>Net Water Amount for Zarqa Governorate Domestic Water Supply</b>	<b>47.23</b>
<b>New Water Development</b>	
Tamween Wells	3.94
Wadi Al-Halabat Wells	5.26
Disi Fossil Water Resources Development	0
<b>Total New Production</b>	<b>9.20</b>
<b>Total Water Amount for Zarqa Governorate Water Supply Area</b>	<b>56.43</b>
<b>Total Water Amount for WAJ Zarqa Water Supply Area</b>	<b>57.20</b>
<b>Water Amount for the Project Sites</b>	<b>20.48</b>

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 m<sup>3</sup>)
  - 1.2 Hashemeyeh Reservoir (1,500 m<sup>3</sup>)
  - 1.3 Sukhna Reservoir (1,000 m<sup>3</sup>)
  - 1.4 Batrawi Reservoir Expansion (14,000 m<sup>3</sup>)
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 m<sup>3</sup>/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



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.

WAJ

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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 7 11183 Jordan or P.O.Box 5012 Amman 11181 Jordan



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 30<sup>th</sup> 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 <sup>st</sup> 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 <sup>st</sup> 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 <sup>nd</sup> 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

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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 <sup>st</sup> 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 <sup>st</sup> 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. No. A/7/2/3744

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 / 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

**ANNEX-IX: Publicity Works Undertaken by Jordanian Side**

Items	Contents	Schedule
Press-release	<ul style="list-style-type: none"> <li>• Distribution of Pamphlet on Project Contents</li> <li>• Press-release to news paper and other mass media</li> </ul>	For inauguration and completion ceremony
Holding of Contests	<ul style="list-style-type: none"> <li>• Contest of message, essay, picture and painting relating to water supply</li> <li>• Awarding ceremony</li> <li>• (A winning picture and messages will be painted in the reservoirs by Japanese Contractor)</li> <li>• Press-release</li> </ul>	For inauguration
Enlightenment activities	<ul style="list-style-type: none"> <li>• Participation of students (seminar on water supply in schools and tour of inspection in construction sites and completion facility, etc.)</li> <li>• Participation of NGO (holding seminar on water supply)</li> </ul>	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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資料 - 6 事業事前計画表（基本設計時）

1. 案件名
ヨルダン国第二次ザルカ地区上水道施設改善計画基本設計調査
2. 要請の背景（協力の必要性・位置付け）
<p>ヨルダン・ハシェミット王国（以下「ヨ」国という）は、国民一人当たりの水資源量が世界のなかでも最も少ない国の1つであり、水政策は常に「ヨ」国において最優先課題として扱われてきた。限りある水資源をいかに有効かつ公平に利用するかが、「ヨ」国の水政策に対する一貫した考え方であり、「ヨ」国の基本計画である経済社会開発計画では、その水・灌漑部門に以下の目標を掲げている。</p> <p>無駄に失われている水損失量を可能な限り少なくすること</p> <p>社会経済的な順位付けによって限りある水資源を最適に配分すること</p> <p>現状の国民一人当たりの水道使用量を増やすこと</p> <p>上記目標の達成のため、「ヨ」国は多くの努力を積み重ねてきている。淡水化プラントの建設による新たな水資源として汽水の利用、灌漑用への下水処理水の再利用、老朽化した既設上水道管路の更新による漏水量の削減、無収水削減技術協力プロジェクトなど、効率的な水利用を目的とした多くのプロジェクトが全国的に同時並行で実施されている。</p> <p>プロジェクトサイトであるザルカ地区には、難民キャンプを含め多くのパレスチナ人難民が居住し、また、湾岸戦争時に帰国または避難してきた出稼ぎ者あるいはイラク戦争で発生した多くのイラク人難民が居住しており、社会的に不安定な地域といえる。</p> <p>プロジェクトサイトでの無収水率は52%と高く、そのうち約31%が老朽配管や高い配水圧に起因する漏水と推定されている。絶対的な供給量の不足に加え、高い漏水率により、一人当たりの実使用水量は84リットル/日と極端に少なく、国家目標の150リットルには遠く及ばない。また、起伏の激しい地形に加え、供給量の不足及び送配水施設容量の不足のため、制限給水が行われ地域的に週に半日～3日のみしか給水できない状況であり、住民の日常生活に大きな影響を及ぼしている。</p> <p>本プロジェクトは「ヨ」国の水政策を上位計画とし、ザルカ地区の給水状況を改善するために要請されたものである。</p> <p>本計画では、既存上水道システムを再構築することにより、給水区域に4配水区を設置し、適切な給水圧を確保すること、漏水量を減少させ実使用量を増加させること、配水管理を適切に行い公平な水配分を図ること、及び衛生的な水の給水を行うことを目的とし、プロジェクトサイトの住民へ安全で安定した給水を実施し住民の生活環境を改善するものである。</p>
3. プロジェクト全体計画概要
<p>➤ プロジェクト全体計画の目標（裨益対象の範囲及び規模）</p> <p>漏水率が減少し実使用水量が増加する。</p> <p>対象地域の住民に安全で安定した給水が行われる。</p> <p>プロジェクト対象は以下のとおりである。</p> <ul style="list-style-type: none"> <li>・ 対象地域：ザルカ県ザルカ地区</li> <li>・ 対象人口：37.4万人（2010年予測人口）</li> </ul>



- プロジェクト全体計画の成果  
対象地域の上水道施設が整備され配水区が設定される。
- プロジェクト全体計画の主要活動  
プロジェクト運営のための人員を配置する。  
ヨルダン水道庁が対象地域に必要な量の水を配分する。  
基幹送配水施設が建設される。  
4 配水区が形成される。  
塩素消毒施設が整備される。  
配水管理技術強化のための技術移転が行われる。
- 投入（インプット）  
日本側： 無償資金協力 22.44 億円  
「ヨ」国側：  
（ア） 本無償資金協力の実施に係わる負担額：1.14 億円  
（イ） 本無償資金協力案件対象施設の建設後の維持管理経費：年平均 8,478 千円  
（バトラウィポンプ場及びハウ塩素消毒施設）
- 実施体制  
主管官庁：水灌漑省  
実施機関：ヨルダン水道庁

#### 4. 無償資金協力の概要

- （１） サイト  
ザルカ市北部地区、ハシミエ市およびスフナ市
- （２） 概要  
基幹送配水施設（送水管、配水連絡管、ポンプ場の更新、配水池）の建設  
4 配水区の設置  
塩素消毒施設の建設  
配水管理技術強化のための技術移転
- （３） 相手国負担事項  
配水区分離のための資機材の提供  
配水池建設予定地の用地取得および造成・整地  
建設予定地のフェンス・ゲートの建設、地敷地内道路、植栽、照明の整備、配水池排水管の敷設  
ソフトコンポーネント実施のための資機材の調達及びザルカ支所での研修場所の整備
- （４） 概算事業費  
概算事業費 23.10 億円（日本側 21.99 億円、「ヨ」国側負担 1.11 億円）
- （５） 工期  
詳細設計・入札期間を含め約 46 ヶ月（予定）
- （６） 貧困、ジェンダー、環境および社会面の配慮  
施設建設用地には、環境社会影響の最も少ないサイトを選定した。

スフナ難民キャンプを含むプロジェクトサイト全域に均等な給水が可能のように計画した。		
5. 外部要因リスク（プロジェクト全体計画の目標達成に関して）		
「ヨ」国の水道整備に関わる政策に変更がない。		
6. 過去の類似案件からの教訓の活用		
第1次事業では、適正な配水区を設定し、ポンプ給水から配水池からの自然流下給水方式に水道システムを変更したことにより、給水圧が安定した。更に、ポンプ配水でなくなったため配水システムの維持管理が容易になったので、今回の設計に活用した。		
7. プロジェクト全体計画の事後評価に係る提案		
(1) プロジェクト全体計画の目標達成を示す成果指標		
成果指標	現状の数値（2005年）	計画値（2010年）
給水時間	12 - 72 時間/週	72 時間以上/週
漏水率	31%	25%
1人1日使用水量（日平均）	84 L/人・日	113 L/人・日
(2) その他の成果指標		
なし		
(3) 評価のタイミング		
2010年以降（協力対象施設完工後）		

資料 - 7 参考資料 / 入手資料リスト

調査名 第二次ザルカ地域上水道施設改善計画 基本設計調査業務

番号	名 称	形態 図書・ビデオ 地図・写真等	オリジナル	発行機関	発行年
1	Geological Map of Jordan (East of the Rift Valley 1/250,000)	地 図	オリジナル	WAJ	1956
2	Geology Series (Sheet 2 AMMAN 1/100,000)	地 図	オリジナル	WAJ	1964
3	Law of Environmental Impact Assessment	図 書	コピー	MOE	2003
4	WAJ財務諸表（損益計算書・貸借対照表、キャッシュフロー等）	図 書	コピー	WAJ	1999~2004
5	WAJ維持管理費	図 書	コピー	WAJ	2000~2004
6	WAJ国庫補助額	図 書	コピー	WAJ	1999~2004
7	WAJ会計検査報告	図 書	コピー	WAJ	2005
8	上下水道料金表(2003年改定)	図 書	コピー	WAJ	2003
9	無収水率：全国(2002~2004)	図 書	コピー	WAJ	2002~2004
10	ポンプ場毎のポンプ仕様（ザルカ）	図 書	コピー	Zarqa WAJ	2004
11	配水地名・容量（ザルカ）	図 書	コピー	Zarqa WAJ	2004
12	ザルカ浄水場の部分民間委託契約書	図 書	コピー	Zarqa WAJ	
13	Statistical Yearbook	CD	オリジナル	Dep. Of Stat.	2004
14	ザルカ地区井戸の揚水量	図 書	コピー	Zarqa WAJ	2001~2004
15	WAJザルカ支所の歳入	図 書	コピー	Zarqa WAJ	2004
16	WAJザルカ支所職員数・平均給与	図 書	コピー	Zarqa WAJ	2004
17	USGSからの資料	CD	コピー	USGS	
18	Statistical Yearbook	図 書	オリジナル	Department of statistic	2004
19	Household Expenditures and Income Survey	図 書	オリジナル	Department of statistic	2002/2003
20	Environmental Statistics	図 書	オリジナル	Department of statistic	2003
21	MAP of Zarqa (1/5,000)	地 図	オリジナル	Geographic Center	
22	MAP of Zarqa (1/10,000)	地 図	オリジナル	Geographic Center	
23	MAP of Zarqa (1/25,000)	地 図	オリジナル	Geographic	

番号	名 称	形態 図書・ビデオ 地図・写真等	オリジナル・コピー	発行機関	発行年
				Center	
24	Technical and Feasibility Study and Final Design of the Upgrading and Expansion of Water Facilities in Central Governorates (1) Inception Report	図書	コピー	WAJ	January 2004
25	(2) Water Resources and Demand Assessment Report	図書	コピー	WAJ	June 2004
26	(3) Site Investigation Report, Volume 1: Main Report -Final-	図書	コピー	WAJ	October 2004
27	(4) Network Analysis Report: Main Report	図書	コピー	WAJ	March 2005
28	(5) Hydraulic Network Analysis Report, Volume 1: Main Report	図書	コピー	WAJ	March 2005
29	(6) Hydraulic Network Analysis Report, Volume 2A: Model Results - Zarqa Governorate - Final -	図書	コピー	WAJ	March 2005
30	(7) Feasibility Study Report - Final -	図書	コピー	WAJ	April 2005
31	(8) Water Systems Facilities Vol. 1A Main Report - Zarqa Governorate - Final -	図書	コピー	WAJ	April 2005
32	(9) Water Systems Facilities Vol. 2A Maps - Zarqa Governorate - Final -	図書	コピー	WAJ	April 2005
33	(10) Drawings for Zarqa (hard copy; existing only)	図面	コピー	WAJ	
34	(11) Electrical copy drawings for Zarqa (land plots, roads, exiting & proposed pipelines)	CD	コピー	WAJ	

# 付 録



## 付録 - 1 プロジェクト地域の将来人口分布の推定

プロジェクト地域の将来人口分布を以下のとおり推定した。

- センサスユニット毎の人口推定値を示し、以下にプロジェクト地域の人口予測値を示す。将来人口を、ザルカ市内の人口分布を以下の手法で推定した。
- 過去の人口センサスユニット( 1994 年 )の人口密度を基にセンサスユニットの飽和人口( 600人/ha )を設定する。
- 表 2-2-1 の予測人口を、1994 年のユニット人口と人口増加率を基に、各ユニットに分配する。もしユニットの人口が飽和人口を超えた場合、人口の増加を停止し、そのユニットのその後の人口は人口密度が低く今後住宅開発が見込まれるユニットに配分する。
- 上記を繰り返し 2005 年から 2025 年までの人口分布を推定する。

センサスユニット t	面積 (1,000 m <sup>2</sup> )	Area	計画 (調整後)						人口密度					飽和 人口密度	飽和人口
			1994	2005	2010	2015	2020	2025	2005	2010	2015	2020	2025		
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
合計	90,465		534,674	837,181	947,193	1,061,247	1,177,457	1,293,648	93	105	117	130	143		
新既開発用地	45,031Z														
新規開発用地	12,298R														
ザルカ	58,852Z		340,261	499,601	565,253	633,317	702,667	772,006	85	96	108	119	131		
ハシミエ	6,161H		13,936	18,754	21,218	23,773	26,376	28,979	30	34	39	43	47		
スフナ	5,595S		9,764	13,609	15,397	17,251	19,140	21,029	24	28	31	34	38		
ルセイファ	18,940R		134,495	254,244	287,654	322,291	357,583	392,869	134	152	170	189	207		
ハッテン	917Sh		36,218	50,973	57,671	64,615	71,691	78,765	556	629	705	782	859		
合計	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
ザルカ地域	837,181	947,193	1,061,247	1,177,457	1,293,648
ザルカ地域以外のザルカ県	73,590	83,260	93,286	103,502	113,715
ザルカ県	910,771	1,030,453	1,154,533	1,280,959	1,407,363
マフラック県村落	2,533	2,866	3,210	3,561	3,913
ハルカ県村落	9,762	11,045	12,375	13,729	15,084
ザルカ支所給水地域合計	923,066	1,044,364	1,170,118	1,298,249	1,426,360



付録 - 2 計画人口及び計画日平均水需要量の推定

配水区	計画人口					計画日平均水需要量 (m3/day)				
	1994	2005	2010	2015	2025	1994	2005	2010	2015	2025
ザルカ低区	188,295	270,315	297,236	320,299	358,948	20,500	32,400	44,600	50,000	54,900
ザルカ高区	21,964	33,587	39,860	48,028	66,775	2,400	4,000	6,000	7,500	10,200
ハシミエ配水区	13,936	18,754	21,218	23,773	28,979	1,500	2,300	3,200	3,700	4,400
スフナ配水区	9,764	13,609	15,397	17,251	21,029	1,100	1,600	2,300	2,700	3,200
アワジャン低区	24,890	37,373	43,440	50,768	67,004	2,700	4,500	6,500	7,900	10,300
アワジャン高区	144,803	234,534	269,150	305,361	377,334	15,800	28,100	40,400	47,600	57,700
ルセイファ低区	74,731	140,041	160,130	182,547	229,300	8,100	16,800	24,000	28,500	35,100
ルセイファ高区	20,074	37,997	43,093	48,608	65,516	2,200	4,600	6,500	7,600	10,000
ハッテン配水区	36,218	50,973	57,671	64,615	78,765	3,900	6,100	8,700	10,100	12,100
ザルカ地域	534,675	837,183	947,195	1,061,250	1,293,650	58,200	100,400	142,200	165,600	197,900
本プロジェクト対象	233,959	336,265	373,711	409,351	475,731	25,500	40,300	56,100	63,900	72,700
ザルカ県全域		910,771	1,030,453	1,154,533	1,407,363		109,300	154,600	180,100	215,300
マフラック県		2,533	2,866	3,210	3,913		300	400	500	600
バルカ県		9,762	11,045	12,375	15,084		1,200	1,700	1,900	2,300
ザルカ支所給水地域		923,066	1,044,364	1,170,118	1,426,360		110,800	156,700	182,500	218,200

総年間水需要量 (百万/年)	40.44	57.20	66.61	79.64
プロジェクト対象 (百万/年)	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
	<b>Total</b>	<b>3,594,842</b>	<b>3,238,331</b>	<b>3,626,750</b>	<b>3,739,352</b>	<b>3,969,336</b>	<b>4,080,112</b>	<b>4,086,219</b>	<b>3,960,753</b>	<b>3,758,630</b>	<b>3,828,601</b>	<b>3,518,189</b>	<b>3,440,566</b>	<b>44,841,681</b>

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	

Implementat ion Possibility	Title	Project Description and Components	Water Supply (MCM/yr)	Approx. Capital Cost	Schedule (Current status and expected completion date)
Will be complete soon	Tamween wells water project in Zarqa	Al-Tamween wells with production equal 450 m <sup>3</sup> / 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"> <li>• Well development (wells number (6,7,8,9,10,11))</li> <li>• Water tank with 1000 m3 capacity</li> <li>• Water pipes with different diameters (400 mm, 300 mm, 250 mm, 200 mm and 100 mm) with total 7800 m</li> <li>• Pumping Building</li> <li>• Operating rooms</li> <li>• Electro-mechanic works</li> <li>• Chlorine room</li> <li>• External works</li> </ul>	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, Mujib Water by treatment and punping from the Dead Sea area to Al-Muntazah pumping station in the amount of about 45 MCM/yr. 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"> <li>• Construction of treatment plant with 55 MCM/yr.</li> <li>• Construction of 41 km of conveyance pipeline 1,000 mm diameter.</li> <li>• Construction of 6 pumping station</li> <li>• Construction of storage reservoirs and pumping stations</li> <li>• A complete SCADA System</li> </ul>	45	125 million USD DBO USAID & Govt of Jordan	The project was completed about 54%, the works are going 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 excavated in wadi-halabat area. The production of these wells is about 600 m3/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 July 2005, the construction works was 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:	100	625 Million USD 1996 prices Private contractor	Not yet started.

Implementat ion Possibility	Title	Project Description and Components	Water Supply (MCM/yr)	Approx. Capital Cost	Schedule (Current status and expected completion date)
		<ul style="list-style-type: none"> <li>Well field consisting of new boreholes (65 wells)</li> <li>Well fields collector, 250mm-1600mm dia steel and/or DI pipes of 260 km length.</li> <li>One collector reservoir (8,500 m3)</li> <li>Main pumping station</li> <li>Regulating tank (85,000 m3) and flow control stations</li> <li>Chlorination units</li> <li>Conveyance pipeline to Amman (325 km), 1800 mm-dia steel pipes, 2000 mm dia steel pipe and 1000 mm dia steel pipes</li> <li>Terminal reservoir at Amman</li> </ul>			
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 Wast System will supply water to the following subsystem:</p> <ul style="list-style-type: none"> <li>Sumaya-Zaatary Khadyeh subsystem</li> <li>Upper Aqed Mafraq subsystem</li> <li>Um-El-Lulu Subsystem</li> </ul> <p>The eastern transmission system starts from Hofa pumping stations, 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 reached Amman. The components are:</p> <ul style="list-style-type: none"> <li>1000 mm pipe, 48 km</li> <li>Pumping station in Zaatary</li> </ul>	-	28 Million USD	Waiting funds from USAID WAJ has been instructed CDM to conduct the detailed study The proposed data for implementation is the year 2006 – 2009.
Nearly completed	Waheda Dam	The dam will give Jordan the ability to store about 225 MCM from the flows of the Yarmouk 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	Waheda Dam Water Supply Project/Irbid	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: <ul style="list-style-type: none"> <li>Intake facilities and transmission pumping stations (PS0, PS1 and PS2)</li> </ul>		50.4 Million USD	Requesting to Japan and waiting fro approval from Japanese government. Feasibility study was completed.

Implementat ion Possibility	Title	Project Description and Components	Water Supply (MCM/yr)	Approx. Capital Cost	Schedule (Current status and expected completion date)
		<ul style="list-style-type: none"> <li>• Water treatment plant</li> <li>• Transmission pipeline ( 1100 mm x 30 km)</li> </ul>			
Cancelled	Desalination Conveyor to Urban Jordan (50+10 MCM)	This project came about a result of the Peace treaty between the Jordan and Israel. The aim of this project is 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 drinkable standards. This project consists of pipelines of different diameters, pumping stations, chlorinating units and telemetry system. According to the Jordanian plans, the construction of the project should start in 2006 and continue for three years.	60 MCM	100 Million JOD	Cancelled because of the water resources in Jordan will meet the water demand.
Completed	Desalination of Deir Alla Brackish Water	<p>WAJ started the implementation of Deir All-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 our resources MWI planned to excuse the project. The project is divided to the following three packages.</p> <ul style="list-style-type: none"> <li>• Drilling and equipping wells</li> <li>• Connection pipelines to connect the wells with the proposed RO unit</li> <li>• Design and build a RO unit to desalinate 2500m<sup>3</sup>/hr in addition to the pre-treatment filters.</li> </ul> <p>The RO unit will be connected to Deir All-Dabouq system to increase water availability.</p>	Supply increased from 45 MCM to 90 MCM	5 Million JOD Govt of Jordan	Completed
Completed	Zai-Dabouq Water Supply	<p>The main objective of the project is 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 consists of the following components.</p> <ul style="list-style-type: none"> <li>• Expansion of pumping station #5</li> <li>• Expansion of the Intake pump station and construction precipitation basin in KAC</li> <li>• A 1200 mm pipeline of 600 m length from station #4 to station #5</li> <li>• A 1200 mm pipeline of 17 km length from Zai treatment plant to about reservoir.</li> </ul>	Same as above	KfW 15 Million JOD & Govt of Jordan 5 Million JOD	Completed.

出所: WAJ

付録 - 5 送水管の容量計算

1. 計算条件 (100%給水人口)

(1) 水需要量

配水区	日最大需要水量 (m³/日)			
	2005	2010	2015	2025
ザルカ低区	38,900	53,500	<b>59,900</b>	66,000
ザルカ高区	4,800	7,200	<b>9,000</b>	12,300
ハシミエ	2,700	3,800	<b>4,400</b>	5,300
スフナ	2,000	2,800	<b>3,200</b>	3,900

: 目標年次 2015 年

: 送水管の設計には日最大需要量を使用

(2) 管路延長及び口径

	パイプラインルート	延長(m)	口径(mm)
	ハウポンプ場 - ハウ交差点 (既存)	4,600 m	既存 700 mm
	ハウ交差点- バトラウィ配水池 (既存)	4,450 m	既存 700 mm
	ハウ交差点- ハシミエ配水池	6,200 m	300 mm/400 mm
	ハシミエ配水池-スフナ配水池	7,700 m	300 mm
	バトラウィ配水池- ザルカ高区配水池	1,600 m	300 mm

注: コロドール井戸開発プロジェクトの竣工図面から採用

(3) 配水池の水位

配水池	高水位 (m)	低水位 (m)
ハウ	605	600
バトラウィ	654	645
ザルカ高区	715	710
ハシミエ	630	625
スフナ	590	585

(4) 計算方法

計算ソフトウェア	EPANET2 ( 米国環境保護庁 )
流量計算式	Hazen-Williams $H = 10.666 C^{-1.85} D^{-4.87} Q^{1.85} \cdot L$ H: 損失水頭 (m) Q: 水量 (m³/sec) D: 管路径 (m) L: 管路延長 (m) C: Hazen-Williams 係数(=110)

## (5) ポンプ容量

( 既存ハウポンプ場 ( ザルカポンプ場への送水用 ) )

ポンプユニット	設計流量( $\text{m}^3/\text{時}$ )	水頭(m)
No.1	500	150
No.2	500	150
No.3	500	150
No.4	500	150
No.5	300	150
No.6	500	150

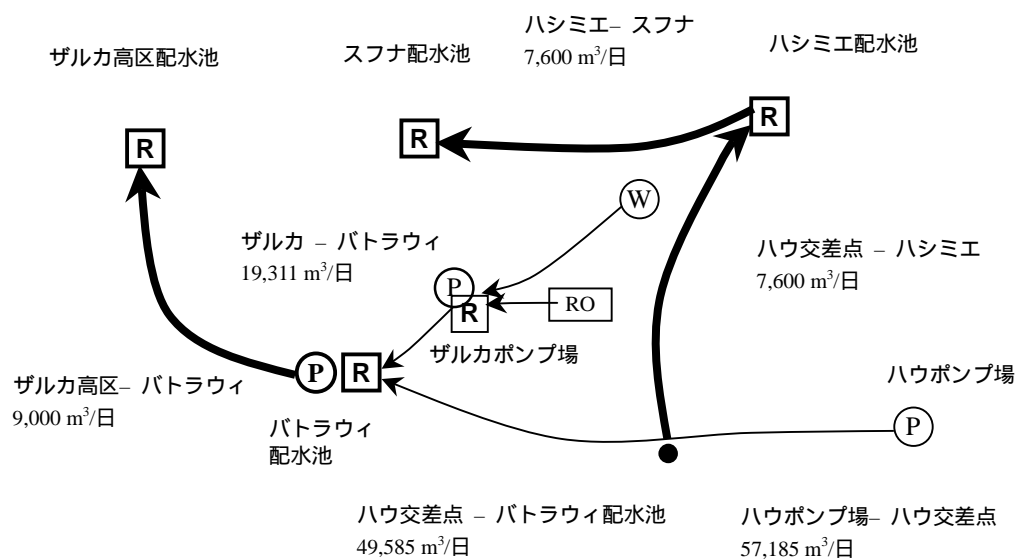
( 計画バトラウィポンプ場 ( ザルカ高区配水池へ送水用 ) )

ポンプユニット	設計流量( $\text{m}^3/\text{時}$ )	Total Head (m)	
No.1	300	90	1 運転
No.2	300	90	1 予備

## 2. 水源の代替案

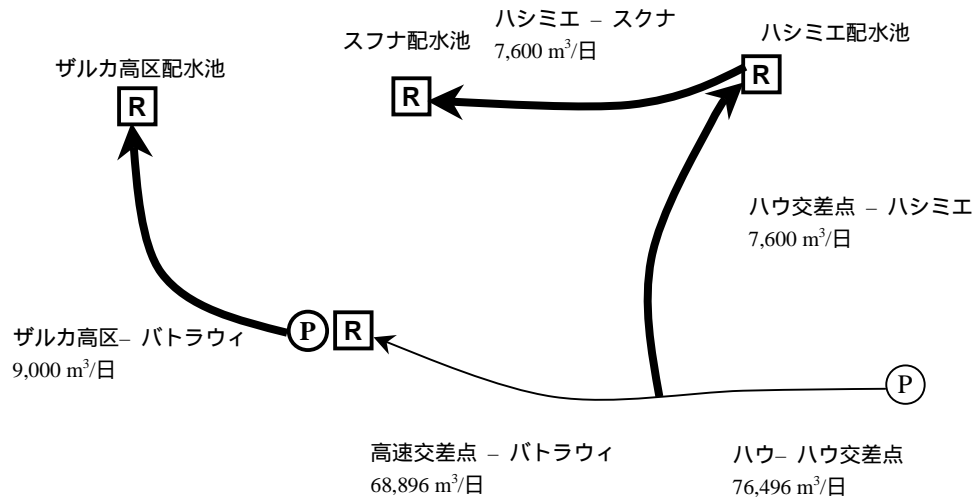
### (1) ケース 1

水源: 既存井戸 ( ザルカ井戸及びハシミエ井戸 ) 及びハウポンプ場水



(2) ケース 2

水源: ハウポンプ場水のみ



3. 解析結果

(1) ケース 1

番号	ハウポンプ場での稼働ポンプ台数	配水池での高水位以上の余剰水圧(m)		評価
		バトラウィ	ハシミエ	
	500m³/h × 4    300m³/h × 2	66	63	OK
	500m³/h × 4    300m³/h × 1	54	51	OK
	500m³/h × 4    300m³/h × 0	37	34	OK
	500m³/h × 3    300m³/h × 2	44	40	OK
	500m³/h × 3    300m³/h × 1	20	18	OK

配水池	送水方法 (稼働ポンプ/自然流下)	配水池での高水位以上の余剰水圧(m)
ザルカ高区	300 m³/時水量、90 m 揚程	3
スフナ	ハシミエ配水池からの自然流下	19

パイプラインルート	口径(mm)	流速(m/s)	単位損失水頭(1m/1000 m)
ハウポンプ場- ハウ交差点	700 mm	1.72	4.7
ハウ交差点- バトラウィ配水池	700 mm	1.49	3.6
ハウ交差点- ハシミエ配水池	300 mm	1.24	6.9
ハシミエ配水池- スフナ配水池	300 mm	0.52	1.4
バトラウィ配水池- ザルカ高区配水池	300 mm	1.47	9.6



(2) ケース 2

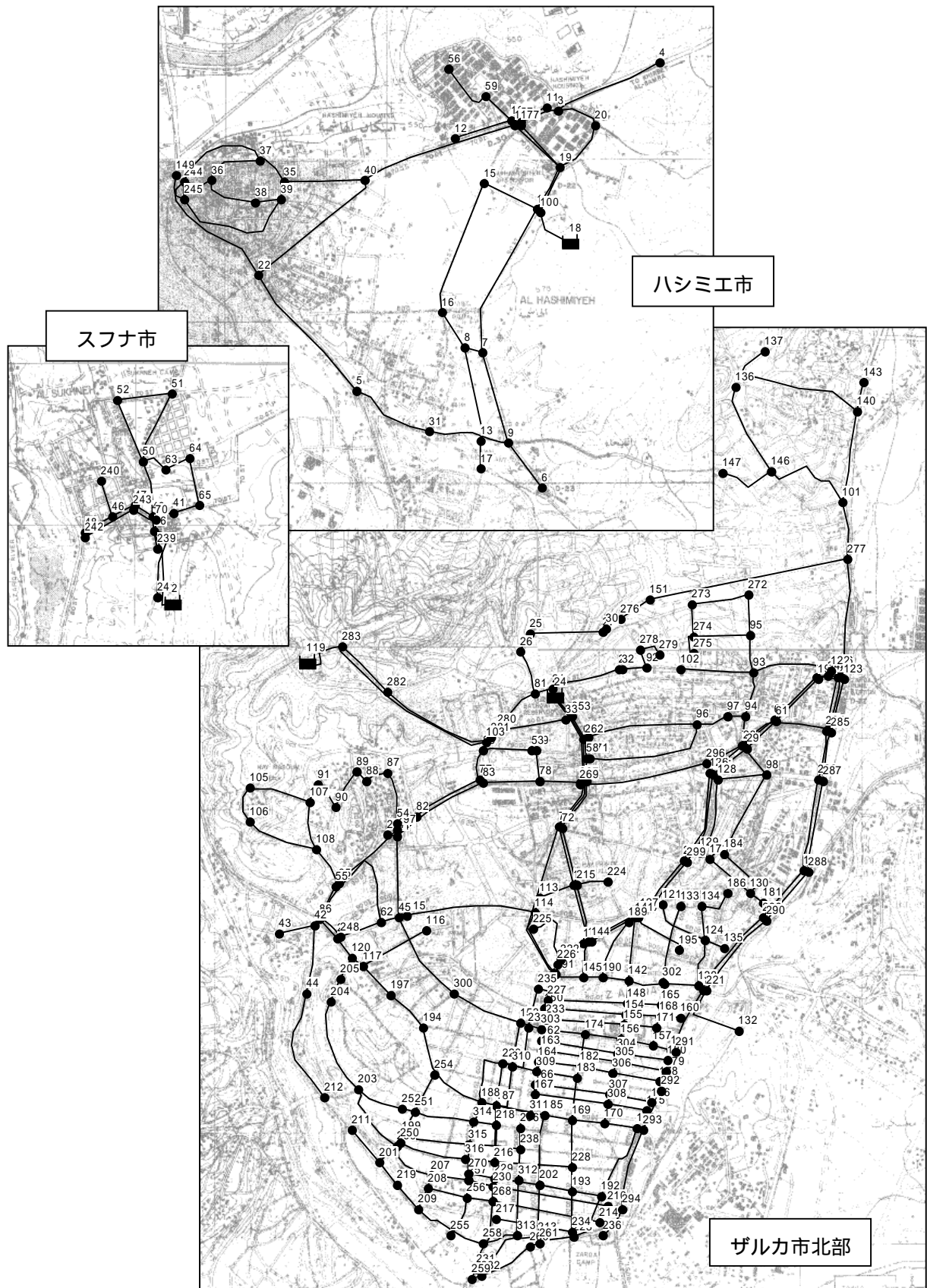
ハウポンプ場での稼働ポンプ台数	配水池での高水位以上の余剰水圧(m)		評価
	バトラウィ配水池	ハシミエ配水池	
500m <sup>3</sup> /時×4 300m <sup>3</sup> /時×2	4	14	OK

配水池	送水方法（稼働ポンプ/自然流下）	配水池での高水位以上の余剰水圧(m)
ザルカ高区	300 m <sup>3</sup> /時水量、90 m 揚程	3
スフナ	ハシミエ配水池からの自然流下	19

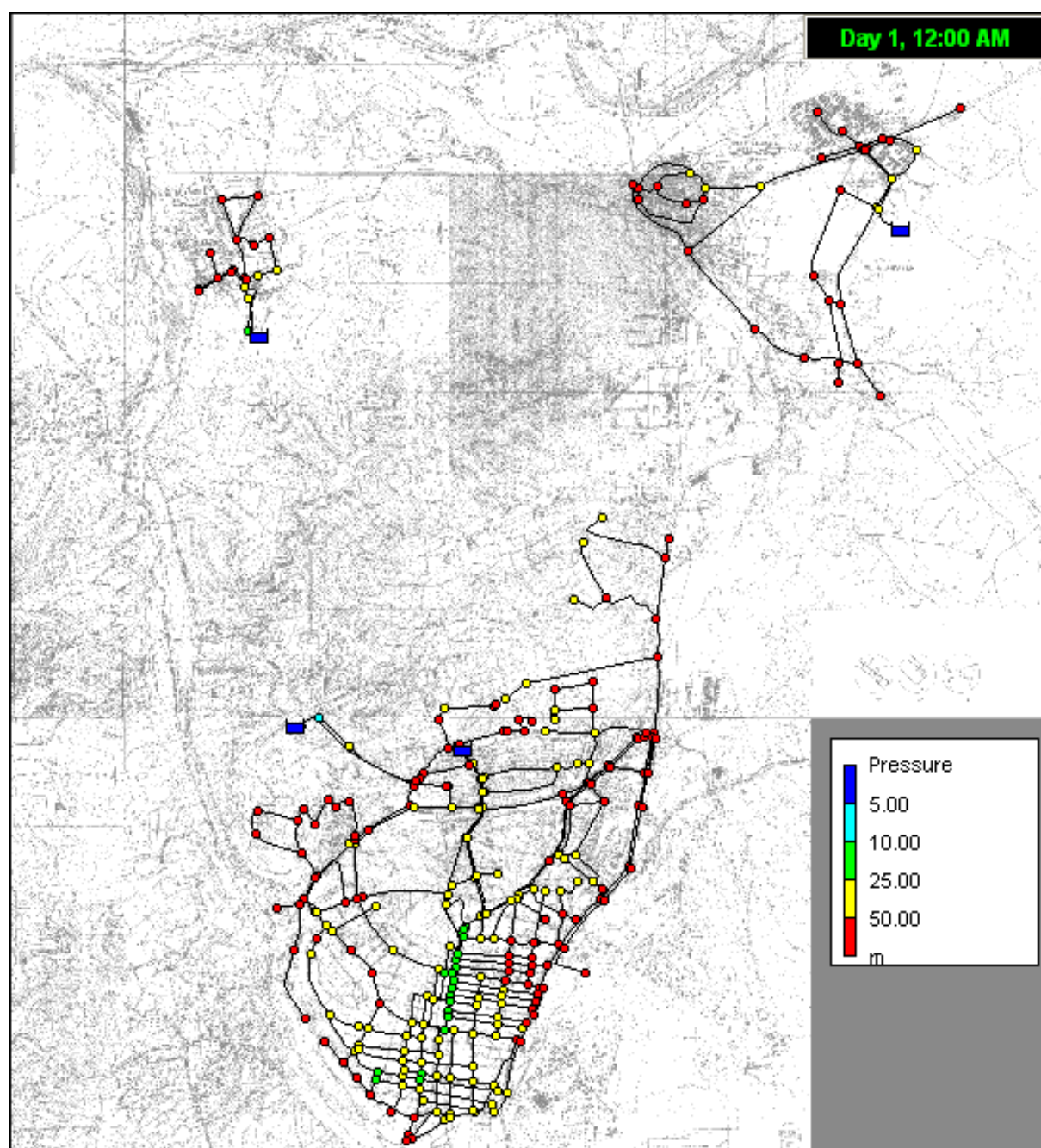
パイプラインルート	口径(mm)	流速(m/s)	単位損失水頭 (1m/1000 m)
ハウポンプ場- ハウ交差点	700	2.30	8.0
ハウ交差点- バトラウィ配水池	700	2.07	6.6
ハウ交差点- ハシミエ配水池	300	1.24	6.9
-2 ハウ交差点- ハシミエ配水池	400	0.70	1.7
ハシミエ配水池- スフナ配水池	300	0.52	1.4
バトラウィ配水池- ザルカ高区配水池	300	1.47	9.6

## 付録 - 6 管網解析結果

### (1) 配水管網の番号付け



(2) 日最大給水量時 (2015 年)

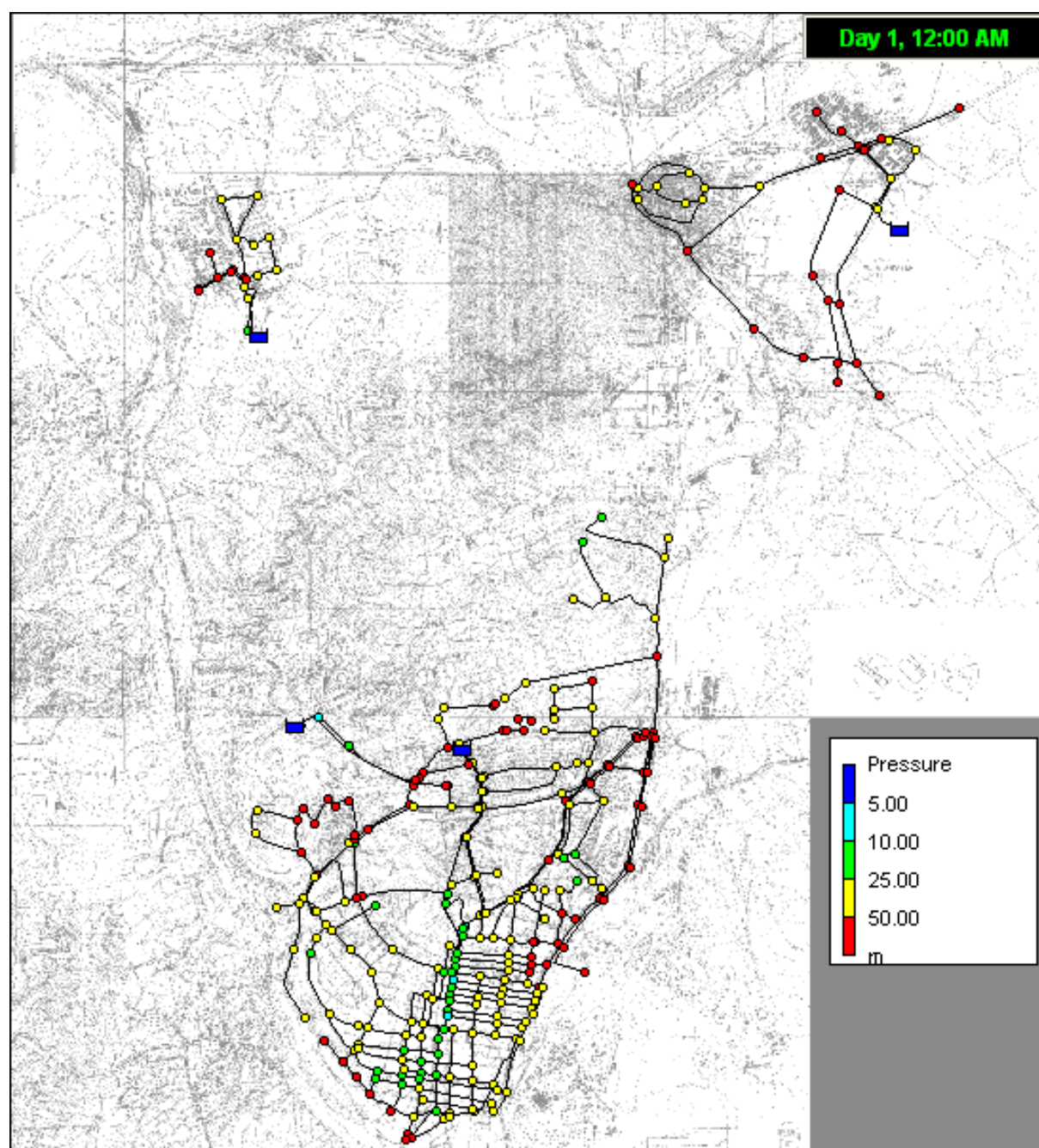


(3) 日最大給水量時データ（2015 年）

Network Data-Node 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 242	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 243	555	134.81	608.28	53.28	June 146	565	244.4	617.63	52.63
June 15	570	179.56	623.55	53.55	June 133	597	308.15	636.25	35.25	June 244	550	156.81	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 245	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 262	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	30.96	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	179.85	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	520	266.96	592.35	57.35	June 160	575	81.48	636.93	41.81	June 268	603	408.33	636.63	41.63	June 26	645	108.48	700.61	56.61
June 56	562	50.37	623.61	67.37	June 162	625	209.14	637.46	12.46	June 270	602	290.81	634.91	32.46	June 27	625	116.44	700.19	75.19
June 59	563	82.96	623.61	60.61	June 162	623	397.04	636.48	13.48	June 292	600	223.56	636.67	36.67	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 393	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	49.11	635.54	63.54
June 69	600	196.37	640.36	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	642.71	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	299.18	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	208.96	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 265	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	283.13	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	510.35	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	291.04	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	40.43	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	540.7	636.36	62.36	June 212	550	422.81	607.01	57.01	June 238	615	93.33	644.36	29.36	June 314	603	246.07	632.39	32.39
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 320	610	27.56	700.19	90.19
June 106	635	339.26	690.25	55.25	June 229	617	141.04	636.66	17.66	June 271	595	189.33	632.69	37.69	June 32	620	41.33	702.56	82.56
June 107	595	398.52	691.93	96.93	June 230	619	157.33	636.65	17.65	June 272	568	96	634.09	66.09	June 33	6			



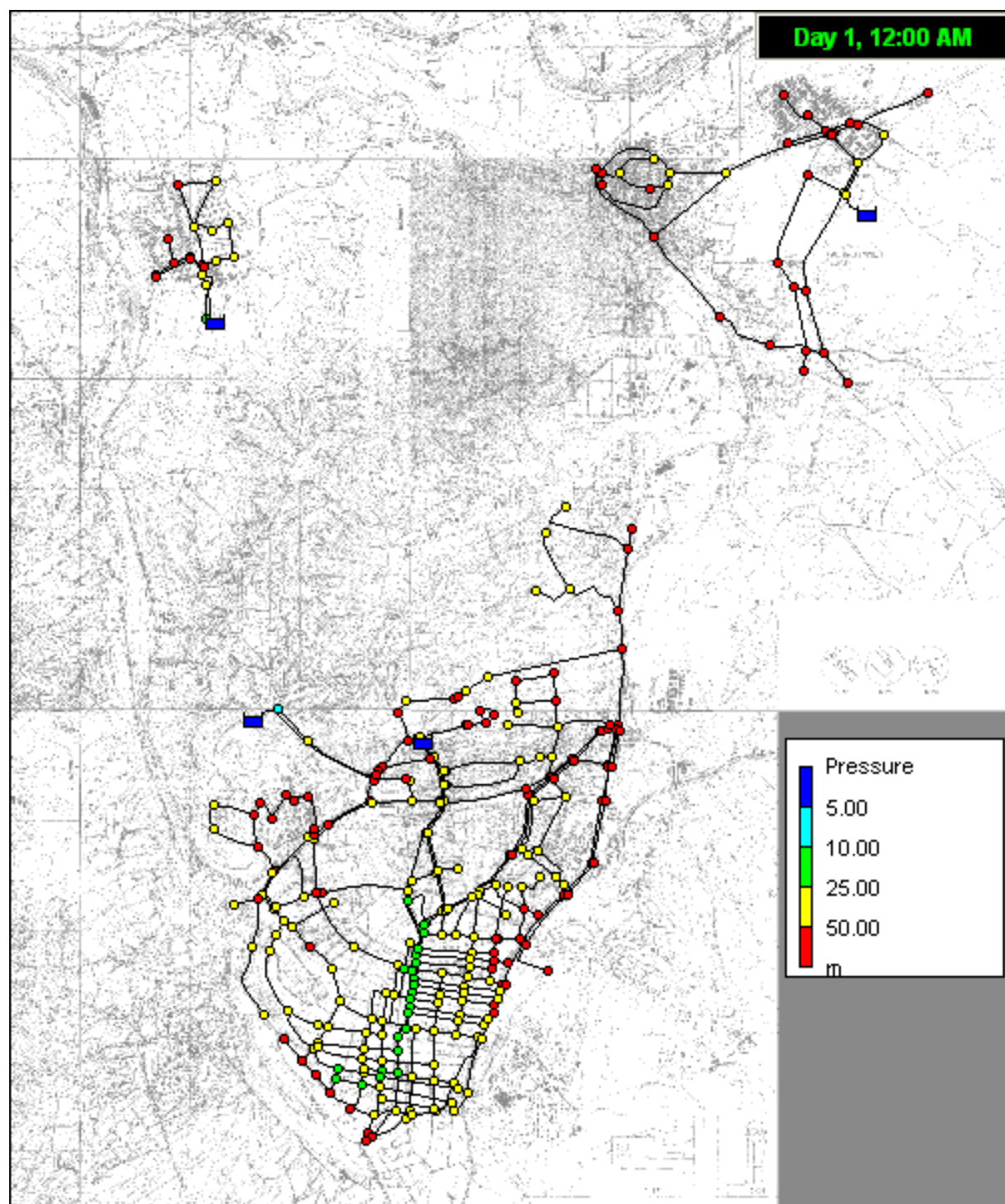
(4) 時間最大給水量時 (2015 年)



## (5) 時間最大給水量時データ (2015 年)

NetworkTable-Nodes																			
NodeID	Elevation	Demand	Head	Pressure	NodeID	Elevation	Demand	Head	Pressure	NodeID	Elevation	Demand	Head	Pressure	NodeID	Elevation	Demand	Head	Pressure
	m	CMD	m	m		m	CMD	m	m		m	CMD	m	m		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 188	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
June 93	600	459.9	626.53	26.53	June 205	563	242.8	591.7	28.7	June 225	610	282.8	631.58	21.58	June 308	590	393.6	620.67	30.67
June 94	585	171.3	626.28	41.28	June 206	603	236.5	622.79	19.79	June 226	620	188.8	632.75	12.75	June 309	615	353.9	630.66	15.66
June 95	578	177.6	626.09	48.09	June 207	607	461.6	620.7	13.7	June 227	620	545.8	631.92	11.92	June 310	600	513.6	631.33	31.33
June 96	595	765.4	625.67	30.67	June 208	607	285.6	620.45	13.45	June 233	620	443.4	631.84	11.84	June 311	613	202	623.76	10.76
June 97	585	143	626.05	41.05	June 209	567	1042.2	619.3	52.3	June 235	606	314.4	632.32	26.32	June 312	604	210.7	621.31	17.31
June 98	580	490.6	624.03	44.03	June 211	555	333.6	615.62	60.62	June 237	615	554.4	631.85	16.85	June 313	597	104.2	620.26	23.26
June 99	570	73	629.93	59.93	June 212	550	570.8	578.77	28.77	June 253	615	126	643.88	28.88	June 314	603	332.2	628.08	25.08
June 101	550	326.4	598.17	48.17	June 213	595	136.4	630.45	35.45	June 262	600	109.8	642.79	42.79	June 315	600	479	621.98	21.98
June 104	567	580.8	629.5	62.5	June 223	598	96	630.46	32.46	June 267	600	137.7	640.38	40.38	June 316	602	395	628.69	26.69
June 105	638	409.2	675.58	37.58	June 228	597	559.8	630.45	33.45	June 269	600	355.7	640.16	40.16	June 30	610	37.2	692.9	82.9
June 106	635	458	675.56	40.56	June 229	617	190.4	630.45	13.45	June 271	595	255.6	623.53	28.53	June 32	620	55.8	697.03	77.03
June 107	595	538	678.51	83.51	June 230	619	212.4</												

(6) 時間最大給水量時 (2010 年)



## (7) 時間最大給水量時データ (2010 年)

NetworkTable-Nodes																			
Elevation Demand				Head Pressure				Elevation Demand				Head Pressure							
NodeID	m	CMD	m	NodeID	m	CMD	m	NodeID	m	CMD	m	NodeID	m	CMD	m				
Junc 10	565	154.12	623.34	58.34	Junc 127	598	542.95	635.9	37.9	Junc 244	540	189.66	594.66	54.66	Junc 137	575	179.81	607.67	32.67
Junc 11	560	39.76	623.32	63.32	Junc 128	580	415.22	624.63	44.63	Junc 245	540	188.61	594.65	54.65	Junc 140	550	319.86	607.86	57.86
Junc 12	565	64.39	623.26	58.26	Junc 129	578	436.77	621.14	43.14	Junc 42	537	499.67	594.53	57.53	Junc 143	550	33.43	607.86	57.86
Junc 14	565	242.45	606.69	41.69	Junc 130	585	502.84	620.67	35.67	Junc 43	555	160.11	594.52	39.52	Junc 146	565	290.3	607.36	42.36
Junc 15	570	213.24	623.01	53.01	Junc 133	597	365.96	632.96	35.96	Junc 44	550	806.16	593.7	43.7	Junc 147	570	67.91	607.35	37.35
Junc 16	570	193.89	621.96	51.96	Junc 134	593	324.61	632.85	39.85	Junc 45	567	831.05	627.04	60.04	Junc 149	530	151.66	600.51	70.51
Junc 22	525	475.74	600.64	75.64	Junc 135	570	98.17	633.11	63.11	Junc 62	565	1098.57	606.9	41.9	Junc 1	590	116.82	623.66	33.66
Junc 31	540	181.92	609.11	69.11	Junc 138	572	566.35	632.66	60.66	Junc 246	562	250.01	599.3	37.3	Junc 3	565	213.59	616.81	51.81
Junc 35	560	144.97	596.78	36.78	Junc 139	572	281.68	633.18	61.18	Junc 247	600	56.12	635.31	35.31	Junc 4	550	122.81	616.31	66.31
Junc 36	550	157.64	594.77	44.77	Junc 141	600	465.63	634.11	34.11	Junc 248	562	973.65	599.42	37.42	Junc 5	535	260.04	605.14	70.14
Junc 37	560	209.02	595.06	35.06	Junc 142	585	485.51	633.98	48.98	Junc 250	590	348.71	629.58	39.58	Junc 6	545	61.93	613.77	68.77
Junc 38	545	88.32	595.07	50.07	Junc 144	605	174.71	634.98	29.98	Junc 251	585	926.32	627.72	42.72	Junc 7	570	122.1	621.58	51.58
Junc 39	550	187.9	595.42	45.42	Junc 145	606	252.12	634.62	28.62	Junc 252	584	88.85	626.73	42.73	Junc 8	570	171.01	621.74	51.74
Junc 40	565	421.9	599.93	34.93	Junc 148	584	398.5	633.95	49.95	Junc 254	578	245.44	627.63	49.63	Junc 9	545	250.19	613.78	68.78
Junc 41	530	128.44	575.77	45.77	Junc 150	620	497.73	634.84	14.84	Junc 255	570	296.11	630.42	60.42	Junc 13	545	134.42	621.71	76.71
Junc 46	500	249.48	576	76	Junc 153	606	670.86	634.41	28.41	Junc 256	606	387.07	630.55	24.55	Junc 17	545	29.91	621.71	76.71
Junc 47	515	120.69	576.16	61.16	Junc 154	586	370.71	633.94	47.94	Junc 257	605	284.49	630.81	25.81	Junc 19	580	182.27	610.3	30.3
Junc 48	490	85.15	575.99	85.99	Junc 155	586	376.51	633.94	47.94	Junc 258	580	721.97	625	45	Junc 20	575	112.6	613.35	38.35
Junc 49	518	357.51	576.36	58.36	Junc 156	585	481.2	633.93	48.93	Junc 259	560	133.01	633.49	73.49	Junc 21	650	176.73	699.98	49.98
Junc 50	520	592.57	565.33	45.33	Junc 157	584	173.12	633.87	49.87	Junc 260	595	60.17	633.52	38.52	Junc 23	625	140.05	699.78	74.78
Junc 51	518	337.45	563.47	45.47	Junc 158	580	44.51	633.87	53.87	Junc 261	595	46.45	633.53	38.53	Junc 25	655	176.64	697.09	42.09
Junc 52	512	317.04	563.48	51.48	Junc 160	576	49.26	633.73	57.73	Junc 268	605	486.12	633.49	28.49	Junc 26	645	125.27	697.68	52.68
Junc 56	562	59.82	623.03	61.03	Junc 161	625	248.34	634.63	9.63	Junc 270	602	345.37	631.13	29.13	Junc 27	625	138.29	696.51	71.51
Junc 59	563	98.53	623.09	60.09	Junc 162	623	424.02	633.28	10.28	Junc 192	590	265.49	633.55	43.55	Junc 28	578	123.33	634.23	56.23
Junc 67	600	198.28	642.99	42.99	Junc 163	618	420.67	632.53	14.53	Junc 193	594	271.83	633.53	39.53	Junc 29	578	123.95	633.45	55.45
Junc 68	600	219.05	629.71	29.71	Junc 164	617	329.89	631.99	14.99	Junc 202	601	521.31	633.53	32.53	Junc 221	572	583.24	631.99	59.99
Junc 69	600	233.21	641.38	41.38	Junc 166	615	407.3	629.69	14.69	Junc 210	590	105.21	633.14	43.14	Junc 284	570	123.33	633.01	63.01
Junc 71	600	355.93	639.1	39.1	Junc 167	615	399.21	629.07	14.07	Junc 214	592	98.17	633.18	41.18	Junc 285	570	122.81	632.76	62.76
Junc 72	600	352.76	640.18	40.18	Junc 169	593	551.31	633.78	40.78	Junc 216	606	385.31	633.52	27.52	Junc 286	575	343.43	632.91	57.91
Junc 73	600	204	641.87	41.87	Junc 170	587	410.82	633.78	46.78	Junc 217	600	86.91	633.35	33.35	Junc 287	575	345.55	632.52	57.52
Junc 74	578	301.12	630.24	52.24	Junc 172	584	251.59	633.63	49.63	Junc 218	602	430.88	633.73	31.73	Junc 288	567	513.04	632.19	65.19
Junc 75	570	181.04	630.72	60.72	Junc 174	598	346.78	634.12	36.12	Junc 219	565	432.46	624.53	59.53	Junc 289	575	628.11	632.71	57.71
Junc 76	570	179.99	631.16	61.16	Junc 175	582	84.8	625.72	43.72	Junc 220	598	926.32	634.14	36.14	Junc 290	575	628.99	632.06	57.06
Junc 77	613	231.71	694.9	81.9	Junc 176	581	93.25	625.95	44.95	Junc 165	578	152.36	633.68	55.68	Junc 291	580	304.73	632.65	52.65
Junc 78	608	200.22	641.21	33.21	Junc 178	580	129.49	632.77	52.77	Junc 168	578	175.59	633.74	55.74	Junc 292	581	210.25	632.65	51.65
Junc 79	610	40.82	641.19	31.19	Junc 179	580	140.75	627.74	47.74	Junc 171	578	142.86	633.82	55.82	Junc 293	584	285.02	632.64	48.64
Junc 80	630	205.06	699.1	69.1	Junc 180	580	140.75	628.37	48.37	Junc 173	590	340.8	620.89	30.89	Junc 294	590	105.56	632.64	42.64
Junc 81	645	189.84	700.07	55.07	Junc 182	602	365.6	632.82	30.82	Junc 181	575	52.78	620.67	45.67	Junc 296	580	553.77	632.26	52.26
Junc 82	630	263.21	693.83	63.83	Junc 183	600	332.7	633.35	33.35	Junc 184	595	557.38	620.76	25.76	Junc 297	610	396.74	693.52	83.52
Junc 83	613	330.68	641.04	28.04	Junc 185	600	609.63	633.83	33.83	Junc 186	606	170.66	632.56	26.56	Junc 298	580	1005.85	635.73	55.73
Junc 84	610	701.82	635.31	25.31	Junc 187	600	1062.85	634.07	34.07	Junc 189	598	231.36	633.23	35.23	Junc 299	580	1015.53	633.94	53.94
Junc 85	590	519.55	687.04	97.04	Junc 188	588	1502.35	630.94	42.94	Junc 190	594	330.42	634.1	40.1	Junc 300	590	777.04	626.79	36.79
Junc 86	556	303.14	595.36	39.36	Junc 194	572	855.6	618.97	46.97	Junc 191	620	361.82	635.3	15.3	Junc 301	578	243.33	633.42	55.42
Junc 87	620	273.41	689.01	69.01	Junc 197	565	398.5	615.41	50.41	Junc 195	585	265.67	632.98	47.98	Junc 302	578	353.29	633.32	55.32
Junc 88	610	133.36	687.83	77.83	Junc 199	590	472.93	628.97	38.97	Junc 196	570	47.86	633.25	63.25	Junc 303	615	171.37	634.63	19.63
Junc 89	620	200.57	687.21	67.21	Junc 200	590	585.88	623.89	33.89	Junc 198	570	47.5	633.17	63.17	Junc 304	590	369.83	628.66	38.66
Junc 90	600	251.59	685.93	85.93	Junc 201	564	666.28	622.74	58.74	Junc 215	606	615.26	638.41	32.41	Junc 305	592	366.48	628.03	36.03
Junc 91	600	173.48	685.39	85.39	Junc 203	580	714.93	623.52	43.52	Junc 222	625	330.06	635.49	10.49	Junc 306	590	237.17	632.78	42.78
Junc 92	620	302.79	699.74	79.74	Junc 204	570	537.32	604.06	34.06	Junc 224	605	127.56	638.41	33.41	Junc 307	592	360.5	626.06	34.06
Junc 93	600	404.57	630.43	30.43	Junc 205	563	213.59	602.97	39.97	Junc 225	610	248.78	634.42	24.42	Junc 308	590	346.25	625.81	35.81
Junc 94	585	150.69	630.24	45.24	Junc 206	603	208.05	627.49	24.49	Junc 226	620	166.09	635.34	15.34	Junc 309	615	311.33	633.69	18.69
Junc 95	578	156.23	630.09	52.09	Junc 207	607	406.07	625.83	18.83	Junc 227	620	480.14	634.68	14.68	Junc 310	600	451.81	634.22	34.22
Junc 96	595																		



## 付録 - 7 本プロジェクトの効果指標に関する検討

本計画の効果をプロジェクトの有無のケースにおいて評価する。両ケースの大きな違いは、プロジェクト無しのケースでは、ポンプ給水方式であり、プロジェクト有りのケースでは、配水池からの自然流下給水方式である。

### (1) 評価条件

- 1) 評価年次：2010 年（プロジェクトの目標年次）
- 2) プロジェクト：あり（ポンプ圧送給水）/なし（配水池からの自然流下給水）
- 3) 条件値
  - 1 人 1 日実使用水量
  - 初期設定漏水率
  - 人口
  - 日平均水需要量

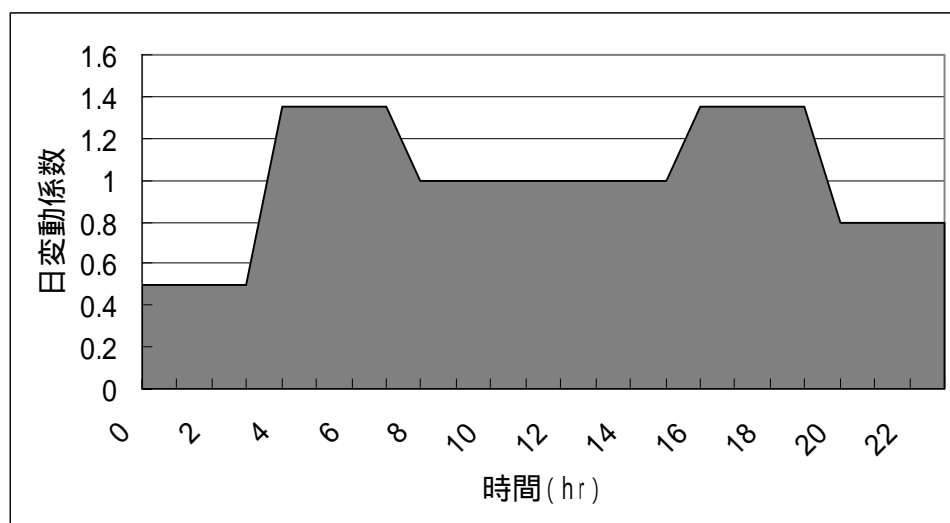
	単位	2005	2010
1 人 1 日実使用水量	lpcd	90	108
初期設定漏水率	%	31	28
計画人口		336,265	373,711
日平均供給水量	m <sup>3</sup> /日	43,700	56,100

配水区	人口			日平均水需要量(m <sup>3</sup> /日)		
	2005	2010	2015	2005	2010	2015
ザルカ低区	270,315	297,236	320,299	35,100	44,600	50,000
ザルカ高区	33,587	39,860	48,028	4,400	6,000	7,500
ハシミエ	18,754	21,218	23,773	2,400	3,200	3,700
スフナ	13,609	15,397	17,251	1,800	2,300	2,700
合計	336,265	373,711	409,351	43,700	56,100	63,900

### 4) 需要量時間変動パターン

以下の需要量時間変動パターンを設定した。なお、夜間においても貯水槽に貯水することから、夜間流量を多少高く設定した。

時間	0-4	4-8	8-12	12-16	16-20	20-24
日変動係数	0.5	1.35	1	1	1.35	0.8



## 5) ポンプ運転パターン

### a) プロジェクト無しの場合の配水ポンプ運転パターン

水需要量の変動に合わせて効率的なポンプ運転パターン（台数制御）を以下のとおり設定した。

No	ポンプ場 送配水先	ポンプ No.	ポンプ No. EPANET2	ポンプカー ブ No. EPANET2	容量 m³/日	全 水頭 (m)	容量 (m³/時)	運転（時間）					
								0-4	4-8	8-12	12-16	16-20	20-24
1	ハウポンプ場（旧） アンマンへ	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	-	-	-	-	-	-
	ハウポンプ場（新） ザルカポンプ場へ ハシミエポンプ場へ バトラウィ配水池へ	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	ザルカポンプ場（屋内） ザルカ市へ バトラウィへ バラットへ	1	306	3	7200	100	300	0	0	0	0	0	0
		2	302	3	7200	100	300	0	0	0	0	0	0
		3	301	3	7200	100	300	0	0	0	0	0	0
		4	300	4	7200	120	300	X	0	0	0	0	0
	ザルカポンプ場（屋外） ルセイファへ ハシミエへ バトラウィへ バラットへ	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	0	X	X	0	X
		11	309	3	7200	100	300	X	0	0	0	0	0
3	ハシミエポンプ場 ハシミエ市へ スフナ市へ	1	80	9	3600	150	150	X	0	X	X	0	X
		2	52	9	3600	150	150	X	0	0	0	0	X
		3	255	10	2880	125	120	0	X	X	X	X	0
		4	85	11	1920	120	80	0	X	0	0	X	0
4	スフナ増圧ポンプ場 バニーハシェム村へ	1			1200	200	50	-	-	-	-	-	-
		2			1800	132	75	-	-	-	-	-	-
5	バトラウィポンプ場 ザルカ高区へ	1	295	12	3600	100	150	0	0	0	0	0	0
		2	192	12	3600	100	150	X	0	0	0	0	X
6	ザルカ脱塩処理場内ポンプ場 ザルカポンプ場	1			9600	50	400	-	-	-	-	-	-
		2			14400	50	600	-	-	-	-	-	-
		3			10800	50	450	-	-	-	-	-	-

0：運転

X：休止

### b) プロジェクトありの場合の配水ポンプパターン

プロジェクトありの場合は、配水池から自然流下配水されるため、配水ポンプの稼働は必要なくなる。

なお、配水池からの配水圧を以下のとおり設定した。なお、配水池の水位の変動は小さいため、計算では考慮しない。

配水池	配水池の低水位 (m)
ザルカ低区	645
ザルカ高区	710
ハシミエ	620
スフナ	585

## (2) 漏水量の低減及び給水圧の改善効果 (2010 年)

### 1) 推定手法

上記の条件の基、プロジェクト実施ありなしのケースにおいて、管網解析 (EPANET 2) を行い、日平均水需要量日における水圧変動を推定した。2 ケースの水圧変動結果を基に漏水量の低減効果を以下の漏水流量換算式を用いて推定した。

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

$Q$  : プロジェクト実施後の漏水量  
 $Q_0$  : プロジェクト実施前の漏水量  
 $r$  : 指数 (=1) ( $r$  は漏水部分の形状により異なるが、一般に  $r = 1$  が使用されている)  
 $P_0$  : プロジェクト実施前の給水圧  
 $P$  : プロジェクト実施後の給水圧

### 2) 推定結果

#### a) 給水圧時間変動推定結果

給水地域の推定平均給水圧の一日の時間変動を下表に示す。平均給水圧が 66m から 54m に減少する。

給水地域推定平均給水圧時間変動 (m)

時間	0-4	4-8	8-12	12-16	16-20	20-24	平均
プロジェクトなし	90	40	68	68	40	90	66
プロジェクトあり	59	49	54	54	49	56	54

#### b) 給水量・漏水量推定結果

	単位	プロジェクトなし	プロジェクトあり
総人口	-	373,711	373,711
総供給水量	m <sup>3</sup> /日	56,100	56,100
推定平均給水圧 (管網解析計算から)	m	0	0
推定漏水率	-	0.31	0.25
推定総使用水量	m <sup>3</sup> /日	38,709	42,075
推定総漏水量	m <sup>3</sup> /日	17,391	14,025
推定 1 人 1 日使用水量	L/人・日	104	113

c) 不良給水圧の割合

時間	0-4	4-8	8-12	12-16	16-20	20-24
プロジェクト無し						
優良給水圧の接点数	297	207	294	294	207	297
不良給水圧の接点数*1	0	90	3	3	90	0
不良給水圧の割合(%)	0	30	1	1	30	0
試算*2 - 日最大需要量時における不良給水圧の割合(%)	0	70	36	36	70	0
プロジェクトあり						
優良給水圧の接点数	297	297	297	297	297	297
不良給水圧の接点数	0	0	0	0	0	0
不良給水圧の割合(%)	0	0	0	0	0	0
試算*2 - 日最大需要量時における不良給水圧の割合(%)	0	0	0	0	0	0

注) \*1: 不良給水圧: 10m 以下の給水圧

\*2: 日平均水需要量時のポンプ運転を想定

d) 結論

プロジェクト実施後、漏水率は 31% から 25% に改善し、374 千人の裨益人口に対し、1 人 1 日実使用水量が 104 リッターから 113 リッターに、約 9% 増加する。更に、プロジェクト無しの場合には、日中の最も多く水を使用する時間帯において、不良給水圧地域の割合が 30% (112 千人相当) であるが、プロジェクト実施後は、不良給水圧地域の割合が 0 % となる。なお、日平均需要量以上の水需要時には更に不良給水地域が増加し、日最大給水量時には、時間に応じ 36% - 70% の不良給水地域となる。プロジェクト実施後の配水池からの自然流下配水においては、日平均時及び日最大給水量時において、不良給水地域は 0 % である。

一旦、明確な配水区が設定され、各配区内への給水が配水池からの自然流下給水になった場合、給水圧の極端な変動が減少するため、現在煩雑に発生している給配水管の破裂事象が大幅に減少することが見込まれる。これにより、漏水量の改善効果も考えられうる。その他の裨益効果を以下に示す。

- 管路の破裂の減少
- 上記による漏水制御コストの減少
- ポンプ圧送給水から自然流下給水への変更により、維持管理が容易となる
- 送水ポンプ運転が簡単となる
- ポンプ運転費用(電気代)の低減
- 給水管理が容易になる(ポンプでの給水圧管理は困難)
- ポンプ近辺の高圧管路で頻繁に発生していた破裂が減少し、破裂時における全地域の断水が減少する。漏水制御対策が容易なる
- 今後、配水区内のサブブロック化が容易になり、漏水対策が実施しやすくなる(無収水対策技術協力プロジェクトで強化された技術・スタッフにより漏水制御対策が進む)
- 給水不良地域では、WAJ あるいは民間の水売りの給水タンクから給水を受けていたが、この状況が改善される

上記のとおり、本プロジェクトにより、漏水量の低減及び公平な給水に加え、施設の維持管理面の効果が測定された。

(3) 更なる漏水率の改善に向けて

配水区が設定された後、以下の施策により、漏水率は 15% 程度に低減可能である。

- 配水サブゾーンの設定と計画的な漏水制御作業 無収水対策技術協力により強化し WAJ 側が実施
- 漏水発生が少ない給水管の交換（亜鉛メッキ・鋼管から HDPE 管） WAJ 側が実施
- 給水管の施工方法の改善 無収水対策技術協力により強化し WAJ 側が実施
- 老朽管の交換 WAJ 側が実施

(1) 「ヨ」国の環境影響評価システム

「ヨ」国における環境影響評価行政は、環境省（Ministry of Environment）の環境影響評価局（Environmental Impact Assessment Directorate）において実施されている。環境影響評価は、EIA Bylaw No. 37/2005 により規定されており、EIA の手順は以下の通りである。

EIA の主要な手順

- 提案されたプロジェクトが EIA の必要なプロジェクトの範疇に入るならば、事業者は、その旨通告され、有資格のコンサルタントをととして調査事項（TOR）（案）を作成するよう要請される。
- スコーピングセッションの日付及び場所を、事業者とステークホルダー参加の基で決定する。
- スコーピングセッションでは、ステークホルダーの関心事項と利害を同定すると共に、環境省技術委員会のコメントを得る。セッションの成果は、TOR（案）に取り込み最終 TOR を作成する。
- EIA 調査は、承認された TOR に基づき、この段階から開始される。
- EIA 報告書（案）が、技術委員会の審査の目的で、EIA 局に提出される。
- 事業者は、EIA 調査が、承認された TOR に適合していない場合、修正、改変、再調査を実施する。
- EIA 調査が、承認された TOR に適合した場合、調査報告書は承認され、プロジェクトは実施に移すことができる。

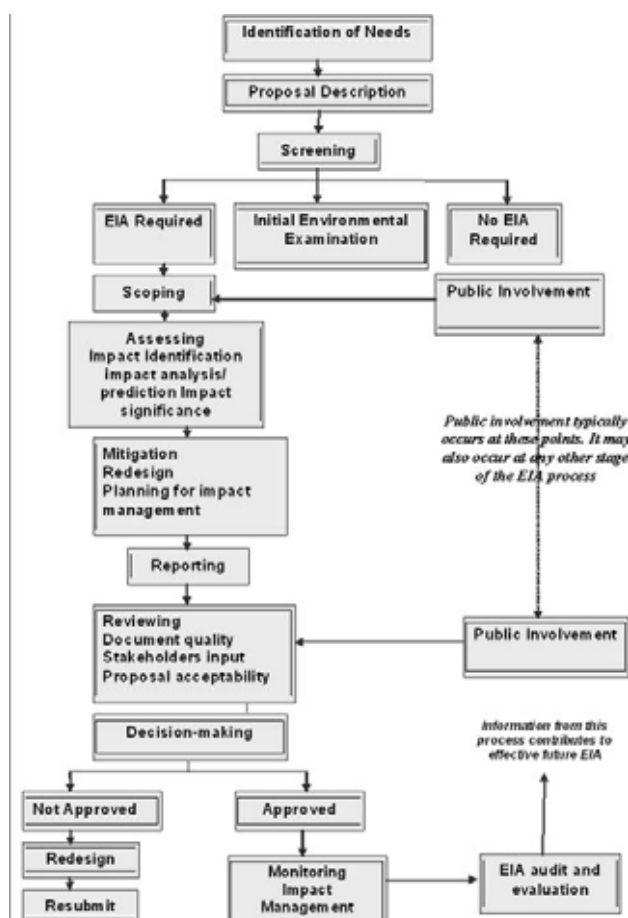
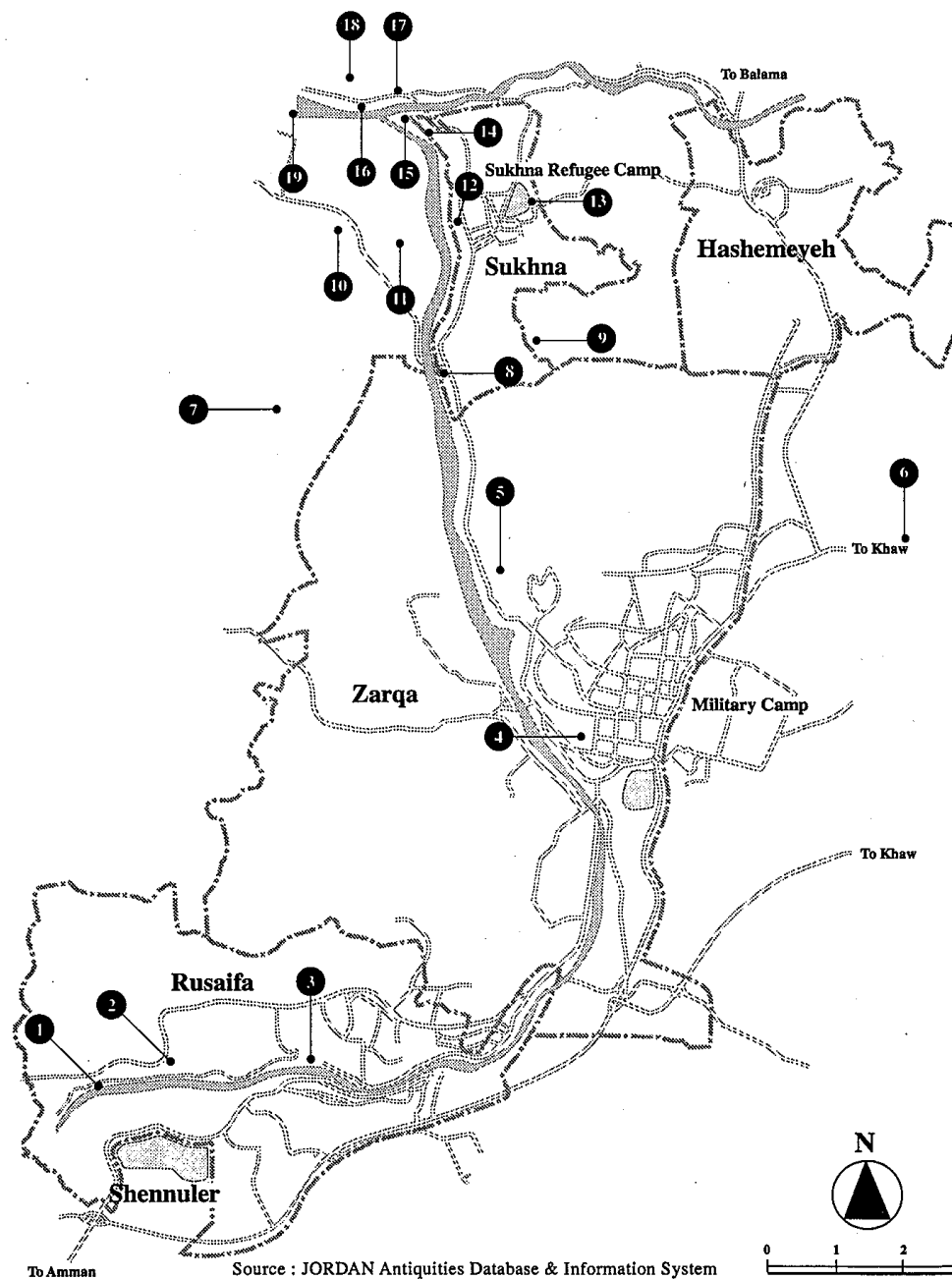


図 A 環境影響（EIA）調査スキーム



出所：JICA 開発調査「ヨルダン国ザルカ地域水道改善計画調査（1996 年）」

図 B 遺跡分布図

## （2）EIA の必要性の確認

配水池・ポンプ場用地 / 送水管ルート of 土地取得、本プロジェクトはヨルダン国法規上では EIA が不要であることを確認する。

EIA 制度の中で、毎週 1 回、審査委員会があり、EIA 調査の必要可否の審査（スクリーニング）が行われる。調査団は、調査団による IEE 結果を添付し、本プロジェクトの施設コンポーネントを提出し、審査を受けた。2005 年 12 月に委員会が開催され、2006 年に結果が判明し、EIA 法（No37 / 2005）に基

づく National Technical Committee for EIA Study Review の審査の結果、本プロジェクトは、インフラ施設プロジェクトであり、EIA 調査が必要と認定された。しかし、その後、環境省から、本プロジェクトに対して、EIA 調査は不要の公式レターの提出があった。

(3) EIA の必要性を確認する確認レター

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.

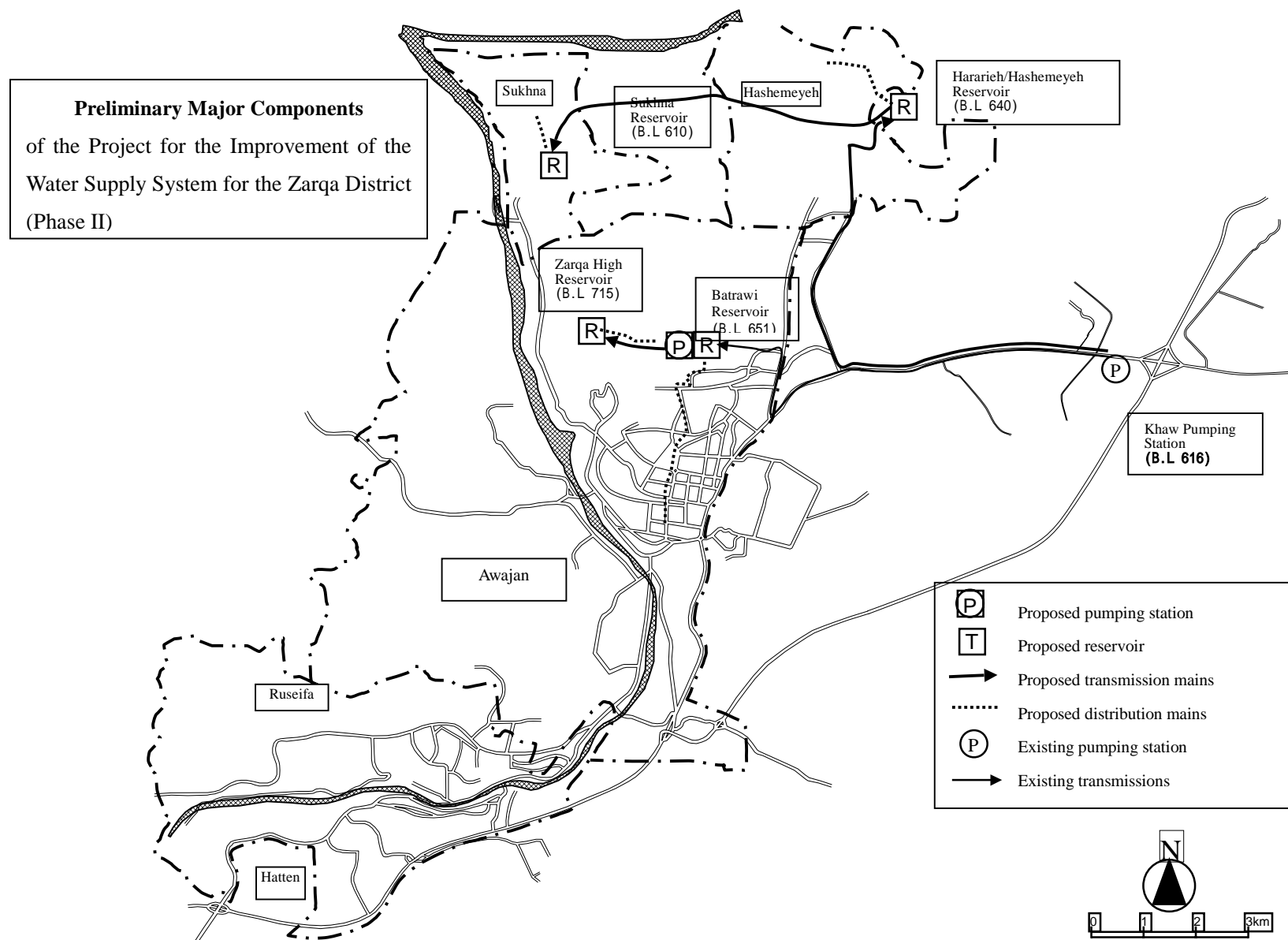
Yours sincerely,

Hiroataka Sato  
Chief Consultant  
JICA Study Team



**Preliminary Major Components of  
the 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 <sup>3</sup>	The land is vacant lot.
	(2) Hashemeyeh Service Reservoir	1000 - 2000 m <sup>3</sup>	The land is vacant lot.
	(3) Sukhna Service Reservoir	Approx 1000 m <sup>3</sup>	The land is vacant lot.
	(4) Batrawi Service Reservoir	10,000 – 15,000 m <sup>3</sup>	WAJ land.
Construction of Transmission Pipelines	(5) Batrawi Pump Station to Zarqa High Zone Service Reservoir	Approx 2 km	All pipes will be installed under the rights of way.
	(6) Khaw Pumping Station to Hashemeyeh Service Reservoir	Approx 10 km	
	(7) Hashemeyeh Pumping Station to Sukhna Service Reservoir	Approx 8 km	
Construction Pump Station with Pump equipment and Substation Equipment	(8) 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.



(4) EIA スクリーニング結果 (環境省からのレター)

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

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

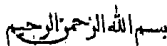
هاتف ٥٥٦-١١٣ - فاكس ٥٥٦-٢٨٨ - ص.ب ١٤٠٨ عمان - ١١٩٤١ - الأردن  
Tel. 5560113 - Fax 5560288 - P.O. Box 1408 Amman - 11941 - Jordan  
E-mail: moenv@moenv.gov.jo  
Web site: www.moenv.gov.jo

15/02 '06 17:13 FAX 0096265858924  
0096265858924

**GM**

JD/GH-033J 2/2

AMMAN



وزارة البيئة

عمارة

韻	審	真	文	文	文	文
韻	審	真	文	文	文	文
韻	審	真	文	文	文	文
韻	審	真	文	文	文	文

الرقم  
التاريخ  
الموافق

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

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.

**Khaled Anis Irani**

Minister of Environment

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

12/2/06

ماتلف 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](mailto:moenv@moenv.gov.jo)

Web site : [www.moenv.gov.jo](http://www.moenv.gov.jo)

(6) WAJ からの EIA 不要の公式レター (次頁レターを添付)



وزارة المياه والري

سلطة المياه

Ministry of Water & Irrigation  
Water Authority



The Hashemite Kingdom  
Of Jordan

Ref. WA 17/2/ 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

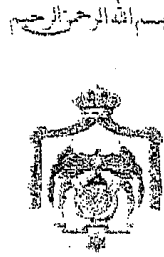
Cc: ASG/ Water Affairs  
Cc: Resident Representative, JICA Jordan Office  
Cc: Circulation

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

(7) 環境省 (MOE) からの EIA 不要の公式レター

٢٨٢  
THE HASHEMITE KINGDOM OF JORDAN  
Ministry of Environment  
AMMAN



بسم الله الرحمن الرحيم  
بمملكة الأردنية الهاشمية  
وزارة البيئة  
عمان

Ref. :  
Date :

السرف :  
التاريخ :  
المرافق :

خطوة أمين عام سلطة المياه

إشارة الى كتابكم رقم م/١٢٥٩/٢/٧ تاريخ ٢٠٠٩/٢/١ بخصوص دراسة تقييم  
الأثر البيئي لمشروع إعادة تأهيل شبكة المياه في الزرقاء.

أرجو عطفكم التكرم بالعلم بان الموضوع قد أعيدت دراسته من قبل اللجنة الفنية  
لمراجعة دراسات تقييم الأثر البيئي في ضوء الحثثات والأنساب الواردة في كتابكم أعلاه.  
واستنادا الى توصية اللجنة بهذا الخصوص اقرر إعفاء المشروع من دراسة تقييم الأثر  
البيئي.  
راجيا عطفكم التكرم بالإيعاز لمن يلزم بإيلاء موضوع المحافظة على البيئة  
الأهمية القصوى، واتخاذ الإجراءات الكفيلة بالحد من الآثار البيئية السلبية الناجمة عن  
تنفيذ المشروع.

واقبلوا فائق الاحترام،،،،

/المهندس خالد أنيس الإيراني

وزير البيئة  
المجلس الوطني  
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

## 付録 - 9 WAJ の現在計画中のプロジェクト

WAJ は 2004 年 1 月から、現地コンサルタント Engicon に委託し、中部 3 県の配水管網改善計画を作成中である。対象地域はザルカ、マダバ及びバルカの中部 3 県で、今回の計画地域は全てこの中のザルカ県の部分に含まれる。計画の目的は、管網解析モデル作成、送水管と配水管システムの拡張と更新のための予備設計、計画区域の一部について詳細設計と入札図書の作成、である。調査期間は、フィージビリティ・スタディ（ ）と詳細設計（ ）の 2 つに区分される。現在（2005 年 12 月）需要量の予測に基づく管網解析が完了している。

計画目標年次は 2025 年であり、それまでの水需要量が想定されている。人口予測などの計画フレームや水供給量は NWMP（国家水マスタープラン）に基づいているが、目標年次が 2025 年と NWMP のものを超えている。そこで、この計画では水供給量は 2025 年においても 2020 年と変わらないとしている。需要量の推定に当たっては、NWMP で計画されている水源開発や水輸送のプロジェクト、漏水率の低減などが計画通りに達成されることを前提としている。目標年次 2025 年の 1 人当たり家庭用水量は国家目標（150 リットル）に近い 130 リットルを見込んでいる。

本計画の目的は、現在のポンプ圧送を配水池からの自然流下方式の給水に改善し、圧力調整弁を設置することにより、給水圧を制御し、漏水量・無収水量を減少させることである。プロジェクトコンポーネントは、送水管、配水管、ポンプ場、配水池、弁類からなる。以下に 2025 年までに必要なプロジェクトコストを示す。

プロジェクト費用（JOD）

地域	管路・弁及び備品等の材料費	土木工事費	機械電気費	合計
ザルカ地区	8,299,500	1,665,000	2,495,000	12,459,500
ルセイファ地区	5,457,000	435,000	625,000	6,517,000
合計	13,756,500	2,100,000	3,120,000	18,976,500

注：上記費用には以下の費用は含まない。

- a. 技術料及び予備費
- b. 給水管の改修
- c. 配水本管の更新
- d. 県外からの送水のための送水施設（本計画のスコープ外：国家水供給スキームにより実施）
- e. 水資源開発（本計画のスコープ外：国家水供給スキームにより実施）
- f. 水源の悪い水のための処理

本計画の中で、スフナ、ハシミエ及びザルカ高区の計画配水地及び送水幹線の一部は、日本の無償で実施されるとして、計画に取込まれている。

本調査は、継続中である。計画されたプロジェクトは、本無償資金協力プロジェクト完了後に開始予定とのことである。無償資金協力プロジェクト施設を、考慮した計画とする必要がある。

無償資金協力プロジェクト自体はそれ自体で完結するものであるため、本計画が無償資金協力プロジェクトの外部要因となることはない。給水管の改修、配水本管の更新及び適切な圧力制御弁の設置により、更に漏水率の低減が見込まれる。



## 付録 - 10 水質データ

### (1) 化学項目

Chemical tests results (WAJ laboratory)

Area: Zarqa

Month: June 2004

No.	Sample site	Date	E.C.	T.D.S	pH	NO <sub>3</sub>	Ca	Mg	Na	K	Cl	SO <sub>4</sub>	HCO <sub>3</sub>
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) 微生物学项目

Biological tests results (WAJ laboratory)

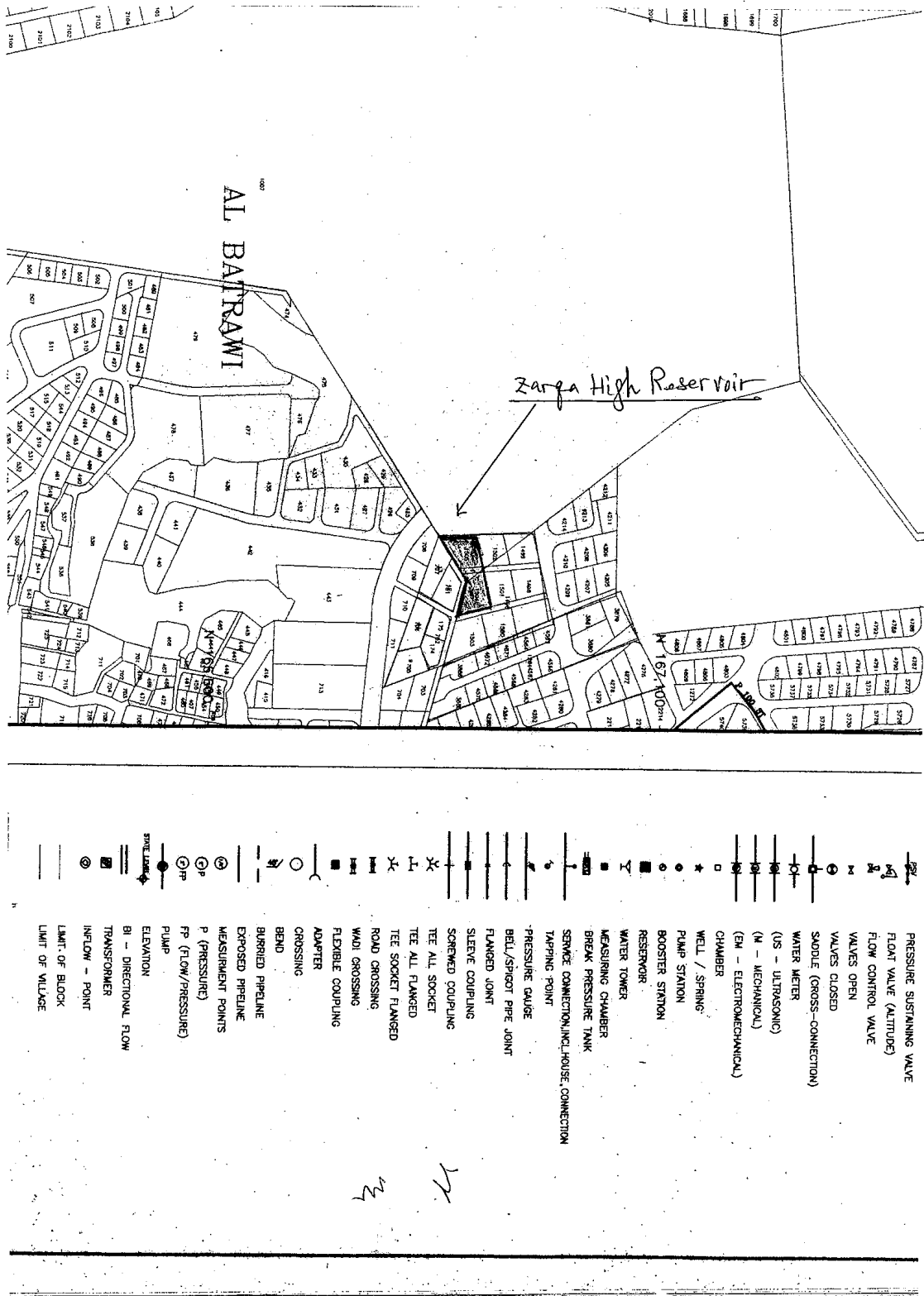
Area: Zarqa

Month: June 2004

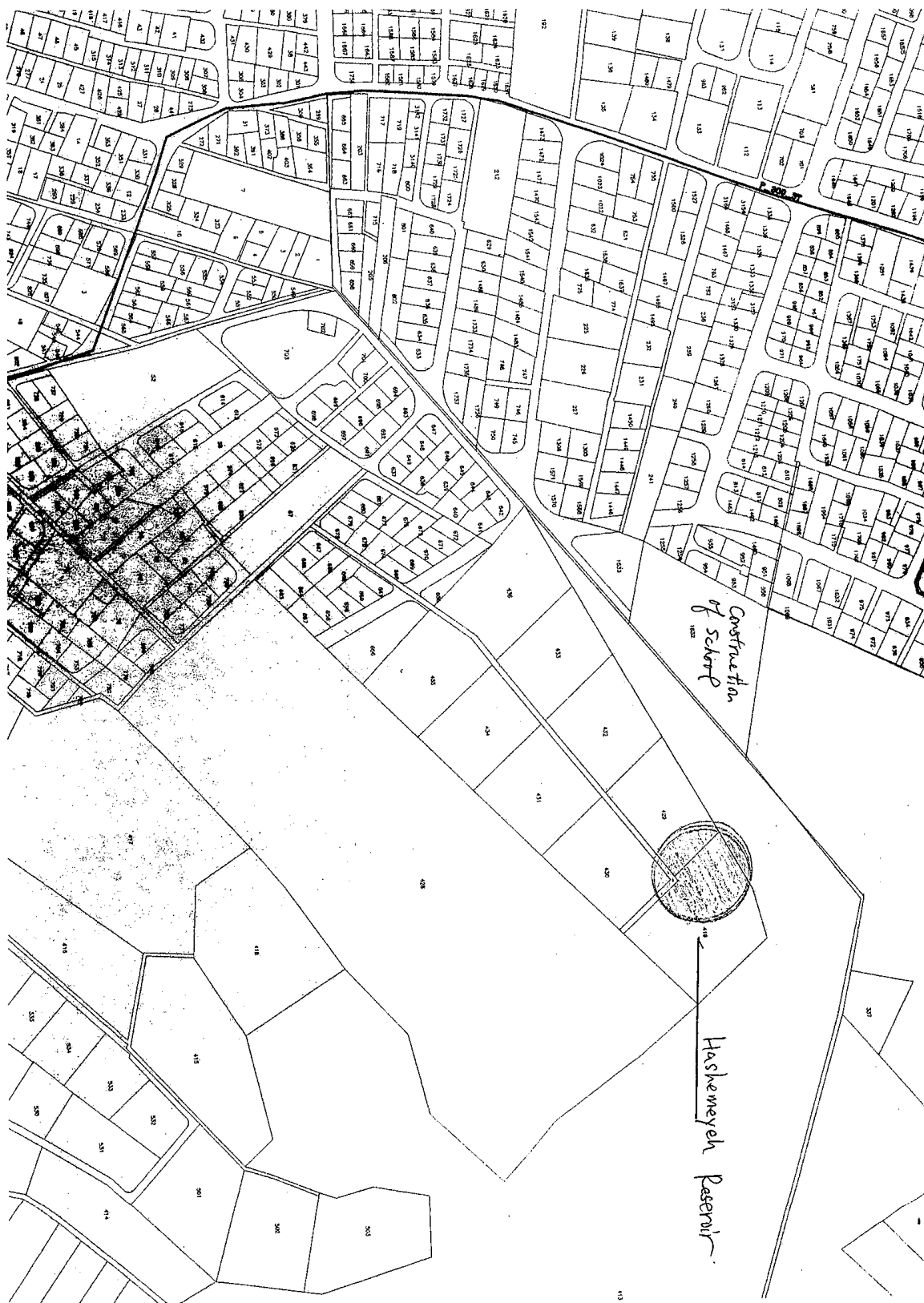
	Sample site	Date	T.Coli	E.Coli	F.Coli	Residual CI2
1	Zarqa PS	6/1	<1.1			1.5
2	Zarqa treatment plant	6/1	<1.1			1.5
3	Hashemeyeh well 5	6/3	50	<2		none
4	Hashemeyeh well 5	6/3	1	9		none
5	Hashemeyeh booster	6/3	<1.1			1.2
6	Hashemeyeh well 5	6/4	23	<2		none
7	Hashemeyeh well 5	6/4	30	2		none
8	Hashemeyeh 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-Aloq 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 Treatment 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

付録 - 11 配水池建設予定地の土地登記

ザルカ高区配水池建設予定

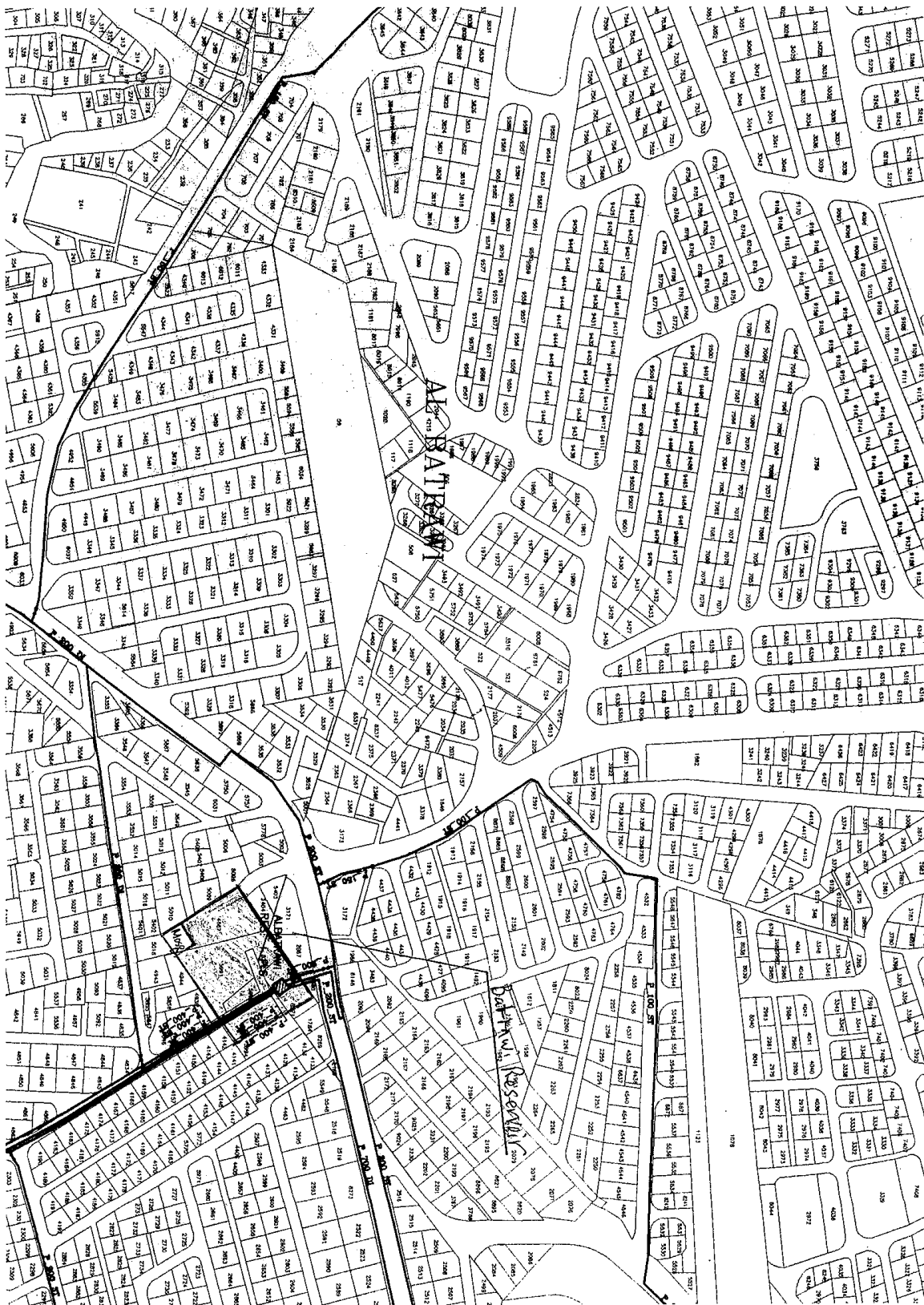


# ハシメエ配水池建設予定地





# バトラウィ配水池建設予定地



付録 - 12 「ヨ」国負担分経費の積算根拠

項目	仕様	数量	単価 (JOD)	現地貨 (JOD)	第1期	第2期	第3期
配水区を分離するための 仕切り弁及び必要資材の調達	仕切り弁口径 100mm	2 ケ	640	1,280	1,280		
	仕切り弁口径 150mm	3 ケ	1,110	3,330	3,330		
	仕切り弁口径 300mm	1 ケ	3,740	3,740	3,740		
	異管種継手 100mm	4 ケ	240	960	960		
	異管種継手 150mm	6 ケ	540	3,240	3,240		
	異管種継手 300mm	2 ケ	920	1,840	1,840		
	単管 100mm	4 ケ	60	240	240		
	単管 150mm	6 ケ	100	600	600		
	単管 300mm	2 ケ	160	320	320		
小計				<b>15,550</b>	<b>15,550</b>		
配水池建設予定地の造成・場内整備	ザルカ高区配水池	1 式	35,000	35,000	35,000		
	ハシミエ配水池	1 式	128,000	128,000		128,000	
	スフナ配水池	1 式	24,000	24,000		24,000	
	バトラウィ配水池	1 式	82,000	82,000			82,000
小計				<b>269,000</b>	<b>35,000</b>	<b>152,000</b>	<b>82,000</b>
配水池建設予定地へのアクセス道路の整備	ハシミエ配水池	m	18,700	18,700		18,700	
	スフナ配水池	m	4,700	4,700		4,700	
小計				<b>23,400</b>		<b>23,400</b>	
ソフトコンポーネントを実施するための資機材の調達及び Zarqa 支所での研修場所の整備	コンピューター（含む基本ソフト）	3 セット	910	2,730		2,730	
	Office XP professional	3 セット	300	900		900	
	A4B&W プリンター	1 台	166	166		166	
	A3 カラープリンター	1 台	395	395		395	
	A4 スキャナー	1 台	35	35		35	
	コンピューター机椅子	4 セット	150	600		600	
	整理棚	3 個	150	450		450	
	ホワイトボード	1 個	40	40		40	
	会議用テーブル	1 脚	270	270		270	
	空調設備	1 セット	540	540		540	
	改修費用	一式	2,000	2,000		2,000	
小計				<b>8,126</b>	<b>8,126</b>		
配水池敷地外から排水路までのオーバーフロー管の敷設	ザルカ高区配水	1 式	85	85,000	85,000		
	ハシミエ配水池	1 式	85	85,000		85,000	
	スフナ配水池	1 式	85	85,000		85,000	
小計				<b>255,000</b>	<b>85,000</b>	<b>170,000</b>	
配水池敷地のフェンス、ゲートの建設、舗装、敷地内道路、植栽、照明	ザルカ高区配水池	1 式	14,300	14,300	14,300		
	ハシミエ配水池	1 式	15,000	15,000		15,000	
	スフナ配水池	1 式	12,500	12,500		12,500	
	バトラウィ配水池	1 式	13,100	13,100			13,100
小計				<b>54,900</b>	<b>14,300</b>	<b>27,500</b>	<b>13,100</b>
水張試験・通水試験用の用水・消毒剤の提供	水張試験（配水池）	m <sup>3</sup>	57,000	57,000	7,500	7,500	42,000
	通水試験（送・配水配管）	m <sup>3</sup>	5,400	5,400	800	3,300	1,300
小計				<b>62,400</b>	<b>8,300</b>	<b>10,800</b>	<b>43,300</b>
本事業の広報活動	住民参加・啓蒙専門家	1 名 x 3 ケ月	1,080	3,240	1080	1080	1080
	補助員	1 名 x 3 ケ月	280	840	280	280	280
	その他必要経費	1 式	-	900	300	300	300
小計				<b>4,980</b>	<b>1,660</b>	<b>1,660</b>	<b>1,660</b>
合計				<b>693,356</b>	<b>167,936</b>	<b>385,360</b>	<b>140,060</b>