

## Appendices

## Appendix 1 Member List of the Study Team

### (1) Field Survey

Team Leader	Mr. Hidenori Kumagaya	Deputy Resident Representative, JICA Jordan Office
Project Coordinator	Mr. Shigeki Miyake	First Project Management Division, Grant Aid Management Department, JICA
Chief Engineer / Water Supply Planning	Mr. Kazufumi Momose	Tokyo Engineering Consultants Co., Ltd.
Operation and Maintenance	Mr. Hiromasa Minakami	Tokyo Engineering Consultants Co., Ltd.
Pipeline Planning	Mr. Takashi Moriguchi	Tokyo Engineering Consultants Co., Ltd.
Facility Planning 1	Mr. Hirotaka Sato	Tokyo Engineering Consultants Co., Ltd.
Facility Planning 2	Mr. Kenichi Takeshita	Tokyo Engineering Consultants Co., Ltd.
Machinery Planning	Mr. Arata Yamaguchi	Nippon Koei Co., Ltd.
Cost Estimation / Procurement Planning	Mr. Judo Hagiwara	Tokyo Engineering Consultants Co., Ltd.

### (2) Additional Field Survey

Route Survey 1	Mr. Kazufumi Momose	Tokyo Engineering Consultants Co., Ltd.
Route Survey 2	Mr. Tadao Funamoto	Tokyo Engineering Consultants Co., Ltd.
Soil Survey	Mr. Judo Hagiwara	Tokyo Engineering Consultants Co., Ltd.

### (3) Explanation of Draft Final Report

Team Leader	Mr. Mitsuo Inagaki	Resident Representative, JICA Jordan Office
Project Coordinator	Mr. Hidetoshi Aoki	First Project Management Division, Grant Aid Management Department, JICA
Chief Engineer / Water Supply Planning	Mr. Kazufumi Momose	Tokyo Engineering Consultants Co., Ltd.
Operation and Maintenance	Mr. Hiromasa Minakami	Tokyo Engineering Consultants Co., Ltd.



## Appendix 2 Study Schedule

### (1) Field Survey

	Date		Itinerary				Stay
			JICA Officers		Consultant		
			Mr. Kumagai, Mr. Miyake	Mr. Momose, Mr. Minakami	Mr. Yamaguchi, Mr. Hagiwara	Mr. Moriguchi, Mr. Sato, Mr Takeshita	
1	25-Nov	Sun	Leave Japan				In flight
2	26	Mon	Arrival to Amman, Courtesy call: EOJ, JICA, MWI, Ministry of Planning		Mr. Moriguchi joined, Preparation of sub-contractor		Amman
3	27	Tue	Courtesy call and meeting : JVA, WAJ, Zarqa Branch		Meeting with sub-contractor, site survey		Amman
4	28	Wed	Inception Report, M/D Discussion, Visit to PMU		Site Survey		Amman
5	29	Thu	M/D Signature, Site Survey		Site Survey		Amman
6	30	Fri	Team Meeting				Amman
7	1-Dec	Sat	Team Meeting, sub-contractor Meegint, Mr. Momose leave Jordan		Mr. Takeshita leave Japan		Amman
8	2	Sun	Interim Report to JICA, EOJ		Mr. Takeshita joined, Site Survey		Amman
9	3	Mon	Mr. Miyake leave Jordan	Meeting with WAJ, CP, WAJ Zarqa, Site Survey			In flight / Amman
10	4	Tue	Arrival to Narita	Customers' Book, WAJ Zarqa	Site, construction survey	Interview of Water Resource	Amman
11	5	Wed		Collection Data of Organization, staff, finance	Site, construction survey	Collection & Survey of Water Resources Reports	Amman
12	6	Thu		WAJ Zarqa, Organization, Staff	Survey of sub-contractor, Pump test	Meeting with WAJ Zarqa	Amman
13	7	Fri	Holiday				Amman
14	8	Sat		Analysis of organization, staff, financial data	Meeting with sub-contractor, Site Survey		Amman
15	9	Sun		Study of organization, staff, financial data	Mr. Sato leave Japan, Site Survey		Amman
16	10	Mon		Donor Meeting with USAID	Mr. Sato joined, site survey, existing facilities		Amman
17	11	Tue		Mr. Momose joined, Team Meeting, Meeting with Mr. Sa'ad Bakri, New Deputy director of MWI			Amman
18	12	Wed		Meeting with Statistical Department, director of Finance, PMU	Rehabilitation planning, facilities estimation	Survey of network, data of wells in WAJ Zarqa	Amman
19	13	Thu		Meeting with director of general affairs, human affairs	Rehabilitation planning, Plain table test	Meeting about network data, water resources	Amman
20	14	Fri	Holiday				Amman
21	15	Sat		Site, donor data survey	Rehabilitation planning, facilities estimation	Survey of candidate site for facilities	Amman
22	16	Sun		Design concept, alternative plan, financial analysis	Rehabilitation planning, facilities estimation	Analysis of water quality, network data	Amman
23	17	Mon		Design concept, alternative plan, financial analysis	Mr. Yamaguchi leave Jordan, Site Hearing Survey	Network Analysis, Demand Forecast	In flight / Amman
24	18	Tue		Alternative plan of water resources, data of organization	Mr. Yamaguchi arrive at Japan, Site Hearing Survey	Alternative plan of transmission, route survey	Amman
25	19	Wed		Meeting with MWI, route survey of transportation	Route survey of transportation	Alternative plan of transmission, route survey	Amman
26	20	Thu		Alternative plan of transmission, list of charges	Interim Discussion of Cost Estimation	Alternative plan of transmission, check of sub-contractor's report	Amman
27	21	Fri	Holiday				Amman
28	22	Sat		Transmission route survey	Recall of part of estimation	Survey of route, balance between demand and supply	Amman
29	23	Sun		Making report, transmission route survey	Site Survey	Design concept, route survey	Amman
30	24	Mon		Discussion of Technical Notes	Alternative project cost	Rough facilities planning	Amman
31	25	Tue		Making report	Alternative project cost	Making report	Amman
32	26	Wed		Discussion of Technical Notes	Recall of estimation of facilities	Making report	Amman
33	27	Thu		Sign to technical notes, report to JICA, EOJ, arrangement of reports, result report of site survey			Amman
34	28	Fri	Holiday, result report of site survey, preparation for return				Amman
35	29	Sat	Leave Jordan				In flight
36	30	Sun	Arrival to Narita				

## (2) Additional Field Survey

	Date		Itinerary			Stay
			Mr. Momose, Mr. Funamoto	Mr. Hagiwara		
1	4/12	Fri	Leave Japan			Amman
2	13	Sat	Meeting with WAJ, arrangement of local staffs, courtesy call: JICA	Meeting with WAJ, preparation of sub-contractor		Amman
3	14	Sun	Survey of road occupation range	Survey of underground		Amman
4	15	Mon	Survey of road occupation range	Survey of underground, meeting of boring survey		Amman
5	16	Tue	Survey of road occupation range	Survey of underground, supervision of boring survey		Amman
6	17	Wed	Survey of road occupation range	Survey of underground		Amman
7	18	Thu	Survey of road occupation range	Survey of surplus soil disposal, supervision of boring survey		Amman
8	19	Fri	Survey of road occupation range	Survey of surplus soil disposal		Amman
9	20	Sat	Survey of road occupation range	Survey of surplus soil disposal, check of boring survey		Amman
10	21	Sun	Leave Jordan			In flight
11	22	Mon	Arrival at Narita			

## (3) Explanation of Draft Final Report

	Date		Itinerary				Stay
			Mr. Inagaki	Mr. Aoki	Mr. Momose	Mr. Minakami	
1	18-May	Sat		Leave Japan			London
2	19	Sun		Arrive at Jordan			Amman
3	20	Mon	Courtesy call: JICA, Ministry of Planning, WAJ, JVA, EOJ				Amman
4	21	Tue	Discussion with USAID, WAJ, GTZ				Amman
5	22	Wed	Discussion with WAJ Zarqa Branch, WAJ				Amman
6	23	Thu	Discussion of M/M and signature with WAJ				Amman
7	24	Fri	Site Visit to Intake, Pump Station, Zai Water Treatment Plant				Amman
8	25	Sat	Team Meeting				Amman
9	26	Sun	Ministry of Planning sign the minuite, (Consultants visit KfW), Report to EOJ, JICA				Amman
10	27	Mon		Leave Jordan	Discussion with WAJ		Amman
11	28	Tue		Arrive at Narita	Leave Jordan		In flight
12	29	Wed		Arrive at Narita			

### Appendix 3 List of Parties Concerned in the Recipient Country

#### (1) Government of Jordan

##### Ministry of Planning

Mr. Abderrzaq Bani Hani, Secretary General  
Dr. Mustafa Al-Saleh, Director, Bilateral Cooperation Dept.  
Ms. Wafa Al-Saket, Bilateral Cooperation Department

##### Ministry of Water and Irrigation

Dr. Hazim El-Naser, Minister  
Mr. Sa'ad Bakri, Secretary General (Since 4 December 2001)  
Ms. Maysoun Zoubi, Director of Finance and Project Follow-up  
Mr. Hishams Bashir, Accountant

##### Water Authority of Jordan

Mr. Munther A. Khleifat, Secretary General  
Mr. Sa'ad Bakri, Assistant Secretary General  
Eng. Jehad Abu-Jamoos, Head of Design Dept. for Water Projects  
Mr. Raed Abu Soud, Director, Program Management Unit (PMU)

##### Water Authority of Jordan, Zarqa Office

Eng. Bassam Saleh, Administrator, Zarqa Directorate  
Eng. Adeb Ammari, Director, Technical Affairs Dpt., Zarqa Directorate  
Eng. Isam Hamarsheh, Director, Unaccounted-for Water Dept., Zarqa Directorate

##### Jordan Valley Authority

Eng. Zafer Alem, Secretary General  
Eng. Ali Barakat Al-Adwan, Assistant Secretary General, Planning and Information

##### Ministry of Health

Dr. Hussein Alkhandak, Director, Environmental Health  
Dr. Ali As'ad, Dty. Director, Disease Control

#### (2) Resident Japanese

##### Embassy of Japan

Mr. Shintaro Sasaki, Ambassador Extraordinary and Plenipotentiary  
Mr. Jun Yoshida, Counsellor  
Mr. Shunichi Kamiya, Second Secretary, Economic Section

##### Jordan Office, JICA

Mr. Mizuo Inagaki, Resident Representative  
Mr. Hidenori Kumagai, Deputy Resident Representative  
Mr. Tsutomu Kobayashi, Asst. Resident Representative  
Eng. Adel O. Zureikat, Sr. Program Officer  
Mr. Hani H. Alkurdi, Program Officer

#### (3) Other Donors

##### United States Agency for International Development (USAID)

Mr. James Franckiewicz, Director, Office of Water Resources & Environment  
Mr. Alex Sundermann, Sr. Advisor, Office of Water Resources & Environment  
Ms. Setta Tutundjian, Project Management Specialist, Office of Water Resources & Environment  
Amal A. Hijazi, Project Management Specialist, Mission Environment Officer  
Shank Gupta, Sr. Engineer

Gesellschaft für Zusammenarbeit (GTZ)  
Mr. Heinz-Michael Hauser, Director, Middle East  
Mr. Udo Kachel, Team Leader

Keditanstalt für Wiederaufbau (KfW)  
Mr. Reinhard Schmidt, Director, KfW Office Amman  
Ms. Sawsan Aruri, Project Management Assistant

World Health Organization (WHO)  
Mr. Hamed A. Bakri, Advisor

United Nations Relief and Works Agency (UNRWA)  
Mr. Fouad Shawa, Chief Field Relief & Social Services

The World Bank  
Mr. Thirumalai G. Srintvasan, Sr. Economist

European Commission in Jordan  
Mr. Mario Rizos, Expert, Civil Engineering Sector

MINUTES OF DISCUSSIONS  
ON THE BASIC DESIGN STUDY  
ON THE PROJECT FOR THE IMPROVEMENT OF THE WATER SUPPLY  
FOR ZARQA DISTRICT  
IN THE HASHEMITE KINGDOM OF JORDAN

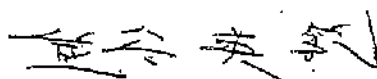
In response to a request from the Government of the Hashemite Kingdom of Jordan (herein after referred to as "Jordan"), the Government of Japan decided to conduct a Basic Design Study on the Project for Improvement of the Water Supply for Zarqa District in the Hashemite Kingdom of Jordan (herein after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


JICA has dispatched to Jordan the Basic Design Study Team (herein after referred to as "the Team"), which is headed by Mr. Hidenori Kumagai, Deputy Resident Representative, JICA Jordan Office, and is scheduled to stay in the country from November 26, 2001 to December 29, 2001.

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

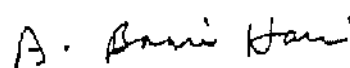
In the course of discussions and field survey, both parties have confirmed the main items described on the attached sheets. The Team will proceed to further work and prepare the Basic Design Study Report.

Amman, November 29, 2001

  
\_\_\_\_\_  
Mr. Hidenori Kumagai  
Leader,  
Basic Design Study Team,  
Japan International Cooperation Agency

  
\_\_\_\_\_  
Mr. Munther Khleifat  
Secretary General,  
Water Authority of Jordan,  
Ministry of Water and Irrigation,  
The Hashemite Kingdom of Jordan

Witness

  
\_\_\_\_\_  
Mr. Abderrzaq Bani Hani  
Secretary General,  
Ministry of Planning,  
The Hashemite Kingdom of Jordan



## ATTACHMENT

### 1. Objective of the Project

The Objective of the Project is to improve water supply conditions in Awajan area of Zarqa municipality and Rusaifa municipality by rehabilitating and upgrading the water supply facilities as a means of contribution to achieving the Water Strategy of Jordan.

### 2. Project Site

The Project sites are Awajan area of Zarqa municipality, Rusaifa municipality and the location of water transmission (intake, conduction, treatment and transmission) facilities in these areas.

### 3. Responsible and Implementing Agency

(1) Responsible organization: Ministry of Water and Irrigation

(2) Implementing organization: Water Authority of Jordan (hereinafter referred to as "WAJ", Annex- I )

### 4. Items requested by the Government of Jordan

After a series of discussions with the Team, the Jordanian side requested the items shown in Annex- II. JICA will assess the appropriateness of the request and will recommend to the Government of Japan is extended.

### 5. Japan's Grant Aid Scheme

The Jordanian side understood that the Japan's Grant Aid Scheme as explained by the Team and as described in Annex- III.

### 6. Necessary measures to be taken by the Jordanian side

The Jordanian side will take necessary measures, as described in Annex- IV, for smooth implementation of the Project, as a condition for the Japanese Grant Aid to be implemented.

### 7. Schedule of the Study

(1) The consultants will proceed to further study in Jordan until December 29, 2001.

(2) Based on the Minutes of Discussions and technical examination of the study results, JICA will prepare the draft report in English and dispatch a mission to Jordan in order to explain its contents around February, 2002.

(3) In case that the contents of the report are accepted in principle by the Jordanian side, JICA will complete the final report and submit it to the Jordanian side around April, 2002.

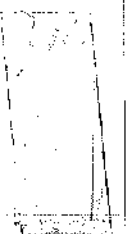
8. Other relevant issues

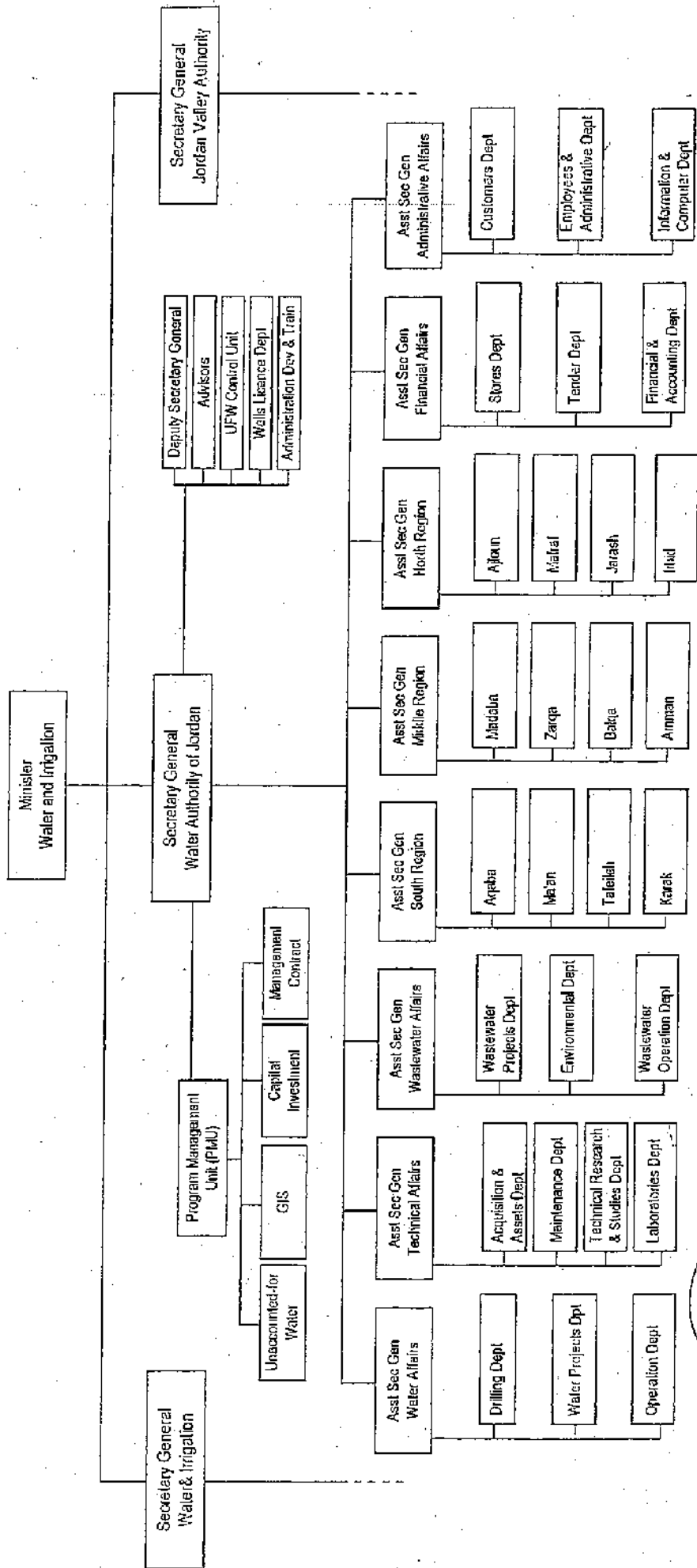
- (1) Jordanian side explained that the Project sites (Awajan area of Zarqa municipality, Rusaifa municipality) are suffering from a sever shortage of water and that only area in where any improvement and rehabilitation programs for water leakage had not been planned or started yet.
- (2) Jordan side explained that the Project sites and components were decided based on the result of Feasibility Study conducted by JICA from 1994 to 1996.
- (3) Both sides agreed that the target year of the Project would be around 2005, a few years after the completion of the Project. And the components, sizes, dimensions and locations of requested facilities would be reviewed based on the water supply capacity to the Project area as of the target year.
- (4) Both sides agreed that the Project would be put emphasis on rehabilitation of existing water supply condition in the Project area rather than expansion of water service area.
- (5) Both sides agreed that the Jordanian side to complete necessary measures to be taken by the Jordanian side such as laying of distribution and service pipes and installation of water meters by the end of the Project.
- (6) The Jordanian side requested the technical support for operation and maintenance of water service facilities as one of the components of the Grant Aid.  
The Team agreed to convey the request letter to the relevant authorities in Japan.
- (7) The Jordanian side promised to secure enough budget and staff for implementation of necessary measures to be taken by the Jordanian side and to operate and maintain the facilities and equipment that would be procured under the Japan's Grant Aid.
- (8) The Jordanian side has no intention of private commission of water services in Zarqa district. However, the Jordanian side will inform the Team about the situation of private commission of water services in Amman and submit the photocopy of the contract document concluded between WAJ and LEMA to the Team.
- (9) By December 20, 2001, the Jordanian side will collect necessary data and respond to the Questionnaire submitted by the Team.
- (10) The Jordanian side agreed to take necessary measures for custom clearance and exemption of all other taxation of the equipment and materials that would be provided for the Project.











Annex - I Organization Chart of Water Authority of Jordan

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Annex - II List of Facilities Requested for Grant Aid

A. Construction of Pumping Stations with Pumps

1. Awajan Pumping Station (to High Awajan 695 reservoir)
2. Awajan Pumping Station (to Low Rusaifa 750 reservoir)
3. Rusaifa Pumping Station (to High Rusaifa 815 reservoir)

B. Provision of Transmission Pumps

1. Khaw Pumping Station (to Awajan)
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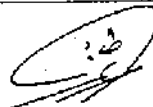
B. Construction of Transmission Pipelines

1. Khaw Pumping Station – Awajan Transmission Pumping Station
2. Awajan Pumping Station – High Awajan 695 reservoir
3. Awajan Pumping Station – Low Awajan 635 reservoir
4. Awajan Pumping Station – Low Rusaifa 750 reservoir
5. Rusaifa 750 Pumping Station – High Rusaifa 815 reservoir

C. Construction and Expansion of Distribution Reservoirs

1. Low Awajan 635 (new)
2. High Awajan 695 (expansion)
3. Low Rusaifa 750 (new)
4. High Rusaifa 815 (new)







### Annex-III Japan's Grant Aid Program

#### 1. Grant Aid Procedures

- a. Japan's Grant Aid Program is executed through the following procedures.
- Application (A request made by the recipient country)
  - Study (Basic Design Study conducted by JICA)
  - Appraisal & Approval (Appraisal by the Government of Japan and Approval by the Cabinet of Japan)
  - Determination of Implementation (Exchange of Notes between the Governments of Japan and the recipient country)
- b. Firstly, the application or request for a Grant Aid project submitted by a recipient country is examined by the Government of Japan (the 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 (Japan International Cooperation Agency) to conduct a study on the request.
- Secondly, JICA conducts the study (Basic Design Study) using (a) Japanese consulting firm(s).
- Thirdly, the Government of Japan appraises the project to see whether or not it is suitable for Japan's Grant Aid Programme, based on the Basic Design Study Report prepared by JICA, and the results are then submitted to the Cabinet for an approval.
- Fourthly, the project, once approved by the Cabinet, becomes official with the Exchange of Notes signed by the Governments of Japan and recipient country.
- Finally, for the implementation of the project, JICA will assist the recipient country in such matters as preparing tenders, contract and so on.

#### 2. Basic Design Study

##### a. Contents of the study

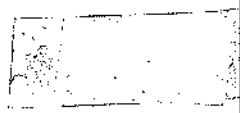
The aim of the Basic Design Study (hereafter referred to as "the Study") conducted by JICA on a requested project (hereafter referred to as "the Project") is to provide a basic document necessary for the appraisal of the Project by the Government of Japan. The contents of the Study are as follows :

- 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 a technical, social and economic point of view.

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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.

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 the Japan's Grant Aid Scheme.

The Government of Japan requests the Government of the recipient country to take whether 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.

b. Selection of Consultants

For smooth implementation of the Study, JICA uses (a) registered consultant firm(s). JICA select (a) firm(s) based on proposals submitted by interested firms. The firm(s) selected carry(ies) out a Basic Design Study and write(s) a report, based upon terms of reference set by JICA.

The consultant firm(s) used for the Study is(are) recommended by JICA to the recipient country to also work on the Project's implementation after the Exchange of Notes, in order to maintain technical consistency and also to avoid undue delay in implementation should the selection process be repeated.

### 3. Japan's Grant Aid Scheme

a. Grant Aid

The Grant Aid Programme 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.

b. 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.

c. Period

"The period of the Grant Aid" means the one fiscal year which the Cabinet approves the

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Project for. Within the fiscal year, all procedures such as exchanging of the Notes, concluding contracts with (a) consultant firm(s) and (a) contractor(s) 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.

d. Purchase of the Products and or Services

Under the Grant Aid, 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.)

e. Necessity of "Verification"

The Government of 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.

f. Undertakings required of 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:

- 1) To secure land necessary for the site of the Project and to clear, level and reclaim the land prior to commencement of the construction.
- 2) To provide facilities for distribution of electricity, water supply and drainage and other incidental facilities in and around the sites.
- 3) To secure building prior to the procurement in case the installation of the equipment.
- 4) To ensure all the expenses and prompt execution for unloading customs clearance at the port of disembarkation and internal transportation of the products purchased under the Grant Aid.
- 5) To exempt Japanese nationals from customs duties, international taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the products and services under the Verified Contracts.

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6) To accord Japanese nationals whose services may be required in connection with the supply of the products and services under the Verified Contracts, such facilities as may be necessary for their entry into the recipient countries and stay therein for the performance of their work.

7) Proper Use

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

h) Re-export

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

i) Banking Arrangements (B/A)

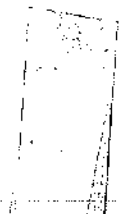
① The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in an authorized foreign exchange bank in Japan (hereinafter referred to as "the Bank"). The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

② The payments will be made when payment requests are presented by the Bank to the Government of Japan under an authorization to pay issued by the Government of the recipient country or its designated authority.











Major Undertakings to be taken by Each Government

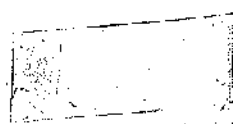
(Annex-IV)

NO	Items	To be covered by Grant Aid	Jordan
1	To secure land		④
2	To clear, level and reclaim the site when needed		②
3	To construct gates and fences in and around the site		②
4	To provide facilities for the distribution of electricity, water supply, drainage and other incidental facilities		
	1)Electricity		
	a.The distributing line to the site		②
	b.The drop wiring and internal wiring within the site	②	
	c.The main circuit breaker and transformer	②	
	2)Water Supply		
	a.The city water distribution main to the site	(②)	(③)
	b.The supply system within the site ( receiving and/or elevated tanks )	③	
	3)Drainage		
	a.The city drainage main ( for storm, sewer and others ) to the site		⑤
	b.The drainage system ( for toilet sewer, ordinary waste, storm drainage and others ) within the site	②	
	4)Gas Supply		
	a.The city gas main to the site		④
	b.The gas supply system within the site	②	
	5)Telephone System		
	a.The telephone trunk line to the main distribution frame / panel (MDF) of the building		⑥
	b.The MDF and the extension after the frame / panel	①	
6)Furniture and Equipment			
a.General furniture		④	
b.Project equipment	②		
5	To bear the following commissions to a bank of Japan for the banking services based upon the B/A		
	1) Advising commission of A/P		②
	2) Payment commission		③
6	To ensure prompt unloading and customs clearance at the port of disembarkation in recipient country		
	1) Marine(Air) transportation of the products from Japan to Jordan	②	
	2) Tax exemption and customs clearance of the products at the port of disembarkation		③
	3) Internal transportation from the port of disembarkation to the project site	(④)	(⑤)

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7	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		•
8	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		•
9	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid		•
10	To bear all the expenses, other than those to be borne by the Grant Aid, necessary for construction of the facilities as well as for the transportation and installation of the equipment		•

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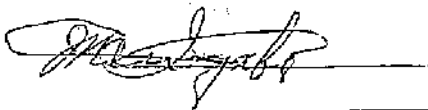
MINUTES OF DISCUSSIONS  
ON  
THE BASIC DESIGN STUDY  
ON  
THE PROJECT FOR IMPROVEMENT OF THE WATER SUPPLY SYSTEM  
FOR THE ZARQA DISTRICT  
IN THE HASHEMITE KINGDOM OF JORDAN  
(EXPLANATION ON DRAFT FINAL REPORT)

In November 2001, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched a Basic Design Study Team on THE PROJECT FOR IMPROVEMENT OF THE WATER SUPPLY SYSTEM FOR THE ZARQA DISTRICT (hereinafter referred to as "the Project") to the Hashemite Kingdom of Jordan (hereinafter referred to as "Jordan"), and through discussion, field survey, and technical examination of the results in Japan, JICA prepared a draft final report of the study.

In order to explain and to consult with the Jordanian side on the contents of the draft final report, JICA sent to Jordan the Draft Final Report Explanation Team (hereinafter referred to as "the Team"), which is headed by Mr. Mitsuo INAGAKI, Resident Representative of JICA Jordan office, JICA, from May 19 to 28, 2002.

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

Amman, May 26, 2002



Mr. Mitsuo INAGAKI  
Leader  
Draft Final Report Explanation Team  
Japan International Cooperation Agency  
Japan



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



Ms. Hala Bsaiso Lattouf  
Secretary General,  
Ministry of Planning  
The Hashemite Kingdom of Jordan

## ATTACHMENT

### 1. Components of the Project

The Jordanian side agreed and accepted in principle the components of the draft final report explained by the Team. After discussions with the Team, the Jordanian side confirmed the items of facilities and technical assistance program described in Annex-I and Annex-II.

### 2. Japan's Grant Aid scheme

The Jordanian side understands 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 Annex-III and Annex-IV of the Minutes of Discussions signed by both sides on November 29, 2001.

### 3. Schedule of the Study

JICA will complete the final report in accordance with the confirmed items and will send it to Jordan by August 2002.

### 4. Implementing agency

The implementing agency is Water Authority of Jordan (WAJ).

### 5. Component of facilities of the Project

(1) The Jordanian side explained the present situation described in the official letter in detail sent to the Japanese embassy from the Minister of Water and Irrigation numbered WA-7-2-2401 dated February 12, 2002, in Annex-III.


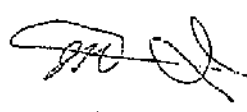
(2) The WAJ explained that it was important to utilize the surplus water from the new water sources, which would be developed in Amman system, in order to reduce energy costs and decrease groundwater yield that is over-exploited.

(3) The Jordanian side explained that the service area expansion project in Ruseifa would be completed by the end of 2003 and emphasized that the implementation of the Project in Ruseifa High and Ruseifa Low zones should be started first in order to operate the expanded system earlier. The Team agreed to convey the request to Japan.

(4) The Jordanian side explained that WAJ did not use pipes of diameter 350 mm and 500 mm as they were not generally used in Jordan. And the Jordanian side requested the Team to study the possible use of pipes of diameter 300, 400 and 600 mm for sustainable maintenance. The Team agreed to convey the request to Japan.

(5) Due to the use of new water source from Amman system, routes of transmission pipelines were selected. Since water will be conveyed by gravity with the effective water head over 250 meters, operation of control valves needs to be made with every care. The Jordanian side confirmed that operators of valves would be trained in the most appropriate way.

(6) The Jordanian side requested to include a telemetry system in the Project. The



Japanese side explained that it would not be agreed.

- (7) The Jordanian side promised to cooperate in the implementation of the Project by providing all the undertakings required of the government of the recipient country, which is described in Annex-III and Annex-IV of the former Minutes of Discussions dated November 29, 2001.

#### 6. Coordination of other projects

- (1) It is the Jordanian side to coordinate donors and monitor the schedule of other projects concerned with the Project.
- (2) The Jordanian side explained that the two water source development projects in Amman as follows,
  - a) Zara and Ma'in Brackish water Desalination (ZMBD) project by United States Agency for International Development (USAID)

The Pre-qualification documents have been delivered and the schedule is tentatively planned of the tender document release in June, tendering on July 17, the contract on August 16, the commencement on December 18, 2002 and the project completion by December 2004. The Jordanian side will acquire the tender documents of ZMBD project in June 2002 and provide it to the Japanese side.

- b) Dier Alla-Zai-Amman Water Project Stage II by Kreditanstalt für Wiederaufbau (KfW)

The contract for the project has been awarded and this project will be completed by July 2003.

The Jordanian side promised to ensure the completion of the above two projects.

- (3) The Jordanian side explained to submit the quarterly report about the progress of the above two projects to the Japanese side for smooth implementation of the Project.
- (4) The Jordanian side promised to allocate water from Amman to the Zarqa district immediately after the completion of the Project as a priority matter.

#### 7. Technical assistance

- (1) The technical assistance program as a "soft component scheme" consists of three activities shown in Annex-II.
- (2) The Jordanian side understood the objectives, the outputs, the activities and the undertakings by the Jordanian side for the technical assistance programs in detail.
- (3) The Jordanian side understood the importance to assign technical staff for the program and to transfer the technology to the operation and maintenance staff in WAJ.

#### 8. Operation of the water supply system

- (1) The Jordanian side explained the situation of the private sector participation in Amman, which is a management contract including operation and maintenance.
- (2) The Jordanian side explained that WAJ Zarqa would operate and maintain the water supply system constructed under the Project on its own in principle, and that it would

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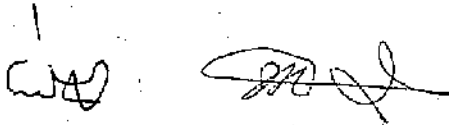


not be privatized.

- (3) The Jordanian side explained that the common water tariff all over Jordan would be continuously applied in Zarqa district.

9. Other relevant issues

- (1) The Jordanian side explained that budget necessary for the undertaking of the Jordanian side would be secured.
- (2) The Team handed copies of the draft final report to the Jordanian side. Both sides agreed it to be confidential, and not to be duplicated or released to any outside parties.
- (3) The Jordanian side requested the modifications in the draft final report, such as about hydraulic gradient line, velocity of water, etc.



THE LIST OF FACILITIES TO BE CONSTRUCTED UNDER THE PROJECT

A. Construction of Transmission Pipeline



- Hutteen junction – Hutteen Reservoir – Ruseifa High Reservoir
- Ruseifa High Reservoir – Ruseifa Low Reservoir
- Awajan High Reservoir – Awajan Low Reservoir

B. Construction and Expansion of Distribution Reservoir

- Awajan High Reservoir (expansion)
- Awajan Low Reservoir
- Ruseifa High Reservoir
- Ruseifa Low Reservoir

C. Construction of Distribution Main

- From Awajan High Reservoir
- From Awajan Low Reservoir
- From Ruseifa High Reservoir
- From Ruseifa Low Reservoir

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## THE TECHNICAL ASSISTANCE UNDER SOFTWARE COMPONENT PROGRAM

### 1. Objectives

This software component program is targeted to establish capacity to effectively operate and maintain distribution networks and control the water distribution by transferring integrated technologies of network mapping, network analysis and the water distribution control. Once the capacity is established, fair water distribution (water distribution control) and effective and continuous reduction of leakage will be brought about.

### 2. Outputs

Outputs can be grouped into three. Once these three outputs are attained, integrated capacity to manage the distribution networks will be brought about.

- 1) Conditions of networks can be easily grasped.
- 2) Hydraulic characteristics of network can be easily grasped.
- 3) Technology of distribution control will be improved.

### 3. Activities

#### (1) Mapping of distribution networks

- a. Preparation, introduction seminar, collection of drawings
- b. Network mapping
- c. Transfer of network mapping technology (including operation)

#### (2) Transfer of network analysis technology

- a. Formulation and simulation of network analysis model
- b. Transfer of network analysis technology

#### (3) Technology transfer on water distribution control

- a. Updating of network information as is expanded
- b. Design, analysis and adjustment of distribution sub-zones
- c. Workshop for integrated technology transfer
- d. Reporting

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JD/GR-021 2/22

وزارة المياه والري  
سلطة المياه

Ministry of Water & Irrigation  
Water Authority



The Hashemite Kingdom  
of Jordan

Ref. No. A-7-2-2401

Date 12-2-2002

التاريخ

الرقم

His Excellency Mr. Shintato Sasaki  
Japanese Ambassador to Jordan  
P.O. Box 2835, Amman 11185

EMBASSY OF JAPAN  
12 FEB 2002  
RECEIVED

Dear Sir,

The Ministry of Water and Irrigation of the Hashemite Kingdom of Jordan presents its compliments to the Embassy of Japan and, with reference to the Request for Japan's Grant Aid for the Project for the Improvement of the Water Supply System for Zarqa District, concerning under-mentioned clarifications, has honor to state that,

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 2001, and clarify some matter in question for unmistakable understanding of the project.

As agreed in the " Technical Note" attached to the present letter, the Ministry of Water and Irrigation considers that the water transmission route for the Project should start from the existing transmission pipes in Amman system and the Facilities to be installed under the Project should be those technically most appropriate. The Ministry of Water and Irrigation would like to request the Japanese Government to understand that this change listed as per the attached sheet will bring more efficient use of resources and success of the Project.

The Ministry will take all the necessary measures to avoid unexpected delay regarding Deir Alla - Dabouq conveyance which scheduled to be completed in mid of 2003 and the Zara-Ma'in brackish-water project which scheduled to start operation in late fall of 2004, and no delay of both of them is expected. Moreover, Ministry will be responsible to the Japanese Government for the completion of them before the target year of the Project 2005. It is also understood that these water resource development projects are decisive factor to produce surplus water in Amman system,

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Water Authority



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of Jordan

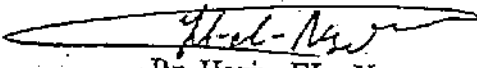
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The Ministry of water and Irrigation wishes to know if the Government of Japan has any objection to the afore- mentioned request.

It would be appreciated if the Embassy would Kindly inform the Ministry of the reply from the Government of Japan as soon as possible.

Sincerely Yours,

  
Dr. Hazim EI - Naser

Minister of Water and Irrigation of the  
Hashemite Kingdom of Jordan

Incl: Minutes of Discussions dated November 29,2001  
"Technical Notes" dated December 27,2001  
Ministry letter No. MWI/6/7/11/119 dated 16-1-2002

cc: Ministry of Planning  
Resident Representative of JIC A Jordan office





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Ministry of Water & Irrigation  
Water Authority



The Hashemite Kingdom  
of Jordan

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Annex : List of Facilities Requested For Grant Aid

A: Construction of Transmission Pipelines

- |   |
|---|
| 1. Hetten Junction to Ruseifa High Via Hetten Reservoir |
| 2. Ruseifa High to Ruseifa Low                          |
| 3. Awajan High to Awajan Low                            |

B: Construction and Expansion of Distribution Reservoirs

- |                                |
|--------------------------------|
| 1. Low Awajan 635 (new)        |
| 2. Hish Awajan 695 (expansion) |
| 3. Low Rusaifa 750 (new)       |
| 4. High Rusaifa 815 (new)      |

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The Hashemite Kingdom Of Jordan  
Ministry of Water & Irrigation

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وزارة المياه والري



Ref.No. MWI/GP/11/119  
Date : 16-2-2002

الرقم :  
التاريخ :

Mujib-Zara-Ma'n brackish water project

المستشار  
مهندسين  
16/2/02

Subject:-Reference : E-mail received on January 9, from Haley H. Minakami <haley@minakami.net>

(i) Back ground:-

The following questions have been asked for concrete evidence before January 18,2002 as these evidences are of vital necessity to push Zarqa project and needed in haste.

- (Q1) Completion of the Construction work by 2004
- (Q2) Readiness of WAJ to buy water continuously from the project, if it will be operated by D-B-O basis

(ii) Answer to Q1:-

- (ii-1) This contract is limited to US firms since it is partially financed by the United States Government through United States Agency for International Development (USAID). The estimated capital cost is (85-90 million US \$). USAID financing is about 90% of the capital cost.
- (ii-2) The Request for Proposals (RFP) was issued in Draft to the already 5-Prequalified United States firms/ Consortia on December 24, 2001. The latest date for receiving comments is January 27, 2002.
- (ii-3) The following is the Outline Program for the following steps: -
  - On March 2002 is the issuance of Final Tender Documents of Request for Proposals. 2 months shall be given to Bidders for preparation of their Bids
  - On May 2002 is the date of submission of the RFP, which is being issued by MWI/WAJ as part of a two-phase bidding process. Phase I consisted of identifying pre-qualified Bidders through a

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Date : \_\_\_\_\_

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Request for Qualifications (RFQ). Phase II consists of this RFP.

Only those Bidders selected through the RFQ process have been invited to submit proposals through this RFP.

- On June 2002, Technical Proposals evaluation shall be completed
- On July 2002, Financial Proposals evaluation shall be completed
- MWI/USAID approval, Decision of Award, and signing of agreement
- Construction period is 2 years. Consequently, the completion of constructions is August 2004.

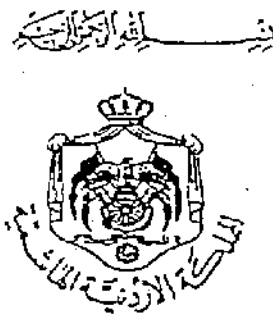
**(iii) Answer to Q2: -**

(iii-1) The project development components for which Proposals are now requested include:

1. Final design and construction of a water treatment/desalination plant sized for a brackish feedwater supply of 55 million cubic meters per year (MCM) and the associated wastewater disposal facilities/pipeline with net desalinated production of 45 MCM/year.
2. Final design and construction of approximately 40 kilometers (km) of conveyance pipeline. (800 to 1200mm in diameter). Generally, it will be located between the north end of the Dead Sea and the existing National Park Pump Station, with most of the alignment along the Amman-Dead Sea Highway.
3. Final design and construction of at least six (6) pumping stations, each with a capacity of approximately 1.5 cubic meters per second (m<sup>3</sup>/sec) at a total dynamic head of up to 280 m (each).
4. Final design and construction of storage reservoirs at the pump station sites.

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JD/GR-021 2/22

Ref.No. \_\_\_\_\_

Date : \_\_\_\_\_

الرقم : \_\_\_\_\_

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5. Final design and construction of a terminal reservoir and pump station near the existing National Park Pump Station, adequate to divert flows to existing reservoir at Dabouq.

6. A complete integrated SCADA system for all of the facilities.

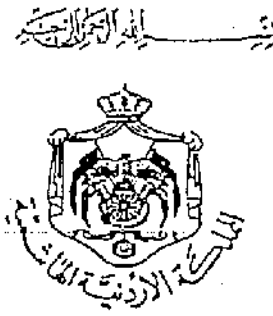
7. Operation and maintenance of all the completed facilities.

(iii-3) The Contractor is required to operate and maintain the scheme for 2-year Defects Liability Period. Another 5- years for operation and maintenance is an option in the Bill of Quantity and a decision shall be taken on awarding the Contract. Training WAJ staff shall be within the last year of Hand-Back the works. Water Authority of Jordan shall pay electricity cost. The Contractor is responsible for managerial and operation/maintenance of the project during O&M period. Award shall be according to a formula that considers the Technical Ranking, the Financial Ranking and the predicted O&M including electricity consumption costs for 20 years. This shall award the contract to the lowest responsive responsible bid (capital +operation and maintenance cost).

(iii-4) Based on the above, this project is a totally financed project from Water Authority of Jordan and USAID grant. The Bulk water tariff for supplying 4-5 millions cubic meters per year assuming stating at 1mcm/y at the first year with increasing 1mcm incremental to the hotels along the Dead Sea would be priced at JD 1/m<sup>3</sup> and in Amman Area. The cost recovery Tariff is calculated for different Scenarios ( US\$ 0.57-0.46) (equivalent ( Fils 400-325 ) or ( JD 0.400-0.325 JD) for the supply to greater Amman Area.

Attached is the Feasibility Report, which shows the viability of the project.

The Hashemite Kingdom Of Jordan  
Ministry of Water & Irrigation



JD/GR-021 22/22  
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Ref.No. \_\_\_\_\_

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The above answer was prepared by Eng. Nazeer, the MWI's Counterpart for this project "Wadi Ma'in, Zara and Mujib Water Treatment and Conveyance Project.

The contents of the above answer are true and correct. The undersigned, the Secretary General for the Ministry of Water and Irrigation, hereby certify this answer.

on the date of January 16, 2002 at Amman

*S. Bakri*

Eng. Sa'ad Bakri  
Secretary General  
Ministry of Water and Irrigation

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## Appendix 5 Allocation of Water from Amman System

This basic design is formulated based on the water resources management plan of Jordan after the target year of 2005 when the project facilities will be constructed. After 2005, water will be supplied to the project area from Amman side and transmission from Khaw pumping station can be discontinued.

The present situation of the water resources in Jordan and the future development projects are reviewed in this appendix, and possibility to allocate the surplus from Amman to Zarqa is confirmed.

### 1. Present Conditions of Water Resources in Jordan

Sources of water supply in Amman and Zarqa are mostly groundwater wells. As the demand has increased in recent years, wells have become overdraft, and remarkable deterioration of water quality and lowering of aquifer level are observed. Table 1 shows safe yield, present yield, necessary amount of reduction, and reduction ratio of wells in each governorate.

Table 1 Description of Wells in Each Governorate

Governorate	Safe Yield (MCM/y)	Actual Yield in 1998 (MCM/y)	Necessary Reduction (MCM/y)	Reduction Ratio (%)
Amman	34	62	28	45
Zarqa	47	89	42	47
Mafraq	77	91	14	15
Irbid	29	46	17	37
Ajloun	2	2	0	0
Jerash	8	4	0 (+4)	0
Balqa	19	47	28	60
Madaba	9	14	5	36
Karak	16	29	13	45
Ma'an	14	23	9	39
Tafielah	12	3	0 (+9)	0
Aqaba	8	6	0 (+2)	0
Total	275	416 (Excluding Ram)	156	38

MCM/y: million cubic meter per year

Source: Water Resources Management in the Hashmite Kingdom of Jordan, JICA, 2001

Lowering of aquifer level is observed in many wells, which is still going on. Levels lowered are in the range of 4 – 30 m and the lowering rate in some wells reaches 10 meters per year (m/y). Particularly higher lowering rates are observed in Rusaifa area. According to reports on Water Resources Management in the Hashemite Kingdom of Jordan, JICA, 2001, aquifer level lowering rates in Amman – Zarqa basin were 0.3 – 1.0 m/y from 1968 to 2000 and that in Azraq basin have been 0 – 0.8 m/y since 1985.

Deterioration in water quality is also remarkable. Increase of salt content and NO<sub>3</sub> concentration is widely observed in Jordan, especially in Amman – Zarqa basin. As the above report says, electric conductivity in 53 wells in Amman – Zarqa basin increased by 23.1% from 1,407 μS/cm in 1985-1989 to 1,731 μS/cm in 1990-1999. In some areas, electric conductivity and NO<sub>3</sub> concentration exceeded the national drinking water standards. To reverse this deterioration, some simulation results show, yields should be reduced by 40% in the national average.

### 2. Water Resources Development Projects

The Jordanian Government is developing new water sources as well as planning to reuse treated wastewater, while groundwater yields are planned to be reduced by almost a half. Recently developed, on-going, and planned projects are as follows:



- **Corridor wells** are located northeast of Hallabat. These wells are operational from July 2001. Water from these wells is mixed with water from Hallabat pumping station and transmitted to Khaw pumping station. Their total production capacity is 11 MCM/y.
- **Lajoun wells** in Karak governorate are under construction. After completion in summer of 2002, these wells are expected to produce 15 MCM/y water.
- **Zai system expansion:** Japan funded expansion of water treatment plant and four pumping stations was completed in 2001. However, Germany funded project to supply water to the plant is not yet completed. The Germany funded project is expected to be completed in the summer of 2003 as the award of contract was made in December 2001 with the construction period of 18 months. After completion of this project, production capacity of Zai system will be expanded from 45 MCM/y to 90 MCM/y, and therefore, water transfer from Zarqa to Amman can be discontinued. In addition, new groundwater wells (21.9 MCM/y) will be constructed by the summer of 2002 in Zai area to supplement the raw water source in case of the shortage.
- **Desalinated brackish groundwater (DBGW):** This project is funded by USAID. In this project, surface water and spring water on the east coast of Dead Sea are collected, desalinated and transmitted to Amman. Now prequalification of contractors is finished. Construction period is expected from August 2002 to August 2004. Envisaged production capacity of this project is 45 MCM/y. A design-build-operate (DBO) contract is adopted in the implementation of the project.
- **Disi fossil groundwater** will be transferred from the south of Jordan to Amman through 320 km pipeline. Prequalification of contractors was completed in January 2002, and operation of this project is expected to start in 2006. BOT contract will be applied for the implementation of the project. Expected production is 100-150 MCM/y. Enough water will be available in Jordan after the completion of this project which will allow to change national water allocation pattern. The water withdrawal rate from over exploited eastern wells can then be reduced to the safe level.
- **Wehda dam project** is to increase intake water from Yarmuk river. The capacity originally envisaged was 108 MCM/y. It, however, was reduced by redesigning. First phase is expected to be completed by 2005. The project will be implemented with finance by Arab Fund and Jordan's own fund. The developed water resource will be mainly utilized in the Irbid governorate for irrigation purpose initially. Utilization as drinking water source will be brought about after 2015.

### 3. Water Allocation for Zarqa

Availability of water source in Zarqa depends partly on the conditions in Amman. Therefore, demand and supply situation in Amman is discussed in the following paragraphs. As a result, it has been found that at least 40 MCM/y of water would be in excess in Amman and can be utilized for Zarqa after 2005.

#### 3.1 Water Demand Projection in Amman

Water demand in Amman is estimated in the reports 'Water Resources Management, JICA, 2001', and 'Hydraulic Analysis of Greater Amman Water Supply System, GTZ, 1997'. The results from these reports are summarized in Table 2.

Table 2 Water Demand Projection in Amman (MCM/y)

Source	1995	1998	2000	2005	2010	2015	2025
Water Resources Management (Scenario 1)	-	87	-	101	138	171	
Water Resources Management (Scenario 2)	-	87	-	103	140	191	
Water Resources Management (Scenario 3)	-	87	-	98	129	169	
Report on Hydraulic Analysis	110	-	117	125	148	175	222

### 3.2 Water Sources for Amman

Each report considers the following water sources to meet the above demand.

#### a. GTZ Report on Hydraulic Analysis of Greater Amman Water Supply System

In 1995, total supplied volume was 88.37 MCM/y against a demand of 110 MCM/y. In the supply, local sources accounted for 25% and the remaining 75% was from sources outside Amman, among which the supply from Zai system accounted for 34% and the sources from eastern wells through Khaw pumping station accounted for 19%.

Water source development projection in the report says that Zai system would be expanded by 45 MCM/y in 2000, the Disi fossil water development with supply of 90 MCM/y in phase 1 will be available from 2005, and additional 60 MCM/y in phase 2 will be available from 2015. With the availability of these new sources of water, expected supply will satisfy demand after 2005, even if the abstraction rate from local wells is reduced to the level of safe yield. It also says that there will be surplus of supply by 16 MCM/y in 2000, 97 MCM/y in 2005, 73 MCM/y in 2010 and 106 MCM/y in 2015.

Table 3 Water Allocation Plan – 1 (MCM/y)

Source Group	Source	1995	2000	2005	2010	2015
Khaw source (Eastern wells)	Azraq	20.00	10.00	10.00	10.00	10.00
	North Eastern Desert	2.90	2.90	2.90	2.90	2.90
	Za'atari & D.Km wells	6.00	6.00	6.00	6.00	6.00
	Hallabat	3.90	3.90	3.90	3.90	3.90
	Dhuleil (Khaldia)	6.60	0.00	0.00	0.00	0.00
	Zarqa to Marka Housing	0.05	0.00	0.00	0.00	0.00
		39.45	22.80	22.80	22.80	22.80
	To Zarqa (45%)	22.33	10.26	10.26	10.26	10.26
	<b>Net Production to Amman</b>	17.12	12.54	12.54	12.54	12.54
Wala/Hidan (Southern wells 1)	Wala/Hidan	11.44	10.00	10.00	10.00	10.00
	To Madaba	6.53	6.53	6.53	6.53	6.53
	<b>Net Production to Amman</b>	4.91	3.47	3.47	3.47	3.47
Qastal/Suwaqaq /Qatrana (Southern wells 2)	Suwaqa	9.14	9.09	9.09	9.09	9.09
	Qatrana	4.62	4.91	4.91	4.91	4.91
		13.76	14.00	14.00	14.00	14.00
	To Madaba villages	5.01	5.01	5.01	5.01	5.01
		8.75	8.99	8.99	8.99	8.99
	Qastal	2.00	2.00	1.00	0.00	0.00
		10.74	10.99	9.99	8.99	8.99
	To Jyza, Airport & Madaba	2.50	2.50	2.50	2.50	2.50
	<b>Net Production to Amman</b>	8.25	8.49	7.49	6.49	6.49
Zai source	Zai Production Upgraded To 45 MCM/y @1998MCM/ y	35.37	45.00	45.00	45.00	45.00
	Add. To 90 MCM/y r after Year 2004	0.00	45.00	45.00	45.00	45.00
		35.37	90.00	90.00	90.00	90.00
	To R.Shawak, Safut, Harbag & Mahis	1.23	0.00	0.00	0.00	0.00
	To Balqa	4.38	4.38	4.38	4.38	4.38
	<b>Net Production To Amman</b>	29.77	85.62	85.62	85.62	85.62
Russeifa Wells (Northern wells)	DN 600	2.32	1.75	1.75	1.75	1.75
	DN 400	3.70	2.75	2.75	2.75	2.75
	<b>Net Production To Amman</b>	6.02	4.50	4.50	4.50	4.50
Local Sources (in Amman)	Tadj Wells	8.71	8.50	8.50	8.50	8.50
	Yajouz well 1	0.23	0.20	0.20	0.20	0.20
	Yajouz well 6	0.27	0.27	0.27	0.27	0.27
	Muhajreen well	3.18	0.00	0.00	0.00	0.00
	Wadi Saqra Well	0.30	0.30	0.30	0.30	0.30
	Wadi Esseer Spring	3.26	3.26	3.26	3.26	3.26
	W. Qa sar well	0.07	0.07	0.07	0.07	0.07
	Azraq Spring to Dabouq	0.26	0.00	0.00	0.00	0.00
	Madhona	0.11	0.11	0.11	0.11	0.11
	Ras El Ain Spring & 2 Wells	5.91	5.90	5.90	5.90	5.90
	<b>Net Production to Amman</b>	22.30	18.60	18.60	18.60	18.60
<b>Disi Fossil Groundwater</b>		0.00	0.00	90.00	90.00	150.00
	<b>Grand Total to Amman</b>	88.37	133.22	222.22	221.22	281.22

b. JICA Report on Water Resources Management

As new water sources, JICA report says that the desalinated brackish water project will be completed in 2005 and Zai system expansion and Disi fossil water project will be completed in 2010. Water allocation is projected as shown in Table 4. Water transfer through Khaw pumping station will be discontinued in 2005-2010.

Table 4 Water Allocation Plan – 2 (MCM/y)

Sources	1998	2005	2010	2015
External wells (From Za'atari and Mafrag)	27	5	0	0
Zai	32	36	58	58
Local wells	33	26	24	25
Madaba	0	3	0	0
Desalinated Brackish Groundwater (DBGW)	0	31	31	40
Disi Fossil Groundwater	0	0	25	48
Export to outside	5	0	0	0
Total Resources Available in Amman	87	101	138	171

c. The Present Basic Design Study

Similar to the above reports, this study also considers that the abstraction from local wells will be reduced to preserve groundwater and new water sources are expected to be able to satisfy the increasing demand.

As new water sources, additional 45 MCM/y will be available from 2003 due to the expansion of Zai system and the 45 MCM/y DBGW will be available from 2004. Disi water project is planned to supply 90 MCM/y from 2007.

In addition to above, Corridor wells (11 MCM/y) were commissioned in July 2001 and Lajoun wells (15 MCM/y) will be commissioned in summer 2002. A total of 26 MCM/y will be increased.

Considering the availability of the above new water sources, water allocation in Amman is projected as in Table 5. Available volume from Zai system, DBGW and Disi is net value after reducing local consumption from production. Table 2-5 shows that demand in Amman (Scenario 1 in Table 2) is satisfied after 2005 and more than 40 MCM/y surplus water will be available for Zarqa and other cities.

Table 5 Water Allocation – 3 (MCM/y)

Sources	1995	2005	2010	2015
External wells (From Za'atari and Mafrag)	27	0	0	0
Zai	32	81	58	58
Local wells	33	23	23	23
Madaba	0	0	0	0
Desalinated Brackish Groundwater (DBGW)	0	40	45	45
Disi Fossil Groundwater	0	0	67	88
Export to outside	5	0	0	0
Total Resources Available in Amman	87	144	193	214
Demand in Amman (Scenario 1 in Table 2)	-	101	138	171
Excess Water in Amman	-	43	55	43

### 3.3 Water Allocation to Zarqa

#### a. JICA Report on Water Resources Management

Water allocation in Zarqa is estimated as in Table 6 from the internal data. In the short term, water transfer from Zarqa to Amman will be reduced and in the long term, local groundwater production will be reduced by almost a half.

Table 6 Water Allocation in Zarqa – 1 (MCM/y)

Sources	1998	2005	2010	2015
External wells (From Za'atari and Mafraq)	13.0	9.9	13.0	16.0
External surface water	0	0.7	0.7	10.7
Local wells	38.6	34.8	23.8	22.2
DBGW, Disi	0	0	17.3	18.6
Total Sources	51.6	45.4	54.8	67.5
To Amman	17.6	5.0	0	0
To Jerash, Mafraq	1.5	1.5	1.5	1.5
Available Sources in Zarqa	32.5	38.9	53.3	66.0
Water Demand in Zarqa	32.5	38.9	53.3	66.0

#### b. This Study

Water supply will exceed the demand in 2005 due to development of new water sources by Zai system expansion, DBGW and Disi fossil water. Accordingly in 2005, water transfer through Khaw pumping station to Amman can be discontinued and the abstraction rate from the local wells can be reduced by a half. Table 7 shows that deficit of supply in Zarqa without considering water sources of Zai system, DBGW, and Disi water will be 13.9 MCM/y in 2005, 28.3 MCM/y in 2010 and 31.0 MCM/y in 2015. On the other hand, surplus of water supply in Amman will be 43.0 MCM/y in 2005, 55.0 MCM/y in 2010 and 43.0 MCM/y in 2015 as shown in Table 7 and can meet the deficit in Zarqa.

Table 7 Water Allocation in Zarqa – 2 (MCM/y)

Sources	1998	2005	2010	2015
External wells (From Za'atari and Mafraq)	13.0	6.5	6.5	6.5
External surface water 1	0	0.7	0.7	0.7
External surface water 2 (Waheda dam)	0	0	0	10.0
Local wells	38.6	19.3	19.3	19.3
Total Sources	51.6	26.5	26.5	36.5
To Amman	17.6	0	0	0
To Jerash, Mafraq	1.5	1.5	1.5	1.5
Available Sources in Zarqa	32.5	25.0	25.0	35.0
Water Demand in Zarqa	32.5	38.9	53.3	66.0
Deficit Amount in Zarqa	0	13.9	28.3	31.0
Excess Amount in Amman (Table 5)	-	43.0	55.0	43.0

Based on this study, WAJ agreed to transfer surplus water in Amman to Zarqa (Technical Notes dated December 27, 2001, and a letter by the Minister of Water and Irrigation dated February 12, 2002).

#### 4. Selection of Water Sources to be Allocated to Zarqa

##### 4.1 Water Sources for Zarqa District Excluding Water Sources from Amman

As described in the previous section, the water resources for Zarqa district in 2000 and 2004 is indicated in Table 8. In 2000, the amount of 52.5 MCM/y is produced in Zarqa area and transmitted from other area, while 31.8 MCM/y is consumed in Zarqa area. 18.7 MCM/y is transmitted to Amman area.

At present, due to overdraft from local wells, groundwater level has lowered remarkably. The Draft Final Report on Water Resources Management in the Hashemite Kingdom of Jordan (JICA, 2001) points out that the present well water production rate in Amman-Zarqa basin is 180% of the safe yield. The lowering of ground water level influences the environment. For example, in Azraq oasis where Azraq wells are located, migratory birds stopover has disappeared. WAJ sets up a plan to reduce the overdraft of groundwater from Azraq wells by a half for two or three months at the beginning of 2002 for emergency countermeasures.

WAJ has a plan to reduce the abstraction of water from wells after 2004 as water resources from Amman increase. The plan to reduce abstraction water by 50 % from wells has been agreed between WAJ and the study team.

Table 8 Water Resources for Zarqa District in 2000 and after 2004  
(Except water resources from Amman)  
Unit :million m<sup>3</sup>/year (MCM/y)

Year	2000	2005	2010	2015
<b>Water Resources in Zarqa Governorate</b>				
<b>Awajan</b>				
Awajan	2.99	1.82	1.82	1.82
<b>Ruseifa district</b>				
Rusaifa 18	0.12			
Basateen	0.85			
Huteen Camp	0.06			
Phosphat Deep	0.50			
Sub-total	1.53	0.82	0.82	0.82
<b>Zarqa district</b>				
Zarqa	2.72	1.49	1.49	1.49
Hashemeyeh	2.94	1.53	1.53	1.53
Sub-total	5.66	3.01	3.01	3.01
<b>Zarqa West</b>				
Marhib	1.35	0.61	0.61	0.61
Beerain	0.27	0.10	0.10	0.10
Um Rummaneh	0.01	0.04	0.04	0.04
Sub-total	1.63	0.74	0.74	0.74
<b>North West</b>				
Aloug Spring	0.04	0.03	0.03	0.03
Sarrout Spring	0.07	0.04	0.04	0.04
Qunieh	0.48	0.27	0.27	0.27
Sub-total	0.59	0.34	0.34	0.34
<b>East</b>				
Azraq	18.92	10.19	10.19	10.19
Hallabat	4.28	1.86	1.86	1.86
Tamween	1.05	0.00	0.00	0.00
Sub-total	24.25	12.05	12.05	12.05
<b>Total</b>	<b>36.65</b>	<b>18.77</b>	<b>18.77</b>	<b>18.77</b>
<b>Water Resources from outside of Zarqa Governorate</b>				
<b>Mafraq</b>				
Zatari	15.32	6.74	6.74	6.74
Khalidia dhlail	0.53	0.24	0.24	0.24
Corridor	8.00	8.00	8.00	8.00
Sub-total	15.85	14.98	14.98	14.98
<b>Total Water Resources in Zarqa District</b>	<b>52.50</b>	<b>33.74</b>	<b>33.74</b>	<b>33.74</b>
<b>Export from Zarqa District and Local Consumption</b>				
To Amman	18.70	0.00	0.00	0.00
To Jerash	0.39	0.40	0.40	0.40
To Mafraq	0.22	0.25	0.25	0.25
To Azraq	1.41	1.50	1.50	1.50
<b>Total</b>	<b>20.72</b>	<b>2.15</b>	<b>2.15</b>	<b>2.15</b>
<b>Available Water Resources in Zarqa District</b>	<b>31.78</b>	<b>31.59</b>	<b>31.59</b>	<b>32.59</b>

#### 4.2 Available Water Resources for Zarqa District including Water Source from Amman

As described above, the surplus water of Amman area will be available in Zarqa area, thus the water sources of Zarqa area is indicated in Table 9.

Table 9 Available amount of water in Zarqa area  
Unit : Million m<sup>3</sup>/year (m<sup>3</sup>/day)

Water Resources	2005	2010	2015
Available water resources from Amman	43 (118,000)	55 (151,000)	43 (118,000)
Available water resources within Zarqa area	31.6 (86,600)	31.6 (86,600)	31.6 (86,600)
Total	74.6 (204,600)	86.6 (237,600)	74.6 (204,600)

#### 4.3 Balance of Demand and Supply in Amman and Surplus

Available water amount in Zarqa depends on Amman's water balance. Zai system expansion (45MCM/y) and Desalinated Brackish Ground Water (DBGW, 45MCM/y) will be available from 2003 and 2004, respectively. In addition, Disi fossil ground water (90MCM/y) will start operation from 2006.

Hydraulic Analysis Report of Greater Amman Water Supply System in 1997 has established the distribution facility plan considering new water sources of Zai expansion and Desalinated Brackish Ground Water systems. Four main distribution zones (R1 – R4) are recommended and each zone is further divided into sub zones to keep distribution pressure as uniform as possible.

Water sources are transferred into Terminal Reservoir in each main distribution zone and sent to sub zones in order. In case water sources are short in one zone, supplement water sources are transferred from next main zone. In case water sources are excess in one zone, excess water is transferred to next main zone.

Terminal Reservoirs in four main zones are as follows.

- R1: Tadj reservoir
- R2: Abu Alanda reservoir
- R3: Dabouq reservoir
- R4: Wadj reservoir

Water sources are mainly Zai system, DBGW, Disi fossil groundwater and local wells. Available quantity every five years is shown in Figure 1. Alternative transmission systems in Amman are considered as available water sources exceed demands. Such alternatives in 2005 and 2010 are shown in Figure 2-1 to Figure 2-4.

##### Water Transmission Alternatives in 2005

Available water sources (Zai: 81 MCM/y, DBGW: 40 MCM/y, Local wells: 23.1 MCM/y)  
Zai system produces 90 MCM/y after expansion. 9 MCM/y is used in other cities.

Case 1 (Figure 2-1): This is the case in which Zai system water is utilized fully. Water required for Zarqa project area is transmitted from Kharabshe reservoir through Hetten junction. Existing Amman transmission system can accommodate such transmission method.

Case 2 (Figure 2-2): This is the case in which DBGW is utilized fully. DBGW is preferentially distributed to R2 zone. Remaining DBGW is transmitted to R3 zone, mixed with Zai system water and distributed to R1, R3 and R4 zones, and transmitted to Zarqa project area.



Trihalomethanes (THM) in the Zai system water is diluted by mixing with DBGW. Existing Amman transmission system can also accommodate such transmission method.

#### Water Transmission Alternatives in 2010

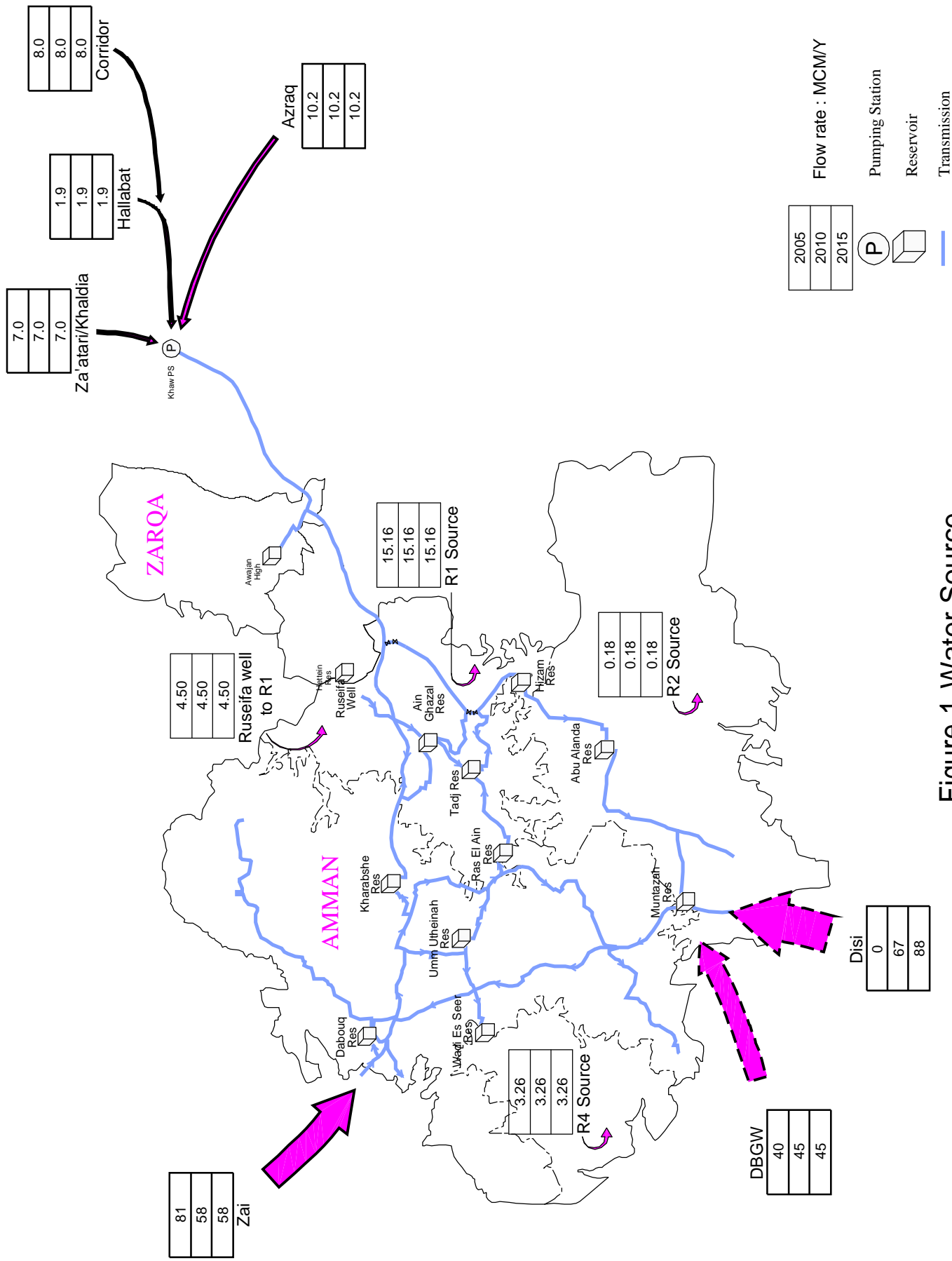
Available water sources: Zai: 58 MCM/y, DBGW: 45 MCM/y, Disi fossil groundwater: 67 MCM/y, and Local wells: 23.1 MCM/y. Water amount of Zai, DBGW and Disi is net water transmitted to Amman after reduction for other consumers.

Case 1 (Figure 2-3): This is the case in which Zai system water is utilized fully. DBGW (45 MCM/y) is transmitted to R3 zone, mixed with Zai water and distributed preferentially to R3, R4 and Zarqa project area. Remaining DBGW/Zai mixed water is also distributed to R1 zone and deficit of R1 zone is supplemented through R2 zone from Disi water.

Case 2 (Figure 2-4): This is the case in which DBGW and Disi fossil groundwater is utilized fully. DBGW (45 MCM/y) is transmitted to R3 zone, mixed with Zai water and distributed to R3, R4 and Zarqa study area. Disi water is distributed to R2 and R1 zones. As transmission water from Muntazah to Abu Alanda is increased in this case, additional pipelines and pumps will be required.

#### 5. Recommended Allocation Plan and Transmission Route

Water transmission system alternatives for Case 1 and Case 2 were evaluated in 2005 and 2010. In 2005, it is possible for both Case 1 and Case 2 to transmit required water in Zarqa area through Kharabshe from Dabouq utilizing existing pipeline, assuming this one is exclusively used for this purpose. It is not necessary to install additional transmission line between Muntaza and Abu Alanda. In 2010, additional pumps and transmission line between Muntaza and Abu Alanda may be required when DBGW and Disi water is utilized fully in Case 2. However, additional pumps and transmission line between Muntaza and Abu Alanda will not be installed in this project as target year of this project is 2005.



Flow rate : MCM/Y

2005
2010
2015

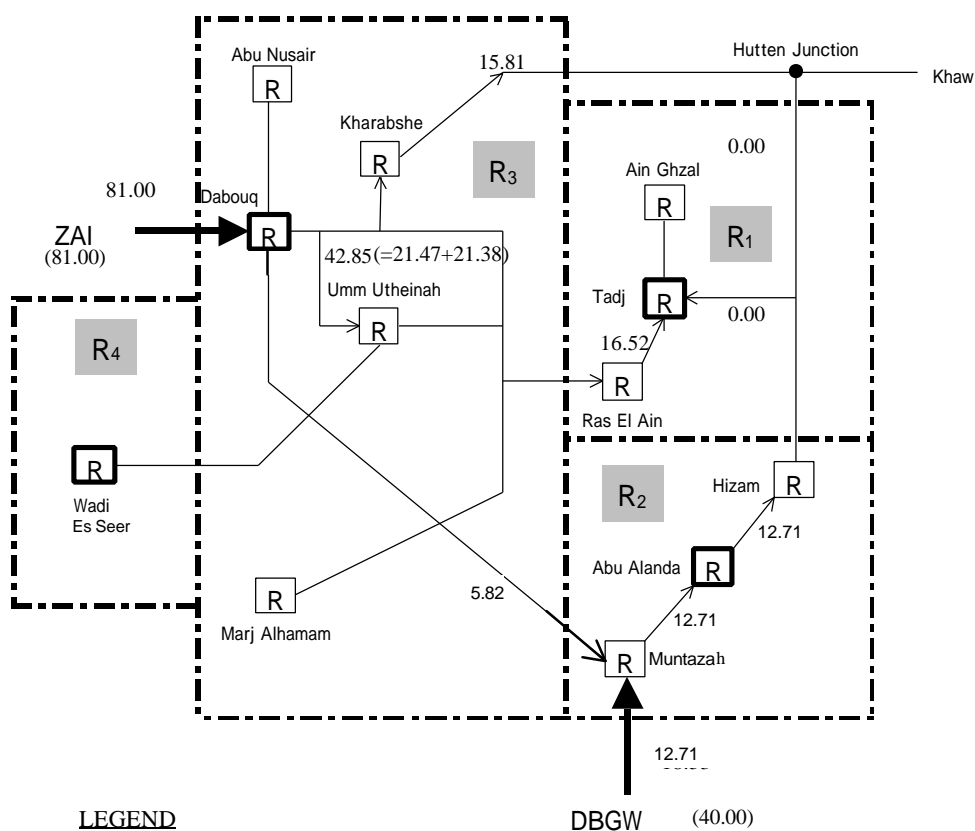
(P) Pumping Station  
 Reservoir  
 Transmission

Figure 1 Water Source

Figure 2-1 Allocation of Sources

<2005> case 1

Year 2005				
Zone	Local sources [mcm]	Demand [mcm]	extra required from Zai [mcm]	extra required from DBGW [mcm]
R1	19.66	36.18	16.52	0.00
R2	0.18	18.71	5.82	12.71
R3+R4	3.26	46.11	42.85	0.00
Zarqa	0.00	15.81	15.81	0.00
	23.10	116.81	81.00	12.71



LEGEND



Terminal Reservoir

DBGW Desalinated Brackish Ground Water

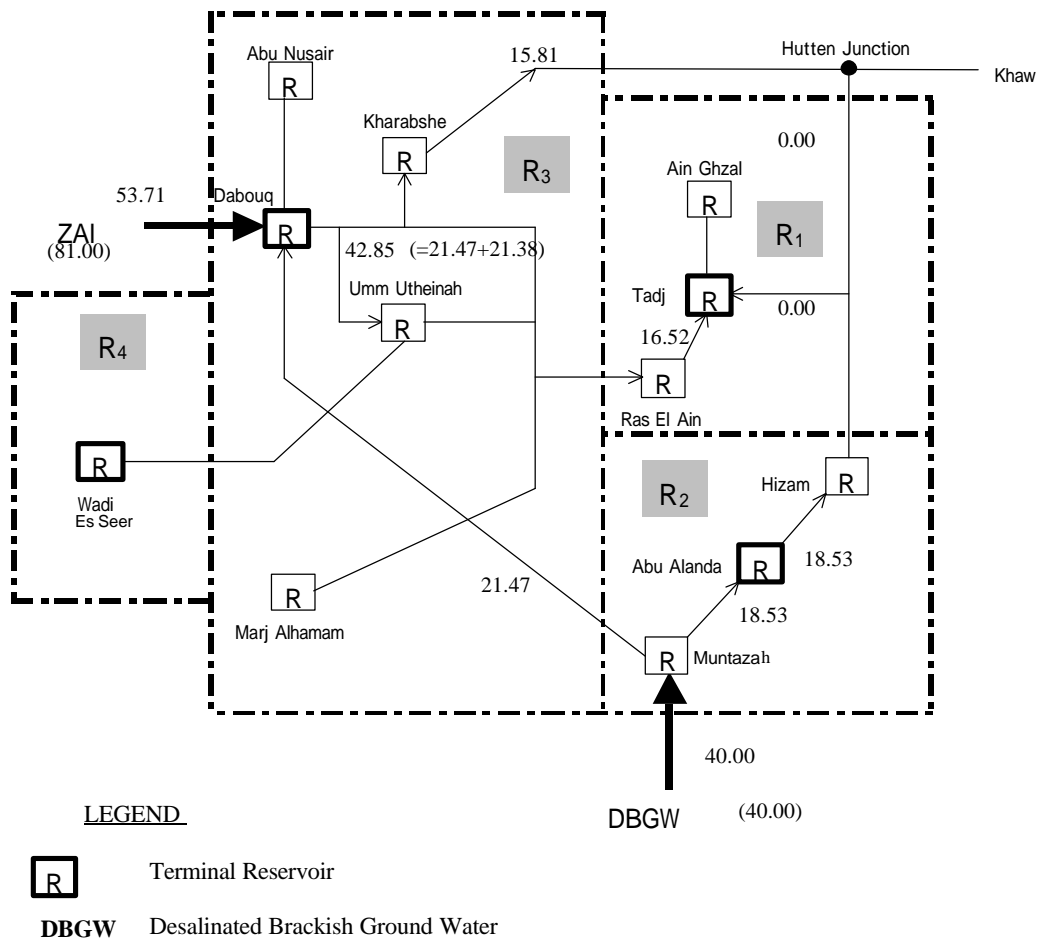
mcm million m<sup>3</sup>

Zai source is utilized at the maximum level. Volume demanded in the Zarqa project area (15.81 mcm/y) can be transmitted by gravity through Kharabshe reservoir and Hutten junction. This option uses the existing transmission pipe, and is most economical.

Figure 2-2 Allocation of Sources

<2005> case 2

Year 2005				
Zone	Local sources [mcm]	Demand [mcm]	extra required from Zai & DBGW [mcm]	extra required from [mcm]
R1	19.66	36.18	16.52	0.00
R2	0.18	18.71	0.00	18.53
R3+R4	3.26	46.11	21.38	21.47
Zarqa	0.00	15.81	15.81	0.00
	23.10	116.81	53.71	40.00



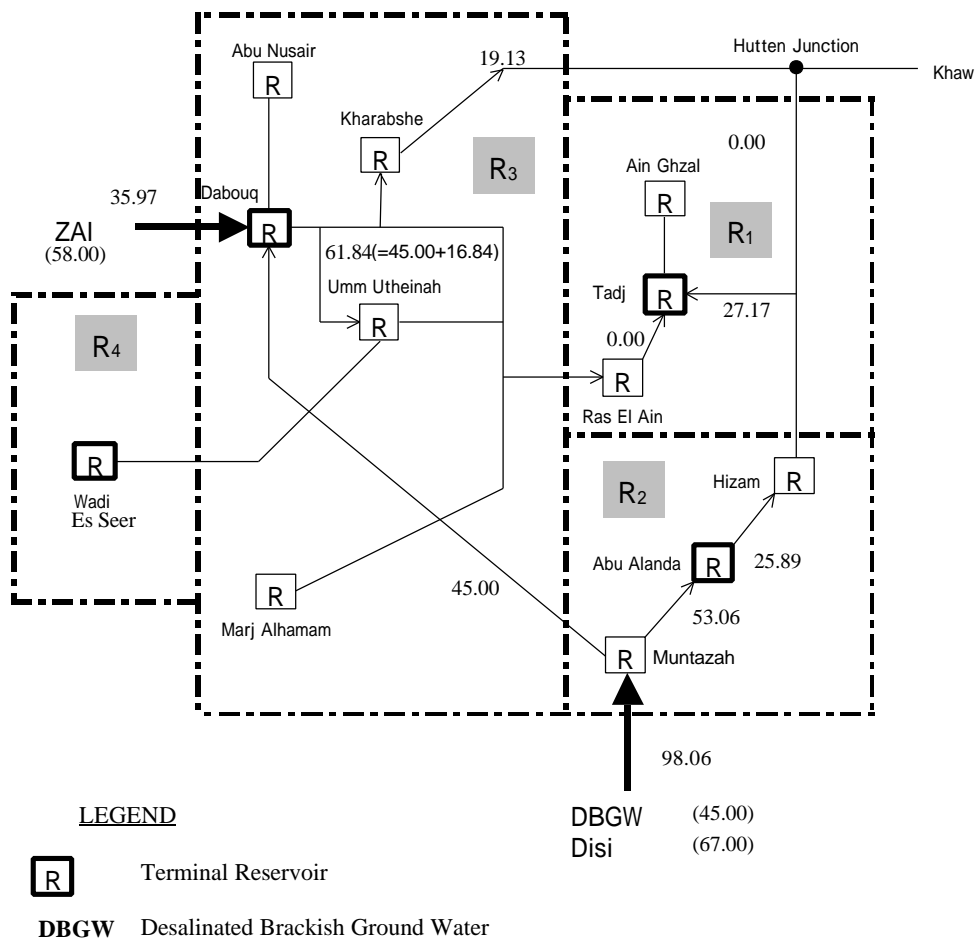
DBGW source is used at the maximum level. All the volume except that demanded in R2 distribution zone (18.53 mcm/y) is transmitted to R3 zone, and is mixed with Zai water. Then it is transmitted to R1, R3 and R4 zones, and Zarqa project area.



Figure 2-4 Allocation of Sources

<2010> case 2

Zone	Year 2010			
	Local Sources [mcm]	Demand [mcm]	extra required from Zai [mcm]	extra required from DBGW & Disi [mcm]
R1	19.66	46.83	0.00	27.17
R2	0.18	26.07	0.00	25.89
R3+R4	3.26	65.10	16.84	45.00
Zarqa	0.00	19.13	19.13	0.00
	23.10	157.13	35.97	98.06



DBGW and Disi sources are utilized at the maximum. DBGW (45.00 mcm/y) is mixed with Zai water and sent to R3, R4 zones and the Zarqa project area. Disi water is sent to R1 and R2 zones.