

【資料】

資料 1. 調査団員・氏名

【第 1 次現地調査】

氏名	担当	所属
横倉 順治 Mr. Junji YOKOKURA	総括 Leader	独立行政法人国際協力機構 気候変動対策室 国際協力専門員 Senior Advisor, Office for Climate Change, JICA
野村 知子 Ms. Tomoko NOMURA	調達監理計画 Procurement Planning	財団法人日本国際協力システム 業務第二部 機材第一課 Japan International Cooperation System (JICS)
川瀬 友裕 Mr. Tomohiro KAWASE	計画管理 Study Planning	独立行政法人国際協力機構 地球環境部 水資源・防災グループ 水資源第 1 課 Program Officer, Water Resource Management Division I Water Resource and Disaster Management Group Global Environment Department, JICA
大谷 重雄 Mr. Shigeo OTANI	業務主任/技術支援計画/ 維持管理計画 Chief Consultant / Technical Assistance Planning / Operation and Maintenance Planning	株式会社協和コンサルタンツ 国際事業部 課長 Manager, International Department Kyowa Engineering Consultants Co., Ltd.
内藤 晃司 Mr. Koji NAITO	水道計画/配水計画 Water Supply Planning	株式会社協和コンサルタンツ 国際事業部 International Department Kyowa Engineering Consultants Co., Ltd.
松本 裕一 Mr. Yuichi MATSUMOTO	機材計画 Equipment Planning	株式会社協和コンサルタンツ 国際事業部 嘱託 International Department Kyowa Engineering Consultants Co., Ltd.

【第 2 次現地調査】

氏名	担当	所属
横倉 順治 Mr. Junji YOKOKURA	総括 Leader	独立行政法人国際協力機構 気候変動対策室 国際協力専門員 Senior Advisor, Office for Climate Change, JICA
野村 知子 Ms. Tomoko NOMURA	調達監理計画 Procurement Planning	財団法人日本国際協力システム 業務第二部 機材第一課 Japan International Cooperation System (JICS)
川瀬 友裕 Mr. Tomohiro KAWASE	計画管理 Study Planning	独立行政法人国際協力機構 地球環境部 水資源・防災グループ 水資源第 1 課 Program Officer, Water Resource Management Division I Water Resource and Disaster Management Group Global Environment Department, JICA

氏名	担当	所属
大谷 重雄 Mr. Shigeo OTANI	業務主任/技術支援計画/ 維持管理計画 Chief Consultant / Technical Assistance Planning / Operation and Maintenance Planning	株式会社協和コンサルタンツ 国際事業部 課長 Manager, International Department Kyowa Engineering Consultants Co., Ltd.
内藤 晃司 Mr. Koji NAITO	水道計画/配水計画 Water Supply Planning	株式会社協和コンサルタンツ 国際事業部 International Department Kyowa Engineering Consultants Co., Ltd.
松本 裕一 Mr. Yuichi MATSUMOTO	機材計画 Equipment Planning	株式会社協和コンサルタンツ 国際事業部 嘱託 International Department Kyowa Engineering Consultants Co., Ltd.
大橋 正 Mr. Tadashi OHASHI	調達計画/積算 Procurement Planning / Cost Estimate O&M planning	株式会社協和コンサルタンツ 国際事業部 International Department Kyowa Engineering Consultants Co., Ltd.

【概略設計概要説明調査】

氏名	担当	所属
岡本 茂 Mr. Shigeru OKAMOTO	団長 Team Leader	独立行政法人国際協力機構 ヨルダン事務所 所長 Chief Representative, Jordan Office, JICA
川瀬 友裕 Mr. Tomohiro KAWASE	計画管理 Study Planning	独立行政法人国際協力機構 地球環境部 水資源・防災グループ 水資源第1課 Program Officer, Water Resource Management Division I Water Resource and Disaster Management Group Global Environment Department, JICA
大谷 重雄 Mr. Shigeo OTANI	業務主任/技術支援計画/ 維持管理計画 Chief Consultant / Technical Assistance Planning / Operation and Maintenance Planning	株式会社協和コンサルタンツ 国際事業部 課長 Manager, International Department Kyowa Engineering Consultants Co., Ltd.
松本 裕一 Mr. Yuichi MATSUMOTO	機材計画 Equipment Planning	株式会社協和コンサルタンツ 国際事業部 嘱託 International Department Kyowa Engineering Consultants Co., Ltd.
大橋 正 Mr. Tadashi OHASHI	調達計画/積算 Procurement Planning / Cost Estimate O&M planning	株式会社協和コンサルタンツ 国際事業部 International Department Kyowa Engineering Consultants Co., Ltd.

資料2. 調査行程

【第1次現地調査】

日数	日程	曜日	JICA団員(総括、調達監理計画、計画管理)	コンサルタント団員		
				業務主任/技術支援計画/ 維持管理計画	水道計画/配水計画	機材計画
1	4月3日	金		移動 成田(10:30) バンコク(15:05)		
2	4月4日	土	移動 羽田(19:55) 関西(21:10) 移動 関西(23:15) ドバイ(05:30)	移動 バンコク(0:30) アンマン(7:30) プロジェクトサイト視察		
3	4月5日	日	移動 ドバイ(07:25) アンマン(9:40) JICAヨルダン事務所・対処方針説明(12:30)、計画・国際協力省表敬/スキーム説明(14:00)、WAJ総表敬(15:00)、WAJ実務レベル協議(15:45)、在ヨルダン日本大使館表敬・対処方針説明(16:30)	現場踏査(ハッテン配水池、ルセイファ配水池高区、低区)		
4	4月6日	月	IC/R協議(9:00)、GTZ/IEEプロジェクト担当者へのヒアリング(13:30)、MCCヒアリング(15:00)			
5	4月7日	火	現場踏査(ザルカ県支所、ザルカPS、ハウPS、中央ワークショップ、ハッテン配水池、ルセイファ配水池高区、低区)			
6	4月8日	水	計画・国際協力省と協議(8:30)	コンサルタント団員打ち合わせ		
			WAJとのM/D協議(10:00)、M/D署名(15:30)			
7	4月9日	木	大使館報告9:00、JICA事務所報告10:00 移動 アンマン(17:30) ドバイ(21:15)	WAJ質問票内容の説明、資料収集		
8	4月10日	金	移動 ドバイ(02:35) 関西(17:20) 移動 関西(19:15) 羽田(20:25)	現場踏査(アワジャン配水池高区・低区、アワジャン井戸、スフナポンプ場、スフナ配水池、ハシミア配水池、ハシミア井戸、ハシミアポンプ場)		
9	4月11日	土	現場踏査(ザルカポンプ場)、ザルカ支所ヒアリング			
10	4月12日	日	ザルカ支所にて資料請求、アズラックポンプ場、アズラック井戸、送水管踏査			
11	4月13日	月	ザルカ支所にて協議、GIS課調査、ポンプ場調査(ハラバット、ハウ)			
12	4月14日	火	(計画管理団員 アンマン発17:30)	WAJ本庁資料収集、要請内容の確認、建設業者ヒアリング		
13	4月15日	水	(計画管理団員 日本着)	ザルカ支所要請内容等会議資料収集、メルヘブポンプ場踏査		
14	4月16日	木	資料収集			
15	4月17日	金	資料整理			
16	4月18日	土	資料整理、現場確認(ザルカ支所)			
17	4月19日	日	変更要請内容の現場確認、WAJ-COD協議、配水管位置			
18	4月20日	月	他ドナープロジェクト内容の確認、建設業者、機材調達業者ヒアリング			
19	4月21日	火	覚書内容協議、要請リスト確認、GTZ会議(10:00)、資料収集、機材調達方法確認、電力料金支払いデータ確認	移動(2:10) バンコク(15:15 22:25)		
20	4月22日	水	資料収集			
			成田(6:30)			
21	4月23日	木	覚書作成、WAJ-PMUの最終確認、覚書署名、資料収集(価格)			
22	4月24日	金	資料整理			
23	4月25日	土	ザルカポンプ場、ザルカ支所、バサティーンポンプ場、ルセイファ支所、給水管・水道メータ調査			
24	4月26日	日	WAJ報告、JICA事務所報告(15:00)、大使館報告(16:30)			
25	4月27日	月	移動(2:10) バンコク(15:15 22:25)			
26	4月28日	火	成田(6:30)			

【第2次現地調査】

日数	日程	曜日	JICA団員 (総括、調達監理計画、計画管理)	コンサルタント団員			
				業務主任/技術支援計画 /維持管理計画	水道計画/配水計画	機材計画	調達計画/積算
			横倉、野村、川瀬	大谷	内藤	松本	大橋
1	6月13日	土	移動 羽田(20:30) 関西(21:45) 移動 関西(23:15) ドバイ(04:45)	移動 成田(10:30) バンコク(15:05)			
2	6月14日	日	移動 ドバイ(07:25) アンマン (9:20) 13:00 JICAヨルダン事務所 14:00 計画・国際協力省表敬 15:00 WAJ総裁表敬、ITR提出・協議 17:30 在ヨルダン日本国大使館表敬	移動 バンコク(0:30) アンマン(05:15)			
3	6月15日	月	9:00 GTZ及びWAJ協議(IEEプロジェクト) インテリムレポート協議 14:00 M C Cヒアリング				
4	6月16日	火	現場踏査(ザルカ県支所、アズラックPS、ハラバットPS)				
5	6月17日	水	計画・国際協力省と協議、WAJとのM/D協議、				
6	6月18日	木	11:00 M/D署名 15:00 JICA事務所報告 16:30 在ヨルダン日本国大使館報告				
7	6月19日	金	移動 アンマン(17:15) ドバイ(21:10)	担当事項調査		移動 成田(10:30) バンコク(15:05)	
8	6月20日	土	移動 ドバイ(03:10) 関西(17:20) 移動 関西(19:15) 羽田(20:25)	am WAJザルカ支所協議 pm ポンプ場調査		移動 バンコク(0:30) アンマン(05:15) pm ポンプ場調査	
9	6月21日	日		施工実態・調達事情調査	WAJ資料収集、統計局	ポンプ場調査	
10	6月22日	月		施工実態・調達事情調査	ハウPS・アズラックPS ベースライン調査		WAJ調達事情調査
11	6月23日	火		施工実態・調達事情調査	ハウPS・ハラバットPS ベースライン調査		am 調達事情調査 pm ハラバットPS調査
12	6月24日	水		施工実態・調達事情調査	データ集計・分析		ポンプ場施工条件調査
13	6月25日	木		施工実態・調達事情調査	ザルカデザリPS ベースライン調査		ポンプ場施工条件調査
14	6月26日	金		資料整理			
15	6月27日	土		維持管理体制調査	メルヘブPS ベースライン調査		調達事情調査
16	6月28日	日		維持管理体制調査	送水管調査	調達事情調査	
17	6月29日	月		維持管理体制調査	送水管調査	調達事情調査	
18	6月30日	火		維持管理体制調査	送水管調査	調達事情調査	
19	7月1日	水		維持管理体制調査	メルヘブPS ベースライン調査		調達事情調査
20	7月2日	木		維持管理体制調査	水解析析、ポンプ設計、協議資料作成		調達事情調査
21	7月3日	金		資料整理	水解析析、ポンプ設計、協議資料作成		資料整理
22	7月4日	土		am WAJザルカ支所協議 pm 市内配管網踏査	am WAJザルカ支所協議 pm ハラバットPS調査		am WAJザルカ支所協議 pm 調達事情調査
23	7月5日	日		財務状況調査	アズラックPS調査	電力調査、仕様検討	市場調査
24	7月6日	月		財務状況調査	ポンプ場レイアウト作成	電力調査、仕様検討	市場調査
25	7月7日	火		財務状況調査	ポンプ場レイアウト作成	電力調査、仕様検討	市場調査
26	7月8日	水		維持管理体制調査	アズラックPS調査		市場調査
27	7月9日	木		am WAJ方針会議 pm 維持管理体制調査			
28	7月10日	金		資料整理	移動(2:10) バンコク (15:15 22:25)	電力調査、仕様検討	資料整理
29	7月11日	土		am WAJ方針会議 pm 資料整理	成田(6:30)	am WAJ方針会議 pm 資料整理	
30	7月12日	日		WAJ資料収集		WAJ資料収集	市場調査
31	7月13日	月		WAJ報告、15:30JICA事 務所報告、16:30大使館 報告		移動(2:10) バンコク (15:15 22:25)	市場調査
32	7月14日	火		移動(2:10) バンコク (15:15 22:25)		成田(6:30)	市場調査
33	7月15日	水		成田(6:30)			市場調査
34	7月16日	木					市場調査
35	7月17日	金					移動(2:10) バンコク (15:15 22:25)
36	7月18日	土					成田(6:30)

【概略設計概要書説明調査】

日順	日程		団長 (岡本)	調査企画 (川瀬)	業務主任 (大谷)	機材計画 (松本)	調達計画/ 積算 (大橋)	
-	10月	9	金		羽田(19:55) 関西(21:10) 関西(23:15) ドバイ(04:45)			
1		10	土		ドバイ(07:25) アンマン (9:20)	成田(10:30) バンコク(15:05)		
2		11	日			バンコク(0:30) アンマン(5:15)		
2		11	日	8:30 JICA事務所打合せ 13:30 計画・国際協力省表敬 14:30 WAJ本庁総裁表敬 / DOD説明 16:30 在ヨルダン日本大使館表敬				
3		12	月	8:00 GTZとの打合せ 9:00 WAJへのDOD説明(設計内容・先方負担事項の確認) 13:00 MCA-Jordanとの打合せ 14:30 WAJへのDOD説明(受電設備の仕様・据付方法の確認) 16:00 第2次ザルカ無償・月例報告への参加				
4		13	火	9:00 ミニッツ協議(WAJ本庁関係者・ザルカ県支所長) 現地調査(電力会社等)				
5		14	水	現地調査(ザルカポンプ場、バトラウィ配水池、電力会社等) ミニッツ協議(WAJ本庁)				
6		15	木	11:00 ミニッツ署名 12:30 JICA事務所報告 15:00 在ヨルダン日本大使館報告				
7	16	金			アンマン(2:10) バンコク(15:15) バンコク(22:25)			
8	17	土			成田(6:30)			

資料 3.関係者(面会者)リスト

【計画・国際協力省- Ministry of Planning and International Cooperation (MOPIC)】

Mr. Saleh Al-Kharabsheh	Director, Projects Department
Ms. Wafa Al-Saket	Head of Asian and Arab Relations Divisions, International Cooperation Department
Mr. Saif Baniata	Asian Relations Section, International Cooperation Department
Ms. Moha Al-Zo'bi	Deputy Director, Projects Department
Ms. Nida'a Al-Momsni	Resercher, Projects Department
Ms. Saif Bani Ara	Charge of Japanese Cooperation

【ヨルダン水道庁-Water Authority of Jordan (WAJ)】

Eng. Munir Oweis	Secretary General
Mr. Waleed Sukkar	Director, NRW & Performance Indicators Initiative, Project Management Unit
Eng. Bassam Saleh	Assistant Secretary General, Water Affairs
Mr. Ziad Haddadin	Assistant Secretary General, Financial Affairs
Eng. Ahmad Househ	Director, Planning and Design Department
Ms. Reham Bani-Hani	Deputy Director, Planning and Design Department
Dr. Mustafa Al-Assaf	Director, Central Operation
Mr. Khalid Alobaidiyn	Director, Central Operation
Ms. Raja Ammani	Director, Finance Department
Eng. Nedaa Halaseh	Director of Tenders & Purchase Department
Mr. Anas Al-Halli	Manager of Main Store Department

【WAJ ザルカ支所-Zarqa Governorate Water Authority(GWA)】

Eng. Nabil Al-Zoubi	Director of Zarqa GWA
Eng. Mohamed Al-Rifaea	Director, Technical Affairs Directorate
Eng. Qasem Ababna	Director, Non-revenue Water Directorate
Eng. Yahya Al-Khawalda	Director, Water Directorate
Eng. Amjad Al-sharea	Director, Rusaifa City water
Eng. Mofid Abed-Alatif	Head, Station Section
Mr. Ghassan Al-Rayyan	Head, Water Network Section
Mr. Hussam Sweilem	Operator GIS Center
Eng. Khaled Al-Dajah	Mechanical Engineer, Station Section
Mr. Kamal Al-Sa'ad	Supervisor, Zarqa Pumping Station

【WAJ 中央修理工場-Central Workshop】

Eng. Jabir Al-Hmoud	Director
Eng. Abdul Rahim Y. Odetalla	Director Work Shop & Maintenance
Eng. Atef S. Besharat	Head of Maintenance Water Equipment Section

【首相府 MC 担当局-Prime Ministry, **Millennium Challenge Unit**】

Ms. Tamam El-Ghul	Director P.O.C
Mr. Mohye Al-Deen Al-Shbool	Deputy Director
Eng. Iyad E. Dahiyat	Project Director / Water & Wastewater, Millennium Challenge Account
Mr. Abdelhakim Shibli	Economic Expert, Millennium Challenge Unit
Mr. Khalid Al Hmoud	Economist, Millennium Challenge Unit

【環境省-Ministry of Environment】

Mr. Hussein Badarin	Director, Directorate of Monitoring & Assessment (EB Member)
---------------------	--

【ドイツ連邦政府技術協力機関-German Technical Cooperation (GTZ)】

Mr. Dieter Rothenberger	Programme Manager
Mr. Holge Lange	Advisor, Dorsch Consult
Mr. Dietrich Ossuald	Technical Advisor of DED, Dorsch Consult
Mr. Ronald Hagger	IEE Project Officer, Dorsch Consult
Mr. Asmaa Jarrar,	Project Officer
Mr. Keith Roberts	Project Manager, Dorsch Consult
Mrs. Maria Scheday	Project Engineer, Dorsch Consult

【在ヨルダン日本国大使館-Embassy of Japan in Jordan】

塩口 哲朗	特命全権大使(Ambassador)
市川 康夫	一等書記官(First Secretary, Economic Section)

【JICA ヨルダン事務所-JICA Jordan Office】

岡本 茂	所長(Chef Representative)
森本 康裕	次長(Deputy Resident Representative)
奥村 真紀子	所員(Representative)
Mr. Hani H. Al Kurdi	副プログラムオフィサー(Deputy Chief Program Officer)

**MINUTES OF DISCUSSIONS
ON
THE PREPARATORY SURVEY
ON
THE PROJECT FOR ENERGY CONSERVATION THROUGH
UPGRADING WATER SUPPLY NETWORK
IN THE HASHEMITE KINGDOM OF JORDAN**

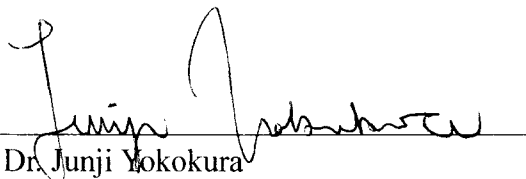
In response to the request from the Government of Hashemite Kingdom of Jordan (hereinafter referred to as "Jordan"), the Government of Japan decided to conduct the Preparatory Survey for the Outline Design on the Project for Energy Conservation Through Updating Water Supply Network (hereinafter referred to as the "Project") and entrusted the implementation of the survey to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to Jordan the Preparatory Survey Team for the Outline Design (hereinafter referred to as "the Team"), headed by Dr. Junji Yokokura, Senior Advisor of the Office for Climate Change, JICA, which is scheduled to stay in the country from 5th April to 26 April 2009.

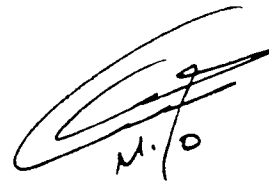
The Team held a series of discussions with the officials concerned from the Government of Jordan and conducted a field survey in the requested area.

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

Amman. 8th April. 2009



Dr. Junji Yokokura
Leader,
the Preparatory Survey Team
Japan International Cooperation
Agency (JICA)



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

ATTACHMENT

1. Objectives of the Project

The objectives of the Project are to save energy used for lifting, conveyance and distribution of water through rationalization of water network system (mitigation measure against climate change), and to stabilize water supply and secure water resource by reducing water loss (adaptation measure against climate change).

2. Scheme of the Project

Both sides confirmed that the Project would be implemented within Japan's Programme Grant Aid for Environment and Climate Change.

3. Survey Area and Project Site

The areas of the Survey are within the Zarqa governorate as shown in **Annex I**, and the sites of the Project will be defined in Preparatory Survey 2.

4. Responsible Agency and Implementing Agency

4-1) The Responsible Agency is the Ministry of Water and Irrigation (hereinafter referred to as "MWI").

4-2) The Implementing Agency is the Water Authority of Jordan (hereinafter referred to as "WAJ"). The Organization chart of WAJ is shown in **Annex II**

5. Items requested by the Government of Jordan

After discussions with the Team, the items described in **Annex III** were requested by the Jordanian side. The both sides confirmed that the Jordanian side would prepare the revised list of Items with its number, specification, installation location and priority, and submit the list to the Team during the further studies by the consultants. JICA will examine the appropriateness of the request and will recommend to the Government of Japan for approval.

6. Scheme of Japan's Programme Grant Aid for Environment and Climate Change

6-1) The Jordanian side understands the scheme of Japan's Programme Grant Aid for Environment and Climate Change explained by the Team as described in **Annex IV** and **Annex V**. The Team explained that the scheme of Japan's Grant Aid for Environment and Climate Change is under discussion and might be slightly modified.

6-2) The Jordanian side will take necessary measures, as described in **Annex VI**, to expedite the smooth implementation of the Project.

7. Administration of the Project

- 7-1) Both sides confirmed the administration of the Project as shown in **Annex VII**.
- 7-2) For promoting proper and smooth execution of the Project, both sides confirmed that the Consultative Committee of the Project (hereinafter referred to as "the Committee") would be established whose functions and provisional composition are described in **Annex VIII** and the composition of the Committee would be discussed and determined during the Preparatory Survey 2 in June 2009.

8. Schedule of the Survey

- 8-1) The consultants will proceed to further studies in Jordan until April 26, 2009.
- 8-2) If the Project is found feasible as the result of the Preparatory Survey, JICA will dispatch the Preparatory Survey 2 Team in June 2009, which aims at collecting data and information required for outline design and preliminary cost estimation of the Project, and at the same time, baseline data required for the measurement of the effect of the Project.
- 8-3) JICA will prepare the draft Outline Design Report and dispatch a mission in order to explain its contents to Jordanian side around October 2009.
- 8-4) 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 December 2009.

9. Other Relevant Issues

9-1) Relevance between the Replacement of Pumps and the Future Water Distribution Plan

Both sides confirmed that the pumps requested to be replaced should be utilized even after water distribution system would be restructured from pumping distribution to gravity distribution by the completion of the Japan's Grant Aid projects in Zarqa Governorate.

9-2) Replacement and Installation Works of Procured Equipment

The Jordanian side requested that the cost of replacement and installation of pumps to be procured in the Project should be included within the Grant, while those of valves, water meters and pipes should be implemented by the WAJ's budget. JICA will examine the appropriateness of the request.

9-3) Relevance between Reconstruction of Zarqa Pumping Station and Equipment Procurement Plan of the Project

The Jordanian side explained that the Zarqa Pumping Station would be reconstructed under WAJ's responsibility before the delivery of the procured equipment. The both sides understood the necessity of coordination between the reconstruction plan of Zarqa Pumping and the equipment procurement plan of the Project.

9-4) Soft Assistance (Soft Component Programme and Technical Assistance)

The Team explained the Jordanian side that the Japan's Programme Grant Aid for Environment and Climate Change could be utilized for Soft Assistance which could contribute to mitigation and adaptation to the Climate Change. The Jordanian side suggested that a soft assistance to improve the operation and maintenance related to the procured equipment would be preferable.

9-5) Overlapping and Coordination with other projects

Both sides confirmed that the Project should not be overlapped with any other project supported by other donor agencies, NGOs, and Jordanian official organization(s). The both sides understood the necessity to coordinate the on-going projects on improvement of water supply facilities and network, especially funded by GTZ and Millennium Challenge Corporation (MCC). The Team explained that JICA would assess the feasibility of the Project in terms of overlapping and coordination with other projects, in accordance with the result of further studies by the consultants of the team.

9-6) Operation and maintenance of facilities and equipment

The Jordanian side agreed to take any necessary measures and allocate necessary budget in order to operate and maintain the facilities and equipment provided by the Project.

9-7) Tax exemption

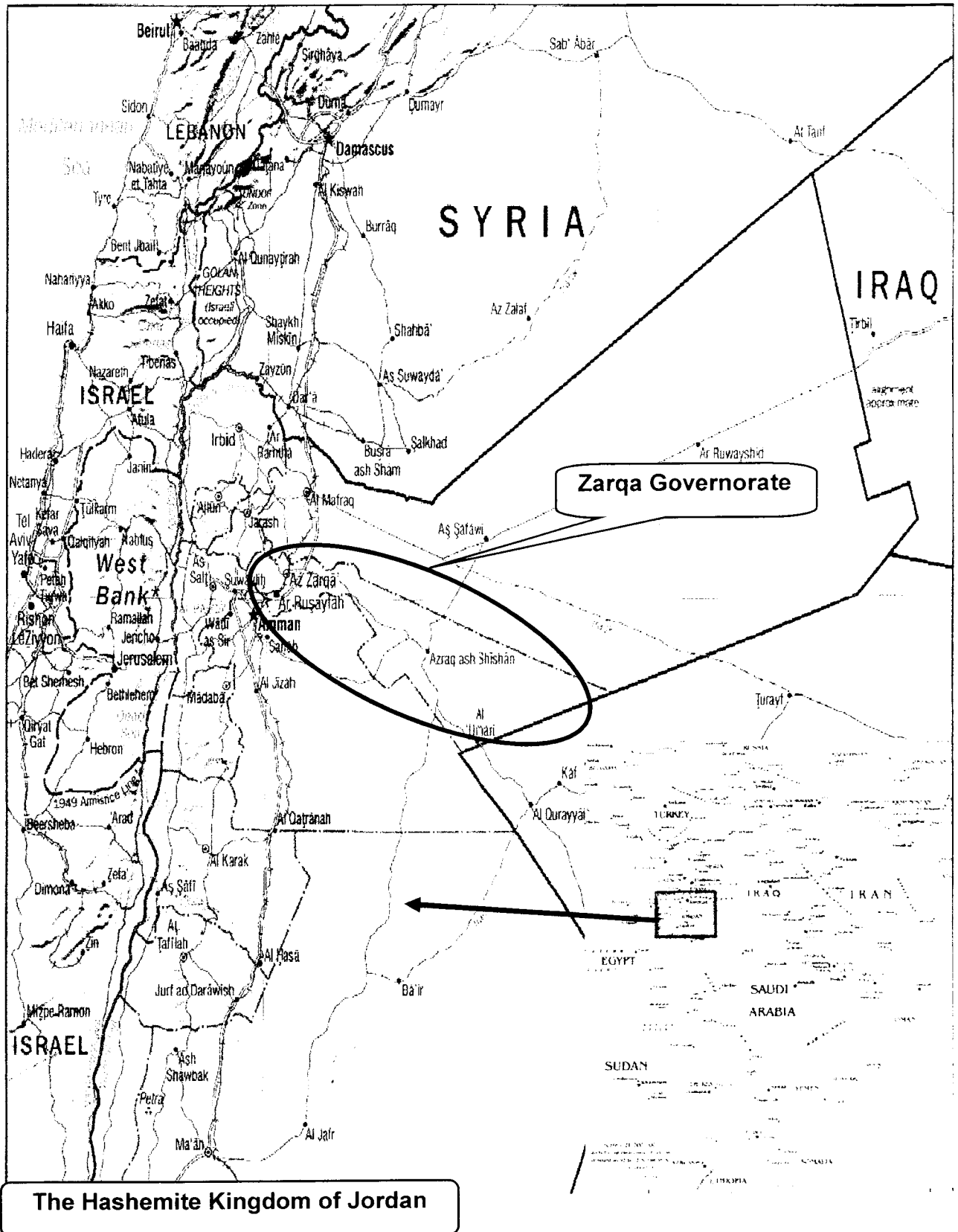
The tax exemption including Value Added Tax (VAT), custom duty, and any other taxes and fiscal levies in Jordan which is to be arisen from the Project activities will be ensured by WAJ. WAJ will take any procedures necessary for tax exemption, and in case that tax exemption is not secured, the cost of tax will be covered by WAJ.

9-8) Environmental Impact Assessment (EIA)

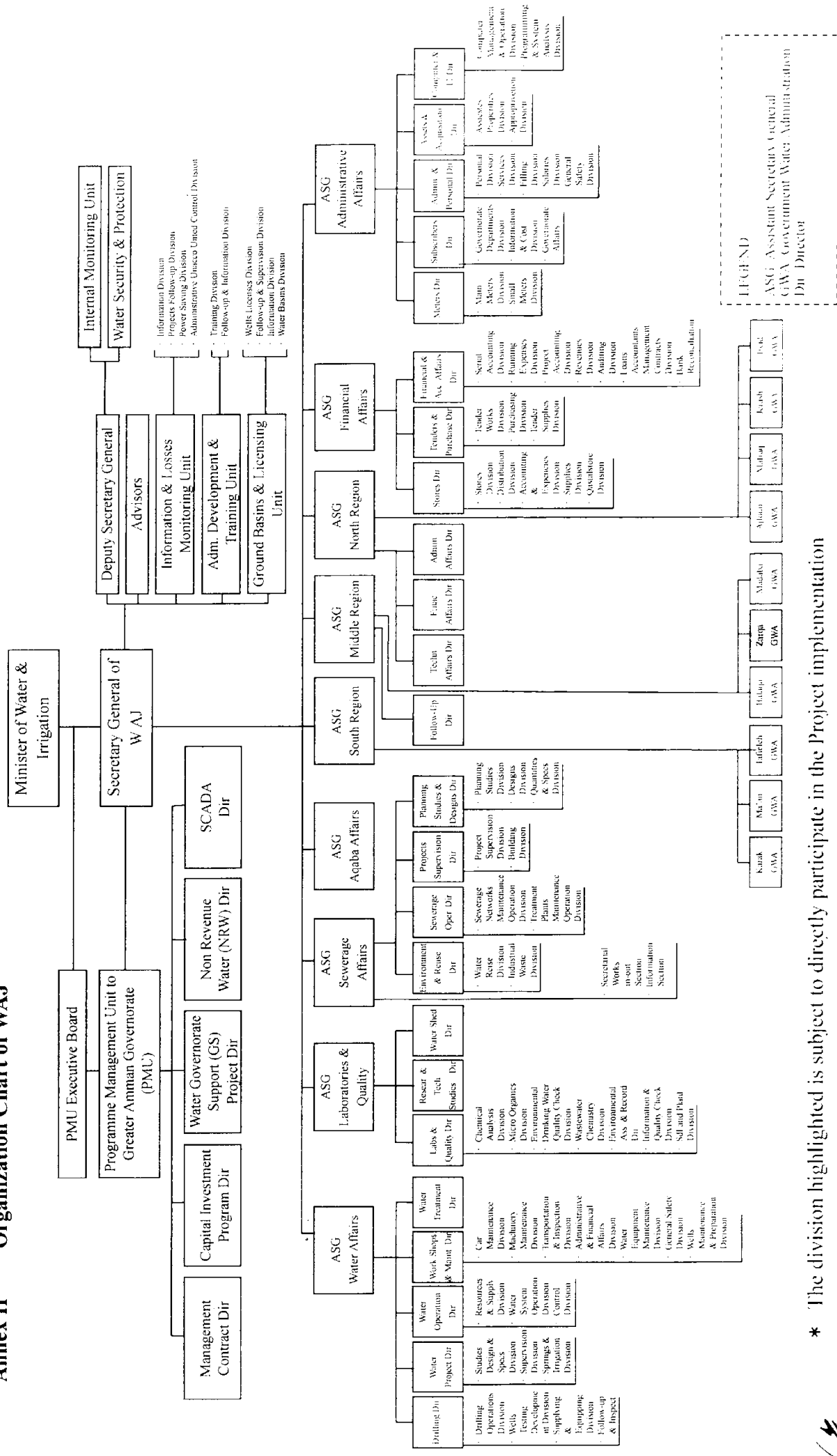
Both sides confirmed that the Jordanian side is responsible for taking any measures to complete EIA, in case that the Survey indicates necessity of EIA for implementing the Project.

Annex I	Survey and Project Site Map
Annex II	Organization Chart of WAJ
Annex III	Tentative List of Items Requested by the Government of Jordan
Annex IV	Japan's Programme Grant Aid for Environment and Climate Change Scheme
Annex V	Flow of Funds and Implementation of the Project
Annex VI	Major Undertakings to be Taken by Each Government
Annex VII	Organization Chart for the Implementation of the Project
Annex VIII	Consultative Committee

Annex I Survey and Project Site Map



Annex II Organization Chart of WAJ



* The division highlighted is subject to directly participate in the Project implementation

Annex III Tentative List of Items Requested by the Government of Jordan

No.	Area/Station	Mark	Materials	Diameter (inch)	Place	PN(bar)	Unit	Quantity
1	Old Azraq Station	GV	Gate Valve	8	Delivery Pipe	40	nos	8
2		GV	Gate Valve	12	Suction Pipe	16	nos	8
4		GV	Gate Valve	24	Pelving Pipe	40	nos	1
5		GV	Gate Valve	24	Pelving Pipe	25	nos	1
6		GV	Gate Valve	24	Suction Pipe	25	nos	1
3		NRV	Non-retaining Valve	8		40	nos	8
9		NRV	Non-retaining Valve	24	Delivery Pipe on pipe from weirs to	40	nos	1
7		WM	Water Meter	24	on pipe from pump station to Khaw	25	nos	1
8	WM	Water Meter	24		40	nos	1	
10	New Azraq Station	V	Valve	10	Delivery Pipe	40	nos	7
11		V	Valve	12	Suction Pipe	25	nos	7
13		V	Valve	24	Delivery Pipe	40	nos	1
14		V	Valve	24	Suction Pipe	25	nos	1
12		NRV	Non-retaining Valve	10		40	nos	7
15		NRV	Non-retaining Valve	24	Delivery Piper	40	nos	1
16	Khaw Station (Amman)	V	Valve	8	Delivery Pipe	40	nos	8
17		V	Valve	12	Suction Pipe	25	nos	8
19		V	Valve	24	on succion pipe from tank	25	nos	4
20		V	Valve	24	Delivery Pipe	40	nos	1
18		NRV	Non-retaining Valve	8	Delivery Pipe	40	nos	8
21		NRV	Non-retaining Valve	24	Delivery Pipe	40	nos	1
22		WM	Water Meter	24		25	nos	1
23		WM	Water Meter	24		40	nos	1
26	Khaw Station (Zarqa)	V	Valve	16	Delivery Pipe	40	nos	6
27		V	Valve	16	Suction Pipe	16	nos	6
29		V	Valve	24	Delivery Pipe	40	nos	2
28		NRV	Non-retaining Valve	16		40	nos	6
24		WM	Water Meter	24		25	nos	1
25		WM	Water Meter	28		40	nos	1
30	Zarqa	P	Pump		Q=400m ³ /h, H=150m	15	nos	4
31		P	Pump		Q=100m ³ /h, H=150m	15	nos	3
32		P	Pump		Q=500m ³ /h, H=250m	25	nos	3
33		P	Pump		Q=300m ³ /h, H=250m	25	nos	2
34		P	Pump		Q=200m ³ /h, H=200m	20	nos	4
35		P	Pump		Q=50m ³ /h, H=200m	20	nos	2
36		P	Pump		Q=70m ³ /h, H=200m	20	nos	1
41		P	Pump		Q=200m ³ /h, H=300m	30	nos	3
42		P	Pump		Q=200m ³ /h, H=320m	32	nos	1
43		P	Pump		Q=200m ³ /h, H=300m	30	nos	1
44		P	Pump		Q=300m ³ /h, H=350m	35	nos	1
45		P	Pump		Q=300m ³ /h, H=250m	25	nos	1
46		P	Pump		Q=225m ³ /h, H=275m	27.5	nos	1
47		P	Pump		Q=100m ³ /h, H=100m	10	nos	2
37		V	Valve	8	Suction Pipe	25	nos	3
38		V	Valve	6	Delivery Pipe	25	nos	3
48		GV	Gate Valve	2	with Flange	40	nos	100
49		GV	Gate Valve	2	with Stim	40	nos	100
50		GV	Gate Valve	1	with Stim	25	nos	200

No.	Area/Station	Mark	Materials	Diameter (inch)	Place	PN(bar)	Unit	Quantity	
51	Zarqa	GV	Gate Valve	1/2		25	nos	500	
52		GV	Gate Valve	3/4		25	nos	300	
53		GV	Gate Valve	1		25	nos	300	
54		GV	Gate Valve	4		16	nos	200	
55		GV	Gate Valve	4		25	nos	100	
56		GV	Gate Valve	4		40	nos	100	
57		NRV	Non-retaining Valve	4		16	nos	50	
58		NRV	Non-retaining Valve	4		25	nos	50	
59		NRV	Non-retaining Valve	4		40	nos	50	
39		NRV	Non-retaining Valve	6		25	nos	3	
40		WM	Water Meter	6		25			
60		GV	Gate Valve	6		16	nos	30	
61		GV	Gate Valve	6		25	nos	30	
62		GV	Gate Valve	6		40	nos	30	
63		GV	Gate Valve	8		16	nos	30	
64		GV	Gate Valve	8		25	nos	30	
65		GV	Gate Valve	8		40	nos	30	
74		BV	Butterfly Valve	12		25	nos	10	
75		BV	Butterfly Valve	12		10	nos	10	
76		BV	Butterfly Valve	16		25	nos	10	
77		BV	Butterfly Valve	16		40	nos	10	
80		BV	Butterfly Valve	24		25	nos	5	
81		BV	Butterfly Valve	16		25	nos	10	
66		NRV	Non-retaining Valve	6		16	nos	20	
67		NRV	Non-retaining Valve	6		25	nos	20	
68		NRV	Non-retaining Valve	6		40	nos	20	
69		NRV	Non-retaining Valve	8		16	nos	20	
70		NRV	Non-retaining Valve	8		25	nos	20	
71		NRV	Non-retaining Valve	8		40	nos	20	
72		NRV	Non-retaining Valve	12		25	nos	10	
73		NRV	Non-retaining Valve	12		40	nos	10	
78		NRV	Non-retaining Valve	16		25	nos	10	
79		NRV	Non-retaining Valve	16		40	nos	10	
82		NRV	Non-retaining Valve	24		25	nos	5	
83		NRV	Non-retaining Valve	24		40	nos	5	
84		DIP	Ductile iron pipes	300mm				m	6000
85		DIP	Ductile iron pipes	200mm				m	6000
86		DIP	Ductile iron pipes	150mm				m	2000

61

62

**Programme Grant Aid for Environment and Climate Change
of the Government of Japan
(Provisional)**

Grant Aid is non-reimbursable fund to a recipient country 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 relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

Based on the “Cool Earth Partnership” initiative of the The Government of Japan (hereinafter referred to as “the GOJ”), the Programme Grant Aid for Environment and Climate Change (hereinafter referred to as “GAEC”) aims to mitigate negative effects of global warming by reducing Green House Gas emission (mitigation measure such as improvement of energy efficiency) and to adapt the supposed effects (adaptation measures such as stabilization of water supply in a region suffering less precipitation due to the climate change).

GAEC may contain multiple components that can be combined to effectively achieve its objectives. The contractors and suppliers may not be confined to Japanese firms and construction, in principle, can be conducted by utilizing local standards.

1. GAEC Procedures

GAEC is executed through the following procedures.

- Application
 - Request made by the recipient country
- Preparatory Survey (hereinafter referred to as “the Survey”)
 - The Survey for Outline Design conducted by Japan International Cooperation Agency (hereinafter referred to as “JICA”)
- Appraisal & Approval
 - Appraisal by the GOJ and Approval by the Cabinet
- Determination of Implementation
 - The Notes exchanged between the GOJ and a recipient country
- Grant Agreement (hereinafter referred to as “the G/A”)
 - Agreement concluded between JICA and a recipient country
- Implementation
 - Implementation of the Project on the basis of the G/A

Firstly, the application or request for a GAEC project submitted by the recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to determine whether it is eligible for GAEC. If the request is deemed appropriate, the GOJ assigns JICA to conduct a survey on the request.

Secondly, JICA conducts the Survey for Outline Design with Japanese consulting firms.

Thirdly, the GOJ appraises the project to see whether it is suitable for Japan's GAEC, based on the Survey report prepared by JICA, then the result is submitted to the Cabinet for approval.

Fourthly, the project, once approved by the Cabinet, becomes official with the Exchange of Notes (hereinafter referred to as E/N) signed by the GOJ and the recipient country. Simultaneously, the Grant will be made available by concluding the G/A between the recipient country and JICA.

JICA is designated by the GOJ as the organization responsible for necessary works for proper execution of the Grant.

Procurement Management Agent (hereinafter referred to as "the Agent") is designated to conduct the procurement services of products and services (including fund management, preparing tenders, contracts) for GAEC on behalf of the recipient country. The Agent is an impartial and specialized organization that shall render services according to the Agent Agreement with the recipient country. The Agent is recommended to the recipient country by the GOJ and agreed between the two Governments in the Agreed Minutes (hereinafter referred to as "A/M").

2. Preparatory Survey for Outline Design

1) Contents of the Survey

The purpose of the Survey, conducted by JICA on a requested project ("the Project"), is to provide the basic documents necessary for the appraisal of the Project by the GOJ. The contents of the Survey are as follows:

- (1) Confirmation of background, objectives, and benefits of the Project and institutional capacity of agencies and communities concerned of the recipient country necessary for the implementation of the Project.
- (2) Evaluation of relevance of the Project to be implemented under the Grant Aid Scheme from a

technical, social, and economic point of view.

- (3) Confirmation of items agreed upon by both parties concerning the basic concept of the Project.
- (4) Preparation of the outline design of the Project.
- (5) Preliminary Estimation of cost for the Project.

The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Project. The Outline Design of the Project is confirmed considering the guidelines of the Japan's Grant Aid scheme.

JICA 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 the smooth implementation of the Survey, JICA will conduct the Survey with JICA-registered consulting firms. JICA selects the firms based on proposals submitted by firms with interest in implementing the Survey. The firms selected will carry out the Outline Design Survey and prepare a report, based on the terms of reference set by JICA.

The consulting firms that will implement the Project after the G/A can be, in principle, Japanese firms recommended by JICA for maintaining technical consistency with the Survey.

3. Implementation of GAEC after the E/N

1) The E/N and the G/A

The content of GAEC will be determined in accordance with the E/N exchanged by the two Governments, in which the objectives of the Project, length of the Project, conditions and amount of the Grant Aid are confirmed. The conclusion of the G/A between the recipient country and JICA follows the exchange of E/N to determine the paying conditions responsibilities of the recipient country and procurement conditions.

2) Details of Procedures

Details of procedures on implementing the Project under GAEC will be agreed between the

authorities of the two governments concerned at the time of the signing of the E/N and the G/A. Essential points to be agreed are outlined as follows:

- a) JICA will supervise the implementation of the Project.
- b) Products and services shall be procured and provided in accordance with JICA's "Procurement Guidelines for the Programme Grant Aid (Type I – E) for Environment and Climate Change."
- c) The recipient country shall conclude a contract with the Agent.
- d) The Agent is the representative acting in the name of the recipient country concerning all transfers of funds to the Agent.

3) Focal points of the “Procurement Guidelines for the Programme Grant Aid (Type I – E) for Environment and Climate Change”

a) The Agent

The Agent is the organization, which provides procurement of products and services on behalf of the recipient country according to the Agent Agreement with the recipient country. The Agent is recommended to the recipient country by the GOJ and agreed between the two Governments in the A/M.

b) Agent Agreement

The recipient country shall conclude the Agent Agreement, in principle, within two months after the signing of the G/A, in accordance with the A/M. The scope of the Agent's services shall be clearly specified in the Agent Agreement.

c) Approval of the Agent Agreement

The Agent Agreement is prepared as two identical documents and the copy of the Agent Agreement shall be submitted to JICA by the recipient country through the Agent. JICA will confirm whether the Agent Agreement is concluded in conformity with the E/N, A/M, and G/A and the Procurement Guidelines for the Programme Grant Aid for Environment and Climate Change then approves the Agent Agreement.

The Agent Agreement concluded between the recipient country and the Agent shall become effective after the approval by JICA in a written form.

d) Payment Methods

The Agent Agreement shall stipulate that “Regarding all transfers of the fund to the Agent, the recipient country shall designate the Agent to act on behalf of the Government and issue a Blanket Disbursement Authorization (“the BDA”) to conduct the transfer of the fund (hereinafter

referred to as “the Advances”) to the Procurement Account from Account of the Government.

The Agent Agreement shall clearly state that the payment to the Agent shall be made in Japanese yen from the Advances and that the final payment to the Agent shall be made when the total remaining amount become less than three percent (3%) of the Grant and its accrued interests.

e) Products and Services Eligible for Procurement

Products and services to be procured shall be selected from those defined in the G/A.

f) Selection of firms

In principle, firms of any nationality could be contracted as long as the firms satisfies the conditions specified in the tender documents.

g) Method of Procurement

When conducting the procurement, sufficient attention shall be paid to transparency in selecting the firms and for this purpose, in principle, competitive tendering shall be employed.

h) Tender Documents

The tender documents should contain all information necessary to enable tenderers to prepare valid offers for the products and services to be procured by GAEC.

The rights and obligations of the recipient country, the Agent and the firms supplying products and services should be stipulated in the tender documents to be prepared by the Agent.

i) Pre-qualification Examination of Tenderers

The Agent may conduct a pre-qualification examination of tenderers in advance of the tender so that the invitation to the tender can be extended only to eligible firms. The pre-qualification examination should be performed only with respect to whether the prospective tenderers have the capability of concluding the contracts.

For this, the following points should be taken into consideration:

- (1) Experience and past performance in contracts of similar kind
- (2) Financial credibility (including assets such as real estate)
- (3) Existence of offices and other items to be specified in the tender documents.
- (4) Their potentialities to use necessary personnel and facilities.

j) Tender Evaluation

The tender evaluation should be implemented on the basis of the conditions specified in the tender documents.

Those tenderers which substantially conform to the technical specifications and other stipulations of the tender documents, shall be judged in principle on the basis of the submitted price. and the tenderer who offers the lowest price shall be designated as the successful tenderer.

The Agent shall submit a detailed evaluation report of tenders to JICA for its information, while the notification of the results to the tenderers will not be premised on the confirmation by JICA.

k) Additional procurement

If there is any remaining balance after the competitive and/or selective tendering and/or direct negotiation for a contract, and if the recipient country would like to procure additional items, the Agent is allowed to conduct this additional procurement, following the points mentioned below:

(1) Procurement of same products and services

When the products and services to be additionally procured are identical with the initial tender and a competitive tendering is judged not efficient, additional procurement can be conducted by a negotiated contract with the successful tenderer of the initial tender.

(2) Other procurements

When products and services other than those mentioned above in (1) are to be procured, the procurement should be conducted through competitive tendering. In this case, the products and services for additional procurement shall be selected from among those in accordance with the G/A.

l) Conclusion of the Contracts

In order to procure products and services in accordance with the guideline, the Agent shall conclude contracts with firms selected by tendering or other methods.

m) Terms of Payment

The contract shall clearly state the terms of payment. The Agent shall make payment from the "advances," against the submission of the necessary documents from the firm on the basis of the conditions specified in the contract. When the services are the object of procurement, the Agent may pay certain portion of the contract amount in advance to the firms on the conditions that such firms submit the advance payment guarantee worth the amount of the advance payment to



the Agent.

4) Undertakings required by the recipient country

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

- a) To secure land necessary for the sites of the Project.
- b) To provide facilities for distributing electricity, water supply and drainage and other incidental facilities in and around the sites if necessary.
- c) To assist prompt execution for domestic transportation of products purchased under the Grant Aid as necessary,
- d) To ensure that customs duty, internal tax and other fiscal levies that may be imposed in Jordan with respect to the purchase of the Components and the Agent's services shall be exempted by the recipient country.
- e) To accord all the concerned parties, whose services may be required in connection with supply of the products and services under the contracts, such facilities as may be necessary for their entry into Jordan and stay therein for the performance of their work.

5) "Proper use of funds"

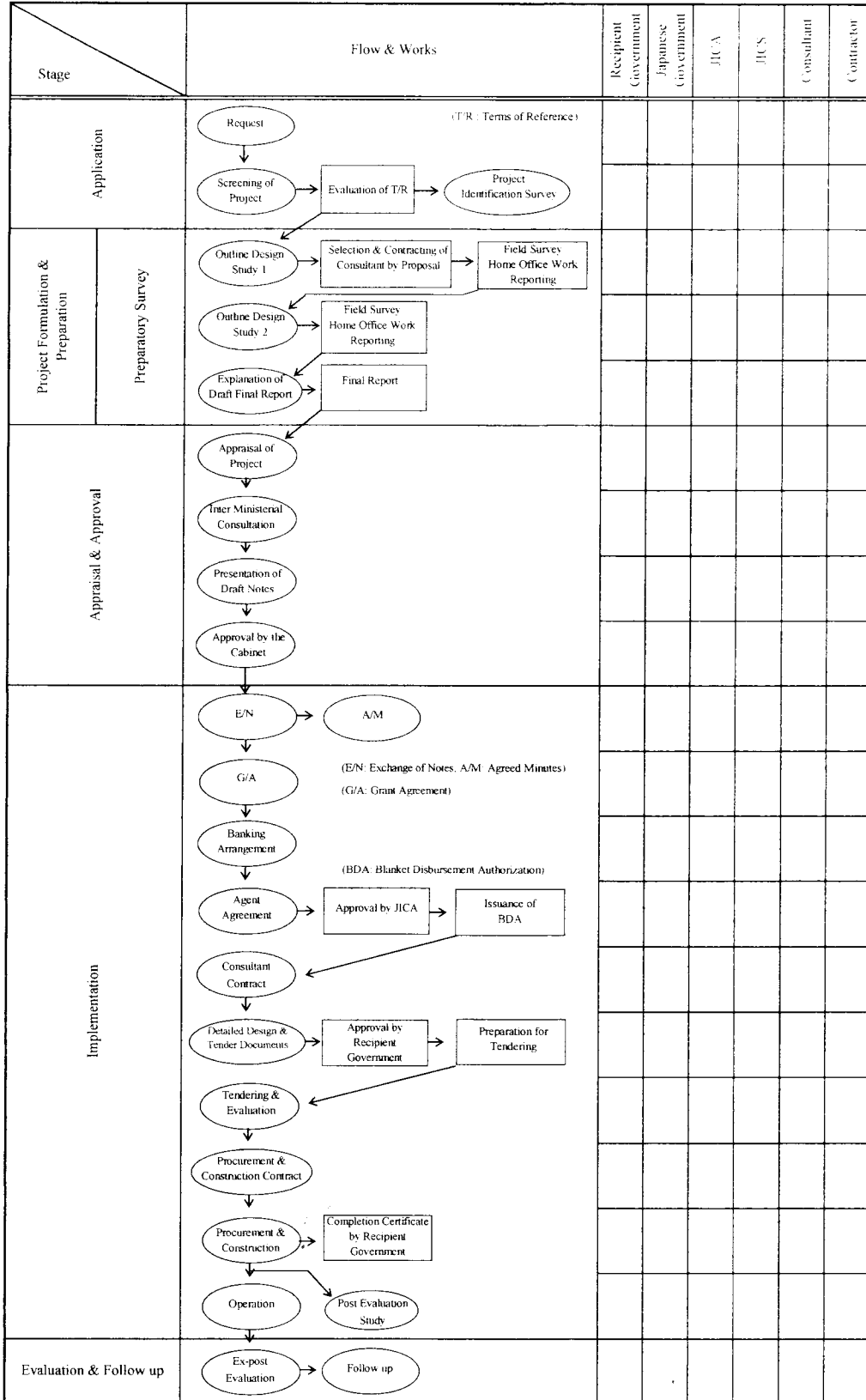
The recipient country is required to take necessary actions so that the facilities constructed under the Grant Aid are properly and effectively used and to ensure sustainable operation and maintenance as well as to bear all the expenses other than those covered by the Grant Aid.

6) "Exported or Re-export"

The products purchased under the Grant shall not be exported or re-exported from Jordan.



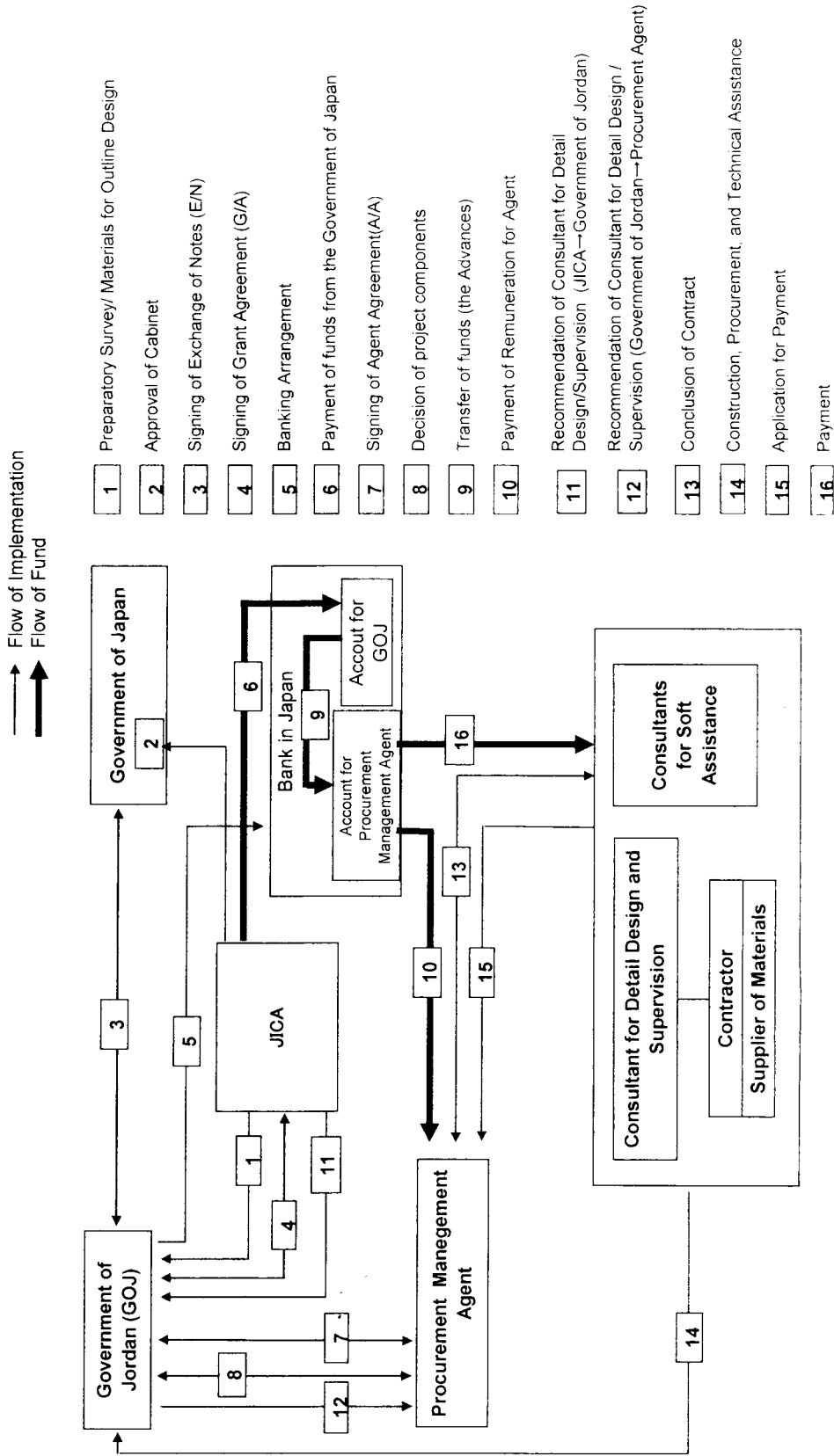
FLOW CHART OF JAPAN'S PROGRAMME GRANT AID FOR ENVIRONMENT AND CLIMATE CHANGE PROCEDURES



4

A

Annex V Flow of Funds and Implementation of the Project



- 1 Preparatory Survey/ Materials for Outline Design
- 2 Approval of Cabinet
- 3 Signing of Exchange of Notes (E/N)
- 4 Signing of Grant Agreement (G/A)
- 5 Banking Arrangement
- 6 Payment of funds from the Government of Japan
- 7 Signing of Agent Agreement(A/A)
- 8 Decision of project components
- 9 Transfer of funds (the Advances)
- 10 Payment of Remuneration for Agent
- 11 Recommendation of Consultant for Detail Design/Supervision (JICA→Government of Jordan)
- 12 Recommendation of Consultant for Detail Design / Supervision (Government of Jordan→Procurement Agent)
- 13 Conclusion of Contract
- 14 Construction, Procurement, and Technical Assistance
- 15 Application for Payment
- 16 Payment

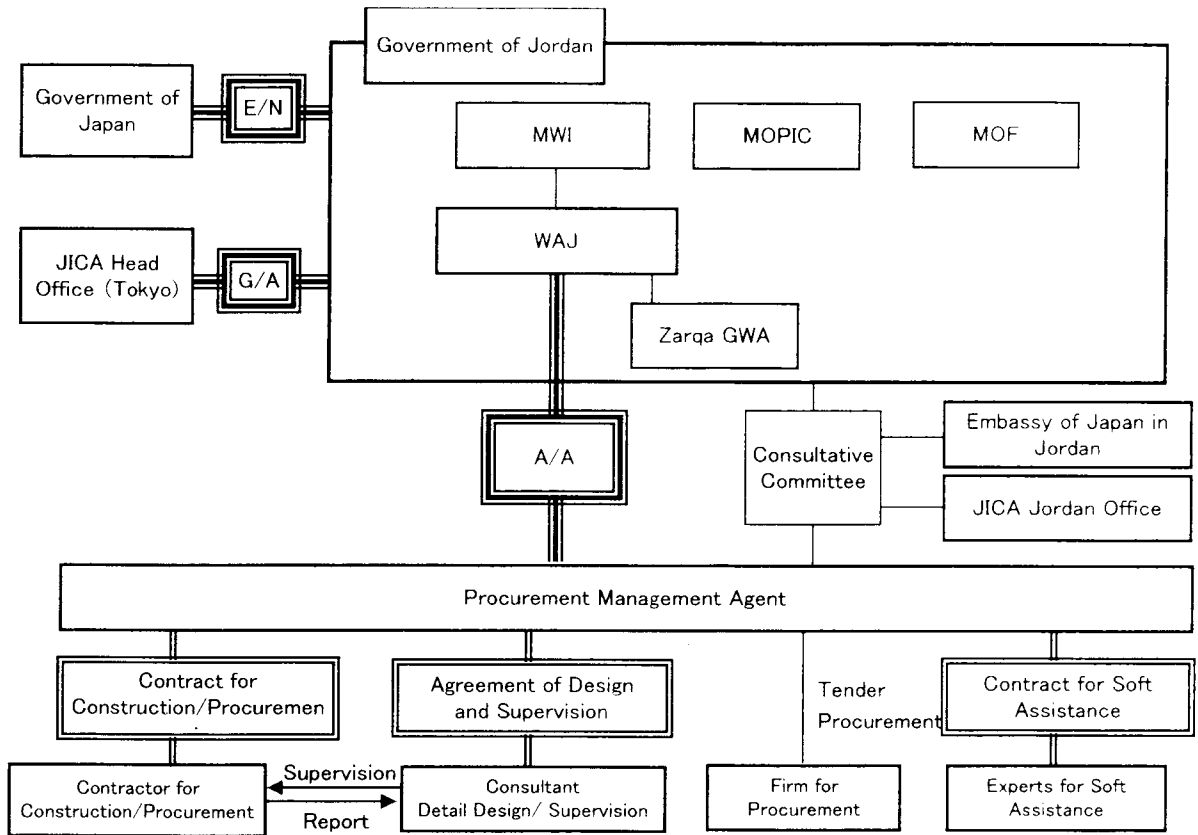
Annex VI Major Undertakings to be Taken by each Government

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 urgently		●*
3	To construct gates and fences in and around the site		●*
4	To construct a parking lot		●*
5	To construct roads		
	1) Within the site		●*
	2) Outside the site		●*
6	To construct the building, hospital and school*	●*	
7	To provide facilities for the distribution of electricity, water supply, drainage and other incidental facilities:		
	1) Electricity		
	a. The power distribution line to the site		●*
	b. The drop wiring and internal wiring within the site	●*	
	c. The main circuit breaker and transformer for the site	●*	
	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 conveying storm water, sewage, etc. from the site)		●*
	b. The drainage system within the site (for sewage, ordinary waste, storm water, etc.)	●*	
	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 applied by the bank in Japan for banking services based upon the Bank Arrangement (B/A):		
	1) Payment of bank commission		●
9	To ensure prompt unloading and customs clearance at the port of disembarkation in the recipient country		
	1) Marine or air transportation of the products from the production countries to the recipient	●	
	2) Tax exemption and customs clearance of the products at the port of disembarkation		●
	3) Internal transportation from the port of disembarkation to the project site	●	
10	To accord Japanese nationals and / or nationals of third countries, including persons employed by the agent whose services may be required in connection with the Components such facilities as may be necessary for their entry into recipient country and stay therein for the performance of their work.		●
11	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the Components and to the employment of the Agent shall be exempted by the Government of recipient country		●
12	To maintain and use properly and effectively the facilities that are constructed and the equipment that is provided under the Grant.		●
13	To bear all the expenses, other than those covered by the Grant and its accrued interest, necessary for the purchase of the Components as well as for the agent's fees.		●
14	To ensure environmental and social consideration for the Project.		●

Note

*: items necessary in case that the construction components shall be included in the Project

Annex VII Organization Chart for the Implementation of the Project



LEGEND:	
	:Official Agreement (Jordan – Japan)
	:Contract(Procurement Management Agent – Firms & Consultants)
	:Report • Supervision • Coordination
E/N	:Exchange of Notes
G/A	:Grant Agreement
A/A	:Agent Agreement
MWI	:Ministry of Water and Irrigation
MOPIC	:Ministry of Planning and International Cooperation
MOF	:Ministry of Finance
WAJ	:Water Authority of Jordan
Zarqa GWA	:Zarqa Governorate Water Authority
JICA	:Japan International Cooperation Agency
JICS	:Japan International Cooperation System

Handwritten mark

Handwritten mark

Annex VIII Consultative Committee

1. Functions

The Consultative Committee (hereinafter referred to as "the Committee") will be established in order to fulfill the following functions:

- 1) to confirm an implementation schedule of the Programme for the speedy and effective utilization of the Grant and its accrued interest;
- 2) to discuss determination and/or modification of the Components, taking into account of the products enumerated in the list attached to the Procurement Guidelines and/or the result of the preparatory survey for the Programme by JICA;
- 3) to discuss modifications of the Programme;
- 4) to exchange views on allocations of the Grant and its accrued interest as well as on potential end-users;
- 5) to identify problems which may delay the utilization of the Grant and its accrued interest, and to explore solutions to such problems;
- 6) to exchange views on publicity related to the utilization of the Grant and its accrued interest; and
- 7) to discuss any other matters that may arise from or in connection with the G/A.

The first meeting of the Committee shall be held immediately after the approval of the Agent Agreement by the JICA, which shall be concluded between WAJ and the Procurement Management Agent (hereinafter referred to as "the Agent").

The selection of the Agent will be agreed between the two governments in the Agreed Minutes attached in the Exchange of Notes.

Further meetings will be held by the request of either the Jordanian side or the Japanese side. The Agent also may advise both sides on the necessity to call a meeting of the Committee.

2. Composition (Provisional)

- 1) Representative of Ministry of Planning and International Cooperation
- 2) Representative of MWI
- 3) Representative of WAJ
- 4) Representative of Zarqa Governorate Water Authority
- 5) Representative of the Procurement Management Agent
- 6) Representative of Embassy of Japan in the Hashemite Kingdom of Jordan
- 7) Representative of JICA Jordan Office



**MINUTES OF DISCUSSIONS
ON
THE PREPARATORY SURVEY II
ON
THE PROGRAMME FOR ENERGY CONSERVATION THROUGH
UPGRADING WATER SUPPLY NETWORK
IN THE HASHEMITE KINGDOM OF JORDAN**

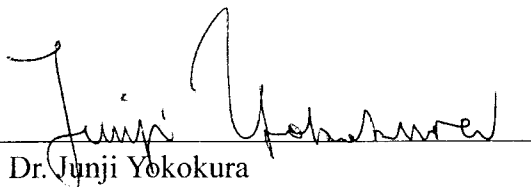
Based on the result of the Preparatory Survey, the Government of Japan decided to conduct a Preparatory Survey 2 for the Outline Design on the Programme for Energy Conservation through Upgrading Water Supply Network (hereinafter referred to as the "Programme") and entrusted the implementation of the survey to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to the Hashemite Kingdom of Jordan (hereinafter referred to as "Jordan") the Preparatory Survey 2 Team for the Outline Design (hereinafter referred to as "the Team"), headed by Dr. Junji Yokokura, Senior Advisor of the Office for Climate Change, JICA, which is scheduled to stay in the country from 14 June to 17 July 2009.

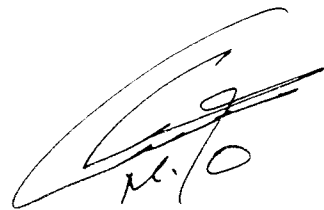
The Team held a series of discussions with the officials concerned from the Government of Jordan and conducted a field survey in the requested area.

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

Amman, 18 June, 2009



Dr. Junji Yokokura
Leader,
the Preparatory Survey Team
Japan International Cooperation
Agency (JICA)



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

ATTACHMENT

1. Objectives of the Programme

The objectives of the Programme are to save energy used for transmission and distribution of water through rationalization of water network system (mitigation measure against climate change), and to stabilize water supply and secure water resource by reducing water loss (adaptation measure against climate change).

2. Survey Area and Programme Site

The site of the Programme is the Zarqa governorate as shown in **Annex I**.

3. Responsible Agency and Implementing Agency

3-1) The Responsible Agency is the Ministry of Water and Irrigation (hereinafter referred to as "MWI").

3-2) The Implementing Agency is the Water Authority of Jordan (hereinafter referred to as "WAJ"). The Organization chart of WAJ is shown in **Annex II**

4. Items requested by the Government of Jordan

After discussions with the Jordanian side and the Team (hereinafter referred to as "the both sides"), the items described in **Annex III** were finally requested by the Jordanian side.

The both sides confirmed that the appropriateness of the request would be examined in accordance with the further studies and analysis in Japan and the final components for the estimation of the Programme would be decided by the Japanese side.

5. Scheme of Japan's Programme Grant Aid for Environment and Climate Change

The Jordanian side understood the scheme of Japan's Programme Grant Aid for Environment and Climate Change and the necessary measures to be taken by the Government of Jordan as explained by the Team and described in as described in **Annex IV**, **Annex V** and **Annex VI** of the Minutes of Discussions signed by both parties on 8 April, 2009.

6. Administration of the Programme

6-1) Both sides confirmed the administration of the Programme as shown in **Annex VII**.

6-2) For promoting proper and smooth execution of the Programme, both sides confirmed that the Consultative Committee of the Programme (hereinafter referred to as "the Committee") would be established whose functions and provisional composition are described in **Annex VIII**.

7. Schedule of the Survey

7-1) The consultants will proceed to further studies in Jordan until 17 July, 2009.

7-2) JICA will prepare the draft Outline Design Report and dispatch a mission in order to explain its contents to the Jordanian side around October 2009.

7-3) In case that the contents of the report are accepted in principle by the Government of Jordan, JICA will complete the final report and send it to the Government of Jordan by December 2009.

8. Other Relevant Issues

The following issues were discussed and agreed by both sides.

8-1) Switch of Distribution System to Gravity-Flow and Procurement of Materials

The equipment and materials requested for distribution network should be designed under the gravity-flow distribution condition which shall be realized with the completion of the projects by the other donors. Thus, the procurement shall be separated into two lots and the equipment and materials for distribution network shall be procured in the second lot after the gravity-flow distribution condition is prepared, while transmission pumps, equipment related to the pumps and transmission pipes shall be procured in the first lot.

8-2) Reconstruction of Zarqa Pumping Station and Equipment Procurement Plan

The Jordanian side would launch the detail design of the reconstruction of the Zarqa Pumping Station following the final Outline Design Report to be submitted at the end of 2009, and complete the construction before the delivery of the transmission pumps and equipment related to the pumps.

8-3) Soft Assistance

The Soft Assistance of the Programme would aim at improving the operation and maintenance of transmission pumps to be procured in the Programme by preparing standard operational and maintenance procedures, and the targets of the Soft Assistance shall be;

- 1) to suitably control pumping flow according to production of water resources and demand of distribution areas,
- 2) to monitor the operational efficiency by accumulating pumping flow data and energy consumption of pumping facilities,
- 3) to select suitable methods for keeping equipment and materials in appropriate condition, by acquisition of accurate knowledge on "Corrective Maintenance,"
- 4) to execute accurate maintenance work that contributes to trouble prevention by acquisition of accurate knowledge on "Preventive Maintenance," and
- 5) to execute safety operation control by acquisition of accurate knowledge on "Safety Operation Control."

8-4) Replacement and Installation Works of Procured Equipment

The cost of replacement and installation of pumps and relevant equipment to be procured in the Programme should be included within the Grant, while those of valves and water meters in the distribution network and transmission pipes should be implemented by the WAJ's budget.

8-5) Overlapping and Coordination with other projects

The Programme should not be overlapped with any other projects supported by other donor agencies, NGOs, and Jordanian official organization(s). Thus, the Jordanian side takes the responsibility for coordinating the on-going projects on improvement of water supply facilities and networks, especially funded by GTZ, KfW, Millennium Challenge Corporation (MCC), etc. Especially, the equipment of Zarqa Treatment plant listed in the requested items (**Annex III**) would be coordinated between GTZ and the Team after the completion of the final report on GTZ's Improving Energy Efficiency project in the end of June 2009.

8-6) Programme Indicators and Methods of Acquiring Baseline Data

The indicators of the Programme effects would be the amount of electricity consumption necessary for operation of pumping facilities and pumping discharge. The Jordanian side would prepare and install electric power meters in the pumping stations targeted in the Programme in order to acquire the baseline data of the indicators and monitor it.

8-7) Eligible Country for Procurement

Regarding the procurement of transmission pumps, equipment related pumps, and transmission pipes in the first lot, the Jordanian side requested that the eligible country for the procurement supplier shall be Japan because of the quality of supervision for the installment of pumps and smooth implementation of the Programme, while procurement supplier of the second lot is of no restriction.

The country origin of the equipment to be procured in the both lots shall be countries belonging to Development Assistance Committee (DAC), due to the reliability of the products.

The Team promised to convey the request to JICA headquarters and related authorities for their consideration.

8-8) Operation and maintenance of facilities and equipment

The Jordanian side agreed to take any necessary measures and allocate necessary budget in order to operate and maintain the facilities and equipment provided by the Programme.

8-9) Tax Exemption

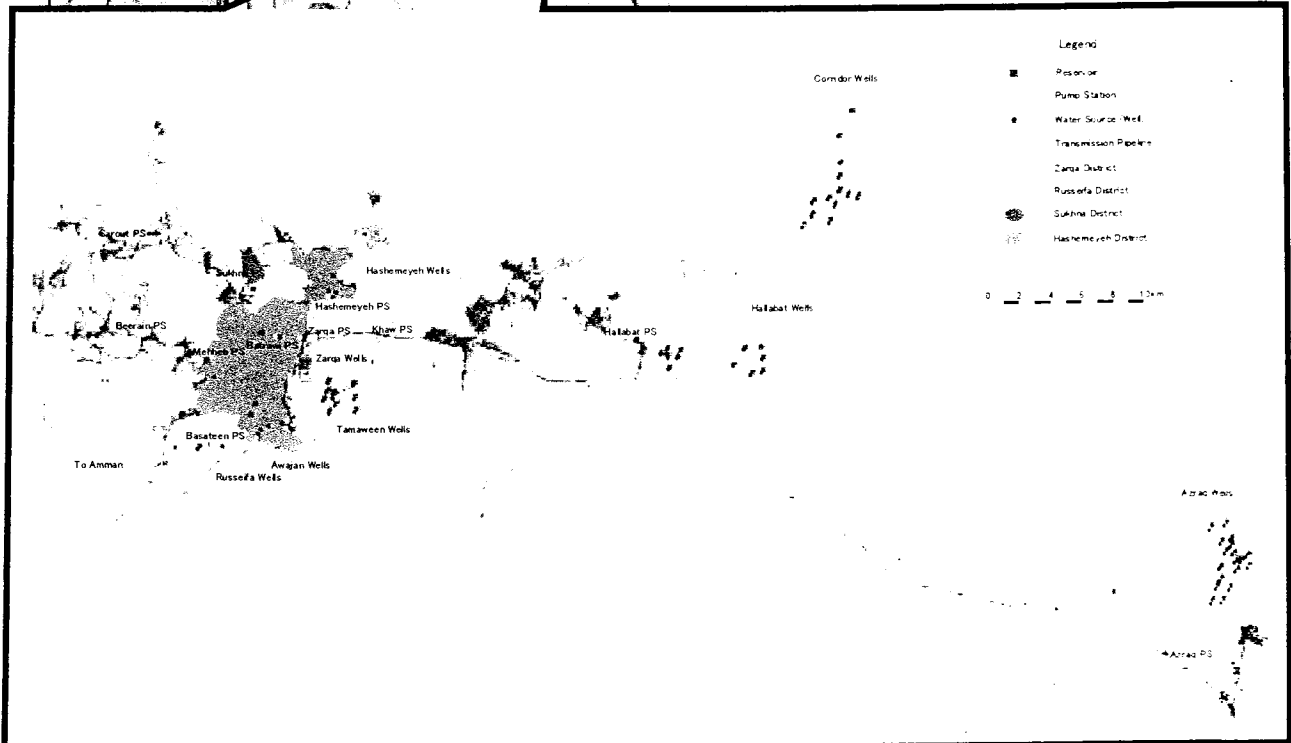
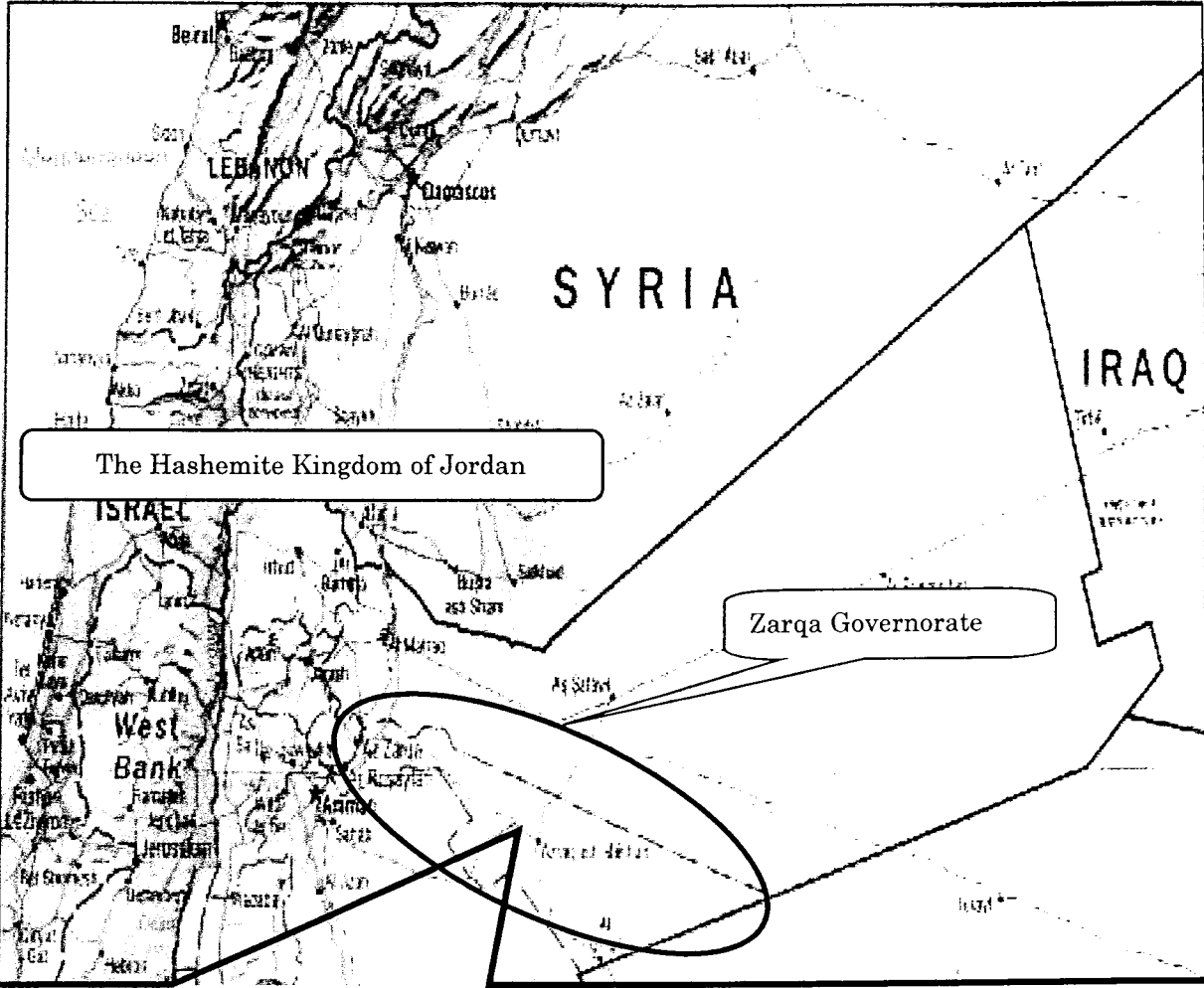
The tax exemption including Value Added Tax (VAT), custom duty, and any other taxes and fiscal levies in Jordan which is to be arisen from the Programme activities will be ensured by WAJ. WAJ will take any procedures necessary for tax exemption, and in case that tax exemption is not secured, the cost of tax will be covered by WAJ.

8-10) Project title

Both sides agreed to modify the title of the Programme as "the Programme for Energy Conservation through Upgrading Water Supply Network."

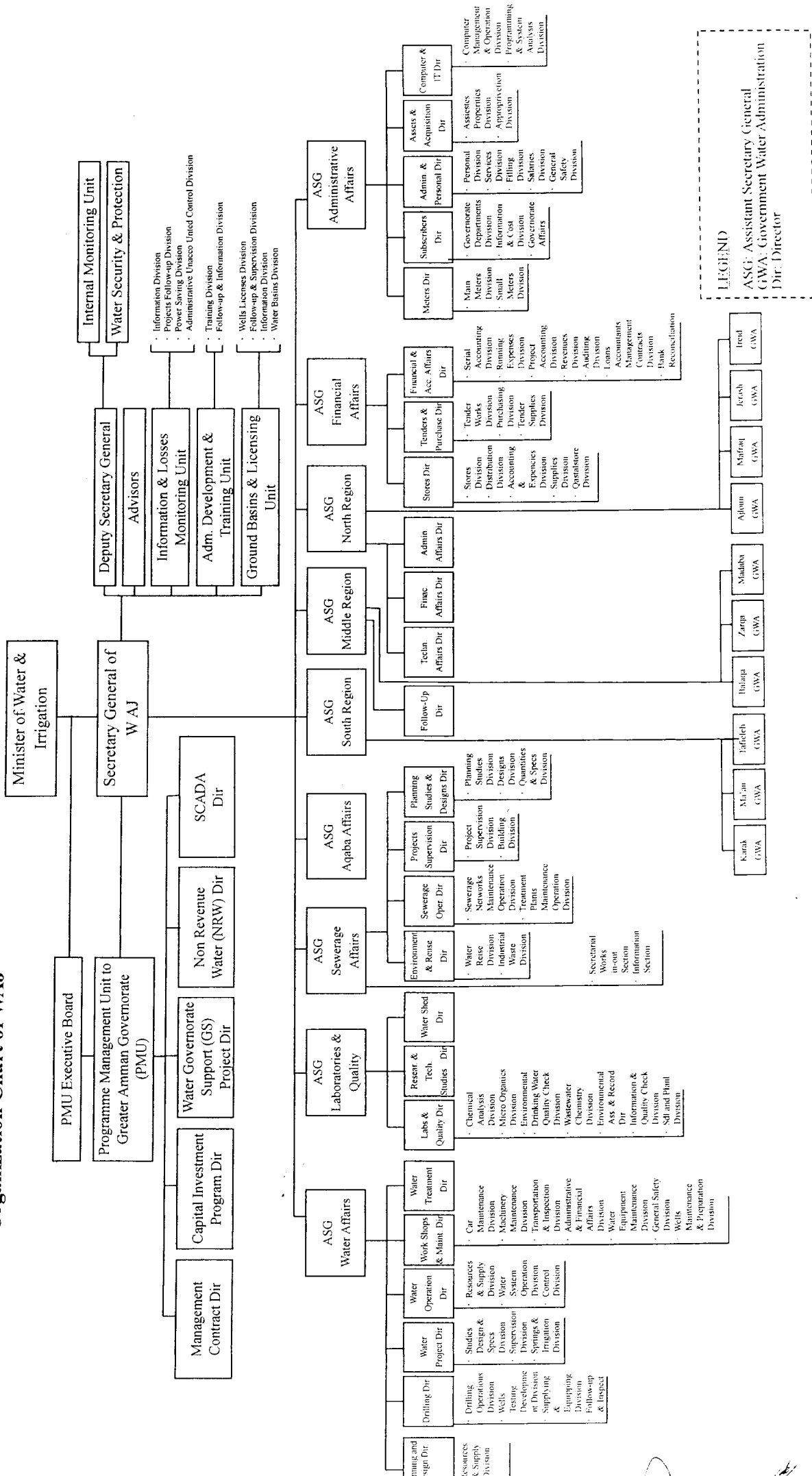
Annex I	Programme Site Map
Annex II	Organization Chart of WAJ
Annex III	List of Items Requested by the Government of Jordan
Annex IV	Programme Grant Aid for Environment and Climate Change of the Government of Japan
Annex V	Flow of Funds and Implementation of the Programme
Annex VI	Major Undertakings to be Taken by Each Government
Annex VII	Organization Chart for the Implementation of the Programme
Annex VIII	Consultative Committee

Annex I Programme Site Map



Handwritten marks and signatures at the bottom right of the page, including a large 'A' and some illegible scribbles.

Annex II Organization Chart of WAJ



Annex III List of Items Requested by the Government of Jordan

Category	Mark	Materials	Diameter (inch)	Location	PN(bar)	Unit	Quantity	Priority	
1	P	Pump (Q=500m ³ /h, H=350m)	-	Azraq P.S. (to Khaw P.S.)	35	nos	2	1	
	P	Pump (Q=300m ³ /h, H=350m)	-	Azraq P.S. (to Khaw P.S.)	35	nos	2		
	WM	Water Meter (Ultrasonic)	24	Azraq P.S.: Inlet pipeline from wells to reservoir	-	nos	1		
	WM	Water Meter (Ultrasonic)	24	Azraq P.S.: Outlet pipeline to Khaw P.S.	-	nos	1		
	WM	Water Meter (Ultrasonic)	24	Khaw Reservoir : Inlet pipeline from Azraq P.S	-	nos	1		
	2	P	Pump (Q=500m ³ /h, H=150m)	-	Halabat station (to Khaw)	15	nos	1	2
		WM	Water Meter (Ultrasonic)	24	Hallabat P.S.: Inlet pipeline from wells to reservoir	-	nos	1	
		WM	Water Meter (Ultrasonic)	24	Hallabat P.S.: Outlet pipeline to Khaw P.S.	-	nos	1	
		WM	Water Meter (Ultrasonic)	24	Khaw Reservoir : Inlet pipeline from Hallabat P.S	-	nos	1	
	2	P	Pump (Q=400m ³ /h, H=100m)	-	Zarqa P.S. to Batrawi Reservoir	16	nos	3	3
DIP		Ductile iron pipes	600mm	Transmission from Zarqa P.S. to Batrawi Reservoir	-	m	-		
WM		Water Meter (Ultrasonic)	-	Zarqa P.S.: Outlet pipeline to Batrawi	-	nos	1		
4		V	Valve	16	New Khaw P.S.: Delivery Pipeline	16	nos	6	4
		V	Valve	16	New Khaw P.S.: Suction Pipeline	16	nos	6	
		V	Valve	24	New Khaw P.S.: Delivery Pipeline	16	nos	2	
		NRV	Non-retaining Valve	16	New Khaw P.S.	16	nos	3	
		WM	Water Meter (electronic)	28	New Khaw P.S.: Outlet pipeline to Batrawi Reservoir	-	nos	1	
		WM	Water Meter (electronic)	16	New Khaw P.S.: Outlet pipeline to Zarqa P.S.	-	nos	1	
		DIP	Ductile iron pipes	Variable	New Khaw P.S.: Inside Connection Pipes	-	m	-	
P	Pump (Q=500m ³ /h, H=50m)	-	Zarqa Treatment Plant: Outlet pipeline to Zarqa Reservoir	5	nos	1	5		
3	P	Pump (Q=100m ³ /h, H=350m)	-	Merheb P.S.: To Berein Reservoir	35	nos	1	6	
	P	Pump (Q=200m ³ /h, H=100m)	-	Merheb P.S.: To Awajan Reservoir	10	nos	1		
	WM	Water Meter (Turbin)	6	Merheb P.S.: Outlet pipeline to Berein	40	nos	1		
	WM	Water Meter (Turbin)	6	Merheb P.S.: Outlet pipeline to Awajan	10	nos	1		
4	GV	Gate Valve	2	Zarqa network	16	nos	100	7	
	GV	Gate Valve	2	Zarqa network	25	nos	100		
	GV	Gate Valve	4	Zarqa network	16	nos	100		
	GV	Gate Valve	4	Zarqa network	25	nos	100		
	GV	Gate Valve	6	Zarqa network	16	nos	30		
	GV	Gate Valve	6	Zarqa network	25	nos	30		
	GV	Gate Valve	8	Zarqa network	16	nos	30		
	GV	Gate Valve	8	Zarqa network	25	nos	30		
	GV	Gate Valve	12	Zarqa network	16	nos	10		
	GV	Gate Valve	12	Zarqa network	25	nos	10		
	GV	Gate Valve	16	Zarqa network	16	nos	3		
	GV	Gate Valve	24	Zarqa network	25	nos	2		
	WM	Water Meter (Ultrasonic)	16	Transmission Line to Russeifa	-	nos	1		
	WM	Water Meter (Ultrasonic)	24	Khaw-Amman Pipeline: Awajan Junction	-	nos	1		
	AV	Air release valve	2	Zarqa network	25	nos	20		
AV	Air release valve	4	Zarqa network	25	nos	20			

Note: The specification and quantity of the equipment and materials are subject to be modified by the study.

Category: 1. Water Transmission form major well water sources, 2. Water Transmission to Batrawi Reservoir

3. Water Transmission to Awajan and Russeifa Reservoirs, 4. Water Transmission and distribution pipelines in Zarqa district

**Programme Grant Aid for Environment and Climate Change
of the Government of Japan
(Provisional)**

Grant Aid is non-reimbursable fund to a recipient country 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 relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

Based on the “Cool Earth Partnership” initiative of the The Government of Japan (hereinafter referred to as “the GOJ”), the Programme Grant Aid for Environment and Climate Change (hereinafter referred to as “GAEC”) aims to mitigate negative effects of global warming by reducing Green House Gas emission (mitigation measure such as improvement of energy efficiency) and to adapt the supposed effects (adaptation measures such as stabilization of water supply in a region suffering less precipitation due to the climate change).

GAEC may contain multiple components that can be combined to effectively achieve its objectives. The contractors and suppliers may not be confined to Japanese firms and construction, in principle, can be conducted by utilizing local standards.

1. GAEC Procedures

GAEC is executed through the following procedures.

- Application
 - Request made by the recipient country
- Preparatory Survey (hereinafter referred to as “the Survey”)
 - The Survey for Outline Design conducted by Japan International Cooperation Agency (hereinafter referred to as “JICA”)
- Appraisal & Approval
 - Appraisal by the GOJ and Approval by the Cabinet
- Determination of Implementation
 - The Notes exchanged between the GOJ and a recipient country
- Grant Agreement (hereinafter referred to as “the G/A”)
 - Agreement concluded between JICA and a recipient country
- Implementation
 - Implementation of the Programme on the basis of the G/A

Firstly, the application or request for a GAEC Programme submitted by the recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to determine whether it is eligible for GAEC. If the request is deemed appropriate, the GOJ assigns JICA to conduct a survey on the request.

Secondly, JICA conducts the Survey for Outline Design with Japanese consulting firms.

Thirdly, the GOJ appraises the programme to see whether it is suitable for Japan's GAEC, based on the Survey report prepared by JICA, then the result is submitted to the Cabinet for approval.

Fourthly, the programme, once approved by the Cabinet, becomes official with the Exchange of Notes (hereinafter referred to as E/N) signed by the GOJ and the recipient country. Simultaneously, the Grant will be made available by concluding the G/A between the recipient country and JICA.

JICA is designated by the GOJ as the organization responsible for necessary works for proper execution of the Grant.

Procurement Management Agent (hereinafter referred to as "the Agent") is designated to conduct the procurement services of products and services (including fund management, preparing tenders, contracts) for GAEC on behalf of the recipient country. The Agent is an impartial and specialized organization that shall render services according to the Agent Agreement with the recipient country. The Agent is recommended to the recipient country by the GOJ and agreed between the two Governments in the Agreed Minutes (hereinafter referred to as "A/M").

2. Preparatory Survey for Outline Design

1) Contents of the Survey

The purpose of the Survey, conducted by JICA on a requested programme ("the Programme"), is to provide the basic documents necessary for the appraisal of the Programme by the GOJ. The contents of the Survey are as follows:

- (1) Confirmation of background, objectives, and benefits of the Programme and institutional capacity of agencies and communities concerned of the recipient country necessary for the implementation of the Programme.
- (2) Evaluation of relevance of the Programme to be implemented under the Grant Aid Scheme

from a technical, social, and economic point of view.

- (3) Confirmation of items agreed upon by both parties concerning the basic concept of the Programme.
- (4) Preparation of the outline design of the Programme.
- (5) Preliminary Estimation of cost for the Programme.

The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Programme. The Outline Design of the Programme is confirmed considering the guidelines of the Japan's Grant Aid scheme.

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

2) Selection of Consultants

For the smooth implementation of the Survey, JICA will conduct the Survey with JICA-registered consulting firms. JICA selects the firms based on proposals submitted by firms with interest in implementing the Survey. The firms selected will carry out the Outline Design Survey and prepare a report, based on the terms of reference set by JICA.

The consulting firms that will implement the Programme after the G/A can be, in principle, Japanese firms recommended by JICA for maintaining technical consistency with the Survey.

3. Implementation of GAEC after the E/N

1) The E/N and the G/A

The content of GAEC will be determined in accordance with the E/N exchanged by the two Governments, in which the objectives of the Programme, length of the Programme, conditions and amount of the Grant Aid are confirmed. The conclusion of the G/A between the recipient country and JICA follows the exchange of E/N to determine the paying conditions responsibilities of the recipient country and procurement conditions.

2) Details of Procedures

Details of procedures on implementing the Programme under GAEC will be agreed between the

authorities of the two governments concerned at the time of the signing of the E/N and the G/A. Essential points to be agreed are outlined as follows:

- a) JICA will supervise the implementation of the Programme.
- b) Products and services shall be procured and provided in accordance with JICA's "Procurement Guidelines for the Programme Grant Aid (Type I – E) for Environment and Climate Change."
- c) The recipient country shall conclude a contract with the Agent.
- d) The Agent is the representative acting in the name of the recipient country concerning all transfers of funds to the Agent.

3) Focal points of the “Procurement Guidelines for the Programme Grant Aid (Type I – E) for Environment and Climate Change”

a) The Agent

The Agent is the organization, which provides procurement of products and services on behalf of the recipient country according to the Agent Agreement with the recipient country. The Agent is recommended to the recipient country by the GOJ and agreed between the two Governments in the A/M.

b) Agent Agreement

The recipient country shall conclude the Agent Agreement, in principle, within two months after the signing of the G/A, in accordance with the A/M. The scope of the Agent's services shall be clearly specified in the Agent Agreement.

c) Approval of the Agent Agreement

The Agent Agreement is prepared as two identical documents and the copy of the Agent Agreement shall be submitted to JICA by the recipient country through the Agent. JICA will confirm whether the Agent Agreement is concluded in conformity with the E/N, A/M, and G/A and the Procurement Guidelines for the Programme Grant Aid for Environment and Climate Change then approves the Agent Agreement.

The Agent Agreement concluded between the recipient country and the Agent shall become effective after the approval by JICA in a written form.

d) Payment Methods

The Agent Agreement shall stipulate that “Regarding all transfers of the fund to the Agent, the recipient country shall designate the Agent to act on behalf of the Government and issue a Blanket Disbursement Authorization (“the BDA”) to conduct the transfer of the fund (hereinafter

referred to as “the Advances”) to the Procurement Account from Account of the Government.

The Agent Agreement shall clearly state that the payment to the Agent shall be made in Japanese yen from the Advances and that the final payment to the Agent shall be made when the total remaining amount become less than three percent (3%) of the Grant and its accrued interests.

e) Products and Services Eligible for Procurement

Products and services to be procured shall be selected from those defined in the G/A.

f) Selection of firms

In principle, firms of any nationality could be contracted as long as the firms satisfies the conditions specified in the tender documents.

g) Method of Procurement

When conducting the procurement, sufficient attention shall be paid to transparency in selecting the firms and for this purpose, in principle, competitive tendering shall be employed.

h) Tender Documents

The tender documents should contain all information necessary to enable tenderers to prepare valid offers for the products and services to be procured by GAEC.

The rights and obligations of the recipient country, the Agent and the firms supplying products and services should be stipulated in the tender documents to be prepared by the Agent.

i) Pre-qualification Examination of Tenderers

The Agent may conduct a pre-qualification examination of tenderers in advance of the tender so that the invitation to the tender can be extended only to eligible firms. The pre-qualification examination should be performed only with respect to whether the prospective tenderers have the capability of concluding the contracts.

For this, the following points should be taken into consideration:

- (1) Experience and past performance in contracts of similar kind
- (2) Financial credibility (including assets such as real estate)
- (3) Existence of offices and other items to be specified in the tender documents.
- (4) Their potentialities to use necessary personnel and facilities.

j) Tender Evaluation

The tender evaluation should be implemented on the basis of the conditions specified in the tender documents.

Those tenderers which substantially conform to the technical specifications and other stipulations of the tender documents, shall be judged in principle on the basis of the submitted price, and the tenderer who offers the lowest price shall be designated as the successful tenderer.

The Agent shall submit a detailed evaluation report of tenders to JICA for its information, while the notification of the results to the tenderers will not be premised on the confirmation by JICA.

k) Additional procurement

If there is any remaining balance after the competitive and/or selective tendering and/or direct negotiation for a contract, and if the recipient country would like to procure additional items, the Agent is allowed to conduct this additional procurement, following the points mentioned below:

(1) Procurement of same products and services

When the products and services to be additionally procured are identical with the initial tender and a competitive tendering is judged not efficient, additional procurement can be conducted by a negotiated contract with the successful tenderer of the initial tender.

(2) Other procurements

When products and services other than those mentioned above in (1) are to be procured, the procurement should be conducted through competitive tendering. In this case, the products and services for additional procurement shall be selected from among those in accordance with the G/A.

l) Conclusion of the Contracts

In order to procure products and services in accordance with the guideline, the Agent shall conclude contracts with firms selected by tendering or other methods.

m) Terms of Payment

The contract shall clearly state the terms of payment. The Agent shall make payment from the "advances," against the submission of the necessary documents from the firm on the basis of the conditions specified in the contract. When the services are the object of procurement, the Agent may pay certain portion of the contract amount in advance to the firms on the conditions that such firms submit the advance payment guarantee worth the amount of the advance payment to

the Agent.

4) Undertakings required by the recipient country

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

- a) To secure land necessary for the sites of the Programme.
- b) To provide facilities for distributing electricity, water supply and drainage and other incidental facilities in and around the sites if necessary.
- c) To assist prompt execution for domestic transportation of products purchased under the Grant Aid as necessary,
- d) To ensure that customs duty, internal tax and other fiscal levies that may be imposed in Jordan with respect to the purchase of the Components and the Agent's services shall be exempted by the recipient country.
- e) To accord all the concerned parties, whose services may be required in connection with supply of the products and services under the contracts, such facilities as may be necessary for their entry into Jordan and stay therein for the performance of their work.

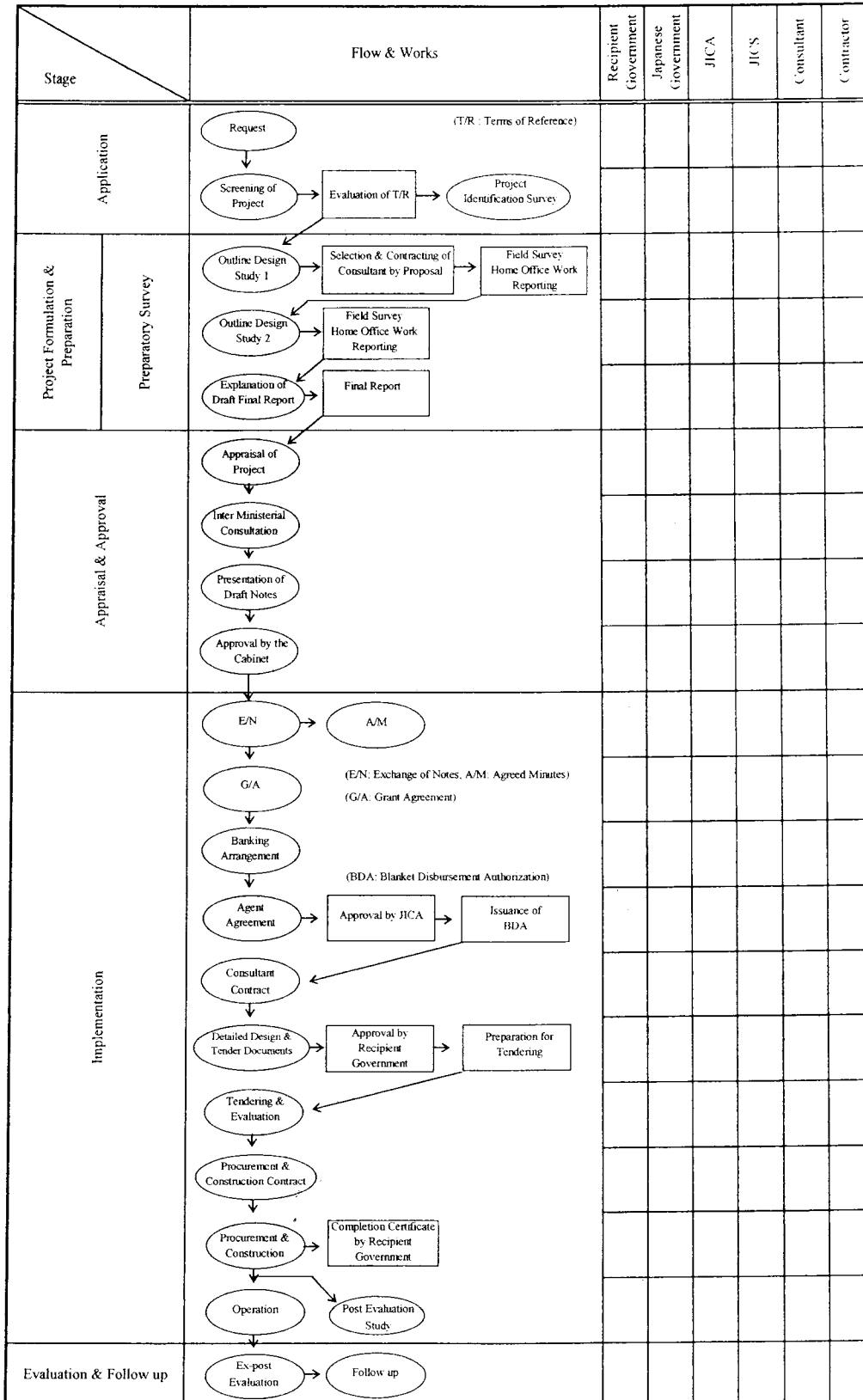
5) "Proper use of funds"

The recipient country is required to take necessary actions so that the facilities constructed under the Grant Aid are properly and effectively used and to ensure sustainable operation and maintenance as well as to bear all the expenses other than those covered by the Grant Aid.

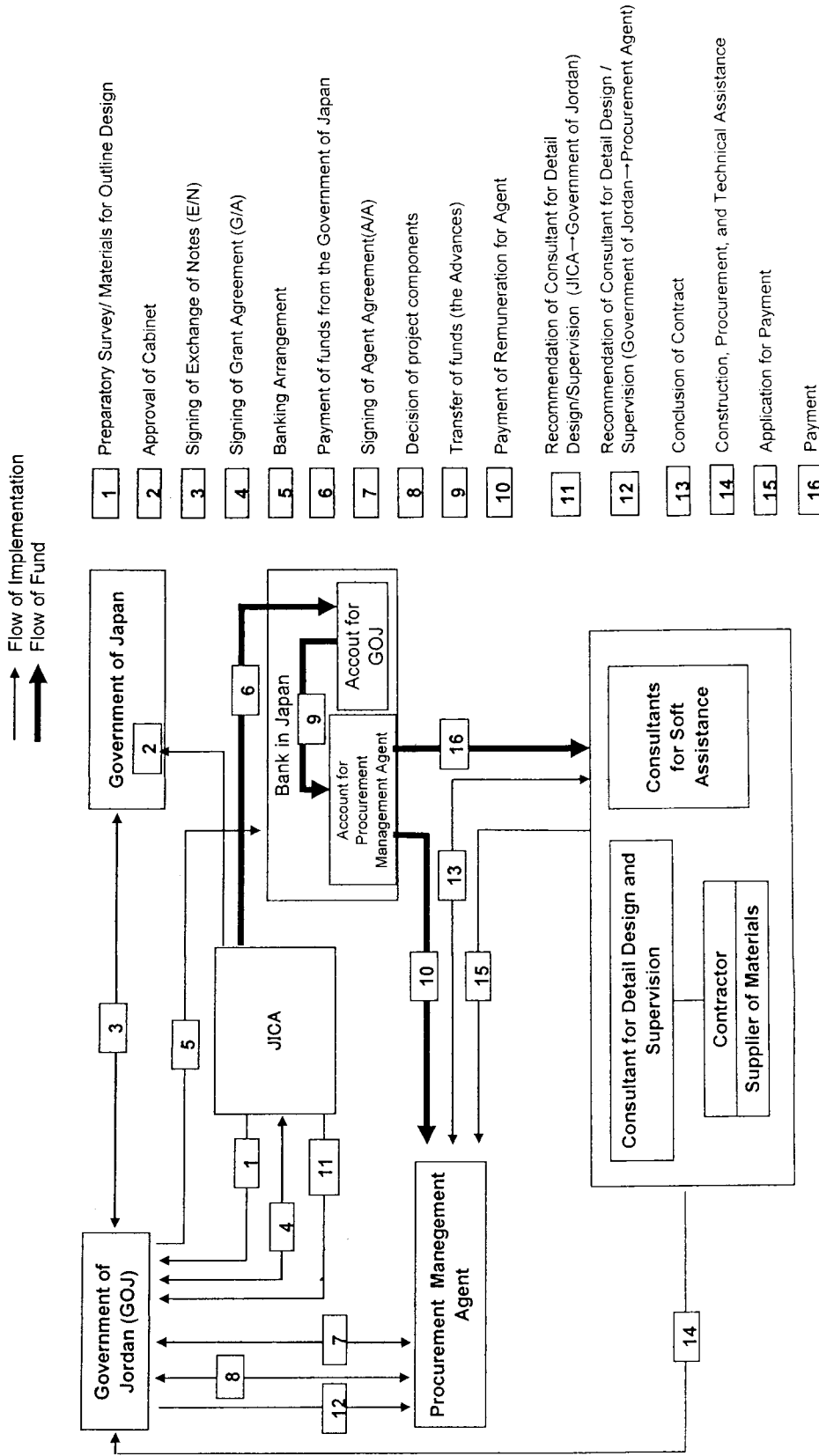
6) "Exported or Re-export"

The products purchased under the Grant shall not be exported or re-exported from Jordan.

FLOW CHART OF JAPAN'S PROGRAMME GRANT AID FOR ENVIRONMENT AND CLIMATE CHANGE PROCEDURES



Annex V Flow of Funds and Implementation of the Programme

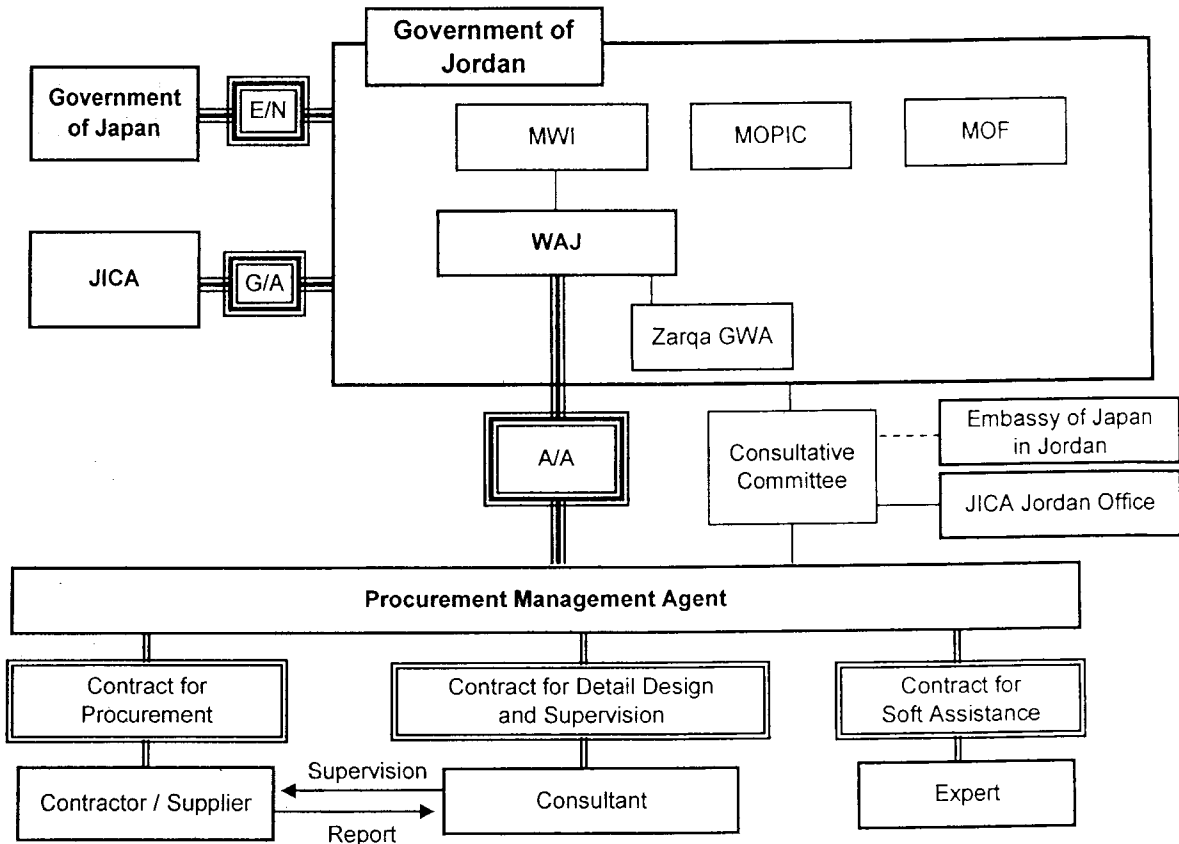


Annex VI Major Undertakings to be Taken by Each Government

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	To bear the following commissions applied by the bank in Japan for banking services based upon the Bank Arrangement (B/A): 1) Payment of bank commission		●
2	To ensure prompt unloading and customs clearance at the port of disembarkation in the recipient country 1) Marine or air transportation of the products from the production countries to the recipient 2) Tax exemption and customs clearance of the products at the port of disembarkation 3) Internal transportation from the port of disembarkation to the programme site	●	●
3	To accord Japanese nationals and / or nationals of third countries, including persons employed by the agent whose services may be required in connection with the Components such facilities as may be necessary for their entry into recipient country and stay therein for the performance of their work.		●
4	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the Components and to the employment of the Agent shall be exempted by the Government of recipient country		●
5	To maintain and use properly and effectively the facilities that are constructed and the equipment that is provided under the Grant.		●
6	To bear all the expenses, other than those covered by the Grant and its accrued interest, necessary for the purchase of the Components as well as for the agent's fees.		●

(Handwritten marks and signatures)

Annex VII Organization Chart for the Implementation of the Programme



- LEGEND:**
- ==== : Official Agreement
 - ==== : Contract (Procurement Management Agent – Firms & Consultants)
 - : Report • Supervision • Coordination
 - E/N : Exchange of Notes
 - G/A : Grant Agreement
 - A/A : Agent Agreement
 - MWI : Ministry of Water and Irrigation
 - MOPIC : Ministry of Planning and International Cooperation
 - MOF : Ministry of Finance
 - WAJ : Water Authority of Jordan
 - Zarqa GWA : Zarqa Governorate Water Authority
 - JICA : Japan International Cooperation Agency
 - JICS : Japan International Cooperation System

(Handwritten marks and signatures)

Annex VIII Consultative Committee

1. Functions

The Consultative Committee (hereinafter referred to as “the Committee”) will be established in order to fulfill the following functions:

- 1) to confirm an implementation schedule of the Programme for the speedy and effective utilization of the Grant and its accrued interest;
- 2) to discuss determination and/or modification of the Components, taking into account of the products enumerated in the list attached to the Procurement Guidelines and/or the result of the preparatory survey for the Programme by JICA;
- 3) to discuss modifications of the Programme;
- 4) to exchange views on allocations of the Grant and its accrued interest as well as on potential end-users;
- 5) to identify problems which may delay the utilization of the Grant and its accrued interest, and to explore solutions to such problems;
- 6) to exchange views on publicity related to the utilization of the Grant and its accrued interest; and
- 7) to discuss any other matters that may arise from or in connection with the G/A.

The first meeting of the Committee shall be held immediately after the approval of the Agent Agreement by the JICA, which shall be concluded between WAJ and the Procurement Management Agent (hereinafter referred to as “the Agent”).

The selection of the Agent will be agreed between the two governments in the Agreed Minutes attached in the Exchange of Notes.

Further meetings will be held by the request of either the Jordanian side or the Japanese side. The Agent also may advise both sides on the necessity to call a meeting of the Committee.

2. Composition (Provisional)

- 1) Representative of Ministry of Planning and International Cooperation
- 2) Representatives of Water Authority of Jordan
 - Secretary General (Chairman of the Committee)
 - Manager of NRW / Performance Indicators & Benchmarking
 - Director of Planning and Design Department
 - Director of Zarqa Governorate Water Authority
- 3) Representative of the Procurement Management Agent
- 4) Representative of JICA Jordan Office

MINUTES OF DISCUSSIONS
ON
THE PREPARATORY SURVEY II
ON
THE PROGRAMME FOR ENERGY CONSERVATION THROUGH
UPGRADING WATER SUPPLY NETWORK
IN THE HASHEMITE KINGDOM OF JORDAN


(EXPLANATION ON DRAFT OUTLINE DESIGN STUDY REPORT)

In June 2009, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched the Preparatory Survey 2 for the Outline Design on the Programme for Energy Conservation through Upgrading Water Supply Network (hereinafter referred to as the "Programme") 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 outline design study report (hereinafter referred to as "the Draft Report").

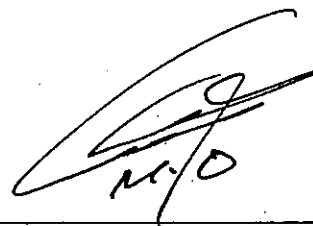
In order to explain and to consult with the Government of Jordan on the components of the Draft Report, JICA sent to Jordan the Draft Report Explanation Team (hereinafter referred to as "the Team"), which is headed by Shigeru Okamoto, Chief Representative, JICA Jordan Office, from 10th October to 16th October, 2009.

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

Amman, 15th October, 2009



Mr. Shigeru Okamoto
Leader,
Draft Report Explanation Team
Japan International Cooperation Agency
(JICA)



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

ATTACHMENT

1. Components of the Draft Report

The Jordanian side agreed and accepted in principle the components of the Draft Report explained by the Team. The components of the Programme are shown in **Annex-1**.

2. Japan's Programme Grant Aid for Environment and Climate Change

The Jordanian side understands the Scheme of Japan's Programme Grant Aid for Environment and Climate Change and the necessary measures to be taken by the Government of Jordan as explained by the Team and described in Annex IV, Annex V and Annex VI of the Minutes of Discussions signed by both sides on 8 April, 2009.

In addition, both sides confirmed the provisional composition of the consultative committee described in **ANNEX-2**

3. Schedule of the Study

JICA will complete the final report in accordance with the confirmed items and send it to the Government of Jordan by January 2010.

4. Other Relevant Issues

The following issues were discussed and confirmed by both sides.

4-1) Programme Cost Estimation

The team explained to the Jordanian side the Programme Cost Estimation as described in **Annex-3** and this cost estimation is provisional and would be further examined by the Government of Japan for the approval of the Grant. Both sides agreed that the Programme Cost Estimation should never be duplicated or released to any outside parties until signing of all the contract(s) for the Programme.

The Jordanian side understood that the Programme Cost Estimation is not final and subject to be modified.

4-2) Undertakings and Obligations of the Jordanian Side

In case that the Programme would be approved by the government of Japan, the Jordanian side would execute the obligations in pace with the progress of the procurement of materials and equipment, in addition to the major undertakings described in Annex VI of the Minutes of discussions signed by both sides on June 18, 2009. The list of the obligations is described in **ANNEX-4**.

4-2-1) Budget Allocation Schedule

The budget for reconstruction of Zarqa pumping station, would be approved and allocated by the end of 2009. Regarding the budget for installation of transmission

pipeline to Batrawi reservoir from Zarqa Pumping Station and other related materials and equipment, the Jordanian side would request the necessary budget for the cabinet to be allocated in 2011 of the Jordanian fiscal year.

4-2-2) Target Areas for Equipment to be Procured in the Second Lot

Equipment to be procured in the Second Lot, such as gate valves and air valves, are restricted to be installed in the distribution networks under gravity distribution system.

4-2-3) Arrangements with Power Distribution Company

The Jordanian side would support the contract between the supplier firm and the power distribution company to install transformers to be procured in the Programme, and to make arrangements for switchover to the medium voltage power receiving system in Azraq pumping station.

4-2-4) Monitoring of Effects on Energy Efficiency Improvement

The Jordanian side would collect and report operational data to JICA, such as the amount of water distribution and electricity consumption by the pumping stations targeted in the Programme, in order to evaluate the effects of the Programme in terms of energy efficiency improvement at the end of the Programme.

4-3) Environmental Impact Assessment (EIA)

The Jordanian side would inform JICA that EIA is not necessary for implementation of the Programme, and send to JICA the official letter approved by the Ministry of Environment by the end of October 2009.

4-4) Jordanian Authority Signing the Agent Agreement

The Jordanian side would determine the signer of the Agent Agreement as the authority representing the Jordanian side, and inform the result to JICA by the end of October 2009.

ANNEX-1	Components of the Programme
ANNEX-2	Consultative Committee
ANNEX-3	Programme Cost Estimation (CONFIDENTIAL)
ANNEX-4	Obligations of the Jordanian side (Table3.1.1 of the Draft Report)

ANNEX-1 Components of the Programme

Equipment	Dia. (inch)	Location	PN(bar)	Unit	Quantity
I. Procurement Lot 1					
1. Azraq Pumping Station					
Pump (Q=425m ³ /h, H=360m)	-	Azraq P.S. to Khaw P.S.	36	nos	5
Water Meter	24	Inlet pipeline from wells to reservoir	-	nos	2
Water Meter	24	Outlet pipeline to Khaw P.S.	-	nos	1
Water Meter	24	Khaw Reservoir : Inlet pipeline from Azraq P.S	-	nos	1
2. Hallabat Pumping Station (to Khaw)					
Pump (Q=500m ³ /h, H=135m)	-	Hallabat station to Khaw	14	nos	2
Water Meter	16	Inlet pipeline from wells to reservoir	-	nos	1
Water Meter	12	Inlet pipeline from wells to reservoir	-	nos	1
Water Meter	24	Outlet pipeline to Khaw P.S.	-	nos	1
Water Meter	24	Khaw Reservoir : Inlet pipeline from Hallabat P.S	-	nos	1
3. Zarqa Pumping Station					
Pump (Q=400m ³ /h, H=100m)	-	Zarqa P.S. to Batrawi Reservoir	16	nos	3
Ductile iron pipes	20	Transmission from Zarqa P.S. to Batrawi Reservoir	16	km	2
Water Meter	20	Zarqa P.S.: Outlet pipeline to Batrawi	-	nos	1
4. Khaw New Pumping Station					
Valve	16	Delivery Pipeline	16	nos	4
Valve	16	Suction Pipeline	16	nos	4
Valve	28	Delivery Pipeline	16	nos	1
Non-retaining Valve	16	Delivery Pipeline	16	nos	4
Water Meter	28	Outlet pipeline to Batrawi Reservoir	-	nos	1
5. Hallabat Pumping Station (to Hallabat Village)					
Pump (Q=150m ³ /h, H=150m)	-	Hallabat station to Hallabat Village	15	nos	2
Water Meter	8	Outlet pipeline to Hallabat Village	-	nos	1
6. Air release valve on Transmission Pipe to Khaw and Water Meter					
Air release valve	4	Transmission Line from Azraq to Khaw	-	nos	40
Air release valve	4	Transmission Line from Hallabat to Khaw	-	nos	15
Water Meter	16	Transmission Line to Russeifa	16	nos	1
Water Meter	24	Khaw-Amman Pipeline: Awajan Junction	25	nos	1
II. Procurment Lot 2					
7. Transmission and Distribution Network					
Gate Valve	4	Zarqa network	16	nos	222
Gate Valve	6	Zarqa network	16	nos	69
Gate Valve	8	Zarqa network	16	nos	32
Gate Valve	12	Zarqa network	16	nos	13
Gate Valve	16	Zarqa network	16	nos	5
Gate Valve	24	Zarqa network	16	nos	2
Air release valve	2	Zarqa network	16	nos	15

ANNEX-2 Consultative Committee

1. Functions

The Consultative Committee (hereinafter referred to as "the Committee") will be established in order to fulfill the following functions:

- 1) to confirm an implementation schedule of the Programme for the speedy and effective utilization of the Grant and its accrued interest;
- 2) to discuss determination and/or modification of the Components, taking into account of the products enumerated in the list attached to the Procurement Guidelines and/or the result of the preparatory survey for the Programme by JICA;
- 3) to discuss modifications of the Programme;
- 4) to exchange views on allocations of the Grant and its accrued interest as well as on potential end-users;
- 5) to identify problems which may delay the utilization of the Grant and its accrued interest, and to explore solutions to such problems;
- 6) to exchange views on publicity related to the utilization of the Grant and its accrued interest; and
- 7) to discuss any other matters that may arise from or in connection with the G/A.

The first meeting of the Committee shall be held immediately after the approval of the Agent Agreement by the JICA, which shall be concluded between WAJ and the Procurement Management Agent (hereinafter referred to as "the Agent").

The selection of the Agent will be agreed between the two governments in the Agreed Minutes attached in the Exchange of Notes.

Further meetings will be held by the request of either the Jordanian side or the Japanese side. The Agent also may advise both sides on the necessity to call a meeting of the Committee.

2. Composition (Provisional)

- 1) Representative of Ministry of Planning and International Cooperation
- 2) Representatives of Water Authority of Jordan
 - Assistant Secretary General on Water Affairs Department (Chairman of the Committee)
 - Manager of NRW / Performance Indicators & Benchmarking
 - Director of Planning and Design Department
 - Director of Zarqa Governorate Water Authority
- 3) Representative of the Procurement Management Agent
- 4) Representative of JICA Jordan Office

ANNEX-3 Programme Cost Estimation

Cost Borne by the Japanese side

	Items	Cost Estimate (million JPY)
Equipment	Electric and pumping facilities, materials for transmission pipelines, water flow meters, equipment for the valves in the distribution networks and pump installation	1051
	Agent fees, Execution design / Procurement supervision / Soft Component	79
Total:		1130 (Approx. 11.70 million USD)

Cost Borne by the Jordanian side

	Items	Cost Estimate (JD)
Azraq Pumping Station		
	Movement of the existing pumps	6,500
	Improvement of the power distribution cables for medium voltage power reception	7,300
	Installation of transmission pipeline in the pumping station	8,800
	Installation of air valves for transmission pipelines	21,100
	Installation of concrete chambers for water flow meters	15,500
	Construction of concrete chambers for the control valves on the transmission pipelines	1,660
Zarqa Pumping Station		
	Construction of the pumping station building and installation of transmission pipelines within the site of the station	400,000
	Arrangement of transformer and installation of secondary power line for the new pumping facility	2,500
	Construction of concrete chambers for water flow meters	3,000
	Construction of concrete chambers for the control valves on the transmission pipelines	3,400
	Installation of transmission pipeline to Batrawi reservoir from Zarqa Pumping Station	500,000
Hallabat Pumping Station		
	Repair of the existing pumping station building	10,000
	Movement of the existing pumps	6,500
	Installation of air valves for transmission pipelines	7,900
	Construction of concrete chambers for water flow meters	14,000
	Construction of concrete chambers for the control valves on the transmission pipelines	6,160
Khaw Pumping Station		
	Installation of valves for the existing pumps	2,000
	Construction of concrete chambers for water flow meters	15,500
	Construction of concrete chambers for the control valves on the transmission pipelines	1,780
Distribution Networks		
	Construction of concrete chambers and indicator house, and supply of electricity for water flow meters	13,000
	Installation of gate valves and air valves	2,900
Soft Assistance		
	Allowance of the participants of WAJ for Technical Guidance, etc.	7,300
Others		
	Commission related to banking arrangement, etc.	8,800
Total:		1,065,600 (Approx. 1.5 million USD)

*Note:

(1) Time of Cost Estimation: End of June 2009

(2) Exchange Rate: 1USD = 96.59JPY, 1EUR = 128.92JPY, 1JD = 136.65JPY

ANNEX-4 Obligations of the Jordanian side

Item	Obligations of the Jordanian side
1. General matters	<ul style="list-style-type: none"> • Application for and acquisition of permission/approval relevant to Programme implementation from the organizations concerned • Banking procedures including Banking Arrangement (B/A) and Blanket Disbursement Authorization (BDA) • Payment of commission for opening the B/A account, commission for BDA notification and other bank commissions • Guarantee of unloading and customs clearance at the port of disembarkation and domestic transportation of the equipment to be procured in this Programme • Arrangement for exemption from internal taxes including customs duties and IVA and other fiscal charges on the equipment and services to be procured in this Programme • Assistance to employees of the consultant and the procurement contractor involved in Programme implementation for their entry into, exit from and stay in Jordan • Implementation of environmental impact assessment and acquisition of permission for installation of the equipment from the Ministry of Environment, if necessary • Guarantee of the safety of the activities for Programme implementation
2. Content and schedule of Programme implementation	<ul style="list-style-type: none"> • Discussion on the content of the Lot 2 equipment after conclusion of the contract for the procurement of Lot 1 (at the Consultative Committee) • Discussion on when to implement the process of selecting the contractor for the procurement of Lot 2 (at the Consultative Committee) • Selection of areas in which installation of Lot 2 is to be implemented (at the Consultative Committee)
3. Preparation for procurement of equipment	<ul style="list-style-type: none"> • Reservation and improvement of storage area for equipment and spare parts (at Ain Ghazal Central Warehouse)
4. Preparation for installation of equipment	<p><u>Azraq Pumping Station</u></p> <ul style="list-style-type: none"> • Necessary arrangements with the power distribution company for switchover of the power distribution system (from low to medium voltage power receiving) • Partial replacement of distribution cables (for switchover to the medium voltage power receiving system) • Removal of the existing transformer at the new pumping station • Relocation of Pump No.3 to the new pumping station (for installation of the procured equipment) • Removal of existing electric panels for generators in the electric room <p><u>Hallabat Pumping Station</u></p> <ul style="list-style-type: none"> • Repair of the existing station building • Relocation of Pump No.1 (for installation of the procured equipment) <p><u>Zarqa Pumping Station</u></p> <ul style="list-style-type: none"> • Construction and furnishing of the new pumping station building • Arrangement of transformer facilities (1,200 kVA transformer for the transmission pumps procured by the Japanese side and transformer for the distribution pumps procured by the Jordanian side) • Installation of inflow pipeline at the new pumping station (from Zarqa Reservoir) • Installation of outflow pipelines from the new pumping station (for the transmission pumps procured by the Japanese side and the distribution pumps procured by the Jordanian side)

Item	Obligations of the Jordanian side
	<ul style="list-style-type: none"> • Installation of trenches for wiring in the station (for the transmission pumps procured by the Japanese side and the distribution pumps procured by the Jordanian side) <p><u>Khaw Pumping Station</u></p> <ul style="list-style-type: none"> • Approval of constructing a flow meter chamber at the inflow pipeline from Hallabat
5. Installation of equipment	<p><u>Azraq Pumping Station</u></p> <ul style="list-style-type: none"> • Construction of water flow meter chambers and installation of cables for water flow meters (three places) • Installation of pipes for partial replacement of the transmission pipeline on the premises of the station (Dia.600mm, approx.. 40 m) • Repair of existing valve chamber for flow control valve and installation of valve(Dia,600mm, one place) • Installation of air valve on the discharge pipe of the water transmission pump (one place) • Installation of air valves and repair of existing air valve chambers on the water transmission pipeline to Khaw Reservoir (40 places) <p><u>Hallabat Pumping Station</u></p> <ul style="list-style-type: none"> • Construction of water flow meter chambers and installation of cables for water flow meters (two places) • Repair of water flow meter chamber and installation of cables for water flow meter (one place) • Construction of valve chamber for flow control valves and installation of valve (Dia.600mm) • Connection of bypass pipeline (between the transmission pipeline to Khaw and the distribution pipeline to the village) • Installation of air valves and repair of existing air valve chambers on the transmission pipeline to Khaw Reservoir (15 places) <p><u>Zarqa Pumping Station</u></p> <ul style="list-style-type: none"> • Installation of lead-in cables on the secondary side of the transformer to the electrical board for the water transmission pumps procured by the Japanese side • Construction of water flow meter chamber and installation of cables (one place: Pipes are to be installed as part of the discharge pipeline from the new pumping station) • Construction of valve chamber for flow control valve and installation of valve (Dia.600mm, one place: Pipes are to be installed as part of the discharge pipeline from the new pumping station) • Installation of water transmission pipeline to Batrawi Reservoir (Dia.600mm, approx.2 km) <p><u>Khaw Pumping Station</u></p> <ul style="list-style-type: none"> • Installation of valves for the pumps (Dia.400mm, 4 sets) • Construction of water flow meter chambers and installation of pipes and cables for water flow meters (three places) • Repair of valve chamber for flow control valve, removal of existing valve and water flow meter, and installation of flow control valve and pipes (Dia.700mm, one place) <p><u>In the distribution networks</u></p> <ul style="list-style-type: none"> • Construction of water flow meter chambers, installation of cables, supply of power source and construction of converter sheds for water flow meters (two places) • Installation of gate valves (Dia.100 – 600 mm, 343 valves) • Installation of air valves (Dia.50, 15 valves)

Item	Obligations of the Jordanian side
	<p><u>Miscellaneous</u></p> <ul style="list-style-type: none"> • Measures to ensure water distribution in the case of temporary shortage of discharge during installation of the equipment
<p>6. Operation and Maintenance Technical Guidance of Pumping Facilities, Soft Component</p>	<ul style="list-style-type: none"> • Appointment of a counterpart for the Technical Guidance and Soft Component • New and additional appointment of personnel in charge of operation management, maintenance / safety management at the assisted pumping stations • Appointment of personnel from unassisted pumping stations to attend the seminars and OJT • Purchase of two personal computers for sorting and analysis of the operation/maintenance records • Payment of allowance for attendance at the above-mentioned seminars and OJT to the relevant personnel • Reservation of lecture rooms suitable for seminars (at VTC) • Contact and coordination with the relevant organizations to facilitate implementation of the Technical Guidance and Soft Component • Monitoring and follow-up for sustainable operation and maintenance of the facilities after implementation of the Technical Guidance and Soft Component
<p>7. Organization</p>	<p><u>Azraq Pumping Station</u></p> <ul style="list-style-type: none"> • Appointment of a safety manager for the medium voltage power receiving system <p><u>Zarqa Pumping Station</u></p> <ul style="list-style-type: none"> • Additional appointment of an electrical facility engineer, mechanical facility engineer and electrical facility technician <p><u>Khaw Pumping Station</u></p> <ul style="list-style-type: none"> • Appointment of a senior manager for the pumping station • Additional appointment of a technician in chlorine management
<p>8. Operation and maintenance of equipment</p>	<ul style="list-style-type: none"> • Implementation of appropriate operation management, maintenance / safety management of the procured equipment • Implementation of appropriate management of the operation of the water transmission system • Implementation of appropriate inventory and procurement management of spare parts • Maintenance contract for the medium voltage power receiving system with a private company

**MEMORANDUM ON
THE PREPARATORY SURVEY ON
THE PROJECT FOR ENERGY CONSERVATION THROUGH
UPGRADING WATER SUPPLY NETWORK
IN THE HASHEMITE KINGDOM OF JORDAN**

1. Revised list of Items to be procured and priority of the Items:

In accordance with Clause 5 of the Attachment of Minutes of Discussions signed on the 8th of April 2009 for the captioned Survey, WAJ has prepared the revised list of Items to be procured and the priority order of its Items as shown in the Attachment 1 and 2 of this memorandum. WAJ side understands that the priority order of the equipment for the direct distribution by pump to the water distribution area is lower priority in consideration with the conditions for the procurement described in Attachment 3.

2. GTZ project:

GTZ is now implementing the Improvement Energy Efficiency (IEE) project on Azraq pumping station, Hallabat pumping station, Khaw pumping station and Zarqa desalination plant in Zarqa governorate under the coordination of WAJ. On the other hand, the Jordanian side has requested procurement of the pump equipments of the same pumping stations to Japanese side. In order to adjust the implementation way of procurement of the equipment and operation and maintenance (O&M) of pumping facilities by Japan and German, the coordination meeting among JICA, GTZ and WAJ will be held at the middle of June after submission of the draft final report of IEE project by GTZ, as discussed in the meeting held on 21st of April 2009. A Minutes of Meeting is as shown in Attachment 4 of this memorandum. The priorities of these pump stations may be rearranged based on the result of the coordination meeting.

3. Pipe for the distribution network:

The location for installation of requested ductile iron pipes are indicated on the map of distribution networks, however the total length of that pipes is not meet with the requested pipeline length of 14.0 km. Also quantity, diameter, nominal pressure and location to be replaced or newly installed of the deformed pipes and valves such as bend, branch, drain, gate valve and air valve have not presented on that pipe lines. Therefore, the Jordanian side will clarify the items and its quantity, specification and locations based on the route survey that will be conducted by WAJ side. The result shall be prepared by the end of May 2009 and shall be handed to the JICA survey team of the second stage.

4. Construction plan of building facilities of Zarqa and Khaw old pumping stations

The reconstruction plan of Zarqa pump station is now under implementation. Through the required procedure of designing, tendering and construction work, the new building of the pump station will be constructed by the end of the year 2009. The draft design drawings will be prepared by the end of May 2009 and will be handed to the JICA survey team of the second stage for the coordination between the reconstruction plan of Zarqa Pump station and the equipment procurement plan of the Project.

Also, WAJ has plan of reconstruction of old Khaw pump station. Therefore, the draft design drawings on Khaw pump station will be prepared by the end of June 2009 and layout of new Khaw

1



pump station will be handed to the JICA office on the end of May.

5. Scenario of water source transmission schedule in Zarqa Governorate:

In accordance with the agreement between WAJ and Miyahouna at least 500m³/h of water shall be exported to Amman. The reallocation of water resources of Disi-Amman conveyor project will be determined and rescheduled after the completion of this project in the year of 2012-2013. WAJ side will prepare the scenario of water source transmission schedule in Zarqa Governorate including such condition and new exploitation plan of wells in order to fix the design discharge for the pump facilities requested to Japanese side, and present it to the JICA survey team of the second stage on the middle of June, 2009.

6. Acquisition of base line data and establish of monitoring plan:

Electric power consumption shall be measured as the index for evaluation of project effect. WAJ understands this point and will equip electric power meters at each pumping station in cooperation with electric supply company.

1) Azraq pump station:

A power meter for new pump station is measuring total consumption of transmission pumps and well pumps. The power meter of transmission pumps should be separated from the meter of well pumps before beginning of July 2009.

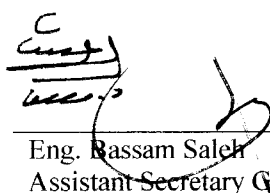
2) Halabat pump station:

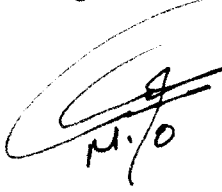
A power meter for pump station is measuring total consumption of transmission pumps and well pumps. The power meter of transmission pumps should be separated from the meter of well pumps before beginning of July 2009.


3) Zarqa pump station:

The power meter for new transmission pumps should be separated from the meter of well pumps and desalination plant.

Amman, 23rd April, 2009


Eng. Bassam Saleh
Assistant Secretary General for Water Affairs,
Water Authority of Jordan (WAJ)
Ministry of Water and Irrigation
The Hashemite Kingdom of Jordan


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


Shigeo Otani
Chief Consultant
Kyowa Engineering Consultant Co., Ltd.
JICA Preparatory Survey Team

Attachment 1

List of Requested Equipment and Materials (21/Apr/09)

No.	Area/Station	Mark	Materials	Diameter (inch)	Place	PN(bar)	Unit	Quantity
1	New Azraq Station	GV	Gate Valve	8	Delivery Pipe	40	nos	4
2		GV	Gate Valve	12	Suction Pipe	16	nos	4
3		GV	Gate Valve	24	Pelving Pipe	40	nos	1
4		GV	Gate Valve	24	Pelving Pipe	25	nos	1
5		GV	Gate Valve	24	Suction Pipe	25	nos	1
6		NRV	Non-retaining Valve	8	on each pump delivery pipe	40	nos	4
7		NRV	Non-retaining Valve	24	Delivery Pipe	40	nos	1
8		WM	Water Meter (electronic)	24	on pipe from wells to reservoir	25	nos	1
9		WM	Water Meter (electronic)	24	on pipe from pump station to Khaw	40	nos	1
10	Old Azraq Station	V	Valve	10	Delivery Pipe	40	nos	7
11		V	Valve	12	Suction Pipe	25	nos	7
12		V	Valve	24	Delivery Pipe	40	nos	1
13		V	Valve	24	Suction Pipe	25	nos	1
14		NRV	Non-retaining Valve	10	on each pump delivery pipe	40	nos	7
15		NRV	Non-retaining Valve	24	Delivery Piper	40	nos	1
16	Khaw Station (Amman)	NRV	Non-retaining Valve	8	Delivery Pipe	40	nos	8
17		NRV	Non-retaining Valve	24	Delivery Pipe	40	nos	1
18		WM	Water Meter (electronic)	24	from Azraq pipeline	25	nos	1
19		WM	Water Meter (electronic)	24	to amman pipeline	40	nos	1
20	Khaw Station (Zarqa)	V	Valve	16	Delivery Pipe	40	nos	6
21		V	Valve	16	Suction Pipe	16	nos	6
22		V	Valve	24	Delivery Pipe	40	nos	2
23		NRV	Non-retaining Valve	16		40	nos	3
24		WM	Water Meter (electronic)	28	to Batrawi pipeline	25	nos	1
25		WM	Water Meter (electronic)	16	to Zarka pipeline	40	nos	1
26	Zarqa	P	Pump (Q=400m3/h, H=150m)		Zarqua station (to Zarka network)	15	nos	3
27		P	Pump (Q=200m3/h, H=150m)		Zarqua station (to Zarka network)	15	nos	2
28		P	Pump (Q=500m3/h, H=250m)		Zarqua station (to Rusaifa)	25	nos	3
29		P	Pump (Q=200m3/h, H=250m)		Zarqua station (to Rusaifa)	25	nos	2
30		P	Pump (Q=500m3/h, H=350m)		Azraq Station (to Khaw)	35	nos	2
31		P	Pump (Q=300m3/h, H=350m)		Azraq Station (to Khaw)	35	nos	2
32		P	Pump (Q=500m3/h, H=150m)		Halabat station (to Khaw)	15	nos	1
33		P	Pump (Q=300m3/h, H=150m)		Halabat station (to Halabat area)	15	nos	1
34		P	Pump (Q=100m3/h, H=350m)		Merheb station (to berein area)	35	nos	1
35		P	Pump (Q=200m3/h, H=100m)		Merheb station (to Awajan area)	10	nos	1
36		P	Pump (Q=500m3/h, H=50m)		treatment station (to Zarka PS)	5	nos	1
37		P	Pump (Q=50m3/h, H=350m)		Sokhneh station	35	nos	1
38		P	Pump (Q=500m3/h, H=350m)		Khaw station (to Amman)	35	nos	2
39		P	Pump (Q=300m3/h, H=350m)		Khaw station (to Amman)	35	nos	2

Note: pump includes pump+ all fittings on suction and delivery + electrical panel + cables+power distrubation panel for the station

Handwritten signatures and initials are present at the bottom of the page, including a large signature on the left, the word 'OK!' in the center, and several other signatures on the right.

No.	Area/Station	Mark	Materials	Diameter (inch)	Place	PN(bar)	Unit	Quantity
40	Zarqa	GV	Gate Valve (with flange)	2	Zarqa network	16	nos	100
41		GV	Gate Valve (with flange)	2	Zarqa network+pump stations	25	nos	100
42		GV	Gate Valve (with stim)	2	Zarqa network+pump stations	40	nos	100
43		GV	Gate Valve	4	Zarqa network	16	nos	100
44		GV	Gate Valve	4	Zarqa network	25	nos	100
45		GV	Gate Valve	4	Zarqa network+pump stations	40	nos	100
46		GV	Gate Valve	6	Zarqa network+pump stations	16	nos	30
47		GV	Gate Valve	6	Zarqa network+pump stations	25	nos	30
48		GV	Gate Valve	6	Zarqa network+pump stations	40	nos	30
49		GV	Gate Valve	8	Zarqa network+pump stations	16	nos	30
50		GV	Gate Valve	8	Zarqa network+pump stations	25	nos	30
51		GV	Gate Valve	8	Zarqa network+pump stations	40	nos	30
52		GV	Gate Valve	12	Zarqa network+pump stations	25	nos	10
53		GV	Gate Valve	12	Zarqa network+pump stations	40	nos	10
54		BV	Butterfly Valve	12	Pump stations (merheb+Basatin+Tamwin+standby)	25	nos	10
55		BV	Butterfly Valve	16	Pump stations (Zarqa+ standby)	25	nos	3
56		BV	Butterfly Valve	16	Pump stations (Zarqa (russaifa)+ standby)	40	nos	3
57		GV	Gate Valve	24	Zarqa network+pump stations	40	nos	2
58		BV	Butterfly Valve	24	Pump stations (Zarqa+ standby)	40	nos	2
59		NRV	Non-retaining Valve	4	Pump stations + wells	16	nos	20
60		NRV	Non-retaining Valve	4	Pump stations + wells	25	nos	20
61		NRV	Non-retaining Valve	4	Pump stations	40	nos	20
62		NRV	Non-retaining Valve	6	Pump stations + wells	16	nos	20
63		NRV	Non-retaining Valve	6	Pump stations	25	nos	20
64		NRV	Non-retaining Valve	6	Pump stations	40	nos	10
65		NRV	Non-retaining Valve	8	Pump stations + wells	16	nos	20
66		NRV	Non-retaining Valve	8	Pump stations	25	nos	20
67		NRV	Non-retaining Valve	8	Pump stations	40	nos	10
68		NRV	Non-retaining Valve	12	Pump stations (merheb+Basatin+Tamwin+standby)	25	nos	8
69		NRV	Non-retaining Valve	12	Pump stations (Zarqa+ standby)	40	nos	3
70		NRV	Non-retaining Valve	16	Pump stations (Zarqa+ standby)	25	nos	3
71		NRV	Non-retaining Valve	16	Pump stations (Zarqa (russaifa))	40	nos	3
72		NRV	Non-retaining Valve	24	Pump stations (Zarqa+ standby)	40	nos	2
73		WM	Water Meter	4	Wells	16	nos	20
74		WM	Water Meter	4	Pump stations	25	nos	10
75		WM	Water Meter	6	Wells	16	nos	25
76		WM	Water Meter	6	Pump stations	25	nos	20
77		WM	Water Meter	8	Wells	16	nos	20
78		WM	Water Meter	8	Pump stations	25	nos	10
79		WM	Water Meter	8	Pump stations	40	nos	10
80		WM	Water Meter (electronic)	12	Pump stations + line (merheb+Basatin+Tamwin+standby)	40	nos	5
81		WM	Water Meter (electronic)	16	Pump stations (Zarqa+ standby)	40	nos	4
82		WM	Water Meter (electronic)	24	Pump stations (Zarqa+ standby)	40	nos	2
83		AV	Air release valve	2	Zarqa network + Wells	25	nos	20
84		AV	Air release valve	4	Zarqa network + main lines	25	nos	20
85		AV	Air release valve	4	Zarqa network + main lines	40	nos	10
86		DIP	Ductile iron pipes	300mm	Zarqa network		meter	6000
87		DIP	Ductile iron pipes	200mm	Zarqa network		meter	6000
88	DIP	Ductile iron pipes	150mm	Zarqa network		meter	2000	

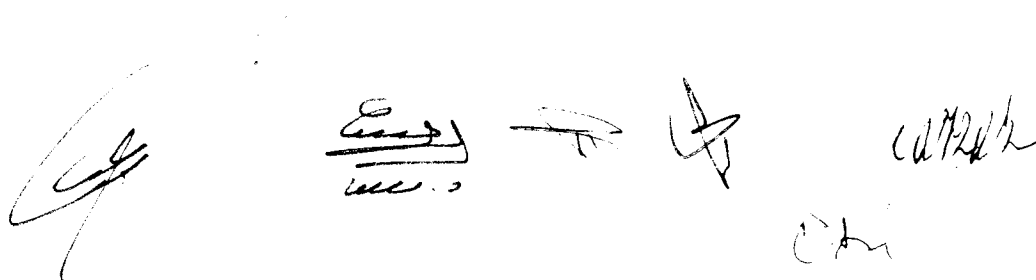
4

Attachment 2

THE PREPARATORY SURVEY ON
THE PROJECT FOR ENERGY CONSERVATION THROUGH UPGRADING WATER SUPPLY NETWORK
IN THE HASHEMITE KINGDOM OF JORDAN

Procurement Priority of the Requested Equipment

<u>Priority order</u>	<u>Requested Items</u>
1.	Pump (Zarqa station, to Batrawi)
2.	Pump (Zarqa station, to other than Batrawi reservoir)
3.	Pump (Azraq station)
4.	Ductile iron pipes (in distribution lines)
5.	Pump (Halabat station)
6.	Water meter, Gate valve, Air valve (in distribution lines)
7.	Gate valve, Butterfly valve, Non-retaining valve, Air valve, Water meter (in pump stations for distribution networks and in wells)
8.	Pump (Khaw station to Amman)
9.	Valve, Water meter (Khaw pump station to Zarqa)
10.	Pump (Merheb station)
11.	Pump (Sokhneh station)
12.	Pump (treatment station of Zarqa to Zarqa reservoir)

The bottom of the page contains several handwritten signatures and stamps. On the left, there is a large, stylized signature. In the center, there is a rectangular stamp with the word 'Energy' written inside, and another signature below it. To the right of the stamp is a simple arrow pointing to the right. Further right is another signature, and on the far right, there are two more signatures, one above the other.

Attachment 3

THE PREPARATORY SURVEY ON
THE PROJECT FOR ENERGY CONSERVATION THROUGH UPGRADING WATER SUPPLY NETWORK
IN THE HASHEMITE KINGDOM OF JORDAN

Conditions for Procurement of Equipment

1. Relevance between the effects of procurement of equipment and project objectives

The effects by the procurement of the requested equipment shall be meet with the project objectives such as reduction of energy consumption in the water supply system and the effective utilization of limited water resources by reduction in water losses.

2. Relevance between the replacement of pumps and the future water distribution plan

The equipment requested to be replaced should be utilized even after water distribution system would be restructured from pumping distribution to gravity distribution.

3. Relevance between reconstruction of pump station and equipment procurement plan

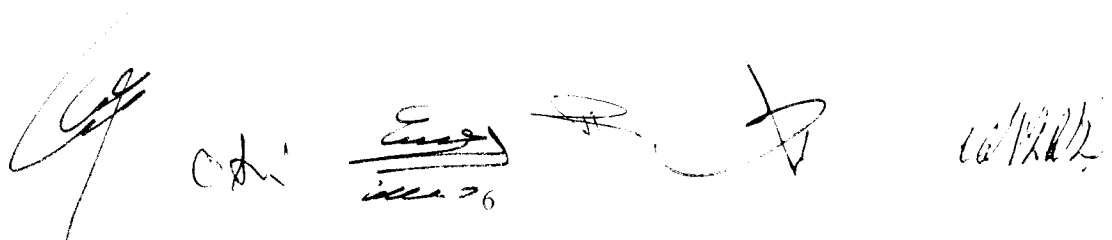
In the case existing building facility of pump station will not be used because of its deterioration, the new building facility shall be constructed under WAJ's responsibility before the delivery of the procured equipment.

4. Overlapping and Coordination with other projects

The Project should not be overlapped with any other project supported by other donor. and Jordanian official organization.

5. Beneficiary

The beneficiary of the Project is the people in Zarqa Governorate.



Handwritten signatures and stamps at the bottom of the page. From left to right: a large signature, a signature with 'CDI' below it, a signature with 'Energy' and '2006' below it, a signature with a star symbol, and a signature with '2006/12/22' below it.

Minutes of Meeting – Decisions Concerning Energy Efficiency/ Water Loss Reduction Projects JICA, GTZ and KfW

Date of Meeting: 21.04.2009

Time: 10:00 -11:30 am

Place: WAJ, Meeting Room 7. Floor

Participants: Dr. Mustafa Assaf (WAJ), Eng. Ahmed Hoseh (WAJ), Eng. Waleed Sukkar (PMU), Eng. Reham Bani-Hani (WAJ), Hani Kurdi (JICA), Makiko Okumura (JICA), Shigeo Otani (JICA/Kyowa Engineering Consultants Co., Ltd), Koji Naito (JICA/Kyowa Engineering Consultants Co., Ltd), Dieter Rothenberger (GTZ), Maria Scheday (GTZ/KfW/Dorsch), Abdelrahim Arrafat (GTZ/KfW/Dorsch), Dietrich Osswald (GTZ/DED), Ronald Hagger (GTZ)

Distribution List: H.E. Munir Oweis, SG WAJ; Dianna Kawwa, Donor Coordination, WAJ; Guy Honore (GTZ) Participants

Topic 1: Coordination of Energy Efficiency Activities in Pumping Stations in Zarqa Governorate

In order to achieve a close cooperation of the projects of GTZ and JICA, and to result in the best effects for WAJ, the following has been agreed:

- GTZ-IEE will focus on 4 pumping stations in Zarqa: Azraq, Khaw (To Amman), Halabat and the Zarqa Desalination Plant
- GTZ-IEE will provide to WAJ and JICA during the first half of June the final drafts of the detailed reports from the energy audit in these four pumping stations. These results will include the existing situation in terms of energy consumption and energy efficiency indicators for these pumping stations, major deficiencies and reasons for high electricity consumption, proposed measures and expected results. It will also include a recommendation concerning the institutional implementation of the recommended measures (e.g. GTZ procurement, outsourcing of operations and maintenance, procurement with extended maintenance contract, Micro-PSPs (Energy contracting), etc.)
- GTZ and WAJ will discuss with JICA the allocation of investment for the recommended measures for these four pumping stations, i.e. where GTZ will be able to provide funding, where private sector funding should be sought, and where JICA could provide funding.
- Measures in other pumping stations in Zarqa Governorate (e.g. Zarqa, Merheb, Sokhneh) will not be part of the GTZ IEE project. This also holds for measures in the distribution network.
- Beginning of June meetings between GTZ and WAJ will take place, to discuss the findings of the Energy Audit and the recommended implementation mechanisms. The results will also be discussed with JICA and the JICA Consultant mission in mid of June.
- JICA agreed to wait for the final draft on the 4 pumping stations before taking any measures and will use the results for their own study.

Topic 2: Coordination of Project Activities with regard to the KfW project in Zarqa Pilot Zone Distribution Network

- Stage I of preparatory survey on 'the Project for Energy Conservation through Upgrading Water Supply Network' by JICA has been completed in April. Stage II survey will take place in June 2009 and the draft final report will be submitted in September 2009 and final report will be submitted in November 2009. If the Project will be approved by Japanese Government. JICA will finance the procurement of equipment, while WAJ will be responsible for the installation.
- Under the Project for Energy Conservation through Upgrading Water Supply Network by JICA a few distribution pipes are planned to be exchanged / newly installed within the KfW Project Zarqa Pilot Zone. It has been mentioned by Dorsch that any JICA interference in that Pilot Zone shall be avoided to keep the projects activities separate. WAJ agreed to keep the activities of both projects separate.
- Plans for procurement of pumps at a new Pump Station for Zarqa, opposite the existing PS are under investigation by JICA consultant.
- Under another Japan's grant aid project, the new Batrawi reservoir is under construction with a capacity of 14,000 m3 at the same place of the existing one and shall supply some zones in Zarqa by gravity.
- GTZ / Dorsch and JICA / Kyowa Engineering Consultants together with WAJ Zarqa shall coordinate the various activities for Zarqa Distribution Network in order to achieve the best outcome of the projects.

Minutes Approved (valid without signature, as agreed in telephone call)

Dieter Rothenberger	Maria Scheday	Hani Kurdi	Ahmad Hoseh
Project Manager GTZ-IEE	Dorsch	JICA	WAJ

**MEMORANDUM ON
THE PREPARATORY SURVEY ON
THE PROGRAMME FOR ENERGY CONSERVATION THROUGH
UPGRADING WATER SUPPLY NETWORK
IN THE HASHEMITE KINGDOM OF JORDAN**

1. Transmission water discharge, quantity of the pump set and installation plan of the pumping equipment

Design discharge of the pump to be procured in the Programme for Energy Conservation Through Upgrading Water Supply Network (hereafter referred to as "the Programme") was proposed by the Consultant based on the data such as actual well yield of water source, current discharge of existing pump and flow capacity of the transmission pipeline. Also, reasonable quantity of the pump set and installation plan were proposed as shown in the following table and in the Attachment-2 of this Memorandum.

WAJ side confirmed the appropriateness of these figures and plan, and basically accepted the Consultant's proposal. However, these figures and plan may be modified in accordance with the further analysis in Japan.

Pump Station	Transmission Discharge	Quantity of Pump Set	Design Discharge per unit	Total Head	Motor Capacity
	m ³ /h	set	m ³ /h	m	kW
1. Azraq PS	1700	5	425	360	740
2. Hallabat PS	500	2	500	140	330
3. Zarqa PS	800	3	400	100	200

* Quantity of pump set include one stand-by at each pump station

* Motor capacity is approximately figure

2. Switch of electricity receiving system to medium voltage system

Though the electric receiving system for most of all pumping stations in WAJ is low voltage (400V), middle voltage system (6,600V) has been adopted for Zai of Miyahuna, Zara Ma'in of WAJ and Wadi Arab in NGWA. Introduction of medium voltage system shall be considered at the opportunity of replacement of existing deteriorated pumping equipment with new equipment in this Programme in order to make assure the future maintenance work and to reduce electric energy consumption for Azraq pumping stations. WAJ has confirmed the reliability of the applying medium voltage system without any problem with the electric power supply company (Electricity Distribution Company: EDCO). However the introduction of medium voltage system for Zarqa pumping station is not reasonable because the voltage 11 kV of primary line is not applicable for that switch of the system. And also medium voltage system for Hallabat pumping station is not recommendable because the safety condition of the existing building is not satisfied with the requirement for the new system.

In the case medium voltage system was introduced, WAJ shall assign a technical supervisor qualified on the medium voltage system for the safety operation and maintenance. The supervisor, electric engineer and operator shall be trained not only on general operation and maintenance but also on medium voltage system, in the Programme. Also, WAJ shall make maintenance contract with private

↓
OK

company specialized for medium voltage use.

WAJ side requests that the transformer to be replaced for switch the system shall be procured and installed by Japanese side through entrustment of the electric power supply company (EDCO) for the future maintenance. In case that the cost of transformer is not financed by Japanese side, WAJ will maintain existing electricity supply system.

3. Zarqa treatment plant and Mreheb pumping station

1) Zarqa Treatment Plant

According to the information of GTZ's programme manager of Improving Energy Efficiency (IEE) project, GTZ has decided to finance the necessary investments for the Zarqa Desalination Plant based on the final report on GTZ's IEE project in the end of June 2009.

The Programme should not be overlapped with any other projects supported by other donor. Therefore, Japanese side will exclude the Zarqa Desalination Plant from the list of the pumping stations to be financed by Japanese side.

2) Merheb Pumping Station

Though the Merheb pumping station is listed in the "List of Items Requested" of Annex III of Minute of Discussions signed between WAJ and JICA on the 18th of June 2009 for the captioned Survey, the possibility of the implementation of the project on that station is low because of the no advantage on the reduction of energy consumption. Present pump operating point (Q and H) is nearly same as design duty point according to the Consultant's actual measurement of discharge and pressure. Furthermore, the transmission line to the Awajan High reservoir is being used as distribution line rather than transmission line.

WAJ side requested to include the pump equipment for the Hallabat Village in the Hallabat pumping station into the procurement list of the Equipment instead of Merheb pumping station.

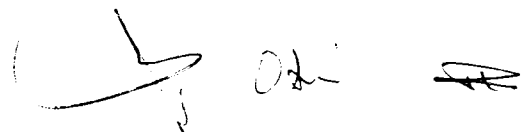
3) List of Items Requested by the Government of Jordan

The WAJ side requested to revise above-mentioned "List of Items Requested" as the Attachment-1 of this memorandum by the reasons mentioned above.

4. Construction plan of building facilities of Zarqa pumping stations:

The WAJ side would complete the construction of new building facilities before delivery of the pump equipment to be procured in the Programme by Japanese side.

In this matter WAJ is now taking measures for the acquisition of the Budget. Total cost required for construction of new pump building and piping rearrangement is estimated as about 400,000JD. Among this total, 160,000JD can be disbursed from WAJ's remaining budget of the year 2009, and the balance of 240,000JD shall be allocated from the budget of the year 2010. Therefore, WAJ has already made application for additional budget from Ministry of Finance as shown in the Attachment-3 herewith.



5. Transmission line between Zarqa pumping station and Batrawi reservoir

The equipment such as pipes and accessories of the transmission line between Zarqa new pumping station and Batrawi reservoir of about 2.2 km will be procured by Japanese side, but installation work of the equipment shall be made by WAJ side.

6. Equipment for the transmission line to Khaw station

The existing air valves on the transmission pipelines from Azraq and Hallabat pumping stations to Khaw reservoir are deteriorated and not in functional. These valves shall be replaced in order to make assure transmission capacity by the pumps to be replaced in the Programme in Azraq and Hallabat pumping stations.

7. Equipment for the distribution network

The gate valves and air release valves requested for replacement of existing valves or additional installation in the distribution network shall be used under the condition of gravity flow system. Therefore only 16 bar of nominal pressure is required for the said equipment.

8. Delivery destination of the Equipment

The delivery destination of the Equipment to be procured in the Programme shall be at the WAJ's Central Warehouse of Ain Ghazal. WAJ side shall take proper measures to keep the space and good circumstances for the store of the Equipment until their installation.

9. Undertakings of the work to be taken by each side

The undertakings of the work to be taken by each side, Japanese and WAJ are confirmed as follows on the Equipment requested.

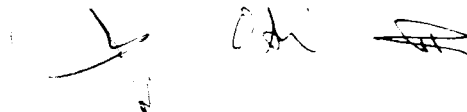
(1) Equipment for pumping station and flow meter

The Japanese side:

- Procurement and installation of pumping facilities such as pumps, motors, power receiving and distribution panels, control panels, cables, valves, pipes, fittings and accessories for the pumps
- Construction of the foundations required for installation of the above-mentioned pump equipments
- Removal of the existing pumping facilities to be replaced
- Procurement and replacement of electric transformer where middle voltage power reception is required
- Replacement of the existing electric transformer used for the facilities other than the Equipment to be procured by Japanese side to meet with the appropriate power capacity, if required
- Procurement, installation and setting of water meter excluding concrete chamber

WAJ side:

- Construction and improvement of buildings and its related facilities for the installation of pumps
- Translocation and improvement of piping within the site of pumping stations
- Preparation of the space for installation of pumps
- Construction of water meter concrete chamber, installation of short pipe and its connection with



existing pipeline and connection of electric power incoming line to the water meter distribution panel

(2) Equipment for transmission pipeline and distribution network

The Japanese side:

- Procurement of pipes and its accessories, gate valves, water meters and air valves
- Installation of water meters excluding concrete chamber

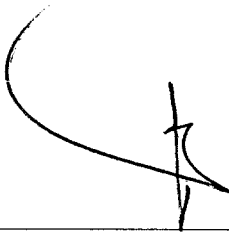
WAJ side:

- Installation of the equipment procured by Japanese side
- Construction of water meter concrete chamber and connection of electric power incoming line to the water meter device
- Repair of the existing concrete chamber of the air valve on the transmission pipeline

10. Environmental Impact Assessment (EIA)

WAJ is now under confirmation on necessity of the Environment Impact Assessment (EIA) for the implementation of the Programme to the Ministry of Environment, however WAJ's understanding is that EIA is not required for the Programme. Inquiring letter on EIA is as Attachment-4 herewith

Amman, 12th July 2009

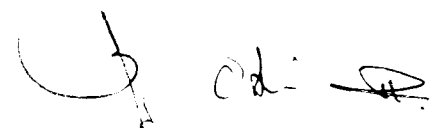


Eng. Bassam Saleh
Assistant Secretary General for Water Affairs,
Water Authority of Jordan (WAJ)
Ministry of Water and Irrigation
The Hashemite Kingdom of Jordan



Shigeo Otani
Chief Consultant
Kyowa Engineering Consultant Co., Ltd.
JICA Preparatory Survey Team

- Attachment 1: Revised List of Items Requested by the Government of Jordan
- Attachment 2: Installation Plan of Pumping Facilities
- Attachment 3: Application of the budget for the year 2010 on the construction of the Zarqa new pumping station
- Attachment 4: Inquiring letter on EIA




Revised List of Items Requested by the Government of Jordan (July 12, 2009)

Equipment	Diameter (inch)	Location	PN(bar)	Unit	Quantity
I. Procurement Lot 1					
1. Azraq Pumping Station					
Pump (Q=425m ³ /h, H=360m)	-	Azraq P.S. to Khaw P.S.	36	nos	5
Water Meter	24	Inlet pipeline from wells to reservoir	-	nos	2
Water Meter	24	Outlet pipeline to Khaw P.S.	-	nos	1
Water Meter	24	Khaw Reservoir : Inlet pipeline from Azraq P.S	-	nos	1
2. Hallabat Pumping Station (to Khaw)					
Pump (Q=500m ³ /h, H=135m)	-	Hallabat station to Khaw	14	nos	2
Water Meter	16	Inlet pipeline from wells to reservoir	-	nos	1
Water Meter	12	Inlet pipeline from wells to reservoir	-	nos	1
Water Meter	24	Outlet pipeline to Khaw P.S.	-	nos	1
Water Meter	24	Khaw Reservoir : Inlet pipeline from Hallabat P.S	-	nos	1
3. Zarqa Pumping Station					
Pump (Q=400m ³ /h, H=100m)	-	Zarqa P.S. to Batrawi Reservoir	16	nos	3
Ductile iron pipes	20	Transmission from Zarqa P.S. to Batrawi Reservoir	16	km	2.2
Water Meter	20	Zarqa P.S.: Outlet pipeline to Batrawi	-	nos	1
4. Khaw New Pumping Station					
Valve	16	Delivery Pipeline	16	nos	4
Valve	16	Suction Pipeline	16	nos	4
Valve	28	Delivery Pipeline	16	nos	1
Non-retaining Valve	16	Delivery Pipeline	16	nos	4
Water Meter	28	Outlet pipeline to Batrawi Reservoir	-	nos	1
5. Hallabat Pumping Station (to Hallabat Village)					
Pump (Q=200m ³ /h, H=148m)	-	Halabat station to Hallabat Village	15	nos	2
Water Meter	8	Outlet pipeline to Hallabat Village	-	nos	1
6. Air release valve on Transmission Pipe to Khaw and Water Meter					
Air release valve	4	Transmission Line from Azraq to Khaw	-	nos	40
Air release valve	4	Transmission Line from Hallabat to Khaw	-	nos	15
Water Meter	16	Transmission Line to Russeifa	16	nos	1
Water Meter	24	Khaw-Amman Pipeline: Awajan Junction	25	nos	1
II. Procurement Lot 2					
7. Transmission and Distribution Network					
Gate Valve	4	Zarqa network	16	nos	222
Gate Valve	6	Zarqa network	16	nos	69
Gate Valve	8	Zarqa network	16	nos	32
Gate Valve	12	Zarqa network	16	nos	13
Gate Valve	16	Zarqa network	16	nos	5
Gate Valve	24	Zarqa network	16	nos	2
Air release valve	2	Zarqa network	16	nos	15

Handwritten signature and initials at the bottom right of the page.

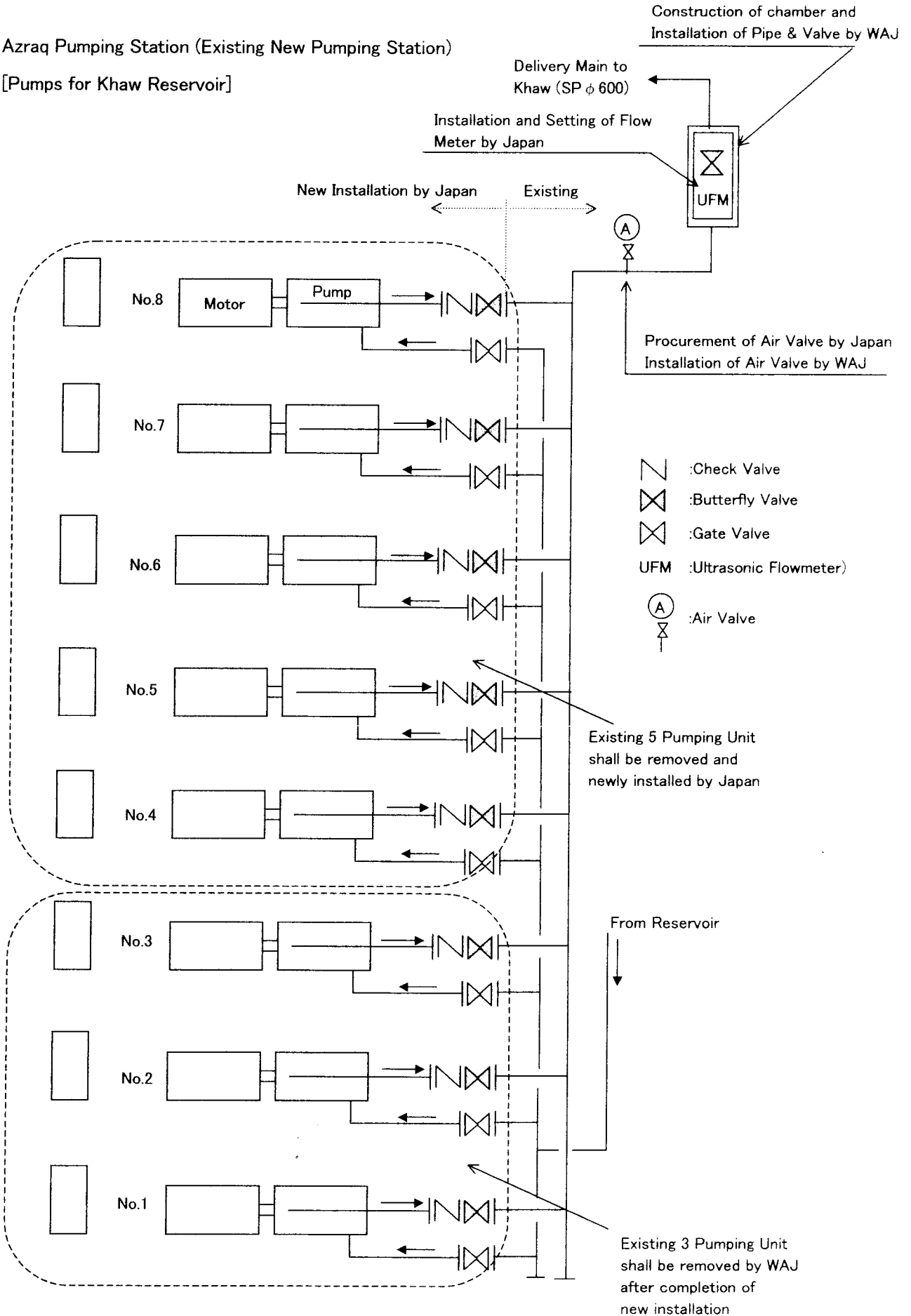
Attachement-2

Installation Plan of Pumping Facilities

4
C. S. W. 

1. Azraq Pumping Station (Existing New Pumping Station)

[Pumps for Khaw Reservoir]







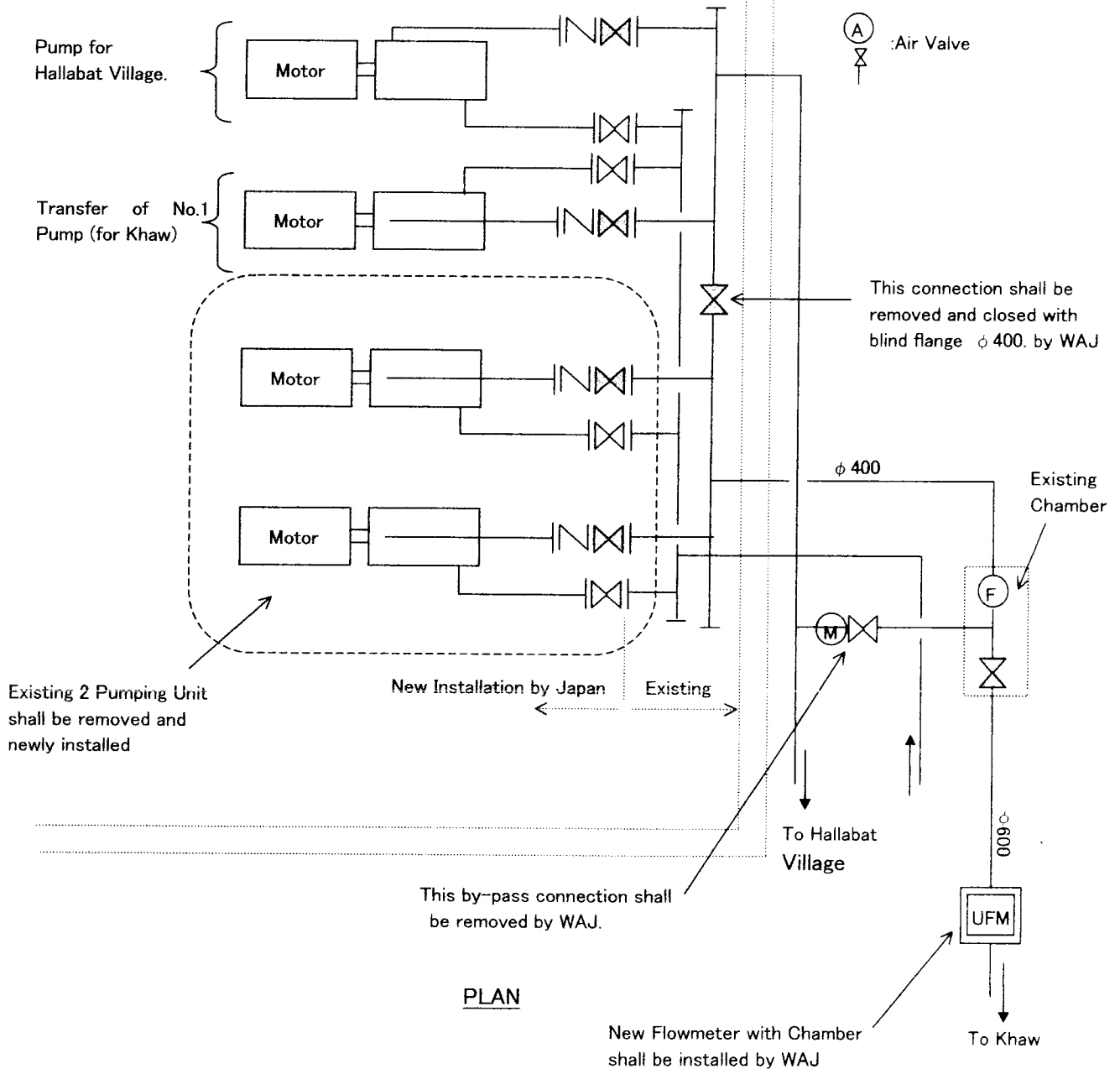
PLAN

Handwritten signature and initials

2. Hallabat Pumping Station

[Pumps for Khaw Reservoir]

-  :Check Valve
-  :Butterfly Valve
-  :Gate Valve
- UFM :Ultrasonic Flowmeter)
-  :Air Valve

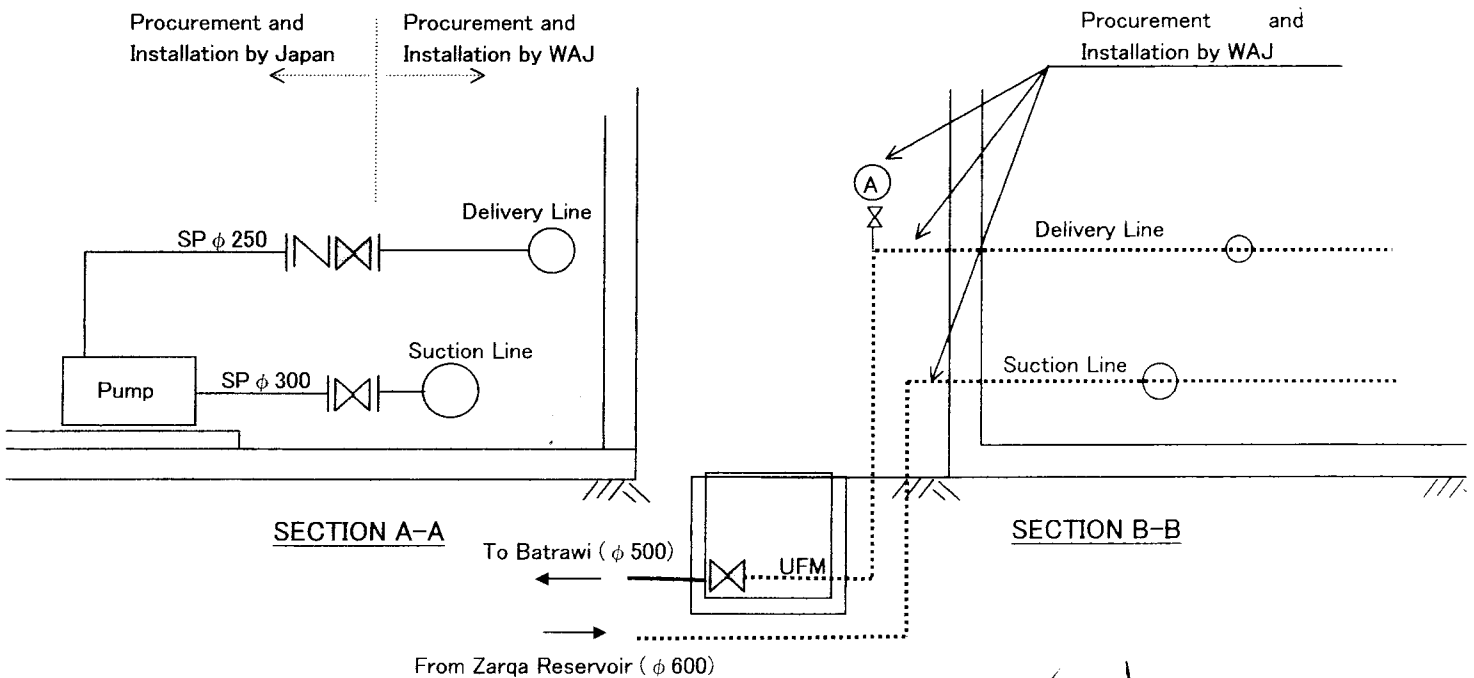
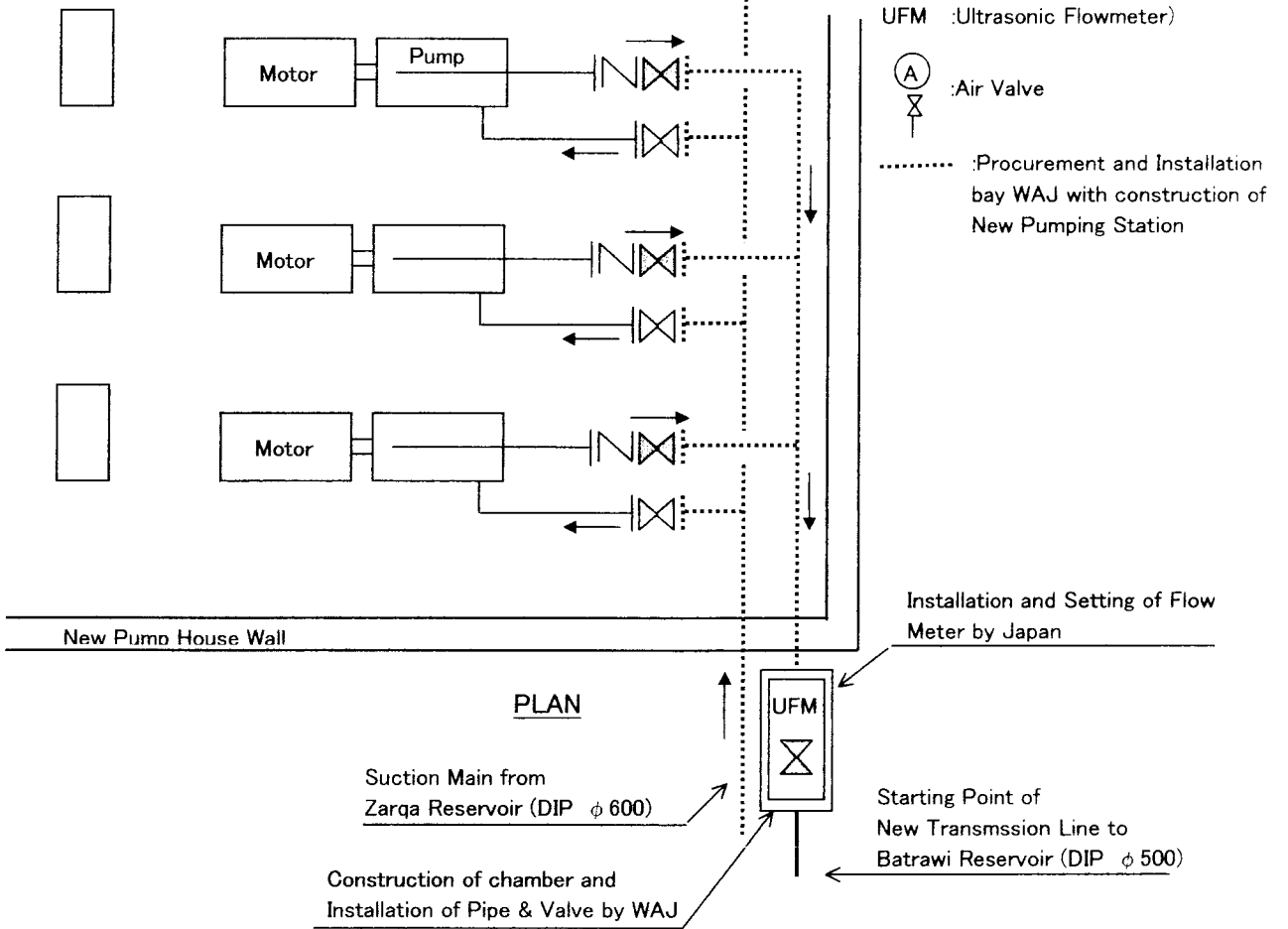


PLAN

[Handwritten signature and initials]

3. New Zarqa Pumping Station

[Pumps for Batrawi Reservoir]



Layout of Piping and Wiring Works, Zarqa New Pumping Station

Existing transformer

Existing Zarqa Pumping

DCIP 600mm:
Procurement and installation by
WAJ

DCIP 500m: Installation
by WAJ

Electric transmission cable prepared by
WAJ for pump No.1 - No.3

Electric transmission cable prepared by
WAJ for pump No.4 ----

Flow meter: installation and setting of flow
meter by Japan. Construction of chamber by
WAJ

Pumps: No1-No3
Procurement and
installation by Japan

Pumps: No4 ----
Procurement and
installation by WAJ

Electrical Panel
Room

Operators
Room

New Zarqa Pumping Station

Existing Zarqa Desalination

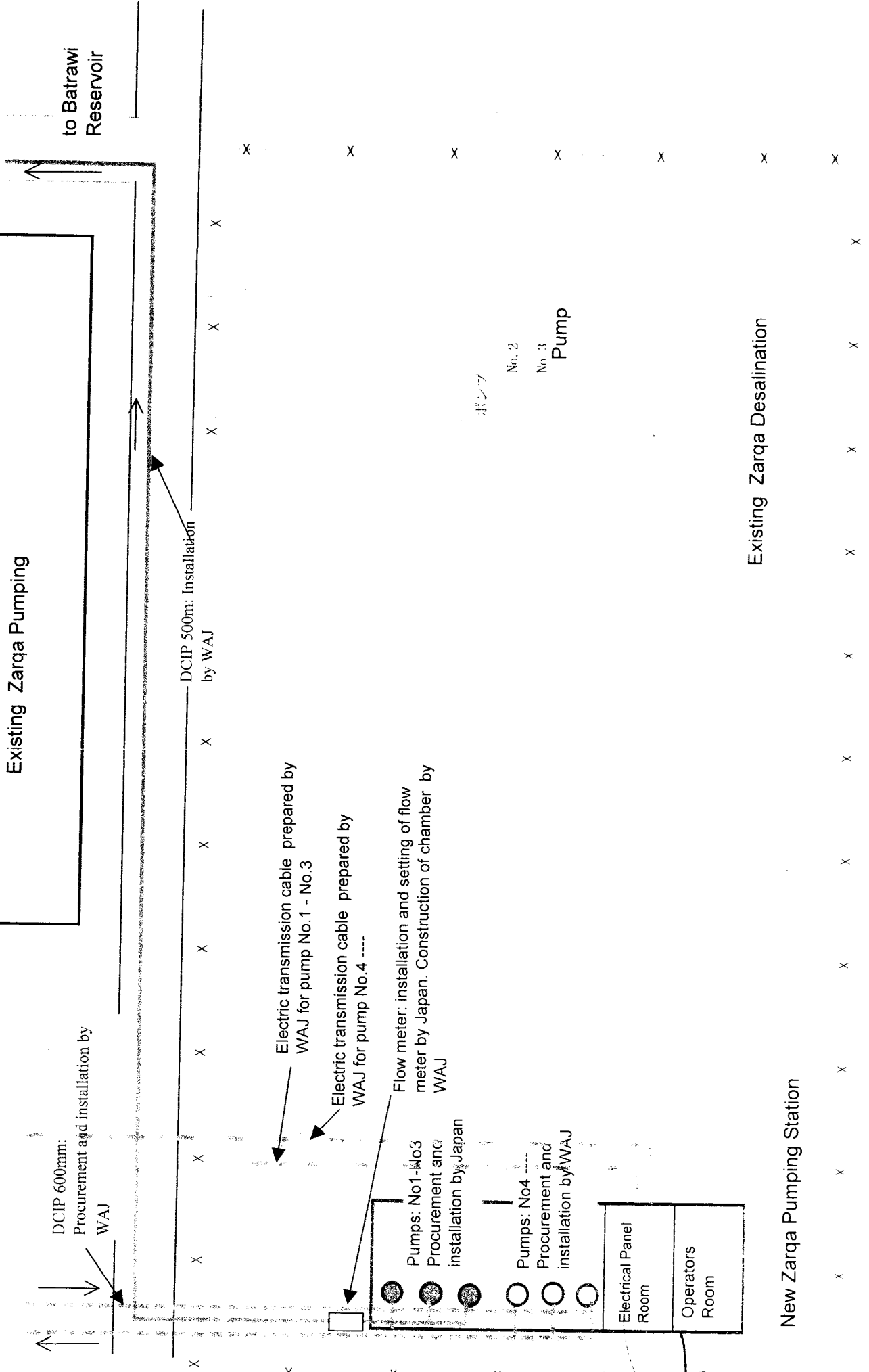
to Batrawi
Reservoir

ポンプ

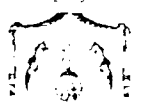
No.2

No.3

Pump



Handwritten signatures and initials at the bottom right of the page.



التاريخ

تاريخ الميزانية

جهة العطاء

محافظة اللوات

المركز وتركيب خط لبطول ٤٤ كم وخط ٥٠٠ مم من محطة
الزرقاء الجديدة وحتى خزان البراوي

اسم العطاء

هدف العطاء

كسب التزويد المائي لمحافظة الزرقاء / خطوط الناقلات لمحافظة الوسط

تمديد خط قطر ٥٠٠ مم لطول ٤٤ كم من محطة الزرقاء
وحسن خزان البراوي

موجز لوصف العمل

اولا :- تحديد مدى جاهزية كل من

مرحلة العطاء	الدراسات	وثائق العطاء	الطرح	الاحاله	تاريخ بداية التنفيذ
تاريخ الجاهزية المتوقع	جاهزة	جاهزة	جاهزة	جاهزة	الآن
كثافة العطاء المتوقعة	٤٤٤ مليون دينار (٥١٦٠٠٠)	مدة التنفيذ المتوقعة		٤ شهور	
الهدف الاستراتيجي	الهدف رقم (١): رفع الكفاءة وتطوير القدرة المؤسسية	الهدف رقم (٢): رفع مستوى خدمات المياه	الهدف رقم (٣): رفع مستوى خدمات الصرف الصحي		
رقم و اسم البرنامج	٨٠٠١ الادارة والخدمات المساندة	٨٠٠٢ المياه	٨٠٠٥ الصرف الصحي		

موازنة التمويل والتدفق النقدي

ثانيا :-

ملاحظات	تفاصيل العطاء				البيان
	المجموع	منحه	قرض	ذاتي	
	0				قيمة العطاء المتوقعه
	0			-	مطلوب ٢٠٠٩
	0			-	مطلوب ٢٠١٠
	0			٥٠٠,٠٠٠	مطلوب ٢٠١١
	0%		ذاتي	١٠٠	نسبة التمويل %
			ذاتي	ذاتي	اسم الجهة المموله

التدفق النقدي للعطاء خلال عام ٢٠٠٩

ثالثا :-

مطلوب ٢٠٠٩	الربع الاول	الربع الثاني	الربع الثالث	الربع الرابع	الاجمالي
ذاتي	-	-	-	-	0
قرض	-	-	-	-	0
منحه	-	-	-	-	0
الاجمالي	0	0	0	0	0

في حال وجود عطاء اشراف على العطاء اعلاه يتم الاشاره لذلك وتعبئة نموذج اخر لعطاء الاشراف وبخلاف ذلك بيان الدائرة المشرفه من سلطة المياه .

ملاحظة

توقيع مساعده الامين العام المختص

مدير الوحدة الادارية

معد البيانات التقديرية

.....

.....

.....



التاريخ ٢٠٠٩/٥/١٢

حجامة - فرع الرياض

محافظة تبوك - الزرقاء

إنشاء محطة ضخ جديدة للزرقاء

للمحافظة

محافظة تبوك - الزرقاء

هدف العطاء: تأمين التزويد المائي لمحافظة الزرقاء وتأمين الرضخ الصحي

موجز لوصف العمل لإنشاء محطة ضخ (٩ مدسخان) بمواقع محطة تحلية الزرقاء وتحديد خطوط قطر ٦٠٠ مم بطول ٢٠٠ متر داخله وإلوان خطوط قطر ٦٠٠ مم خارج بطول ٢٠٠ متر

تحدد مدى جاهزية كل من

ولا

مرحلة العطاء	الدراسات	وثائق العطاء	الطرح	الاحاله	تاريخ بداية التنفيذ
تاريخ الجاهزية المتوقع	جاهزة	جاهزة	٢٠٠٩/٩/١	٢٠٠٩/١١/١	٢٠٠٩/١٢/١
كفة العطاء المتوقعة	٤٠٠٠٠٠٠ دينار	٤٠٠٠٠٠٠٠ دينار	٤٠٠٠٠٠٠٠ دينار	٤٠٠٠٠٠٠٠ دينار	٤٠٠٠٠٠٠٠ دينار
الهدف الاستراتيجي	الهدف رقم (١): رفع الكفاءة وتطوير القدرة المؤسسية	الهدف رقم (٢): رفع مستوي خدمات المياه	الهدف رقم (٣): رفع مستوي خدمات الصرف الصحي		
رقم و اسم البرنامج	٨٠٠١ الإدارة والخدمات المساندة	٨٠٠٢ المياه	٨٠٠٥ الصرف الصحي		

موازنة التمويل والتدفق النقدي

ثانياً

تفاصيل العطاء					البيان
ملاحظات	المجموع	منحه	قرض	ذاتي	
	0			٤٠٠٠٠٠	قيمة العطاء المتوقعه
	0			١٦٠٠٠٠	مطلوب ٢٠٠٩
	0			٢٤٠٠٠٠	مطلوب ٢٠١٠
	0			-	مطلوب ٢٠١١
	0%			١٠٠%	نسبة التمويل
					اسم الجهة الممولة

التدفق النقدي للعطاء خلال عام ٢٠٠٩

ثالثاً

الاجمالي	الربع الرابع	الربع الثالث	الربع الثاني	الربع الاول	مطلوب ٢٠٠٩
0	١٦٠٠٠٠	-	-	-	ذاتي
0					قرض
0					منحه
0	0	0	0	0	الاجمالي

في حال وجود عطاء اشراف على العطاء اعلاه يتم الاشاره لذلك وتعبئة نموذج اخر لعطاء الاشراف وبخلاف ذلك بيان الدائره المشرفه من سلطة المياه.

ملاحظة

توقيع مساعدم الامين العام المختص

مدير الوحدة الادارية

معد البيانات التقديرية

資料5. 事業事前計画表(概略設計時)

1. 案件名
ヨルダン・ハシェミット王国 上水道エネルギー効率改善計画
2. 要請の背景(協力の必要性・位置付け)
<p>気候変動に関する政府間パネル (IPCC: Intergovernmental Panel on Climate Change) 第4次評価報告書によると、中東地域は気候変動により水利用可能性が減少する地域とされ、さらに飲料水の確保が困難になることが予測されている。そのため、ヨルダン国政府は気候変動対策を喫緊の課題として掲げており、温室効果ガスの排出削減と経済成長を両立させ、気候の安定化に貢献しようとする国を支援する我が国の枠組みである「クールアースパートナーシップ」への賛意を示している。</p> <p>本計画対象地域のザルカ県では、一人当たりの給水量が約140L/日(2007年統計)と他の地域と同様に非常に少ない。一方、無収水率が約56%以上と高く、ヨルダン国や各援助機関が無収水削減に向けた取り組みを実施している。</p> <p>我が国は、1994年から1996年に実施した開発調査「ザルカ地区上水道施設改善計画調査」の提言に基づき、2次にわたる無償資金協力「ザルカ地区上水道施設改善計画」を実施した。これらの支援により、送水管、配水池、配水幹線の整備を行うことにより配水池からの自然流下による配水システムへの切り替えを中心とする基幹水道施設の再編は完了する。</p> <p>しかしながら、配水区内での配水管理の更なる改善、老朽化したポンプの更新など、限りある水資源の有効利用と水供給の安定化という観点から継続的な対策が必要とされている。特に、ザルカ県の上水道施設は、ポンプの老朽化や不適切な維持管理などによって、故障の頻発や送配水能力の低下という問題を抱えている。また、ザルカ県は起伏の多い地形を有し、送配水システムにおいて多くのポンプを使用しなければならない状況に置かれているが、ヨルダン国は電力のほぼ全量を火力発電に依存しているため、老朽化した非効率なポンプの運転は電力消費を増大させるだけでなく、温室効果ガスの排出量の増加にもつながる恐れがある</p> <p>こうした中、ヨルダン政府は、気候変動対策支援の一環として、新たに日本国の無償資金協力のスキームとして平成20年度に導入された「環境プログラム無償資金協力」として、本案件を2008年8月に日本政府に要請した。その要請内容は、ザルカ県の上水道システムにおける送水ポンプの更新を始めとする機材調達と技術支援からなっている。上位目標は「送配水システムの適性化により消費エネルギーを節減し、気候変動の緩和に資する。」「気候変動に起因する降雨量の減少と飲料水確保の困難化に適応する。」とされる。</p>
3. プロジェクト全体計画概要
<p>*下線部: 本無償資金協力で直接関係する成果、活動及び投入</p> <p>(1) 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>本プロジェクトの実施により、ザルカ地区における送配水に係る消費エネルギーが節減され(緩和策)、ザルカ地区への送配水が安定化する(適応策)。さらに、既往の無償資金協力との相乗効果によって、エネルギー消費の節減に伴う二酸化炭素排出量の削減が達成される。</p> <p>(整備される送配水施設が直接対象とする給水対象人口: ザルカ北部 33.6万人 2010年推計値)</p>

(2) プロジェクト全体計画の成果(下線は本無償資金協力が直接関係する事項)

ポンプ施設、送水管、各種バルブを調達する。

ポンプ設備のエネルギー消費効率が改善する。

ザルカ地区の送配水システムの効率が改善する。

(3) プロジェクト全体計画の主要活動 (下線は本無償資金協力が直接関係する事項)

ポンプ設備・流量計を調達し、据付ける。

送水管・バルブを調達する。

送水管・バルブを据付ける。

ポンプ設備の運転・維持管理技術、送水システム運用管理技術を指導する。

ポンプ設備の運転・維持管理技術、送水システム運用管理技術の指導を受ける。

整備された設備を活用して計画的な送配水管理を行う。

(4) 投入(インプット) (下線は日本側投入)

日本側(=本案件):無償資金協力 11.31 億円

相手国側

- ・ 無償資金協力に対応する負担事項履行のために必要な経費
- ・ ポンプ場の運転維持管理に係る経費の確保及び人員の配置

(5) 実施体制

主管官庁 : 水・灌漑省(MWI)

実施機関 : ヨルダン水道庁 (WAJ)

4. 無償資金協力案件の内容

(1) サイト

ヨルダン国ザルカ県(アズラックポンプ場、ハラバットポンプ場、ザルカポンプ場、ハウポンプ場、ザルカ配水区)

(2) 概要

ポンプ設備の調達

アズラックポンプ場、ハラバットポンプ場、ザルカポンプ場

バルブ・流量計の調達

アズラックポンプ場、ハラバットポンプ場、ザルカポンプ場、ハウポンプ場、既設の送配水管

送水管の調達

ザルカポンプ場～バトラウィ配水池間 (約 2km、ダクティル铸铁管 600mm)

技術指導

- ・ ポンプ場の運転管理要員に対するポンプ運転・維持管理技術の指導(運用指導)
- ・ 送水システム管理者に対する送水システム運用管理技術の指導(ソフトコンポーネント)

(3) 相手国側負担事項

ザルカポンプ場の建設(建屋・場内配管)
送水管の布設 (ザルカポンプ場～パトラウィ配水池間)
流量計・バルブ用のコンクリートボックスの建設
バルブの据付(ハウポンプ場、既設の送配水管)
技術指導の受講

(4) 概算事業費

概算事業費 12.77 億円(無償資金協力 11.31 億円、ヨルダン側負担 1.46 億円)

(5) 工期

詳細設計・入札期間を含め約 36 ヶ月(予定)

(6) 貧困、ジェンダー、環境及び社会面の配慮

特になし。

5. 外部要因リスク

(1) 地下水量が急激に減少しない。

6. 過去の類似案件からの教訓の活用

特になし。

7. プロジェクト全体計画の事後評価に関わる提案

(1) プロジェクト全体計画の目標達成を示す成果指標

指標	現状(2009 年度)		計画(2012 年度)	
	運転効率 (%)	電力原単位 (kWh/m ³)	運転効率 (%)	電力原単位 (kWh/m ³)
アズラックポンプ場	57	1.88	68	1.58
ハラバットポンプ場(ハ ウ配水池向け)	57	0.62	68	0.52
ハラバットポンプ場(ハ ラバット村向け)	34	1.20	65	0.63
ザルカポンプ場	50	0.78	68	0.40

(2) その他の成果指標

計画流量を送水した場合の消費電力量が、本計画実施により 8,687 MWh/年削減される。

(3) 評価のタイミング

2012 年度末、計画完了時

資料 6. ソフトコンポーネント計画書

(1) ソフトコンポーネントを計画する背景

ザルカ地区上水道システムの改善計画については、JICAが策定したマスタープランに基づき2次にわたる日本の無償資金協力「ザルカ地区上水道施設改善計画」が実施され、送水管、配水池、配水幹線の整備が進められている。これにより配水効率の向上と、それに伴う配水エネルギーの節減が期待された。

本計画では、送水効率の向上と送水エネルギーの節減を図ることを目的に、主要な既存送水ポンプ場（アズラック、ハラバット、ザルカ）のポンプ設備の更新を行う。これにより、上記の無償資金協力との相乗効果を生み、ザルカ地区に対する、より安定的な給水と運転・維持管理経費の節減が可能となる。

ザルカ地区のポンプ場には、それぞれ運転要員が常駐し、さらに、保守管理のための機械・電気工が配属されている。しかし、ポンプ設備の運転・維持管理における問題点は多く、効率的な運転を妨げているだけでなく、頻繁な故障の発生や老朽化の進行を早める一因となっている。そのため、ポンプ設備が更新されても適正な運転・維持管理が行われず、計画の実施効果が損なわれる可能性が高い。

従って、本計画の実施効果を確実にするためには、送水ポンプ設備や流量計の調達を行うと同時に、整備されたポンプ設備を適性に運転・維持管理する能力強化のための技術指導及び適正な送水の運用とエネルギー効率の向上を図るための技術指導を、理論・実践の両面から行うことが必要である。

送水ポンプ設備運用上の現在の問題点は下記のとおりである。

運転管理上の問題

- ・ 運転員が、ポンプ始動時や停止時の操作、起動・停止のタイミング等のポンプ運転に関する正しい知識を持っていない。

保守管理上の問題

- ・ 設備に異常や損傷が発生した場合、迅速な補修が行われていない。
- ・ 日常点検が不十分なため、損傷が小規模な段階での補修が行われない。
- ・ 保守作業は、ポンプ・電動機等の回転機器摺動部への油脂類補給が定期的に行われているだけでその他予防保全を目的とした維持管理作業は行われていない。
- ・ 運転維持管理の記録は、日々の送水量、運転時間のみが記録されているだけである。保守点検や機器更新の記録がないため、いつ、どのような不具合や異常があったかが把握できない。

安全管理上の問題

- ・ 安全管理に対する理解が乏しく、災害防止、危機管理に対する技術が備わっていない。
- ・ 中圧受電に対する経験がない。

管理組織、管理指導上の問題

- ・ 運転管理を行う技師や技能工の人員が適正でなく補充の必要がある。また、中圧受電システム導入につき中圧電気設備取扱いの責任者が新規に任命される必要がある。
- ・ 体系的な運転・維持管理マニュアルが存在しないため、運転員や技能工は各自の経験に頼った作業しか行うことができない。
- ・ 技師、技能工、運転員に対する技術指導が体系的に行われていない。臨時的に中央訓練センター（VTC）や中央修理工場（CWS）による研修はあるが、概論的あるいは断片的な範疇にとどまっている。

- ・ 運転の記録は限定的なもの(稼働ポンプ番号、ポンプ吐出流量、吐出圧力、配水池水位、塩素注入量)にとどまり、その記録も、整理、分析、活用がされていない。

送水システム管理上の問題

- ・ 各ポンプ場は定時運転、送水先の貯水タンクの水位状況による運転しかしておらず、送配水システム全体の配分を考慮した運転方法が採られていない。
- ・ 送水効率、電力使用効率、ポンプ効率を基にしたポンプの運転状況の診断が行えていない。
- ・ エネルギー消費量の削減を念頭においた施設運転及び整備が行われていない。

上記の ~ の問題点の対応については、ポンプ据付後の調達業者による初期操作・運用指導による技術指導を行う。についてはソフトコンポーネントの実施により対処する。

(2) ソフトコンポーネントの目標

適正な送水システムの運転管理を行うことにより、配水需要量(配水池の需要)に応じた送水の効率化、安定化が行われ、エネルギー利用の節減が図られる。また、ポンプ送水量、ポンプ運転の電圧、電流、電力使用量等の運転管理データを記録し、整理・分析してポンプ運転状況の診断を行うことは、効率的なポンプの運用とエネルギー利用の節減のために効果的である。

(3) ソフトコンポーネントの成果

ザルカ支所の上水道システム管理者(エンジニア)が送水システム全体における総合的な送水管理や、エネルギー効率を意識した送水ポンプ設備の運転を行えるようになる。また、ポンプ設備の運転効率を基にした保全管理を行うことができるようになる。

(4) 成果達成度の確認方法

指導項目における最終目標を設定し、内容毎に指導担当者がチェックを行い、技術移転の理解度の最終確認を行う。最終確認においては指導対象者に作業を演習させ、その結果を評価する。

表 1 ソフトコンポーネント最終目標

指導事項	最終目標
送水システム運用管理	送配水計画に応じたポンプの運転計画の策定 運転管理記録の分析、ポンプ運転効率の評価 ポンプ送水システム管理マニュアルの完成

(5) ソフトコンポーネントの活動(投入計画)

ソフトコンポーネントの活動対象者は、ヨルダン水道庁(以下、WAJ: Water Authority of Jordan)の送水システムの運転を統括する水道部部长、ポンプ課課長及びそのスタッフ(技師、技能工)とする。

表 2 ソフトコンポーネントの概要

支援内容	活動項目	活動対象者
送水システム運用管理	効率的な送水計画の策定指導 ポンプ設備の運転効率診断技術指導	ザルカ支所の上水道システム管理者(水道部部长 1、ポンプ課課長 1、機械設備技師 1、電気設備技師 1)、アズラック(管理責任者 1)、技能工 6

派遣要員を本邦コンサルタント(送水システム運用技術)1名とする。

調達業者は、据付が完了した設備の試運転・調整を行った後、引き続き、各設備、機材の初期操作指導、運転管理、保守管理、安全管理に関する技術指導を実施する。コンサルタントはこの後にソフトコンポーネントとして技術支援を行う。ソフトコンポーネントの実施期間は国内0.25ヶ月、現地0.27ヶ月を予定する。なお、コンサルタントは初期操作・運用指導管理業務に継続して、本ソフトコンポーネントを現地で実施するため、日本からヨルダンへの移動日数は現地期間に計上されていない。そのため現地期間0.27ヶ月(8日間)の内訳は、現地活動6日間とヨルダンから日本への移動日2日間を加えたものである。

本計画の実施機関はWAJであることから、実施方法及び内容につきWAJと協議した上で、WAJの研修指導関係者立会のもとで実施する。ソフトコンポーネントは本計画における機材調達対象の各ポンプ場で順次実施する。ソフトコンポーネントの活動内容を下表に示す。

表3 ソフトコンポーネント活動内容と作業日数

項目	活動内容	日数
国内準備作業	講義・演習計画の策定、マニュアル・講義、演習計画資料の作成	5日
現地活動 (対象者:システム管理者)	1)送水システム運用技術: ポンプによる送水理論、運転管理記録の整理、運転記録の分析、 運転状況の診断、報告書作成実習	3日
	2)ポンプ設備効率診断技術: ポンプ運転効率、電力原単位、使用電力量の評価方法 3)アズラック、ハラバット、ザルカの各ポンプ場における演習	
	ソフトコンポーネント完了報告書の作成、管理に関する助言、マニュアルの完成	2日
	WAJに対する報告	1日

(6) ソフトコンポーネントの実施リソースの調達方法

水道システムのコンセプトを熟知したコンサルタントがポンプ場の運用計画の立案と実践において技術支援を行う。

(7) ソフトコンポーネントの実施工程

各送水ポンプ場におけるポンプ設備の据付が完了した後、機材調達業者による試運転・調整、設備の初期操作指導・運用指導がアズラック、ハラバット、ザルカの各送水ポンプ場において順次行われる。ソフトコンポーネントは、これらの技術指導が全て完了し、本計画において更新された設備全てが運用できる状況になった後に直ちに実施する。実施工程を次図に示す。

作業項目	実施者	実日数 (日)	2011年			2012年							
			10月	11月	12月	1月	2月	3月	4月	5月	6月		
ポンプ据付工事					アズラックポンプ場	ハラバットポンプ場	ハラバットポンプ場	ハラバットポンプ場	ハラバットポンプ場				
ザルカ - バトラウィ送水管敷設工事					ザルカポンプ場								
1. 初期操作・運用指導													
講義、演習用資料、管理マニュアル、記録様式の作成	調達業者	10		10									
実施機関との打合せ、作業準備	調達業者	1			1								
全体システム管理理論	調達業者	2			2								
運転管理技術指導	調達業者	7×4			7	7	7	7	7				
安全管理技術指導	調達業者	1			1								
保守管理技術(点検整備)指導	調達業者	7×4			7	7	7	7	7				
保守管理技術(修理)指導	調達業者	7			7								
運転・維持管理マニュアル、管理記録ファオームの完成	調達業者	2×4			2	2	2	2	2				
初期操作・運用指導管理	コンサルタント	20, 16, 16, 23			20	16	16	23					
2. ソフトコンポーネント													
講義、演習用資料、管理マニュアル、記録様式の作成	コンサルタント	5						5					
送水システム運用技術指導	コンサルタント	3											
完了報告書作成	コンサルタント	2											
実施機関への報告	コンサルタント	1											

項目	作業担当	2011年			2012年							
		10月	11月	12月	1月	2月	3月	4月	5月	6月		
ソフトコンポーネント (コンサルタント)	送水システム運用技術						5(0.25)	8(0.27)				
	車両							6(0.20)				

注：日本とヨコ間の移動日を4日見込む、()内数字はM/M

図 1 ソフトコンポーネントの技術者派遣計画（調達業者による初期操作・運用指導工程を含む）

(8) ソフトコンポーネントの成果品

成果品として下記の書類を作成し WAJ 側に提出する。使用言語は英語とする。

- ポンプ送水システム管理マニュアル
- 講義、演習用資料
- ソフトコンポーネント完了報告書

(9) ソフトコンポーネントの概算事業費

ソフトコンポーネントの概算事業費は、下表に示すとおり、1,486,000 円である。また、内訳書は別添のとおりである。

表 4 ソフトコンポーネント概算事業費

項目	現地貨		米ドル		日本円	合計(円)
	JD	円換算	USD	円換算		
直接人件費	0	0	0	0	408,000	408,000
直接経費	55.41	7,000	505.02	48,000	500,000	555,000
間接費	0	0	0	0	523,000	523,000
合計	55.41	7,000	505.02	48,000	1,431,000	1,486,000

為替レート：1JD=136.65 円、1USD=96.59 円

(10) 相手国実施機関の責務

ソフトコンポーネント活動による効果やその持続性を高めるため、また、活動を円滑に実施するためにヨルダン国側の負担で実施すべき事項は以下のとおりである。

- ・ ソフトコンポーネントのカウンターパートの任命
- ・ 運転・維持管理記録の整理、分析のために使用するパソコン 2 式の購入
- ・ ソフトコンポーネント活動実施後の施設運営及び維持管理にかかる持続性維持のためのモニタリング及びフォローアップ

7. 参考資料

7-1 送水管水理計算表

7-2 水撃圧の簡易計算書

7-3 ベースラインデータ

7-1 送水管水理計算表

- (1) アズラック-ハウ送水管
- (2) ハラバット-ハウ送水管
- (3) ザルカ-バトラウイ送水管

Azraq-Khaw Transmission Pipeline

New Station G.L. 552.50 m

Design Flow: 1,700 m³/h Reservoir L.W.L. 563.00 m

Coefficient of Roughness: 125 Pumping Head: 360.00 m

Sta.	Invert Level or G.L. (m)	Parcial Dist. (m)	Accum. Dist. (m)	Flow (L/s)	Hydraulic Grade	Friction Head Loss (m)	Hydraulic Grade Line (m)	Dynamic Head (m)	Internal Dia. (mm)	Velocity (m/s)	Water Hammer (m)	Remark
Tank	563.00	0.00	0.00				923.00					LWL=563m
Pump	553.00	250.00	250.00	472	0.00470	1.17539	921.82	368.82	587	1.744	221.29	G.L.+0.5m. Pipeline 250m
Road	562.50	270.00	520.00	472	0.00470	1.26942	920.56	358.06	587	1.744	214.83	Internal Pipeline 270m
149	562.05	86.70	606.70	472	0.00470	0.40763	920.15	358.10	587	1.744	214.86	Air Valve No.1 ↑
151	561.67	35.56	642.26	472	0.00470	0.16719	919.98	358.31	587	1.744	214.99	
155	558.04	207.32	849.58	472	0.00470	0.97473	919.01	360.97	587	1.744	216.58	
158	553.48	179.28	1028.86	472	0.00470	0.84290	918.16	364.68	587	1.744	218.81	
161	554.82	166.56	1195.42	472	0.00470	0.78309	917.38	362.56	587	1.744	217.54	
163	557.54	154.10	1349.52	472	0.00470	0.72451	916.66	359.12	587	1.744	215.47	Air Valve No.2
166	553.01	90.74	1440.26	472	0.00470	0.42662	916.23	363.22	587	1.744	217.93	
172	553.63	347.01	1787.27	472	0.00470	1.63149	914.60	360.97	587	1.744	216.58	
175	556.42	172.07	1959.34	472	0.00470	0.80900	913.79	357.37	587	1.744	214.42	Air Valve No.3
178	554.58	118.00	2077.34	472	0.00470	0.55479	913.23	358.65	587	1.744	215.19	
179	554.67	81.00	2158.34	472	0.00470	0.38083	912.85	358.18	587	1.744	214.91	Air Valve No.4
180	554.35	40.00	2198.34	472	0.00470	0.18806	912.66	358.31	587	1.744	214.99	
182	548.74	117.01	2315.35	472	0.00470	0.55013	912.11	363.37	587	1.744	218.02	NP40
185	548.11	126.17	2441.52	472	0.00470	0.59320	911.52	363.41	587	1.744	218.05	
186	548.89	48.73	2490.25	472	0.00470	0.22911	911.29	362.40	587	1.744	217.44	
190	558.75	154.03	2644.28	472	0.00470	0.72418	910.57	351.82	587	1.744	211.09	
191	559.13	85.78	2730.06	472	0.00470	0.40330	910.16	351.03	587	1.744	210.62	Air Valve No.5
196	553.27	299.29	3029.35	472	0.00470	1.40713	908.76	355.49	587	1.744	213.29	
201	557.46	282.44	3311.79	472	0.00470	1.32791	907.43	349.97	587	1.744	209.98	Air Valve No.6
247	538.32	2536.59	5848.38	472	0.00470	11.92596	895.50	357.18	587	1.744	214.31	
279	555.10	2834.34	8682.72	472	0.00470	13.32586	882.18	327.08	587	1.744	196.25	Air Valve No.7
308	581.18	1906.55	10589.27	472	0.00470	8.96378	873.21	292.03	587	1.744	175.22	
310	590.28	180.79	10770.06	472	0.00470	0.85000	872.36	282.08	587	1.744	169.25	
311	599.17	110.42	10880.48	472	0.00470	0.51915	871.84	272.67	587	1.744	163.60	
312	600.29	60.19	10940.67	472	0.00470	0.28299	871.56	271.27	587	1.744	162.76	Air Valve No.8
318	583.00	335.63	11276.30	472	0.00470	1.57799	869.98	286.98	587	1.744	172.19	↑
321	582.53	165.97	11442.27	472	0.00470	0.78032	869.20	286.67	587	1.744	172.00	
341	592.00	106.00	11548.27	472	0.00470	0.49837	868.70	276.70	587	1.744	166.02	
342	594.82	92.40	11640.67	472	0.00470	0.43443	868.27	273.45	587	1.744	164.07	
345	602.73	71.64	11712.31	472	0.00470	0.33682	867.93	265.20	587	1.744	159.12	
347	605.22	94.43	11806.74	472	0.00470	0.44397	867.49	262.27	587	1.744	157.36	Air Valve No.9, Replaced by WAJ
350	597.35	50.53	11857.27	472	0.00470	0.23757	867.25	269.90	587	1.744	161.94	
351	596.63	42.00	11899.27	472	0.00470	0.19747	867.05	270.42	587	1.744	162.25	
365	604.05	1820.42	13719.69	472	0.00470	8.55884	858.50	254.45	587	1.744	152.67	
366	606.73	49.58	13769.27	472	0.00470	0.23310	858.26	251.53	587	1.744	150.92	
371	602.02	202.76	13972.03	472	0.00470	0.95329	857.31	255.29	587	1.744	153.17	
380	613.62	422.24	14394.27	472	0.00470	1.98519	855.32	241.70	587	1.744	145.02	No.8-No.10は、WAJにより交換。
386	617.67	274.99	14669.26	472	0.00470	1.29289	854.03	236.36	587	1.744	141.82	
395	628.54	523.50	15192.76	472	0.00470	2.46127	851.57	223.03	587	1.744	133.82	↑
398	636.89	151.69	15344.45	472	0.00470	0.71318	850.86	213.97	587	1.744	128.38	
401	658.45	178.23	15522.68	472	0.00470	0.83796	850.02	191.57	587	1.744	114.94	↓
403	661.11	80.74	15603.42	472	0.00470	0.37961	849.64	188.53	587	1.744	113.12	Air Valve No.10, No.11
406	658.31	151.82	15755.24	472	0.00470	0.71379	848.93	190.62	587	1.744	114.37	Replaced by WAJ
408	651.13	136.74	15891.98	472	0.00470	0.64289	848.28	197.15	587	1.744	118.29	
412	644.70	274.94	16166.92	472	0.00470	1.29265	846.99	202.29	587	1.744	121.37	
416	649.39	231.04	16397.96	472	0.00470	1.08625	845.90	196.51	587	1.744	117.91	Air Valve No.12
417	648.70	38.68	16436.64	472	0.00470	0.18186	845.72	197.02	587	1.744	118.21	
419	643.15	81.25	16517.89	472	0.00470	0.38200	845.34	202.19	587	1.744	121.31	
420	639.60	94.82	16612.71	472	0.00470	0.44580	844.89	205.29	587	1.744	123.18	
436	630.97	859.80	17472.51	472	0.00470	4.04241	840.85	209.88	587	1.744	125.93	NP25
439	633.60	162.16	17634.67	472	0.00470	0.76241	840.09	206.49	587	1.744	123.89	
441	635.50	125.64	17760.31	472	0.00470	0.59071	839.50	204.00	587	1.744	122.40	Air Valve No.13
443	634.70	80.00	17840.31	472	0.00470	0.37613	839.12	204.42	587	1.744	122.65	
445	630.90	181.81	18022.12	472	0.00470	0.85479	838.27	207.37	587	1.744	124.42	
463	626.43	1038.93	19061.05	472	0.00470	4.88461	833.38	206.95	587	1.744	124.17	
464	625.04	47.61	19108.66	472	0.00470	0.22384	833.16	208.12	587	1.744	124.87	
498	611.80	1944.07	21052.73	472	0.00470	9.14019	824.02	212.22	587	1.744	127.33	
505	613.56	391.17	21443.90	472	0.00470	1.83911	822.18	208.62	587	1.744	125.17	Air Valve No.14
510	612.50	319.37	21763.27	472	0.00470	1.50154	820.68	208.18	587	1.744	124.91	↓
514	613.82	153.00	21916.27	472	0.00470	0.71934	819.96	206.14	587	1.744	123.68	
541	628.07	1700.83	23617.10	472	0.00470	7.99658	811.96	183.89	587	1.744	110.34	Air Valve No.15
547	623.01	387.17	24004.27	472	0.00470	1.82031	810.14	187.13	587	1.744	112.28	
567	628.60	1083.00	25087.27	472	0.00470	5.09180	805.05	176.45	587	1.744	105.87	Air Valve No.16
570	628.18	200.00	25287.27	472	0.00470	0.94031	804.11	175.93	587	1.744	105.56	
580	627.60	490.00	25777.27	472	0.00470	2.30377	801.81	174.21	587	1.744	104.52	
590	622.65	510.00	26287.27	472	0.00470	2.39780	799.41	176.76	587	1.744	106.06	
610	612.90	1097.00	27384.27	472	0.00470	5.15763	794.25	181.35	587	1.744	108.81	

Sta.	Invert Level or G.L (m)	Parcial Dist. (m)	Accum. Dist. (m)	Flow (L/s)	Hydraulic Grade	Friction Head Loss (m)	Hydraulic Grade Line (m)	Dynamic Head (m)	Internal Dia. (mm)	Velocity (m/s)	Water Hammer (m)	Remark
1086	640.03	105.71	53646.42	472	0.00470	0.49700	670.78	30.75	587	1.744	30.75	Air Valve No.38
1090	635.47	180.85	53827.27	472	0.00470	0.85028	669.93	34.46	587	1.744	34.46	Air Valve No.39
1093	635.30	147.62	53974.89	472	0.00470	0.69405	669.23	33.93	587	1.744	33.93	
1096	632.74	168.10	54142.99	472	0.00470	0.79033	668.44	35.70	587	1.744	35.70	
1098	627.46	54.90	54197.89	472	0.00470	0.25812	668.18	40.72	587	1.744	40.72	Air Valve No.40
1144	598.34	2641.78	56839.67	472	0.00470	12.42052	655.76	57.42	587	1.744	45.00	
1189	585.85	2497.84	59337.51	472	0.00470	11.74378	644.02	58.17	587	1.744	45.00	
1198	586.85	434.31	59771.82	472	0.00470	2.04194	641.98	55.13	587	1.744	45.00	
1219	581.39	1027.40	60799.22	472	0.00470	4.83040	637.15	55.76	587	1.744	45.00	
1229	590.71	503.77	61302.99	472	0.00470	2.36851	634.78	44.07	587	1.744	44.07	Air Valve No.41
1248	580.35	1001.72	62304.71	472	0.00470	4.70966	630.07	49.72	587	1.744	45.00	
1250	583.03	83.75	62388.46	472	0.00470	0.39376	629.68	46.65	587	1.744	45.00	Air Valve No.42
1260	575.44	549.15	62937.61	472	0.00470	2.58187	627.09	51.65	587	1.744	45.00	
1265	576.85	252.50	63190.11	472	0.00470	1.18715	625.91	49.06	587	1.744	45.00	
1267	585.60	141.81	63331.92	472	0.00470	0.66673	625.24	39.64	587	1.744	39.64	Air Valve No.43
1273	573.00	255.35	63587.27	472	0.00470	1.20055	624.04	51.04	587	1.744	45.00	
1281	575.67	209.04	63796.31	472	0.00470	0.98282	623.06	47.39	587	1.744	45.00	
1283	580.46	143.46	63939.77	472	0.00470	0.67449	622.38	41.92	587	1.744	41.92	
Khaw	611.00	317.50	64257.27	472	0.00470	1.49275	620.89	9.89	587	1.744	9.89	
Total						302.11						

Hallabat-Khaw Transmission Pipeline

Total Flow: 1,700 m³/h Station G.L. 593.20 m

Hallabat Design Flow: 500 m³/h Reservoir L.W.L. 593.80 m

Coefficient of Roughness: 122 Pumping Head: 135.00 m (By Requested Capacity)

Sta.	Invert Level. (m)	Partial Dist. (m)	Accum. Dist. (m)	Flow (L/s)	Hydraulic Grade	Friction Head Loss (m)	Hydraulic Grade Line (m)	Dynamic Head (m)	Nominal Dia. (mm)	Velocity (m/s)	Water Hammer (m)	Remark
Tank	593.80	0.00	0.00				728.80					LWL594m
Pump	593.70	50.00	50.00	139	0.00051	0.02562	728.77	135.07	587	0.514	81.04	G.L.+0.5m, Pipeline 50m
1	591.92	50.00	100.00	139	0.00051	0.02562	728.75	136.83	587	0.514	82.10	
2	591.79	75.00	175.00	139	0.00051	0.03842	728.71	136.92	587	0.514	82.15	
3	592.25	25.00	200.00	139	0.00051	0.01281	728.70	136.45	587	0.514	81.87	
4	592.09	25.00	225.00	139	0.00051	0.01281	728.68	136.59	587	0.514	81.96	
5	592.47	75.00	300.00	139	0.00051	0.03842	728.65	136.18	587	0.514	81.71	
6	593.12	25.00	325.00	139	0.00051	0.01281	728.63	135.51	587	0.514	81.31	
7	593.07	100.00	425.00	139	0.00051	0.05123	728.58	135.51	587	0.514	81.31	
8	592.42	150.00	575.00	139	0.00051	0.07685	728.51	136.09	587	0.514	81.65	
9	593.09	225.00	800.00	139	0.00051	0.11527	728.39	135.30	587	0.514	81.18	
10	593.27	50.00	850.00	139	0.00051	0.02562	728.36	135.09	587	0.514	81.06	
11	593.53	25.00	875.00	139	0.00051	0.01281	728.35	134.82	587	0.514	80.89	
12	593.68	25.00	900.00	139	0.00051	0.01281	728.34	134.66	587	0.514	80.80	Connection with Corridor Line
13	594.20	75.00	975.00	472	0.00492	0.36931	727.97	133.77	587	1.745	80.26	
14	593.98	25.00	1000.00	472	0.00492	0.12310	727.85	133.87	587	1.745	80.32	
15	594.73	25.00	1025.00	472	0.00492	0.12310	727.72	132.99	587	1.745	79.80	
16	594.20	25.00	1050.00	472	0.00492	0.12310	727.60	133.40	587	1.745	80.04	
17	594.56	125.00	1175.00	472	0.00492	0.61551	726.98	132.42	587	1.745	79.45	
18	595.51	25.00	1200.00	472	0.00492	0.12310	726.86	131.35	587	1.745	78.81	
19	594.58	25.00	1225.00	472	0.00492	0.12310	726.74	132.16	587	1.745	79.30	
20	594.97	50.00	1275.00	472	0.00492	0.24621	726.49	131.52	587	1.745	78.91	
21	597.19	425.00	1700.00	472	0.00492	2.09275	724.40	127.21	587	1.745	76.33	
22	597.48	25.00	1725.00	472	0.00492	0.12310	724.28	126.80	587	1.745	76.08	
23	597.65	100.00	1825.00	472	0.00492	0.49241	723.78	126.13	587	1.745	75.68	
24	597.54	25.00	1850.00	472	0.00492	0.12310	723.66	126.12	587	1.745	75.67	
25	598.91	275.00	2125.00	472	0.00492	1.35413	722.31	123.40	587	1.745	74.04	
26	598.62	50.00	2175.00	472	0.00492	0.24621	722.06	123.44	587	1.745	74.06	
27	602.47	175.00	2350.00	472	0.00492	0.86172	721.20	118.73	587	1.745	71.24	
28	602.75	25.00	2375.00	472	0.00492	0.12310	721.08	118.33	587	1.745	71.00	
29	603.75	125.00	2500.00	472	0.00492	0.61551	720.46	116.71	587	1.745	70.03	Air Valve No.1
30	604.18	75.00	2575.00	472	0.00492	0.36931	720.09	115.91	587	1.745	69.55	
31	601.86	150.00	2725.00	472	0.00492	0.73862	719.35	117.49	587	1.745	70.50	
32	601.32	50.00	2775.00	472	0.00492	0.24621	719.11	117.79	587	1.745	70.67	
33	601.64	50.00	2825.00	472	0.00492	0.24621	718.86	117.22	587	1.745	70.33	
34	601.47	25.00	2850.00	472	0.00492	0.12310	718.74	117.27	587	1.745	70.36	
35	602.06	75.00	2925.00	472	0.00492	0.36931	718.37	116.31	587	1.745	69.78	
36	602.50	125.00	3050.00	472	0.00492	0.61551	717.75	115.25	587	1.745	69.15	
37	602.83	75.00	3125.00	472	0.00492	0.36931	717.38	114.55	587	1.745	68.73	
38	602.87	25.00	3150.00	472	0.00492	0.12310	717.26	114.39	587	1.745	68.63	
39	603.78	100.00	3250.00	472	0.00492	0.49241	716.77	112.99	587	1.745	67.79	
40	603.80	75.00	3325.00	472	0.00492	0.36931	716.40	112.60	587	1.745	67.56	
41	603.35	125.00	3450.00	472	0.00492	0.61551	715.78	112.43	587	1.745	67.46	
42	602.90	50.00	3500.00	472	0.00492	0.24621	715.54	112.64	587	1.745	67.58	
43	603.33	25.00	3525.00	472	0.00492	0.12310	715.41	112.08	587	1.745	67.25	
44	601.04	25.00	3550.00	472	0.00492	0.12310	715.29	114.25	587	1.745	68.55	
45	600.03	50.00	3600.00	472	0.00492	0.24621	715.04	115.01	587	1.745	69.01	
46	601.07	25.00	3625.00	472	0.00492	0.12310	714.92	113.85	587	1.745	68.31	
47	600.03	25.00	3650.00	472	0.00492	0.12310	714.80	114.77	587	1.745	68.86	
48	600.32	25.00	3675.00	472	0.00492	0.12310	714.67	114.35	587	1.745	68.61	
49	602.60	50.00	3725.00	472	0.00492	0.24621	714.43	111.83	587	1.745	67.10	
50	602.88	50.00	3775.00	472	0.00492	0.24621	714.18	111.30	587	1.745	66.78	
51	603.93	50.00	3825.00	472	0.00492	0.24621	713.94	110.01	587	1.745	66.00	
52	603.88	25.00	3850.00	472	0.00492	0.12310	713.81	109.93	587	1.745	65.96	
53	602.57	75.00	3925.00	472	0.00492	0.36931	713.44	110.87	587	1.745	66.52	
54	606.97	100.00	4025.00	472	0.00492	0.49241	712.95	105.98	587	1.745	63.59	
55	607.05	25.00	4050.00	472	0.00492	0.12310	712.83	105.78	587	1.745	63.47	Air Valve No.2
56	606.09	50.00	4100.00	472	0.00492	0.24621	712.58	106.49	587	1.745	63.90	
57	605.16	25.00	4125.00	472	0.00492	0.12310	712.46	107.30	587	1.745	64.38	
58	604.91	25.00	4150.00	472	0.00492	0.12310	712.34	107.43	587	1.745	64.46	
59	606.28	150.00	4300.00	472	0.00492	0.73862	711.60	105.32	587	1.745	63.19	
60	607.38	50.00	4350.00	472	0.00492	0.24621	711.35	103.97	587	1.745	62.38	
61	605.94	75.00	4425.00	472	0.00492	0.36931	710.98	105.04	587	1.745	63.02	
62	606.23	50.00	4475.00	472	0.00492	0.24621	710.74	104.51	587	1.745	62.70	
63	606.24	50.00	4525.00	472	0.00492	0.24621	710.49	104.25	587	1.745	62.55	
64	606.06	75.00	4600.00	472	0.00492	0.36931	710.12	104.06	587	1.745	62.44	
65	607.04	25.00	4625.00	472	0.00492	0.12310	710.00	102.96	587	1.745	61.77	
66	606.93	75.00	4700.00	472	0.00492	0.36931	709.63	102.70	587	1.745	61.62	
67	608.36	50.00	4750.00	472	0.00492	0.24621	709.38	101.02	587	1.745	60.61	
68	607.80	50.00	4800.00	472	0.00492	0.24621	709.13	101.33	587	1.745	60.80	

Sta.	Invert Level. (m)	Parcial Dist. (m)	Accum. Dist. (m)	Flow (L/s)	Hydraulic Grade	Friction Head Loss (m)	Hydraulic Grade Line (m)	Dynamic Head (m)	Nominal Dia. (mm)	Velocity (m/s)	Water Hammer (m)	Remark
166	584.98	25.00	20910.00	472	0.00492	0.12310	629.81	44.83	587	1.745	44.83	
167	584.91	25.00	20935.00	472	0.00492	0.12310	629.68	44.77	587	1.745	44.77	
168	581.24	134.00	21069.00	472	0.00492	0.65983	629.02	47.78	587	1.745	45.00	
169	579.43	291.00	21360.00	472	0.00492	1.43292	627.59	48.16	587	1.745	45.00	
170	578.03	54.00	21414.00	472	0.00492	0.26590	627.33	49.30	587	1.745	45.00	
171	580.27	71.00	21485.00	472	0.00492	0.34961	626.98	46.71	587	1.745	45.00	
172	580.50	75.00	21560.00	472	0.00492	0.36931	626.61	46.11	587	1.745	45.00	
173	579.59	150.00	21710.00	472	0.00492	0.73862	625.87	46.28	587	1.745	45.00	
174	586.41	125.50	21835.50	472	0.00492	0.61798	625.25	38.84	587	1.745	38.84	Air Valve No.14
175	582.27	109.50	21945.00	472	0.00492	0.53919	624.71	42.44	587	1.745	42.44	
176	579.64	64.50	22009.50	472	0.00492	0.31761	624.39	44.75	587	1.745	44.75	
177	581.11	85.50	22095.00	472	0.00492	0.42101	623.97	42.86	587	1.745	42.86	
178	587.77	100.00	22195.00	472	0.00492	0.49241	623.48	35.71	587	1.745	35.71	
179	587.99	25.00	22220.00	472	0.00492	0.12310	623.36	35.37	587	1.745	35.37	
180	587.29	25.00	22245.00	472	0.00492	0.12310	623.23	35.94	587	1.745	35.94	
181	588.75	50.00	22295.00	472	0.00492	0.24621	622.99	34.24	587	1.745	34.24	
182	585.91	200.00	22495.00	472	0.00492	0.98482	622.00	36.09	587	1.745	36.09	
183	593.95	125.00	22620.00	472	0.00492	0.61551	621.39	27.44	587	1.745	27.44	
184	594.54	25.00	22645.00	472	0.00492	0.12310	621.26	26.72	587	1.745	26.72	Air Valve No.15
185	588.29	100.00	22745.00	472	0.00492	0.49241	620.77	32.48	587	1.745	32.48	
Khaw	612.50	79.35	22824.35	472	0.00492	0.39073	620.38	7.88	587	1.745	7.88	Inlet Level=612.5m
Total						108.4						

Zarqa Pumping Station - Batrawi Reservoir New Pipeline

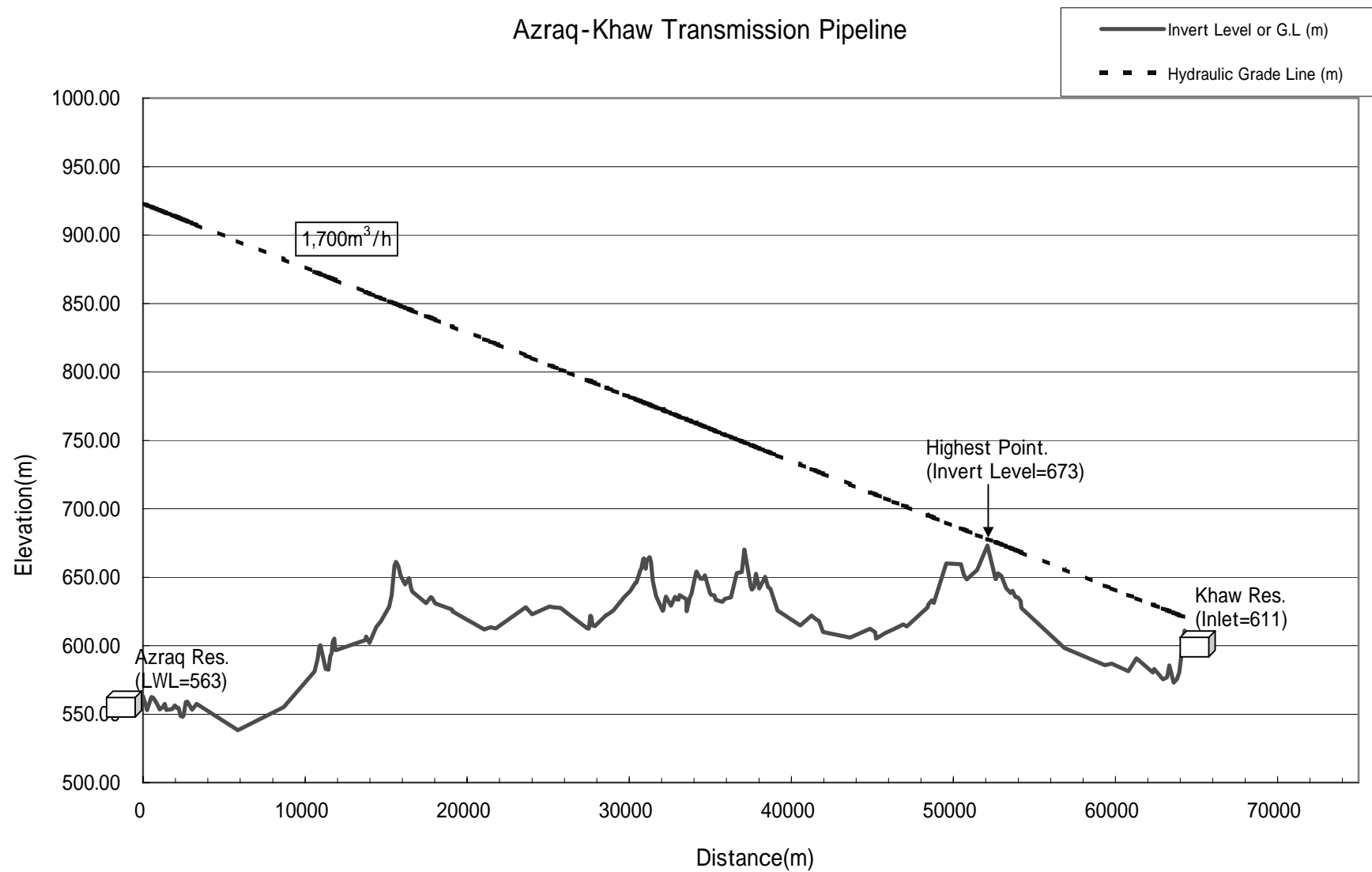
Zarqa Station G.L. 565.00 m Batrawi Tank G.L. 635.20 m

Design Flow: 800 m³/h Zarqa Reservoir L.W.L. 570.30 m Batrawi Tank HWL 654.00 m

Coefficient of Roughness: 110 Pumping Head: 90.00 m

Sta.	Ground Level. (m)	Parcial Dist. (m)	Accum. Dist. (m)	Flow (L/s)	Hydraulic Grade	Friction Head Loss (m)	Hydraulic Grade Line (m)	Dynamic Head (m)	Nominal Dia. (mm)	Velocity (m/s)	Water Hammer (m)	Remark
Tank	570.30	0.00	0.00				660.30					LWL:570.3m
Pump	565.50	120.00	120.00	222	0.00129	0.15532	660.14	94.64	603	0.777	56.79	G.L.+0.5m, Pipeline 120m
1	566.18	50.00	170.00	222	0.00129	0.06471	660.08	93.90	603	0.777	56.34	
2	565.93	50.00	220.00	222	0.00129	0.06471	660.02	94.09	603	0.777	56.45	
3	565.90	2.59	222.59	222	0.00129	0.00335	660.01	94.11	603	0.777	56.47	
4	565.85	50.33	272.92	222	0.00129	0.06514	659.95	94.10	603	0.777	56.46	
5	568.75	47.08	320.00	222	0.00129	0.06094	659.89	91.14	603	0.777	54.68	
6	572.00	55.27	375.27	222	0.00129	0.07154	659.81	87.81	603	0.777	52.69	
7	573.36	21.00	396.27	222	0.00129	0.02718	659.79	86.43	603	0.777	51.86	
8	574.90	23.73	420.00	222	0.00129	0.03071	659.76	84.86	603	0.777	50.91	
9	578.09	50.00	470.00	222	0.00129	0.06471	659.69	81.60	603	0.777	48.96	
10	581.20	50.00	520.00	222	0.00129	0.06471	659.63	78.43	603	0.777	47.06	
11	584.07	50.00	570.00	222	0.00129	0.06471	659.56	75.49	603	0.777	45.30	
12	585.32	16.17	586.17	222	0.00129	0.02093	659.54	74.22	603	0.777	45.00	
13	588.75	33.83	620.00	222	0.00129	0.04379	659.50	70.75	603	0.777	45.00	
14	592.77	41.57	661.57	222	0.00129	0.05380	659.44	66.67	603	0.777	45.00	
15	593.40	8.43	670.00	222	0.00129	0.01091	659.43	66.03	603	0.777	45.00	
16	595.65	50.00	720.00	222	0.00129	0.06471	659.37	63.72	603	0.777	45.00	
17	596.90	26.32	746.32	222	0.00129	0.03407	659.33	62.43	603	0.777	45.00	
18	597.60	23.68	770.00	222	0.00129	0.03065	659.30	61.70	603	0.777	45.00	
19	598.50	26.66	796.66	222	0.00129	0.03451	659.27	60.77	603	0.777	45.00	
20	600.20	23.34	820.00	222	0.00129	0.03021	659.24	59.04	603	0.777	45.00	
21	604.20	51.25	871.25	222	0.00129	0.06633	659.17	54.97	603	0.777	45.00	
22	607.47	48.75	920.00	222	0.00129	0.06310	659.11	51.64	603	0.777	45.00	
23	610.83	50.00	970.00	222	0.00129	0.06471	659.04	48.21	603	0.777	45.00	
24	614.19	50.00	1020.00	222	0.00129	0.06471	658.98	44.79	603	0.777	44.79	
25	617.35	46.90	1066.90	222	0.00129	0.06070	658.92	41.57	603	0.777	41.57	
26	617.57	22.28	1089.18	222	0.00129	0.02884	658.89	41.32	603	0.777	41.32	
27	617.70	20.55	1109.73	222	0.00129	0.02660	658.86	41.16	603	0.777	41.16	
28	617.40	10.27	1120.00	222	0.00129	0.01329	658.85	41.45	603	0.777	41.45	
29	616.37	50.00	1170.00	222	0.00129	0.06471	658.79	42.42	603	0.777	42.42	
30	615.35	50.00	1220.00	222	0.00129	0.06471	658.72	43.37	603	0.777	43.37	
31	614.36	50.00	1270.00	222	0.00129	0.06471	658.66	44.30	603	0.777	44.30	
32	613.41	50.00	1320.00	222	0.00129	0.06471	658.59	45.18	603	0.777	45.00	
33	613.77	44.25	1364.25	222	0.00129	0.05727	658.53	44.76	603	0.777	44.76	
34	613.51	30.75	1395.00	222	0.00129	0.03980	658.49	44.98	603	0.777	44.98	
35	614.11	25.00	1420.00	222	0.00129	0.03236	658.46	44.35	603	0.777	44.35	
36	615.93	50.00	1470.00	222	0.00129	0.06471	658.40	42.47	603	0.777	42.47	
37	617.80	50.00	1520.00	222	0.00129	0.06471	658.33	40.53	603	0.777	40.53	
38	619.64	50.00	1570.00	222	0.00129	0.06471	658.27	38.63	603	0.777	38.63	
39	621.48	50.00	1620.00	222	0.00129	0.06471	658.20	36.72	603	0.777	36.72	
40	623.33	50.00	1670.00	222	0.00129	0.06471	658.14	34.81	603	0.777	34.81	
41	625.17	50.00	1720.00	222	0.00129	0.06471	658.07	32.90	603	0.777	32.90	
42	626.40	50.00	1770.00	222	0.00129	0.06471	658.01	31.61	603	0.777	31.61	
43	627.70	50.00	1820.00	222	0.00129	0.06471	657.94	30.24	603	0.777	30.24	
44	628.97	50.00	1870.00	222	0.00129	0.06471	657.88	28.91	603	0.777	28.91	
45	630.28	50.00	1920.00	222	0.00129	0.06471	657.81	27.53	603	0.777	27.53	
46	631.59	50.00	1970.00	222	0.00129	0.06471	657.75	26.16	603	0.777	26.16	
47	632.90	50.00	2020.00	222	0.00129	0.06471	657.69	24.79	603	0.777	24.79	
48	634.00	50.85	2070.85	222	0.00129	0.06581	657.62	23.62	603	0.777	23.62	
49	635.20	5.40	2076.25	222	0.00129	0.00699	657.61	22.41	603	0.777	22.41	
Tank	654.00	100.00	2176.25	222	0.00129	0.12943	657.48	3.48	603	0.777	3.48	Tank HWL 654
Total						2.8						

Azraq-Khaw Transmission Pipeline



— Invert Level or G.L. (m)
- - - Hydraulic Grade Line (m)

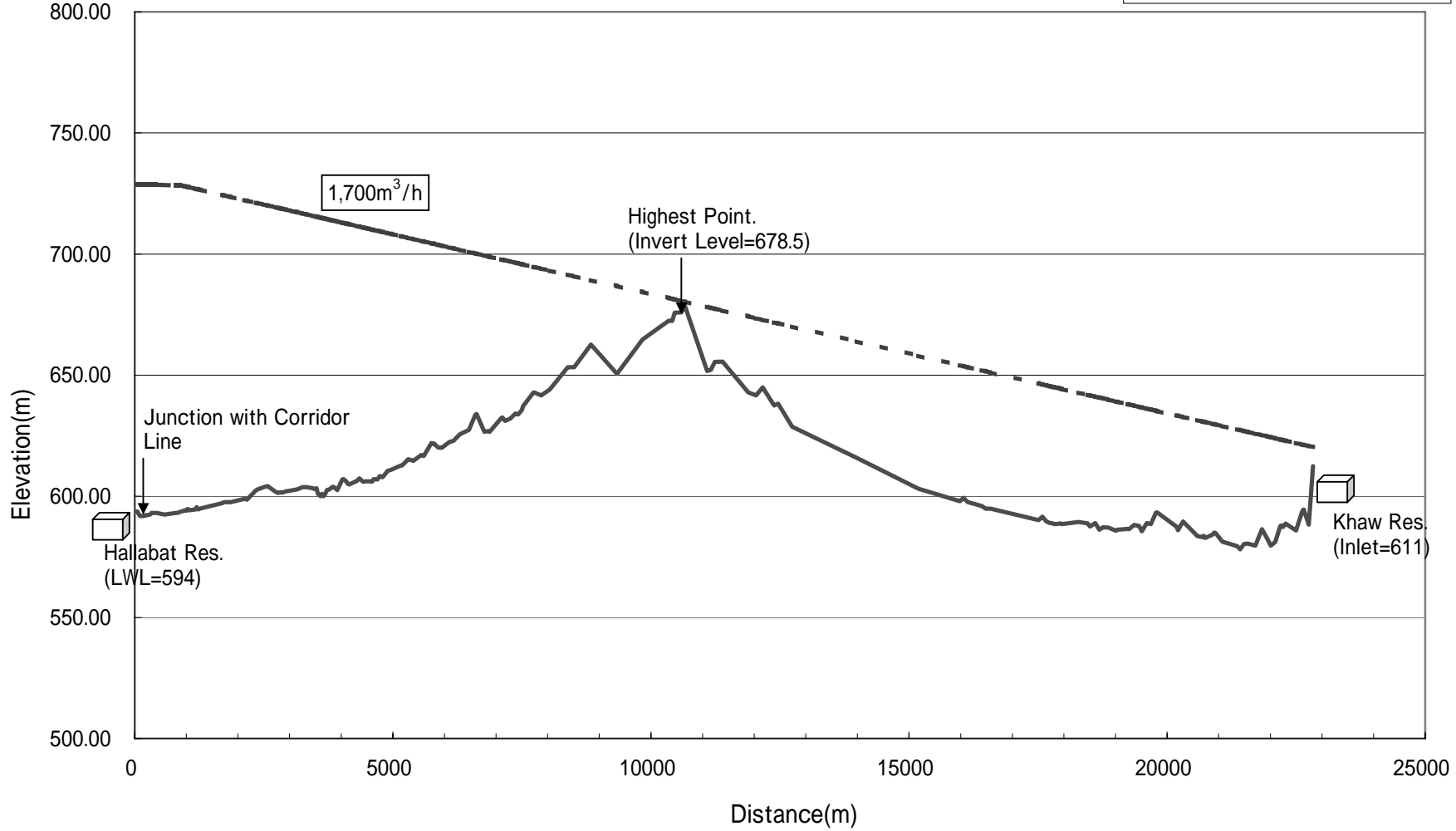
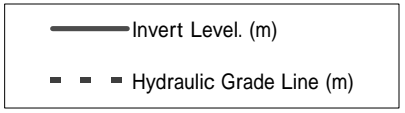
1,700m³/h

Azraq Res.
(LWL=563)

Highest Point.
(Invert Level=673)

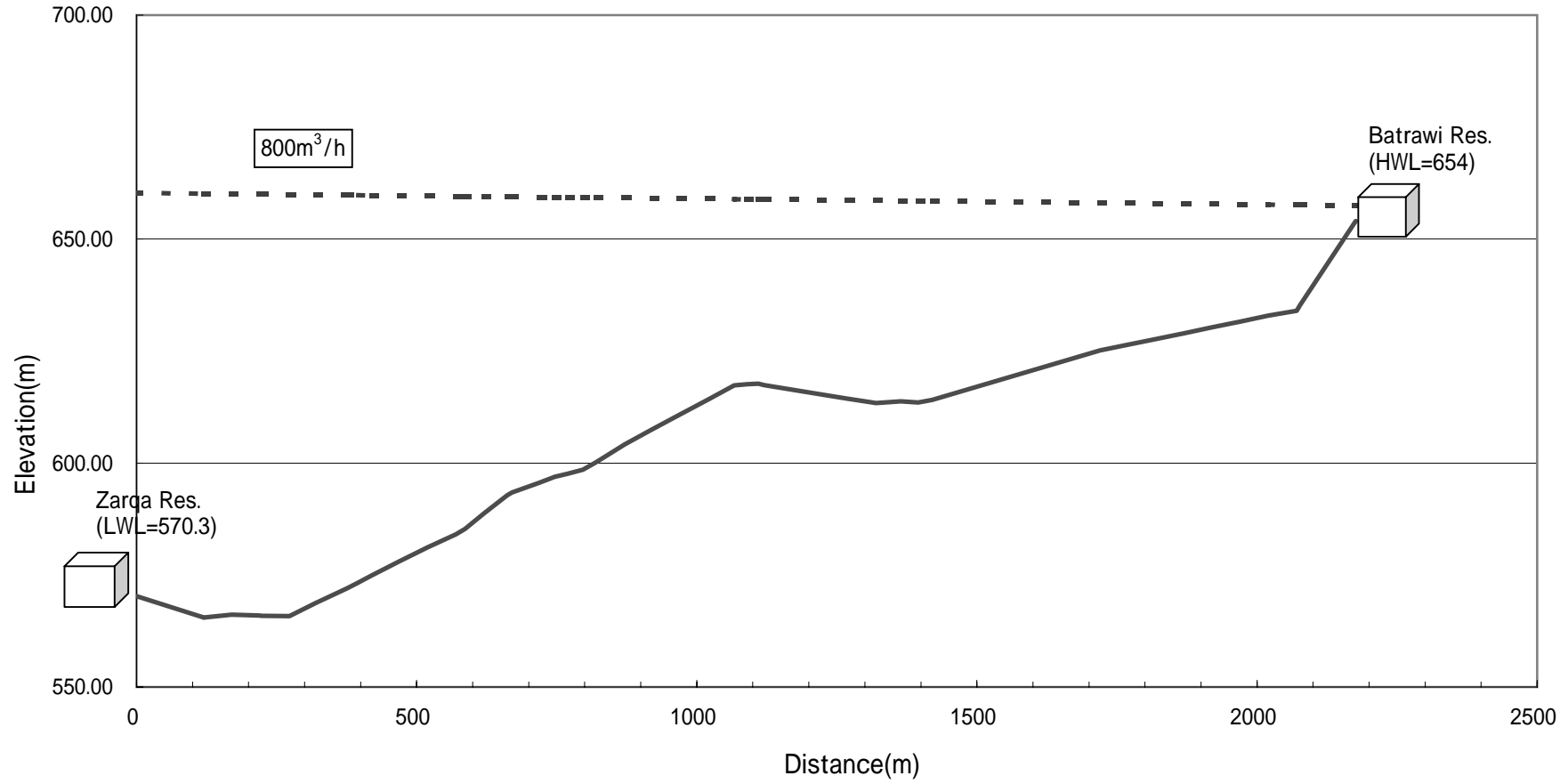
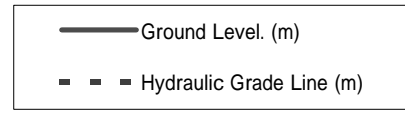
Khaw Res.
(Inlet=611)

Hallabat-Khaw Transmission Pipeline



A-95

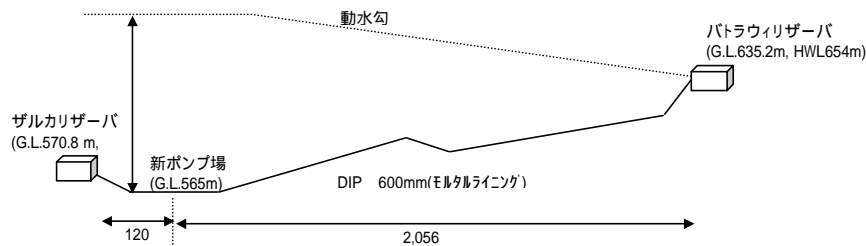
Zarqa Station - Batrawi Reservoir Transmission Pipeline



A-96

7-2 水撃圧の簡易計算書

[ザルカポンプ場]



1. 条件

計画給水量	800 m ³ /h
	13.3 m ³ /min
ポンプ台数	2 台
1台当り吐出力	6.7 m ³ /min
ポンプ全揚程	90 m
吸水井LWL	570 m
配水池HWL	654 m
最高実揚程	84 m
送水管	口径 603 mm
	延長 2,176 m
原動機	出力 160 kW
	回転数 1,470 rpm
	電圧 0.4 kV

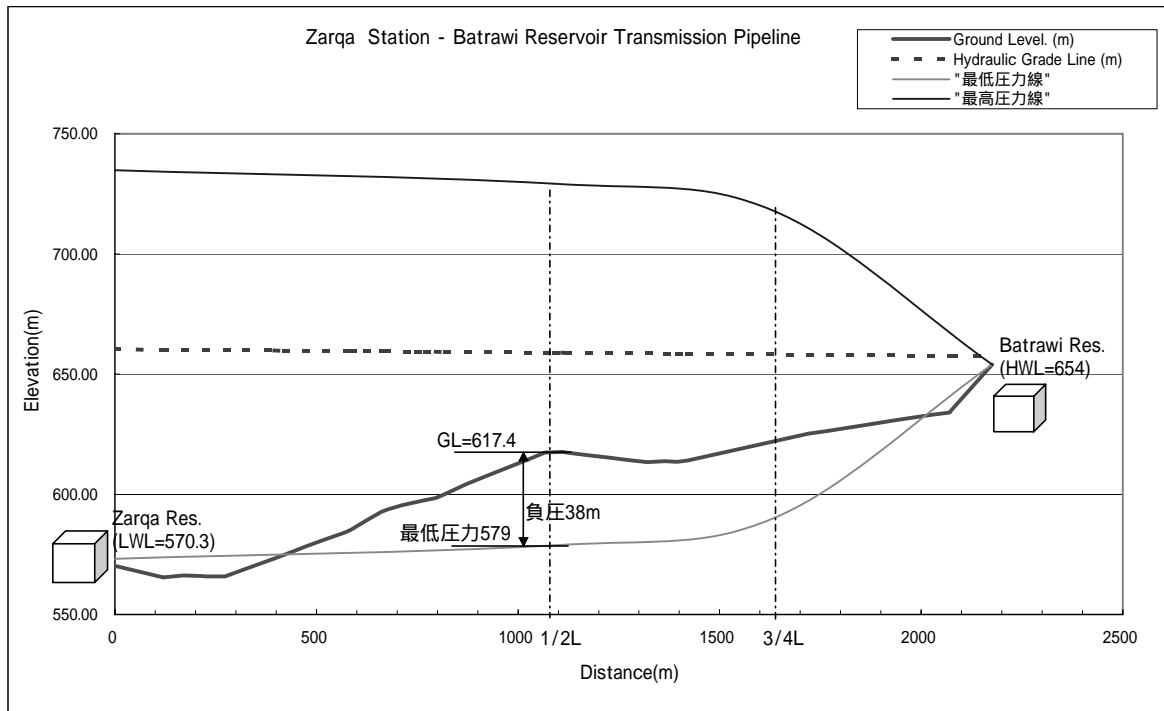
2. 計算表

No.	項目		計算結果	単位	条件	計算式
1	ポンプ台数	N	2	台	条件	
2	ポンプ規定吐出力	Q _n	0.112	m ³ /sec	条件	
3	ポンプ規定全揚程	H _n	90	m	条件	
4	ポンプ回転数	N _n	1,470	rpm	条件	
5	ポンプ効率	ρ	74	%	条件	
6	水の比重量		1		条件	
7	電動機出力	P	160	kW	条件	
8	電動機の慣性効果	(GD ²) ₂	15.0	kgf·m ²		かご形電動出力 GD ² 線図より
9	ポンプの慣性効果	(GD ²) ₁	1.5	kgf·m ²		(GD ²) ₂ の10%
10	回転部分の全慣性効果	(GD ²)	16.5	kgf·m ²		(GD ²) ₁ +(GD ²) ₂
11	ポンプ軸動力	P _n	133.5	kW		9.8 × Q _n × H _n / ρ
12	ポンプトルク	M _n	88.5	kg·m		974 × P _n / N _n
13	ポンプの慣性係数	K	1.37			(375 × M _n) / (GD ² × N _n)
14	管路計画流量	Q	0.222	m ³ /sec	条件	
15	管内径	D	0.6	m	条件	
16	管路延長	L	2,176	m		
17	管路規定流速	V _n	0.78	m/sec		
18	圧力波伝播速度		1,127	m/sec		1425 / (1+k/E × D/t)
	管厚	t	0.013	m		
	水の体積弾性率	k	207,000,000	kg·m ²		2.07 × 10 ⁸
	管材料の縦弾性係数	E	16,000,000,000			ダクタイル管 1.6 × 10 ¹⁰
19	管路定数	2	1.00			/9.8 × V _n / H _n
20	圧力波往復時間	μ	3.86	sec		2L/
21	K·μの値	K·μ	5.29			
22	管路損失	H	5.60	m		
	動水勾配	l	0.00129			
23	管路損失とポンプ全揚程の比率(%)		6.22	%		H / H _n × 100

3. 最低圧力の計算

管路定数 $2p=$ 1.00
 $K \cdot \mu =$ 5.29
 の場合の最低圧力を求める。
 最低圧力 $=H_n \times H$ (%)

管路損失比率(%)				最低圧力(m)	距離(m)	最低圧力線	最高圧力線
最低圧力H (%)	0	20	6.22				
ポンプ直後	4.0	2.5	3.5	3.2	0	573	735
1/2L地点	12.0	5.0	9.8	8.8	1,088	579	729
3/4L地点	25.0	16.0	22.2	20	1,632	590	718
					2,176	654	654



4. 水撃作用防止対策

1/2L地点(1088m)地点での負圧を-6m以下にするため、フライホイールを検討する。

1/2L地点のGL	617.0 m
1/2L地点の実揚程	47.0 m
目標負圧の場合の実揚程	41.0 m
この地点での最低圧力の割合	46 %

最低圧力の割合が の場合に対する $K \cdot \mu$ 値の計算

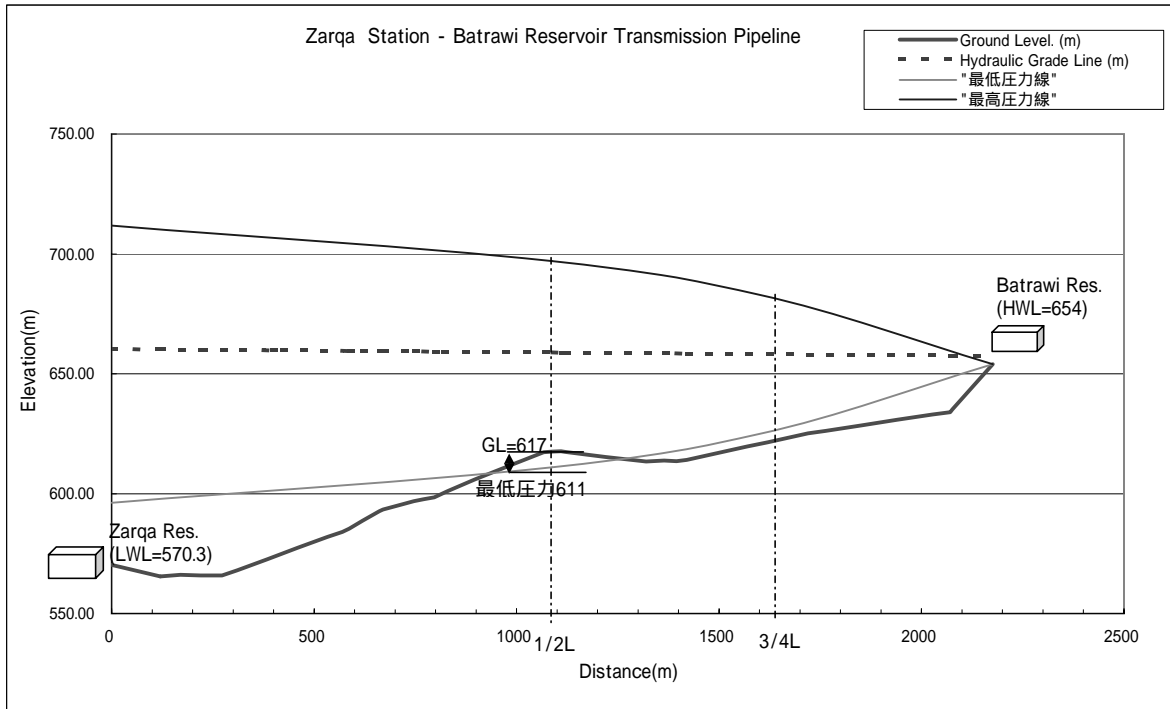
1/2L地点での圧力(%)	配管損失(%)	$K \cdot \mu$
46	0	1.25
46	20	0.88
46	6.22	1.13 (比例配分)

5. 水撃圧検討図の再作成

K・μが のときのH%を求める。

管路損失比率(%)	0	20	6.22	最低圧力(m)	距離(m)	最低圧力線	最高圧力線
最低圧力H (%)							
ポンプ直後	30.0	27.0	29.1	26.2	0	596	712
1/2L地点	49.0	38.0	45.6	41	1,088	611	697
3/4L地点	66.0	55.0	62.6	56.3	1,632	626	682
					2,176	654	654
1/2L地点の最低圧力線=	611.0						
1/2L地点のGL=	617.0						
差圧=	-6.0						

6m程度となるため水中分離を発生する恐れはない。



6. フライホイール容量の決定

K・μが のときのフライホイールの容量を求める。

$$K = 0.29$$

慣性体全体の慣性効果

$$GD^2 = (375 \times M_n) / (K \times N_n) \text{より、}$$

$$GD^2 = 78 \text{ kgf} \cdot \text{m}^2$$

フライホイールの慣性効果 GD^2_f は

$$GD^2_f = GD^2 - (GD^2)_1 - (GD^2)_2 \text{より}$$

$$GD^2_f = 61.5 \text{ kgf} \cdot \text{m}^2$$

以上よりフライホイールの慣性効果は、

$$62 \text{ kgf} \cdot \text{m}^2$$

7.3 ベースラインデータ

(1) ポンプの効率

ポンプ効率(η_p)は、ポンプにより単位時間に水に与えられる有効エネルギー(水動力)と、外部からポンプ軸に与えられる動力(軸動力 P)との比で表される。

$$\text{ポンプ効率}(\eta_p) = P_W / P \times 100 (\%)$$

$$\text{水動力}(P_W) = 0.163 \times \gamma \times Q \times H \text{ (kW)}$$

P: ポンプ軸動力 (kW)

Q: 吐出量 (m³/分)

H: 全揚程 (m)

γ : 液体の密度 (水の場合は 1)

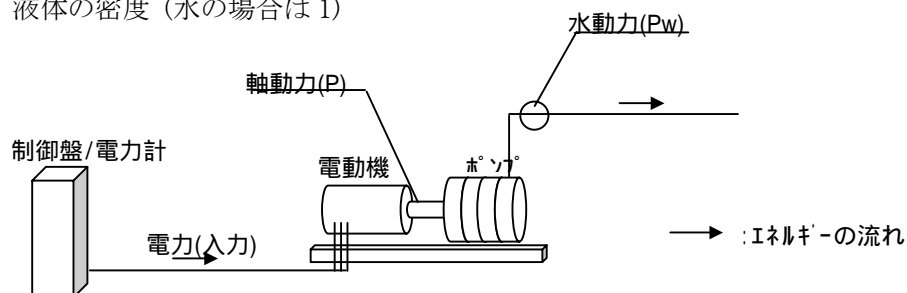


図1 ポンプの動力伝達の概要

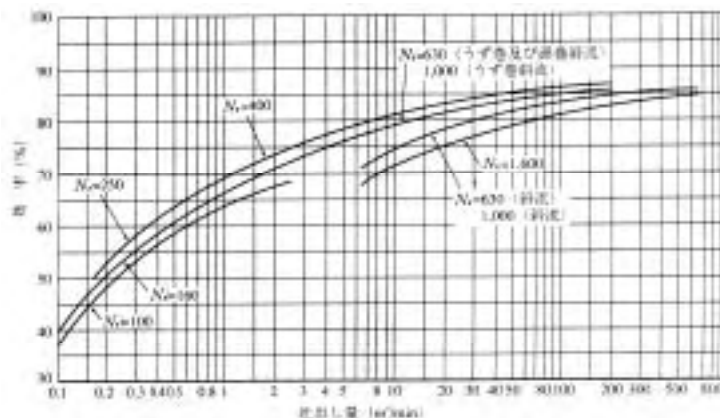
実際に稼動しているポンプの水動力は、ポンプ吐出量(Q)と全揚程(H)を測定することによって算出できる。ポンプの最高効率は、比速度(N_s)及びポンプ容量によって変化し、また機種や形式によっても違ってくる。日本工業規格(JIS)では、ポンプが満たすべき効率を以下のとおり規定している。各種ポンプの最高効率の参考値を図2に示す。

表1 ポンプ効率の規定値(両吸込渦巻ポンプ)

吐出量 (m3/分)	2	3	4	5	6	8	10	15	20	30	40	50	60	70
A 効率 (%)	67	70	71	72	73	74	75	76	77	78	78.5	79	79.5	80
B 効率 (%)	57	59	60	61	61.5	62.5	63	64	65	66	66.5	67	67.5	68

A 効率:ポンプ効率の最高値

B 効率:規定吐出量におけるポンプ効率



出展: 水道用ポンプマニュアル (1992 年)

図2 吐出量とポンプ効率

(2) 電動機出力と力率

電動機出力は、以下の式を用いて計算することができる。

$$\text{電動機出力}(P) = \sqrt{3} \times V \times I \times \cos \theta$$

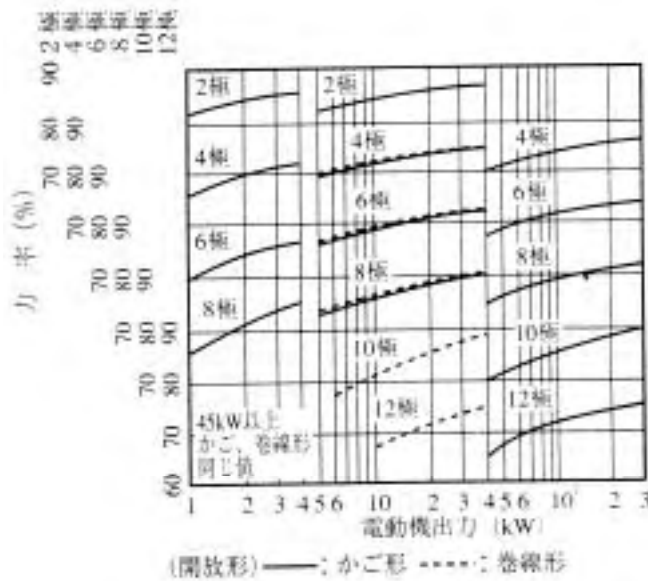
V: 電圧 (V)

I: 線電流 (A)

$\cos \theta$: 力率=0.70~0.90

力率は、電動機が発生する有効エネルギー(kW)と無効エネルギー(kvar)により定まり、誘導電動機の場合、電源は無効電力も負担することになる。一般に、力率は極数が多いほど、同一極数の場合には小出力のものほど悪くなり、また、負荷が減少するほど効率と同様に力率も低下する。

本調査では、各ポンプ場の電動機について銘版からそれぞれの力率を読み取り、測定した電圧、電流を用いて、実際の電動機出力を算出した。また、ポンプと電動機は直結式であるため、ポンプ軸に与えられている動力が実際の電動機出力と同等として、ポンプ効率を算出する。三相誘導電動機の全負荷における出力と力率の関係の一例を図3に示す。



出展：水道用ポンプマニュアル（1992年 日本水道協）

図3 三相誘導電動機の出力と力率例

(3) プロジェクトの効果指標

本計画によりポンプ設備が更新されることで、ポンプの効率が向上する。つまり、「電動機に与えられる電力(消費電力 kWh)」が「送水エネルギー(P_w :水動力)」に変換される割合が大きくなる。これを踏まえ、本プロジェクトの効果としては、以下のとおり想定する。

- ① 送水ポンプを更新することによるポンプ効率(%)の向上
- ② 電力原単位(消費電力(kWh)/ポンプ吐出量(m³))の改善
- ③ 電力消費量の減少に伴う二酸化炭素排出量の削減

(4) 取得済みのベースラインデータ

協力対象となっているポンプ場のうち、アズラック及びハラバットについては、現地調査を通じてベースラインデータが取得できている。これは、ポンプ運転に伴い消費された電力とその際の送水量を実測し、ポンプ効率及び送水原単位電力量を算出したものである。

表 2 要請対象のポンプ場におけるベースラインデータ

【アズラックポンプ場】

測定回数	①吐出力 Q (m ³ /h)	②全揚程 H (m)	③電流 I (A)	④電圧 V (V)	⑤水動力 P _w (kW)	⑥電動機 力率 cos θ	⑦電動機 出力 P (kW)	⑧効率 (%)	⑨送水原単 位電力量 (kWh/m ³)	備考
1 旧	1,115	260	1525	644	787	0.87	1,480	53%	1.33	旧 No.4,6
1 新	372	260	686	382	262	0.93	422	62%	1.14	新 No.3
小計	1,486				1,050		1,902			
2 旧	1,113	259	1532	641	784	0.87	1480	53%	1.33	旧 No.4,6
2 新	371	259	722	380	261	0.93	442	59%	1.19	新 No.3
小計	1,484				1,045		1,922			
平均								57%	1.25	

注記 ①吐出力 m³/h: 超音波流量計を吐出側配管に取り付けて旧ポンプ場 2 台及び新ポンプ場 1 台の合計流量を測定した。計算の便宜上、新旧ポンプ場での流量は GTZ 測定データを参考に配分している。

- ②揚程(m) : 吐出側配管に圧力データロガーを取り付けて測定
- ③電流値(A) : AC クランプメータにより、実効値を測定
- ④電圧(V) : ポンプ操作盤電圧計より読み取り
- ⑤水動力 kW) : 水動力=0.163 x 水密度(1.0) x ①吐出力(m³/min に換算) x ②揚程
- ⑥電動機力率 : ポンプ銘板より読み取り
- ⑦電動機出力(kW) : $\sqrt{3} \cdot \text{④電圧 V} \cdot \text{③電流 A} \cdot \text{⑥電動機力率}$
- ⑧効率(%) : $\text{⑤水動力 kW} \div \text{⑦電動機出力 kW}$
- ⑨送水原単位電力量(kWh/m³): $\text{⑦電動機出力 kW} \div \text{①吐出力 m}^3/\text{h}$

【ハラバットポンプ場】

測定回数	①吐出力 Q (m ³ /h)	②全揚程 H (m)	③電流 I (A)	④電圧 V (V)	⑤水動力 P _w (kW)	⑥電動機 力率 cos θ	⑦電動機 出力 P (kW)	⑧効率 (%)	⑨送水原単 位電力量 (kWh/m ³)	備考
1	460	133	445	408	166	0.90	283	59	0.62	
2	460	133	443	408	166	0.90	282	59	0.61	
3	460	120	448	408	150	0.90	285	53	0.62	
平均								57	0.62	

注記 ①吐出力 m³/h : 超音波流量計による測定値が不安定であり、GTZ 測定データより推定した。
②以下については、アズラックポンプ場と同様につき省略。

アズラックの場合、電力原単位の実測値は 1.25kWh/m³ であるが、計画値より電動機出力が 250kW、揚程が 100m 程度計画の運転点から大きく外れた運転を行っていた。本プロジェクトを通じて、設計流量を流すために必要なポンプを整備することになるため、現在のように少ない流量を送水している場合のベースラインデータでは、プロジェクトの成果を判断することができない。従って、計画の改善値から推定した。このため、現在のポンプを継続使用して設計流量を送水する場合を想定して算出した 1.88kWh/m³ をベースラインデータとして使用する。また、ザルカポンプ場については、既存のポンプ設備は配水管網への直接配水を行っていること、また、本プロジェクトで調達するポンプは配水池への送水専用ポンプとなることから、ベースラインデータの実測はできていない。従って、使用電力量の実績とポンプ効率の推定値を基に、ベースラインを設定した。