資　料　編

[資料]

1　調査団員・氏名

(1) 協力準備調査団名簿

氏名 Name	担当分野 Job title	所属 Occupation
大村　良樹 Mr. Yoshiki OMURA	団長 Team Leader	独立行政法人国際協力機構 国際協力専門員 Senior Advisor, JICA
宣原　由子 Mr. Yuko NOBUHARA	セクタープログラム管理 Sector Programme Management	独立行政法人国際協力機構 中東・欧州部中東第二課 Middle East Div. 2, Middle East and Europe Dept., JICA
緒方　隆二 Mr. Ryuji OGATA	計画管理 Survey Planning	独立行政法人国際協力機構 地球環境部水資源・防災 G 水資源第一課 Water Resources Management Div. 1, Water Resources and Disaster Management Group, Global Environment Dep., JICA
鎗内美奈 Ms. Mina YARIUCHI	計画管理 Survey Planning	独立行政法人国際協力機構 地球環境部水資源・防災 G 水資源第一課 Water Resources Management Div. 1, Water Resources and Disaster Management Group, Global Environment Dep., JICA
佐藤 弘孝 Mr. Hirotaka SATO	業務主任 Chief Consultant	株式会社 TEC インターナショナル 執行役員 技術グループ　グループマネージャー Director Group Manager, Engineering Department TEC International Co., Ltd.
本間　真 Mr. Makoto Homma	副業務主任 Deputy Chief Consultant	株式会社 TEC インターナショナル 参事 技術グループ　技術第 2 チーム Senior Engineer, Technical Team 2 Engineering Department TEC International Co., Ltd.
タパ バッタ　バハドール Dr. Phatta Thapa	送配水計画 Transmission and Distribution Planning	株式会社 TEC インターナショナル 主幹 技術グループ　技術第 1 チーム Senior Engineer, Technical Team 1 Engineering Department TEC International Co., Ltd.
中園　隼人 Mr. Hayato Nakazono	業務調整/積算補助/管路計画 (2) Coordinator/Cost Estimation/Pipe Planning(2)	株式会社 TEC インターナショナル 主事 技術グループ　技術第 2 チーム Staff Engineer, Technical Team 2 Engineering Department TEC International Co., Ltd.

(2) 概略設計概要説明調査団名簿

氏名 Name	担当分野 Job title	所属 Occupation
大村　良樹 Mr. Yoshiki OMURA	団長 Team Leader	独立行政法人国際協力機構 国際協力専門員 Senior Advisor, JICA
鎗内美奈 Ms. Mina YARIUCHI	計画管理 Survey Planning	独立行政法人国際協力機構 地球環境部水資源・防災G水資源第一課 Water Resources Management Div. 1, Water Resources and Disaster Management Group, Global Environment Dep., JICA
佐藤 弘孝 Mr. Hirotaka SATO	業務主任 Chief Consultant	株式会社TECインターナショナル 執行役員 技術グループ　グループマネージャー Director Group Manager, Engineering Department TEC International Co., Ltd.
本間　真 Mr. Makoto Homma	副業務主任 Deputy Chief Consultant	株式会社TECインターナショナル 参事 技術グループ　技術第2チーム Senior Engineer, Technical Team 2 Engineering Department TEC International Co., Ltd.

2　調査工程

(1) 協力準備調査（第 1 次調査）

日程		団長	セクタープログラム管理	計画管理	業務主任/運営・維持管理計画	副業務主任/水道施設設計	送配水計画	管路計画	上水道機材計画	施工計画/積算	業務調整/積算補助/管路計画(2)
		大村 良樹	宣原 由子	緒方 隆二	佐藤 弘孝	本間 真	タパ・バッタ・バハドール	森口 卓	原田 容逸	岩重 博人	中園 隼人
2 月 7 日	木	着:アンマン									
8 日	金		発:東京	同左	発:東京	発:東京	発:東京				発:東京
9 日	土		着:アンマン	同左	着:アンマン	着:アンマン	着:アンマン				着:アンマン
10 日	日	WAJ 本部打合せ、MOPIC 打合せ、GIZ 打合せ					資料収集				資料収集
11 日	月	WAJ バルカ事務所打合せ、現場踏査(Ain Al Basha)									同左
12 日	火	現場踏査(Deir Alla)									同左
13 日	水	ミニッツ協議、JVA 打合せ(緒方氏のみ)					資料収集				資料収集
14 日	木	ミニッツ修正・署名	ミニッツ修正・署名 発:アンマン	ミニッツ修正・署名			資料収集				資料収集
15 日	金		着:東京		団内打合せ			発:東京	発:東京		団内打合せ
16 日	土				資料整理			着:アンマン	着:アンマン		資料整理
17 日	日	JICA 事務所報告 発:アンマン		JICA 事務所報告 発:アンマン	JICA 事務所報告		団内打合せ	団内打合せ	団内打合せ		団内打合せ
18 日	月	着:東京		着:東京	調査準備、資料収集						同左
19 日	火				現場踏査(全体施設、井戸調査)						同左
20 日	水										
21 日	木										
22 日	金				団内打合せ						同左
23 日	土				団内打合せ						同左
24 日	日				現場踏査(井戸調査、配水池)						資料収集
25 日	月				発:アンマン	現場踏査(ポンプ施設、送配水管)					発:アンマン
26 日	火										着:東京
27 日	水										
28 日	木										
3 月 1 日	金					団内打合せ					
2 日	土					団内打合せ					
3 日	日					現場踏査(送配水管、その他施設)					
4 日	月										
5 日	火										
6 日	水					現場踏査(送配水管、施設再調査)					

日程		団長	セクタープログラム管理	計画管理	業務主任/運営・維持管理計画	副業務主任/水道施設設計	送配水計画	管路計画	上水道機材計画	施工計画/積算	業務調整/積算補助/管路計画(2)
		大村 良樹	宣原 由子	緒方 隆二	佐藤 弘孝	本間 真	タパ・バッタ・バハドール	森口 卓	原田 容逸	岩重 博人	中園 隼人
7日	木										
8日	金					団内打合せ					
9日	土					団内打合せ					
10日	日				着:アンマン	現場踏査(施設再調査)			WAJ 打合せ 発:アンマン		
11日	月				現場踏査(施設再調査)				着:東京		
12日	火				資料整理						
13日	水				WAJ 打合せ 発:アンマン						
14日	木				着:東京	着:東京	着:東京	着:東京			

(2) 協力準備調査 (第 2 次調査)

日程		業務主任/運営・維持管理計画	副業務主任/水道施設設計	送配水計画	管路計画	上水道機材計画	施工計画/積算	業務調整/積算補助/管路計画(2)
		佐藤 弘孝	本間 真	タパ・バッタ・バハドール	森口 卓	原田 容逸	岩重 博人	中園 隼人
4月12日	金							
4月13日	土		発:東京	発:東京	発:東京			
4月14日	日	発:東京	着:アンマン	着:アンマン	着:アンマン			
4月15日	月	着:アンマン	現場踏査	現場踏査(配水池予定地の確認、ザイ浄水場－ダボーク配水池間の送水管ルート)、水理モデルの確認				
4月16日	火	現場踏査						
4月17日	水							
4月18日	木	施設計画チェック						
4月19日	金	団内打合せ						
4月20日	土	団内打合せ						
4月21日	日	施設計画案に関して WAJ と協議		Sector Survey Report 用の資料収集	PC/RC Tank の比較検討			
4月22日	月	Sector Survey Report に関して MPU と協議						
4月23日	火	JICA 報告・協議					発:東京	発:東京
4月24日	水	大使館報告					着:アンマン	着:アンマン
4月25日	木	発:アンマン	現場踏査				現場踏査	
4月26日	金	着:東京	団内打合せ				同左	
4月27日	土		団内打合せ				同左	
4月28日	日		社会条件調査結果の取りまとめ、再委託準備	Disi ﾌﾟﾛｼﾞｪｸﾄ関係者との協議、ISSP 担当者との協議、ミヤフナ社との協議	現場踏査		見積入手資料の整理、施工計画調査及び積算関連調査下準備	井戸の水質測定、給水圧測定、環境社会配慮資料の作成、ISSP 担当者との協議
4月29日	月							
4月30日	火							
5月1日	水		再委託準備、契約					
5月2日	木							
5月3日	金		団内打合せ				同左	
5月4日	土		団内打合せ				同左	
5月5日	日		電力および	再委託業者との調査地点確			見積入手資	既設井戸の

日程		業務主任/運営・維持管理計画	副業務主任/水道施設設計	送配水計画	管路計画	上水道機材計画	施工計画/積算	業務調整/積算補助/管路計画(2)
		佐藤 弘孝	本間 真	タパ・パッタ・バハドール	森口 卓	原田 容逸	岩重 博人	中園 隼人
5月6日	月		CO2 削減調査、JICA 協議	認、既設管との接続位置確認、ISSP との協議			料の整理、施工計画調査及び積算関連調査下準備	水質測定、既設給水圧測定
5月7日	火							
5月8日	水					発:東京		
5月9日	木					着:アンマン		
5月10日	金		発:アンマン	団内打合せ				
5月11日	土		着:東京	団内打合せ				
5月12日	日			道路切断・横断許可に関する調整、公共事業省との現場確認、セクター調査報告書のための資料収集		現場踏査、水灌漑省データベース課との協議、WAJ 維持管理担当との打合せ	見積入手資料の整理、施工計画調査及び積算関連調査下準備	EIA 適用除外の Exemption レター入手、ISSP と協議
5月13日	月							
5月14日	火							
5月15日	水							
5月16日	木							
5月17日	金							
5月18日	土							
5月19日	日			道路横断工法の検討		WAJ 水質試験担当者との協議、保健省環境・保健課との協議	見積入手資料の整理、施工計画調査及び積算関連調査下準備	データ収集
5月20日	月							
5月21日	火			発:アンマン	発:アンマン			
5月22日	水			着:東京	着:東京			発:アンマン
5月23日	木							着:東京
5月24日	金					団内打合せ		
5月25日	土					団内打合せ		
5月26日	日					WAJ 本庁維持管理部との協議、WAJ 地下水調査課との協議	見積入手資料の整理、施工計画調査及び積算関連調査下準備	
5月27日	月							
5月28日	火							
5月29日	水							
5月30日	木							
5月31日	金						発:アンマン	
6月1日	土						着:東京	
6月2日	日					既設給水圧測定		
6月3日	月							
6月4日	火							
6月5日	水							
6月6日	木					発:アンマン		
6月7日	金					着:東京		
6月8日	土		発:東京					
6月9日	日	着:アンマン	着:アンマン					
6月10日	月	資料取り纏め						
6月11日	火	JICA 報告・協議						
6月12日	水	大使館報告						
6月13日	木	発:アンマン	現場踏査					
6月14日	金	着:東京	発:アンマン					
6月15日	土		着:東京					

(3) 概略設計概要説明

日程		団長	計画管理	業務主任/運営・維持管理計画	副業務主任/水道施設設計
		大村 良樹	鎗内 美奈	佐藤 弘孝	本間 真
1月26日	日	着:アンマン 団内打合せ JICA事務所打合せ			
27日	月	WAJ本部打合せ			
28日	火	バルカ現場踏査			
29日	水	ミニッツ協議			
30日	木	ミニッツ署名 JICA事務所報告 大使館報告			現地離任
		発:アンマン			
31日	金				
2月1日	土				
2日	日		PMUで情報収集 WAJマルカ研修センター訪問		
3日	月			WAJバルカ支所にて情報収集	
4日	火		WAJ財務部にて情報収集 発:アンマン		

3　関係者(面会者)リスト

(1) 協力準備調査

＜ヨルダン側＞

1. 計画・国際協力省(Planning and International cooperation)

Ms. Eba'a Q. Al-Eysa'a	プロジェクトエンジニア(Project Engineer)
Ms. Wa'ed T. Al-Ja'afreh	プロジェクトエンジニア(Project Engineer)

2. 水灌漑(Ministry of Water and Irrigation: MWI)

Eng. Iyad Dahiyat	パフォーマンスマネージメントユニット ディレクター Director, Performance Management Unit(PMU)
Eng. Waleed Sukkar	パフォーマンスマネージメントユニット アドバイザー Director, PMU
Dr. Mohammad Al-Waqfi	パフォーマンスマネージメントユニット 監視＆会計マネジャー Monitoring and Accounting manager, PMU
Eng. Nabil Zou'bi	ヨルダン紅海プロジェクトマネジャー Project Manager, Jordan Red Sea Project
Mr. Ibrahim Obadah	制度支援＆強化(ISSP)プログラム　プロジェクトコーディネーター Project Coordinator, ISSP Program
Mr. Saddam Khleifat	ISSP 水道事業部、技術マネジャー Technical Manager, Water Supply, ISSP program
Eng. Bassam Saleh	Disi プロジェクトディレクター, SWECO Disi Project Disi Project, SWECO

3. ヨルダン水道庁 (WAJ)

Eng. Tawfiq Z. Habashneh	総裁 (Secretary General)
Eng. Malek Rawashdeh	技術部　副総裁 Assistant Secretary General, Technical Affairs
Eng. Reham Bani-Hani	調査 ・フィージビリティ調査課　課長 Director, Study, Design and Plan and Feasibility Study Directorate
Eng. Haneen Qablan	調査 ・フィージビリティ調査課　技師 Study, Design and Plan and Feasibility Study Directorate
Eng. Asma'a Alwahadneh	調査 ・フィージビリティ調査課　技師 Study, Design and Plan and Feasibility Study Directorate
Eng. Khalid Al-Obaidiyn	バルカ県支所　所長 Director, Balqa Governorate Water Administration
Eng. Jamal Alkharabsheh	バルカ県支所維持管理・無収水部　部長(Director, Non-revenue water directorate, Balqa GWA)
Eng. Mohammed Hossam Sallam	アインアルバシャ地区事務所　所長 (Manager, Ain Al Basha Directorate, Balqa GWA)
Eng. Ghazi Aladwaw	ディルアラ地区事務所　所長(Manager, Deir Alla Directorate, Balqa GWA)
Dr. Muna Hirdiyeh	総裁補佐　水質試験所 (Assistant Secretary General, Laboratory)
Mr. Abed Al-Raheem	維持管理部,　部長
Mr. Kamil Wabsh	維持管理部、技師
Mr. Kamil Wabsh	維持管理部、技師
Mr. Osama Al-Samhouli	技術部技術課、技師
Mr. Ayman Jaber	全国水道マスタープラン局、技師
Ms. Rania Shabun	水質分析情報局、技師

Dr. Khair Hadidi	水道水生産・送水部、部長

4. ヨルダン王国地理センター(Royal Jordanian Geographic Center)

Dr. Awni Moh'd Kasawneh	総裁(Secretary General)
Mr. Tayseer Darweesh	GIS 部　部長 (Director, GIS Directorate)

5. 保健省 (Ministry of Health)

Mr.Mohamed Abadi	環境・保健部、技師

＜ドナー＞

6. ドイツ復興金融金庫(KfW)

Ms. Sandra Gmelin	水資源・廃棄物プロジェクトマネージャー Project Manager, Water Resources and Solid Waste
Dr. Manuel Schiffler	中東・北アフリカ部　上級水道専門家 Senior Water Supply Expert, Middle East and North Africa
Ms. Anna Lena Muller	水セクター政策部水廃棄物課　国際エコノミスト International Economist, Water and Solid Waste Section, Department of Water Sector Institution
Dr. Stefan Gramel	水セクター政策部中東水資源・廃棄物　技師 Engineer, Middle East Water and Solid Waste Section, Department of Water Sector Institution

7. ドイツ国際協力公社(GIZ)

Mr. Elke Zimmermann	ドイツ-ヨルダン プログラム 水資源管理 技術顧問 Technical Adviser, Water Resources, Germany and Jordan Program
Mr. Dieter Rothenberger	ドイツ-ヨルダン プログラム 水資源管理 プログラムマネージャー Program Manager, Water Resources, Germany and Jordan Program
Eng. Guy Honore	ドイツ-ヨルダン プログラム 水資源管理 プログラムコーディネーター Program Coordinator, Water Resources, Germany and Jordan Program

8. ヨルダン国公共事業省(Ministry of Public Works and Housing: MPWH)

Eng. Reema Aaydl	公共事業省道路局技術部長

＜日本側＞

1. JICA ヨルダン事務所 (JICA Jordan Office)

涌井　純二　Mr. Junji Wakui	次長(Additional Resident Representative)
高田　健二　Mr. Kenji Takada	所員(Representative)
平田　知美　Ms. Tomomi Hirata	所員(Representative)
Mr. Hani H. Al-Kurdi	副主任プログラムオフィサー(Program Officer)

2. 在ヨルダン日本大使館 (Embassy of Japan in Jordan

服部　孝典 Mr. Takanori Hukube	一等書記官(First Secretary)
桑名　真也 Mr. Shinya Kuwana	二等書記官(Second Secretary)

(3) 概略設計概要説明

＜ヨルダン側＞

1. 水灌漑(Ministry of Water and Irrigation: MWI)

Eng. Waleed Sukkar	パフォーマンスマネージメントユニット アドバイザー Director, PMU

2. ヨルダン水道庁

Eng. Tawfiq Z. Habashneh	総裁 (Secretary General)
Eng. Malek Rawashdeh	技術部　副総裁 Assistant Secretary General, Technical Affairs
Eng. Reham Bani-Hani	調査 ・フィージビリティ調査課　課長 Director, Study, Design and Plan and Feasibility Study Directorate
Eng. Asma'a Alwahadneh	調査 ・フィージビリティ調査課　技師 Study, Design and Plan and Feasibility Study Directorate
Mr. Mohamad	財務部、副部長 Assistant Director, Financial Directorate
Eng. Khalid Al-Obaidiyn	バルカ県支所　所長 Director, Balqa Governorate Water Administration
Eng. Jamal Alkharabsheh	バルカ県支所維持管理・無収水部　部長(Director, Non-revenue water directorate, Balqa GWA)
Eng. Ghazi Aladwaw	ディルアラ地区事務所　所長(Manager, Deir Alla Directorate, Balqa GWA)
Eng. Firas Zriqat	機械技師、マルカ研修所 Mechanical Engineer, Marka Training Center

＜日本側＞

1. JICA ヨルダン事務所

涌井　純二　Mr. Junji Wakui	次長(Additional Resident Representative)
平田　知美　Ms. Tomomi Hirata	所員(Representative)
Mr. Hani H. Al-Kurdi	副主任プログラムオフィサー(Program Officer)

2. 在ヨルダン日本大使館

吉田　憲正　Mr.Norimasa Yoshida	一等書記官(First Secretary)

4 協議議事録 (M/D)

(1) 協力準備調査時

MINUTES OF DISCUSSIONS ON THE PREPARATORY SURVEY FOR THE PROJECT FOR REHABILITATION AND EXPANSION OF THE WATER NETWORKS IN BALQA GOVERNORATE IN THE HASHEMITE KINGDOM OF JORDAN

In response to the request from the Government of the Hashemite Kingdom of Jordan (hereinafter referred to as "Jordan"), the Government of Japan decided to conduct a Preparatory Survey (hereinafter referred as "the Survey") for the Project for Rehabilitation and Expansion of the Water Networks in Balqa Governorate (hereinafter referred to as "the Project") and entrusted the survey to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to Jordan the Preparatory Survey Team (hereinafter referred to as "the Team"), which is headed by Mr. Yoshiki OMURA, Senior Advisor, JICA, and is scheduled to stay in the country from February 9, 2013 to March 14, 2013 for the first phase and from middle of April 2013 to middle of June, 2013 for the second phase.

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

In the course of discussions and field survey, both parties confirmed the main items described in the attached sheets.

Amman, February 14, 2013

Mr. Yoshiki OMURA
Leader,
Preparatory Survey Team
Japan International Cooperation
Agency

Eng. Basem Telfah
Secretary General,
Ministry of Water and Irrigation and
Acting Secretary General,
Water Authority of Jordan
The Hashemite Kingdom of Jordan

Dr. Saleh Kharabsheh
Secretary General,
Ministry of Planning and International
Cooperation
(Witness)

ATTACHMENT

1. Objective of the Project

The objective of the Project is to reduce non-revenue water and electricity consumption for water supply in the target areas by controlling water pressure of distribution network.

2. Project site

Tentative site of the Project is Deir Alla and Ain Al-Basha Districts in Balqa Governorate as shown in **Annex-1**.

3. Responsible 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-2**

4. Items requested by the Government of Jordan

After discussions with the Jordanian side and the Team (hereinafter referred to as " both sides"), the items described in **Annex-3** were 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 of the Project would be decided by the Japanese side.

5. Japan's Grant Aid Scheme

5-1) The Jordanian side understands the Japan's Grant Aid Scheme explained by the Team, as described in **Annex-4**.

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

6. Schedule of the Survey

6-1) The consultant members of the Team will conduct studies in Jordan until March 14, 2013 for the first phase and from middle of April 2013 to middle of June 2013 for the second phase. Main purpose of the first phase is to collect basic information and examine the scope of the Project including the confirmation of the target area. Main purpose of the second phase is to conduct outline design of the Project.

6-2) JICA will prepare the draft Preparatory Survey report in English and dispatch a mission in order to explain its contents to Jordanian side around October 2013.

6-3) In case that the contents of the report are accepted in principle by the Jordanian side, JICA will finalize the report and send it to the Jordanian side around December 2013.

1

The Jordanian side understands that execution of the Preparatory Survey does not necessarily imply the Japanese Government's commitment of the project implementation.

7. Other relevant issues

7-1) Review of the existing water supply plan

The both sides confirmed that the Team will review the feasibility study, "Technical and Feasibility Study and Final Design of the Upgrading and Expansion of Water Facilities in Central Governorates" (hereinafter referred to as "the F/S") conducted in April 2005.

7-2) Target year

The Team explained that the target year of the Project is set up as the year immediately after the construction because Japan's grant aid aims to implement the project components to meet the urgent and immediate needs in the Project area. The both sides confirmed that the target year of the Project shall be 2020 though the Project is requested based on the target year of "the F/S" (2025). However, the target year for pipelines would be 2025 because of the difficulty of the stepwise expansion of pipe capacity.

7-3) Target areas

The tentative target areas are as follows. The target areas will be examined by the Survey (first phase) and confirmed through discussion between both sides.

i) Deir Alla District
ii) Ain Al-Basha District

7-4) Policy of the outline design

The Both sides agreed that the outline design will be done according to the following technical consideration to establish efficient water supply systems:

- Separation of transmission from distribution system
- Gravity distribution from service reservoir
- Optimization of energy use in the system, especially for pumping facilities
- Definition of District Metered Area (DMA)
- Selection and location of pressure reducing facilities
- Replacement of existing pipes including asbestos pipes

7-5) Branch pipelines of diameter less than 100 mm and replacement of the service connection

The procurement and installation of tertiary network of diameter less than 100 mm and service connections are not mentioned in the request from the Jordanian side. The present status and the necessity of replacement of the tertiary network and service connections will be examined by the Team. The measure to be taken for future will be confirmed through the discussion between both sides based on the result of the Preparatory Survey.

2

7-6) Pump Facilities for the Target Areas

The water distribution system in the target area will be converted from the direct pumping system to gravity flow system by construction of distribution reservoirs at high land and other facilities through the Project activities. The Team will examine the present status of water distribution system, which may be necessary to be improved for distribution system conversion and recommend necessary measures for establishment of appropriate distribution system.

7-7) Measures to be taken by the Jordanian side

Other than measures described in **Annex-5**, Jordanian side will take the following measures:

1) The Jordanian side agreed to secure water resources which are necessary for ensuring the outcome of the Project by the study mission of draft report around October 2013.
2) The Jordanian side agreed to submit a document that certified to secure enough budgets for implementation of necessary measures to be taken by Jordanian side for 2014 and the schedule of implementation of the measures by the study mission of draft report around October 2013.
3) The Jordanian side agreed to assign the counterpart personnel in charge of the following works during the Team`s stay in Jordan:

- Project coordination
- Facility design and cost estimation
- Operation and maintenance for water supply systems

7-8) Technical assistance ("Soft Component" of the Project)

The Jordanian side requested the technical assistance on the appropriate distribution management of water flow and pressure for the overall water supply system to promote the sustainable and effective operation of the facilities constructed in the Project. The Team agreed to study its necessity and if it was confirmed, the implementation of technical assistance as soft component program would be considered in the Project.

7-9) Tax exemption

Both sides confirmed that 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.

7-10) Sector Survey Report

The Team will also study present status of water works management and organization structure of WAJ, progress of non-revenue water reduction activities, relevant laws and regulations, and recommend effective technical cooperation project(s) to complement the efforts done by WAJ. The Team will make a separate report based on the result of sector survey.

7-11) Coordination with other projects

Both sides confirmed that the Project would be coordinated with any other project supported by other development partners, NGOs, and Jordanian official organizations rather than making duplication.

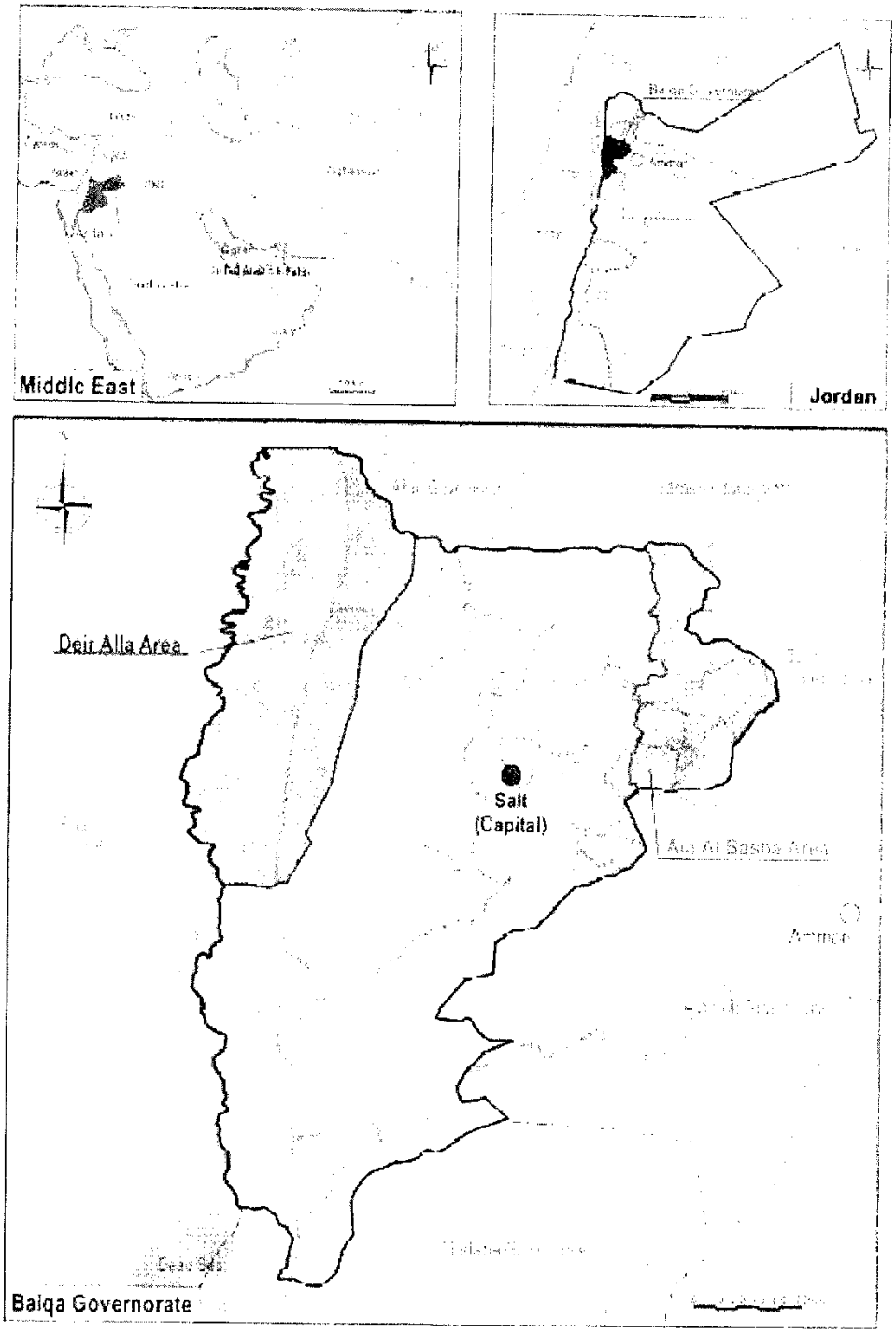
7-12) Environmental Impact Assessment (EIA)

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.

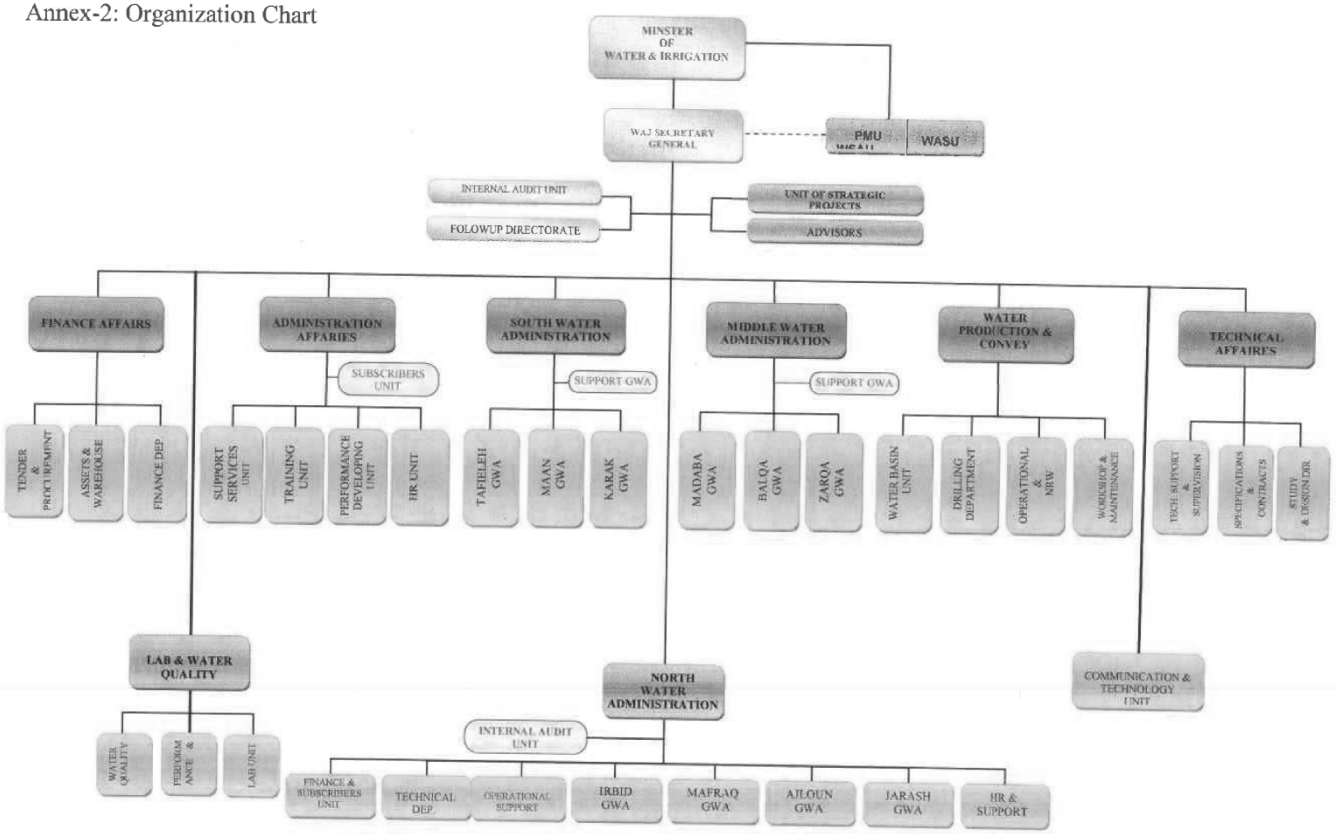
Annex-1	Project Sites Map
Annex-2	Organization Charts
Annex-3	Items Requested by the Jordanian Side
Annex-4	Japan's Grant Aid Scheme
Annex-5	Major Undertakings to be taken by Each Government

4

Annex-1: Project Sites Map



Annex-2: Organization Chart



8

Annex-3: Items Requested by the Jordanian Side

Component	Deir Alla district	Ain Al Basha district
1. Installation of transmission and distribution pipeline	Ductile pipes, L=24,600m Dia.150mm× 7,000m Dia.200mm×13,000m Dia.250mm× 2,800m Dia.300mm× 1,300m Dia.400mm× 500m	Ductile pipes, L=27,200m Dia.100mm×15,000m Dia.150mm× 2,700m Dia.200mm× 7,000m Dia.400mm× 2,500m
2. Construction of pumping station	[Ma'adi Pumping Station] Pump Q=200m^3/hr, Head=140m, 2 nos. [New Rajeb Pumping Station] Pump Q=500m^3/hr, Head=52m, 2 nos.	None
3. Construction of reservoirs	[New Ma'adi High reservoir] V=2,500 m^3, 1 No. [New Rajeb Upper Tank] V=6,000 m^3, 1 No	[Baqaa] V=8,000 m^3, 1 No. [Safout] V=2,000 m^3, 1 No [New Eskandanavian] V=2,000 m^3, 1 No. [New Abu Nasir 1] V=1,000 m^3, 1 No [New Abu Nasir 2] V=1,000 m^3, 1 No.

Annex-4: JAPAN'S GRANT AID SCHEME

The Government of Japan (hereinafter referred to as "the GOJ") is implementing the organizational reforms to improve the quality of ODA operations, and as part of this realignment, JICA was reborn on October 1, 2008. After the reborn of JICA, following the decision of the Government of Japan (hereinafter referred to as "the GOJ"), Grant Aid for General Project is extended by JICA.

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 the relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

1. Grant Aid Procedures (Attachment 1)

Japanese Grant Aid is conducted as follows-

- Preparatory Survey (hereinafter referred to as "the Survey")
  - the Survey conducted by JICA
- Appraisal & Approval
  -Appraisal by The GOJ and JICA, and Approval by the Japanese 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

2. Preparatory Survey

(1) Contents of the Survey

The aim of the Survey is to provide a basic document necessary for the appraisal of the Project by JICA and the GOJ. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of agencies concerned of the recipient country necessary for the implementation of the Project.

- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, financial, social and economic point of view.

- Confirmation of items agreed on by both parties concerning the basic concept of the Project.

- Preparation of an outline design of the Project.

- Estimation of costs of 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 Grant Aid 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 smooth implementation of the Survey, JICA uses (a) registered consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

The Report on the Survey is reviewed by JICA, and after the appropriateness of the Project is confirmed, JICA recommends the GOJ to appraise the implementation of the Project.

3. Japan's Grant Aid Scheme

(1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the E/N will be singed between the GOJ and the Government of the recipient country to make a plead for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

(2) Selection of Consultants

The consultant firm(s) used for the Survey Will be recommended by JICA to the recipient country to also work on the Project's implementation after the E/N and the G/A, in order to maintain technical consistency.

(3) Eligible source country

Under the Japanese Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. When JICA and the Government of the recipient country or its designated authority deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality.)

(4) Necessity of "Verification"

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

(5) Major undertakings to be taken by the Government of the Recipient Country

In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as Attachment 1.

(6) Proper Use

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

(7) Export and Re-export

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

(8) Banking Arrangements (B/A)

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

b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

(9) Authorization to Pay (A/P)

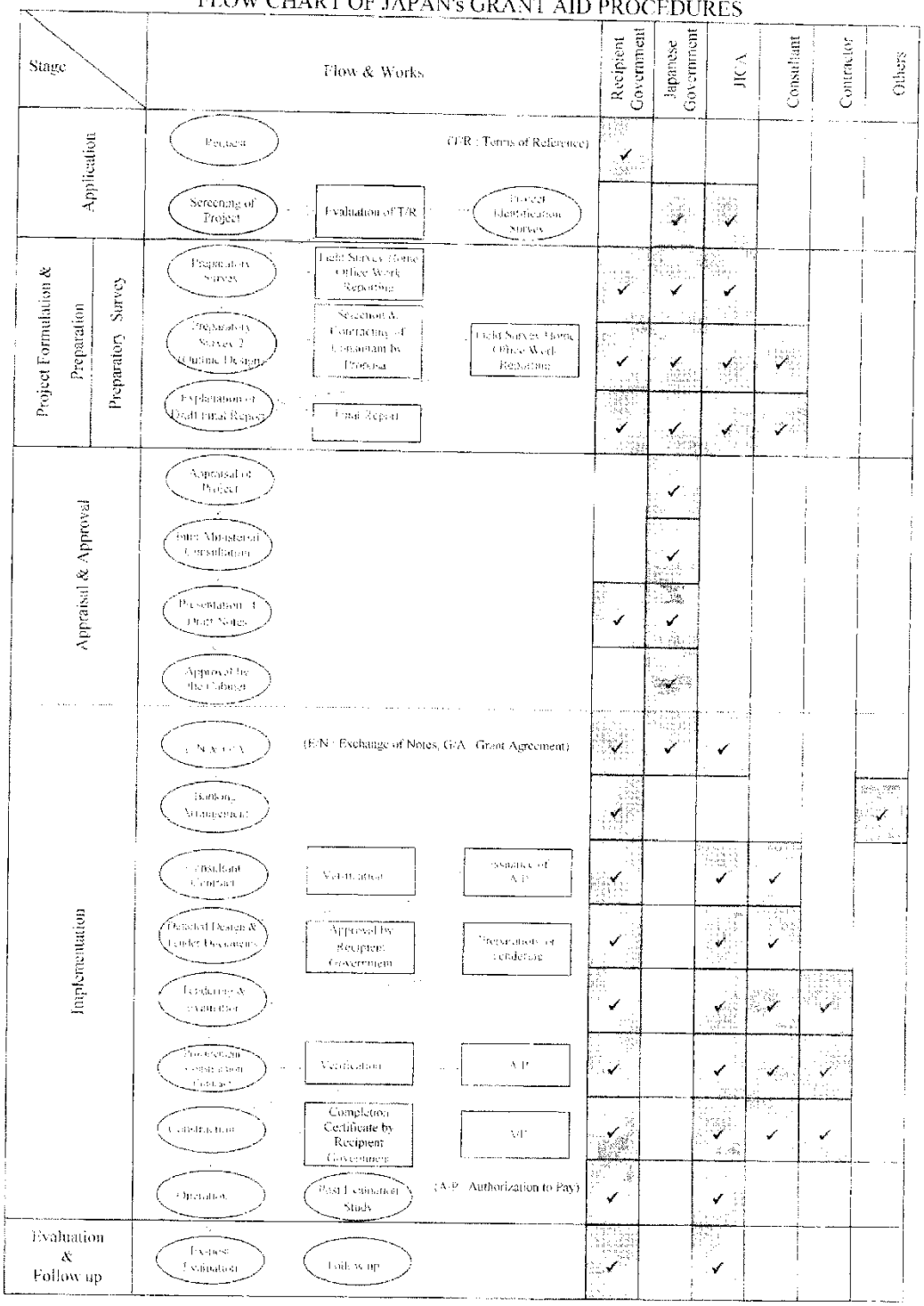
The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions to the Bank.

(10) Social and Environmental Considerations

A recipient country must ensure the social and environmental considerations for the Project and must follow the environmental regulation of the recipient country and JICA socio-environmental guideline.

Attachment 1 for Annex-4

FLOW CHART OF JAPAN's GRANT AID PROCEDURES



Annex-5: Major Undertakings to be taken by Each Government

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

(B/A: Banking Arrangement, A/P: Authorization to pay, N/A: Not Applicable)

(2) 準備調査報告書（案）説明時

MINUTES OF DISCUSSIONS
ON
THE PREPARATORY SURVEY
FOR
THE PROJECT FOR REHABILITATION AND EXPANSION OF THE WATER NETWORKS IN BALQA GOVERNORATE IN THE HASHEMITE KINGDOM OF JORDAN

(EXPLANATION OF THE DRAFT REPORT)

The Government of Japan decided to conduct the Preparatory Survey on the Project for Rehabilitation and Expansion of the Water Networks in Balqa Governorate (hereinafter referred to as "the Project") and entrusted the survey to the Japan International Cooperation Agency (hereinafter referred to as "JICA"), therefore JICA has conducted the Preparatory Survey on the Project. Through discussions, field surveys, and technical examination of the study results in Japan, JICA prepared a draft final report of the survey.

In order to explain and to consult with the Government of the Hashemite Kingdom of Jordan (hereinafter referred to as "Jordan") on the components of the draft final report, JICA dispatched to Jordan the Draft Final Report Explanation Team (hereinafter referred to as "the Team"), headed by Mr. Yoshiki OMURA, Senior Advisor, JICA, from the 26th day to the 30th day of January 2014.

As a result of discussions, both sides confirmed the main items described in the attached sheet.

Amman, 30th January 2014

Mr. Yoshiki OMURA
Leader
Preparatory Survey Team,
Japan International Cooperation Agency

Eng. Tawfiq Z. Habashneh
Secretary General,
Water Authority of Jordan
Ministry of Water and Irrigation

ATTACHMENT

1. Components of the Draft Final Report

The Jordanian side agreed and accepted in principle the components of the draft final report explained by the Team. The Project sites map and components of the Project are respectively shown in **Annex-1** and **Annex-2**.

2. Responsible and implementation agency

2-1) The Responsible Agency is the Ministry of Water and Irrigation (hereinafter referred to as "MWI").

2-2) The Implementing Agency is the Water Authority of Jordan (hereinafter referred to as "WAJ").

3. Japan's Grant Aid Scheme

3-1) The Jordanian side understood the Japan's Grant Aid Scheme explained by the Team, as described in **Annex-3**.

3-2) The Jordanian side will take the necessary measures, as described in **Annex-4**, for smooth implementation of the Project, as a condition for the Japanese Grant Aid to be implemented.

4. Submission of the Final Report

JICA will complete the final report in accordance with the confirmed items and send it to the Government of Jordan in April 2014.

5. Other Relevant Issues

5-1) Project cost estimate and fairness

The Team explained to the Jordanian side the estimated project cost as attached in **Annex-5**. Both sides confirmed that this cost estimate is provisional and would be examined further by the Government of Japan for its final approval. Furthermore, both sides confirmed that this project cost estimate is CONFIDENTIAL, and should never be duplicated in any forms or released to any other parties until the relevant contracts are awarded by the Government of Jordan, in order to secure fairness of tender procedure.

5-2) Necessary budget to be covered by the Jordanian side

The Japanese side explained necessary project cost to be covered by the Jordanian side as attached in **Annex-5** and necessary annual operation and maintenance cost. The Jordanian side agreed to secure

necessary budget.

5-3) Tax Exemption

The both sides confirmed that the tax exemption including Value Added Tax (VAT), customs duty, and any other taxes and fiscal levies in Jordan, which is to be imposed in relation to the Project activities, will be ensured by the Jordanian side. WAJ will take any necessary procedures for tax exemption, and in case that tax exemption is not secured, the cost of tax will be borne by WAJ.

5-4) Undertakings of the Jordanian side

The Team explained to the Jordanian side its undertakings as listed in **Annex-4**, and the Jordanian side understood and agreed to execute them. The following items are to be emphasized:

1) Land Acquisition

WAJ agreed to take necessary procedures to acquire land for the sites of the Project for construction of three reservoirs as described in the draft final report, and complete them by the end of September 2014.

2) Securing bulk water supply to Balqa Governorate

The both sides confirmed that, as a prerequisite to the Project, an additional bulk water of 4 MCM a year shall be allocated to the Balqa Governorate by completion time of the Project expected in 2017. Total amount of 1.09 MCM a year shall be secured to Deir Alla from the existing Abu Zeghan RO Plant owned by Miyahuna LLC, and total amount of 7.7 MCM a year of water to Ain Al Basha from Zai/Dabouq Conveyer to utilize the pressure for providing reservoirs with water.

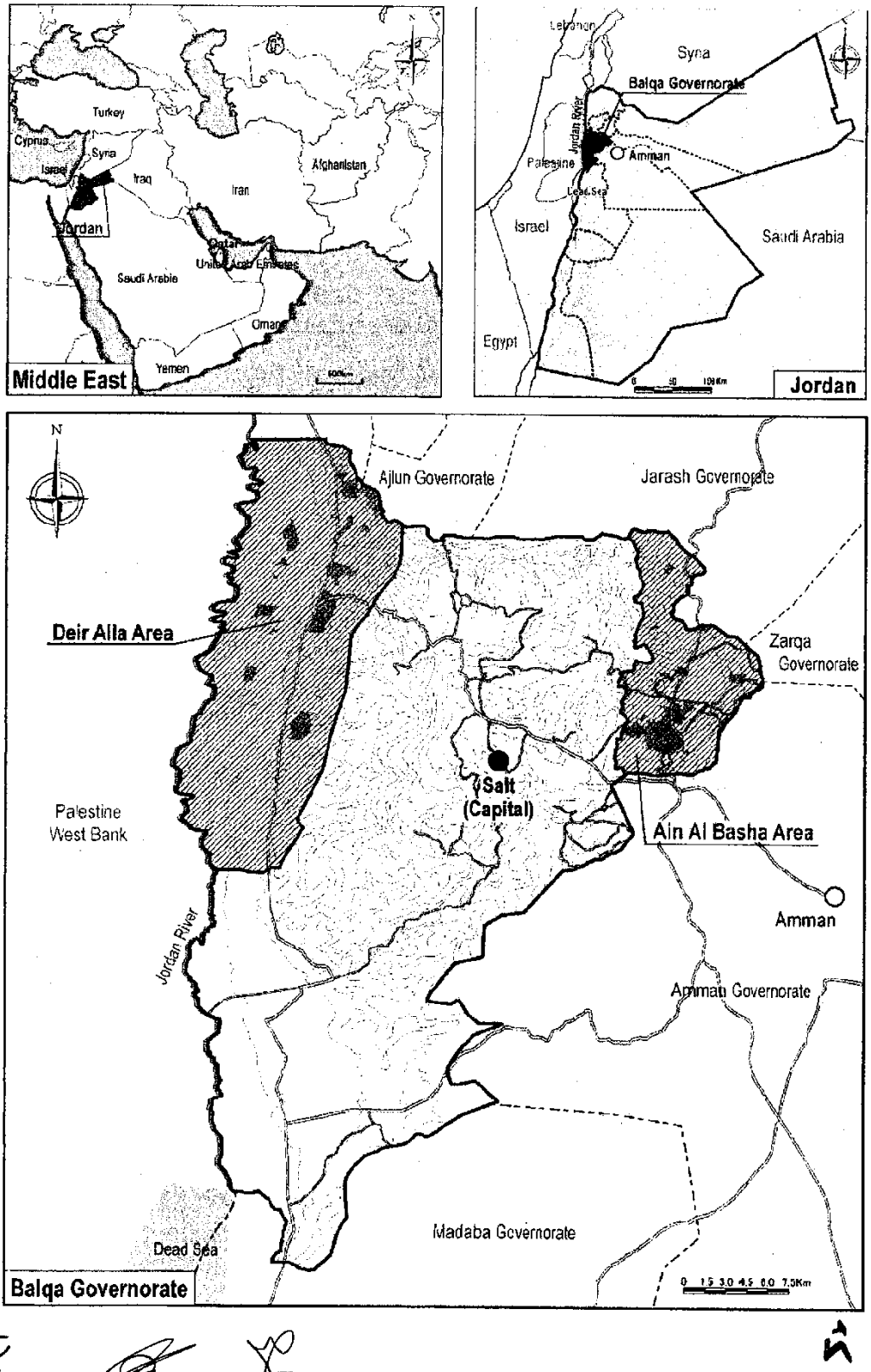
WAJ agreed to secure a MWI approval by March 2014 to allocate said volume of water to the Balqa Governorate upon to the Project completion.

3) Technical assistance ("Soft Component" of the Project)

Both side confirmed that the technical assistance on the effective operation and maintenance of distribution network is provided as a soft component of the Project. To secure the effectiveness of the soft component, WAJ shall assign competent and appropriate staff who can acquire the necessary skills and knowledge to apply to their jobs.

Annex- 1 Project Sites Map
Annex- 2 Component of the Project
Annex- 3 Japan's Grant Aid Scheme
Annex- 4 Major Undertakings to be taken by Each Government
Annex- 5 Cost borne by the Japanese and the Jordanian sides

Annex- 1 Project Sites Map



Annex- 2 Component of the Project

Item	Area	Component		Unit	Capacity and Quantity
Procurement and Construction	Ain Al Basha	Pipeline	100mm DI	M	350
			150mm DI	M	5,740
			200mm DI	M	4,700
			250mm DI	M	540
			300mm DI	M	8,750
			Total	M	20,080
		Distribution Reservoir	New Abu Nsair 1	m^3	900
			New Abu Nsair 2	m^3	1,100
			Total	m^3	2,000
		Pressure Reducing Valve		units	5
		Flow Meter		units	7
	Deir Alla	Pipeline	150mm DI	m	1,090
			250mm DI	m	4,450
			300mm DI	m	9,620
			Total	m	15,160
		Distribution Reservoir	Ma'adi	m3	3,300
		Pump Station	Ma'adi Pump Station	No.	1
		Pressure Reducing Valve		units	6
		Flow Meter		units	11
	Grand Total	Pipeline	100mm DI	M	350
			150mm DI	M	6,830
			200mm DI	M	4,700
			250mm DI	M	4,990
			300mm DI	M	18,370
			Total	M	35,240
		Distribution Reservoir		units	3 (5,300m^3 in total)
		Pump Station		units	1
		Pressure Reducing Valve		units	11
		Flow Meter		units	18
Soft Component	Technical Assistance for Capacity Development of Management of Water Distribution System			Lot	1

Annex- 3 Japan's Grant Aid Scheme

The Government of Japan (hereinafter referred to as "the GOJ") is implementing the organizational reforms to improve the quality of ODA operations, and as part of this realignment, JICA was re-organized on October 1, 2008. After the re-organization of JICA, following the decision of the GOJ, Grant Aid for General Project is extended by JICA.

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 the relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

1. Grant Aid Procedures (Attachment 1)

Japanese Grant Aid is conducted as follows:

- Preparatory Survey (hereinafter referred to as "the Survey")
  - The Survey conducted by JICA
- Appraisal & Approval
  - -Appraisal by the GOJ and JICA, and Approval by the Japanese 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

2. Preparatory Survey

(1) Contents of the Survey

The aim of the Survey is to provide a basic document necessary for the appraisal of the Project by JICA and the GOJ. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of agencies concerned of the recipient country necessary for the implementation of the Project.
- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, financial, social and economic point of view.
- Confirmation of items agreed on by both parties concerning the basic concept of the Project.
- Preparation of an outline design of the Project.
- Estimation of costs of 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 Grant Aid 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 smooth implementation of the Survey, JICA uses (a) registered consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

The Report on the Survey is reviewed by JICA, and after the appropriateness of the Project is confirmed, JICA recommends the GOJ to appraise the implementation of the Project.

3. Japan's Grant Aid Scheme

(1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the E/N will be singed between the GOJ and the Government of the recipient country to make a plead for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

(2) Selection of Consultants

The consultant firm(s) used for the Survey Will be recommended by JICA to the recipient country to also work on the Project's implementation after the E/N and the G/A, in order to maintain technical consistency.

(3) Eligible source country

Under the Japanese Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. When JICA and the Government of the recipient country or its designated authority deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality.)

(4) Necessity of "Verification"

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

(5) Major undertakings to be taken by the Government of the Recipient Country

In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as Attachment 2

(6) Proper Use

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

(7) Export and Re-export

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

(8) Banking Arrangements (B/A)

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

b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

(9) Authorization to Pay (A/P)

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

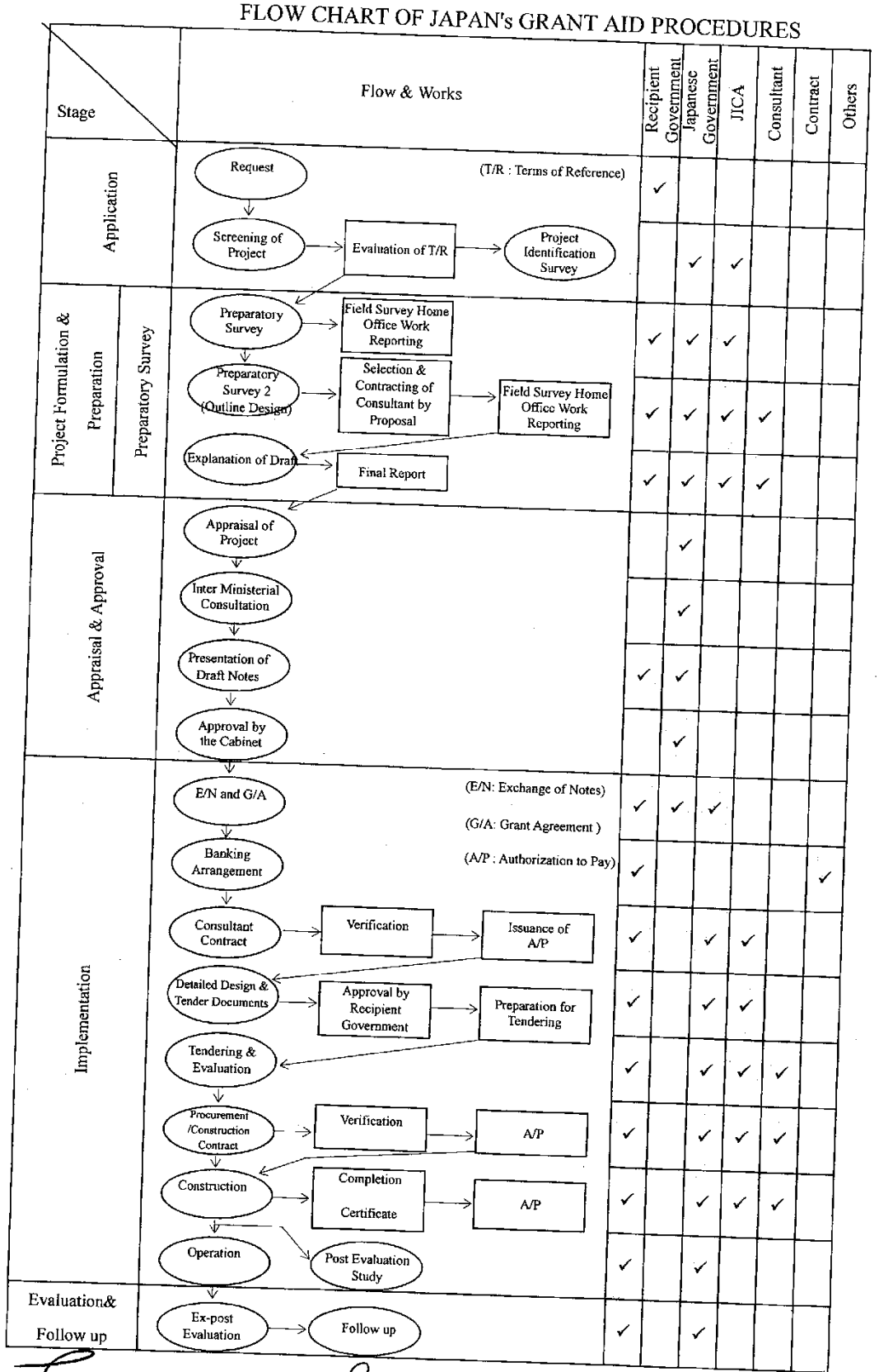
(10) Social and Environmental Considerations

A recipient country must ensure the social and environmental considerations for the Project and must follow the environmental regulation of the recipient country and JICA socio-environmental guideline.

(End)

Attachment 1 for Annex-3

FLOW CHART OF JAPAN's GRANT AID PROCEDURES



Annex-4: Major Undertakings to be taken by Jordanian Government

NO	Items	To be covered by the Grant	To be covered by Recipient side
1	To secure land		•
2	To clear, level and reclaim the site when needed	•	
3	To construct gates and fences in and around the site		•
4	To construct the parking lot	•	
5	To construct access roads		
	1) Within the site	•	
	2) Outside the site	• (base course)	• (asphalt)
6	To construct the building	•	
7	To provide facilities for the distribution of electricity, water supply, drainage and other incidental facilities		
	1)Electricity		
	a. The distributing line to the site		•
	b. The drop wiring and internal wiring within the site	•	
	c. The main circuit breaker and transformer		•
	2)Water Supply		
	a. The municipal water service pipe to the site		•
	b. The supply system within the site	•	
	3)Drainage		
	a. The municipal drainage main (for storm, sewer and others) to the site	N/A	N/A
	b. The drainage system (for toilet sewer, ordinary waste, storm drainage and others) within the site	N/A	N/A
	4)Gas Supply		
	a. The municipal gas main to the site	N/A	N/A
	b. The gas supply system within the site	N/A	N/A
	5)Telephone System		
	a. The telephone trunk line to the main distribution frame / panel (MDF) of the building	N/A	N/A
	b. The MDF and the extension after the frame / panel	N/A	N/A
	6)Furniture and Equipment		
	a. General furniture	N/A	N/A
	b. Project equipment	•	
8	To bear the following commissions to a bank of Japan for the banking services based upon the B/A		
	1) Advising commission of A/P		•

	2) Payment commission		•
9	To ensure prompt unloading and customs clearance at the port of disembarkation in recipient country		
	1) Marine (Air) transportation of the products from Japan to the recipient country	•	
	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 whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		•
11	To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract		•
12	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid		•
13	To bear all the expenses, other than those to be borne by the Grant Aid, necessary for construction of the facilities as well as for the transportation and installation of the equipment		•

(B/A: Banking Arrangement, A/P: Authorization to pay, N/A: Not Applicable)

Confidential

Annex-5: Project Cost to be borne by Each Government

1. Project Components by the Japanese Grant Aid

   This Page is closed due to the confidentiality.

2. Project Components by the Jordanian Government

   Total Project Cost to be borne by the Jordanian Government: Approximately JPY 32.5 Million. (equivalent to approx. JD 232 Thousand).

(Applied conversion rate: JD 1 = JPY 140.17)

ヨルダン国
バルカ県送配水網改善・拡張計画準備調査

ソフトコンポーネント計画書

2014 年 3 月

株式会社 TEC インターナショナル

ヨルダン国バルカ県送配水網改善・拡張計画準備調査
ソフトコンポーネント計画書

目　　次

図　表　目　次

別紙 1：　ソフトコンポーネントに係る概算事業費の詳細

1. ソフトコンポーネントを計画する背景

無償資金協力「ヨルダン国バルカ県送配水網改善・拡張計画」は、ヨルダン国（以下、「ヨ」国）バルカ県のアインアルバシャ地区とディルアラ地区の水道施設を改善・拡張することにより、①配水区への公平な配水、②配水圧を適切な水圧に抑え漏水量を削減、③エネルギー効率の高いシステムへの変換、を目的とするものである。本計画には、配水区と DMA の設定、配水池の建設、送配水管更新、減圧施設およびバルクメーターの設置をコンポーネントに含み、本プロジェクトの実施によって、プロジェクト対象地区の給水状況が改善され、また、漏水量削減による有収量が増加し、電力使用量も減少するので、WAJ の水道事業の健全化にも寄与することができる。

1）現状

アインアルバシャ、ディルアラとも、水道システムは水源井戸と他の水源からの供給に依存し、水源井戸以外ではアインアルバシャはザイ浄水場、ディルアラでは 2 カ所の RO プラントから送水を受けている。両地区とも、水源からの大部分の水は、一旦、配水池とポンプ受水槽まで送られ、自然流下、あるいはポンプによって増圧され給水される。しかしながら、既存配水池の設置レベルは充分な高さがなく、容量も不足しているため、協力対象地区の大部分のエリアには、配水ポンプ、ブースターポンプによって給水されている。

両地区とも、起伏の激しい地形にもかかわらず、給水圧を適正に保つための減圧装置はなく、ゾーニングも設定されていない。ポンプも老朽化したものが多く、配水先の状況に応じた適切な性能を持ったものは少なく、その結果、標高の低い地域は高い水圧に標高の高い地域は低い水圧になり、漏水や出水不良の原因となっている。配水池の不備や不適切なポンプ性能のため、適切に給水を行うことが難しく、給水地区への公平な水配分が困難となっている。また、低い効率でのポンプ運転を行っているため、電力消費量が大きい。このような給水状況を改善するため水道施設の改善が求められてきたが、他県に比べ援助プロジェクトは少なく、とくにディルアラ地区は支援がほとんどなく、水道施設改善のプロジェクトはほとんど実施されてこなかった。

水道施設が充分に整備されていないという環境のもとで、WAJ の地区事務所は配水管理を担っているが、以下のような問題を抱えている。

① 既存配水区には配水先の状況（給水域、給水時間、給水量、給水圧など）を定量的にとらえるためのモニタリング設備がほとんどない。配水区内のデータ収集は行われていないため、その方法が身についておらず、データの活用法も理解していない。

② 本プロジェクトでは必要な箇所に流量メーターを取り付けることになるので、顧客側の使用水量との比較から、無収水率を求めることが可能になる。しかしながら、今までは WAJ の地区事務所のレベルにおいて無収水率は求めた経験がなく、その方法を充分に理解していない。

③ 給水圧を適正に保つために減圧装置は必要な設備であるが、その減圧幅の設定と維持管理技術はとりわけ重要である。アインアルバシャには一部減圧弁が設置されているものの、ディルアラにはなく、両地区事務所の職員に減圧装置の運用と維持管理技術を習得している者はほとんどいない。

2) ソフトコンポーネントの必要性

本プロジェクトによりアインアルバシャ、ディルアラ地区の送配水施設および配水区が整備され、送配水システムが改善される。しかし、送配水データの管理と活用、適切な配水管網の維持管理が持続的に実施されなければ、本プロジェクトの効果は最大限に発揮されない。一方、実際に送配水システムを運用・管理するアインアルバシャとディルアラ地区事務所職員の知識、技術水準はこれらの活動を適切に実施するためには不十分であり、また、両事務所を監督する立場のWAJ バルカ支所職員も両地区事務所を指導する能力は充分とはいえない。このような状況から、実際の配水管理を担当する両地区事務所に加え、WAJ バルカ支所の職員も含めて本ソフトコンポーネントにより技術支援を行い、関係機関の連携による将来の活動を念頭におき、送配水管理および無収水管理に係る能力を強化する必要がある。

また、本ソフトコンポーネントは「ヨ」国で実施された技術協力プロジェクト「無収水対策能力向上プロジェクト」(2005 年～2008 年) および「無収水対策能力向上プロジェクトフェーズ 2」(2009 年～2011 年) の成果を活用する計画である。技術協力プロジェクトは WAJ の無収水対策に係る組織体制整備および能力向上 (漏水探査、水道メーター設置、配水ネットワークの管理等) を支援している。本ソフトコンポーネントを通して、配水モニタリングの適切な運用、配水データの管理・分析法、配水データをもとにした無収水量の算定に係わる技術移転および能力強化を行うことで、両地区事務所および WAJ バルカ支所職員は配水管理技術を修得することが可能となる。

2. ソフトコンポーネントの目標

アインアルバシャおよびディルアラ地区事務所職員、WAJ バルカ支所職員の配水管理に係る能力が向上する。

3. ソフトコンポーネントの成果

ソフトコンポーネントによる成果および主な活動は以下のとおりである。本ソフトコンポーネントをとおして、アインアルバシャおよびディルアラ地区事務所職員、WAJ バルカ支所職員は設置されたバルクメーターから流量データを持続的に収集することが可能となり、これを分析し適正な配水管理と無収水量の算定が可能となる。

【成果 1】アインアルバシャおよびディルアラ地区事務所職員、WAJ バルカ支所職員は、バルクメーターの流量データを継続的に収集・分析する能力が身につき、ゾーンおよび DMA の配水量を把握することによって、公平な水配分へのアプローチが可能となる。

【成果 2】 アインアルバシャおよびディルアラ地区事務所職員、WAJ バルカ支所職員は、バルクメーターによる配水データと徴収水量 (検針水量) から無収水量を算定し、無収水量削減のためにデータを活用することが可能となる。

【成果 3】 アインアルバシャおよびディルアラ地区事務所職員、WAJ バルカ支所職員は、給水圧を適正な範囲にコントロールすることが可能となる。

4. 成果達成度の確認方法

表 1 の方法によりソフトコンポーネントの成果達成度を確認する。研修員は WAJ バルカ県の水道運営を指導、監督する WAJ バルカ支所から 2 名と実際に水道運営の実施者であるアインアルバシャ地区事務所とディルアラ地区事務所からそれぞれ 2 名を選定する。ソフトコンポーネントの成果達成度は研修員全員が下記確認項目を満たすことを目標とする。

表 1　ソフトコンポーネント成果の確認方法

分野	成果	達成度の確認項目
配水データ管理	WAJ バルカ支所職員は、バルクメーターの流量データを継続的に収集・分析する能力が身につき、ゾーンおよび DMA の配水量を把握することによって、公平な水配分へのアプローチが可能となる。	➢ モニタリングの重要性を認識しているか。 ➢ バルクメーターの維持管理を習得しているか。 ➢ バルクメーターからのデータ収集、集計、分析、図表化できるか。 ➢ 分析結果から問題点を抽出し適正な配水コントロールへのアプローチを提示できるか。
無収水量の算定	WAJ バルカ支所職員は、バルクメーターによる配水データと徴収水量（検針水量）から無収水量を算定し、無収水量削減のためにデータを活用することが可能となる。	➢ 無収水量の概念を認識しているか。 ➢ 配水データ、徴収水量（検針水量）の比較により無収水量を算定できるか。 ➢ 無収水量の評価方法を理解しているか。 ➢ 無収水削減のための対策案を提示できるか。
給水圧管理	WAJ バルカ支所職員は、給水圧を適正な範囲にコントロールすることが可能となる。	➢ 適正な配水圧範囲を認識しているか。 ➢ 減圧弁の原理を理解しているか。 ➢ 減圧弁の維持管理と減圧幅の調整法を習得しているか。

5. ソフトコンポーネントの活動（投入計画）

詳細活動内容を表 2 に示す。

表 2　ソフトコンポーネントの詳細活動内容

番号	活動	投入	
		日本国側	「ヨ」国側参加人数
1	研修準備		
1）	国内準備（専門家 1 名）		
①	技術移転計画書作成	1 名×1 日＝1 人日	―
②	テスト作成・質問票作成・研修用テキスト(案) 準備	1 名×4 日＝4 人日	―
	小計	5 人日	
	移動	1 名×2 回×2 日＝4 人日	―
2)	実施準備・導入技術説明会		
①	研修室設立・C/P 打合せ・実施準備・説明会準備	1 名×3 日＝3 人日	1 名×4 日＝4 人日：CE
②	研修生の選定（研修前テスト・アンケート・評価・選定）	1 名×1 日＝1 人日	1 名×1 日＝1 人日：CE
③	実施説明会	1 名×1 日＝1 人日	5 名×1 日＝5 人日
	小計	5 人日	10 人日
2	研修		
1)	配水データ管理（配水管理技術者）		
①	配水データ収集の目的と方法の説明、機器の概説と維持管理法（バルクメーター、水圧計）（講義）	1 名×1 日＝1 人日	5 名×1 日＝5 人日
②	データフォーマット作成とデータ取得	1 名×7 日＝7 人日	3 名×7 日＝21 人日
③	配水データの入力、処理、分析方法（講義と演習）	1 名×4 日＝4 人日	5 名×4 日＝20 人日
④	分析結果から配水管理の評価と対策（講義と演習）	1 名×2 日＝2 人日	5 名×2 日＝10 人日

番号	活動	投入	
		日本国側	「ヨ」国側参加人数
2)	無収水量の算定		
①	無収水量算定の目的と方法の説明（講義）	1名×1日＝1人日	5名×1日＝5人日
②	配水データと徴収水量からの無収水量の算定（講義と演習）	1名×2日＝2人日	5名×2日＝10人日
③	無収水量の評価と対策（講義と演習）	1名×2日＝2人日	5名×2日＝10人日
3)	給水圧管理		
①	給水圧の適正範囲基準（講義）	1名×2日＝2人日	5名×2日＝10人日
②	減圧弁の概説（講義）	1名×2日＝2人日	5名×2日＝10人日
③	減圧弁の減圧幅調整法と維持管理（講義と演習）	1名×3日＝3人日	3名×3日＝9人日
	小計	26人日	110人日
3.	総合報告		
1)	総合セミナー		
①	準備（アインアルバシャとディルアラ）	1名×2日＝2人日	4名×2日＝8人日
②	セミナー開催（アインアルバシャとディルアラ）	1名×1日＝1人日	10名×1日＝10人日
2)	報告書作成・マニュアル整備		
①	ソフトコンポーネント評価報告	1名×1日＝1人日	―
②	総合報告書作成・提出	1名×1日＝1人日	―
	小計	5人日	18人日
	移動	1名×2日×2回＝4人日	―
	合計	49人日	138人日

6. ソフトコンポーネントの実施リソースの調達方法

本ソフトコンポーネントは、配水管理技術者（邦人コンサルタント）を延べ1.6ヶ月間派遣し、直接支援型で実施する。ソフトコンポーネントを実施する技術者の必要要件は以下のとおりとする。

1) 管網水理学を理解している

2) 送配水運用計画を立案できる

3) 「ヨ」国側技術者に対する研修をマネジメントする能力がある

本技術者は、水理学、送配水運用計画の策定に係る経験に加えて「ヨ」国技術者と意思疎通を行うための語学力、開発途上国における送配水システムの維持管理上の問題点を理解していることが求められる。

なお、配水管理技術者を「ヨ」国および第三国から調達することは可能であるが、それらの技術を総合的に理解し、研修を実施することができる技術者の調達は困難である。従って、必要要件を満たし、「ヨ」国の送配水システムの状況を理解している本邦コンサルタントが適当である。

要員配置計画の詳細を表3に示す。

表 3　ソフトコンポーネントの要員配置計画

要員分野	人数	所属	内容
配水管理	1	本邦	本邦の配水管理技術を現地の状況および研修員の技術水準に応用し以下の事項を実施する。 ・　研修テキストの作成、研修の実施 ・　テスト、レポート宿題の作成・評価 ・　各種フォーマットの整備 ・　セミナーの実施 ・　データの収集・編集・モデル化 ・　評価

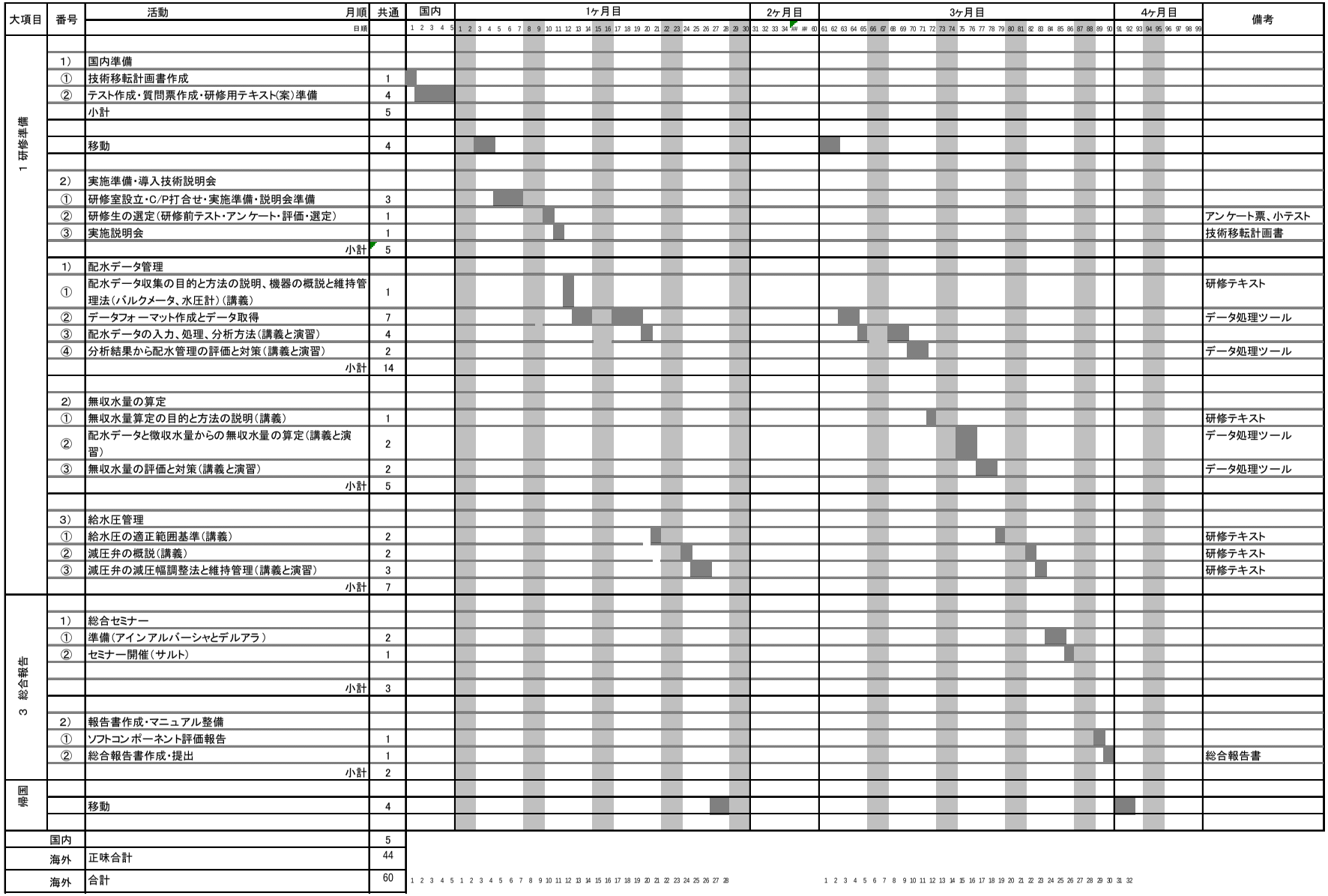
7.　ソフトコンポーネントの実施工程

本プロジェクトの施設建設工事は 19.5 ヶ月で実施される。本ソフトコンポーネントを実施するために建設される配水池、DMA 等で測定される配水量および水圧のデータが必要となる。従って、本ソフトコンポーネントは施設完成後に行う。これらのデータの収集期間を見込み、ソフトコンポーネントは前期と後期に分けて行うものとする。前期では基本的な知識の習得を目的に講義を中心とした研修を実施する。その後、後期が始まるまでの 1 ヶ月の間に「ヨ」国が測定データを収集する。後期では、収集データを使ったデータの入力、処理、分析方法、および、分析結果から配水管理、無収水対策、給水圧管理の方法の習得を目的とした研修を実施する。ソフトコンポーネントの期間は約 3.2 ヶ月、必要人日は以下のとおりである。実施計画を表 4、詳細活動計画を図 1 に示す。

- 実働日数：49 日、国内準備 5 日および現地 44 日
- 歴日数（図-1 参照）：　65 日（国内準備 5 日、現地 60 日）
- 歴月数：　国内準備期間：0.17MM(=5/30)、派遣期間：1.43MM(=60/30)（60 日）

表 4　実施計画

活動	国内	現地 第 1 ヶ月目	現地 第 2 ヶ月目	現地 第 3 ヶ月目
1. 研修準備				
1）国内準備（専門家 1 名）	▬			
2）実施準備・導入技術説明会		▬▬		
2. 研修				
1）配水データ管理（配水管理技術者）		▬▬		▬▬
2）無収水量の算定				▬
3）給水圧管理		▬		▬
3. 総合報告				
1）総合セミナー				▬
2）報告書作成・マニュアル整備				▬



大項目	番号	活動	共通	国内	備考
		月順		1ヶ月目 2ヶ月目 3ヶ月目 4ヶ月目	
		日順		1 2 3 4 5 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 ## ## 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99	
1 研修準備					
	1）	国内準備			
	①	技術移転計画書作成	1		
	②	テスト作成・質問票作成・研修用テキスト(案)準備	4		
		小計	5		
		移動	4		
	2）	実施準備・導入技術説明会			
	①	研修室設立・C/P打合せ・実施準備・説明会準備	3		
	②	研修生の選定(研修前テスト・アンケート・評価・選定)	1		アンケート票、小テスト
	③	実施説明会	1		技術移転計画書
		小計	5		
	1）	配水データ管理			
	①	配水データ収集の目的と方法の説明、機器の概説と維持管理法(バルクメータ、水圧計)(講義)	1		研修テキスト
	②	データフォーマット作成とデータ取得	7		データ処理ツール
	③	配水データの入力、処理、分析方法(講義と演習)	4		
	④	分析結果から配水管理の評価と対策(講義と演習)	2		データ処理ツール
		小計	14		
	2）	無収水量の算定			
	①	無収水量算定の目的と方法の説明(講義)	1		研修テキスト
	②	配水データと徴収水量からの無収水量の算定(講義と演習)	2		データ処理ツール
	③	無収水量の評価と対策(講義と演習)	2		データ処理ツール
		小計	5		
	3）	給水圧管理			
	①	給水圧の適正範囲基準(講義)	2		研修テキスト
	②	減圧弁の概説(講義)	2		研修テキスト
	③	減圧弁の減圧幅調整法と維持管理(講義と演習)	3		研修テキスト
		小計	7		
3 総合報告					
	1）	総合セミナー			
	①	準備(アインアルバーシャとデルアラ)	2		
	②	セミナー開催(サルト)	1		
		小計	3		
	2）	報告書作成・マニュアル整備			
	①	ソフトコンポーネント評価報告	1		
	②	総合報告書作成・提出	1		総合報告書
		小計	2		
帰国					
		移動	4		
	国内		5		
	海外	正味合計	44		
	海外	合計	60	1 2 3 4 5 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32

図 1　詳細活動計画

8. ソフトコンポーネントの成果品

以下の報告書及び成果品を作成・提出する。

報告書・成果品	内容	時期
技術移転計画書（英文）	ソフトコンポーネントの内容、達成目標、詳細スケジュール、実施方法等	開始時
完了報告書（英文）（和文要約）	技術移転内容、能力向上結果、研修評価、技術移転マニュアル、写真を含む総合報告書	完了時
配水データ	入力済み配水データ	完了時
マニュアル類	配水データ入力・管理マニュアル	完了時
その他	指導記録、出力物、研修テキスト	完了時

9. 相手国実施機関の責務

バルカ県の水道事業の責任機関は WAJ バルカ支所であり、WAJ バルカ支所の指導のもと、アインアルバシャ地区とディルアラ地区の現場事務所が水道事業の運営にあたり、配水管理の実際の意志決定者は現場事務所となる。これら関係する機関は、水道事業における配水管理の重要性を共通認識として共有しており、配水管理の能力向上には担当職員への技術移転を行い、技術力の底上げの必要性を理解している。また、WAJ バルカ支所はコンピューターのシステム環境が整備され、技術移転の主体となるデータ処理にも慣れているが、地区事務所は現地の状況と実務に精通しているものの、WAJ バルカ支所ほどコンピューターを使った仕事には慣れていない。このような状況から、ソフトコンポーネントの活動が効率よく行われ、その成果が新施設の運用・維持管理に有効に生かされるために、想定される阻害要因に対して相手国実施機関は以下のような対策をとることが求められる。

1) 研修員の人選

地区事務所にはコンピューターに慣れていない職員も多く研修についていけない可能性もあるので、研修員の人選は適切に行われる必要がある。研修では配水管理の技術に加え、コンピューターを使ったデータ処理技術も研修内容となるため、以下の条件を前提に相手国実施機関は WAJ バルカ支所および両地区事務所の職員の中から研修生を選定するとともに、選定した研修生は本邦コンサルタントがその適正を判断して最終的な人選を行うものとする。

- 配水管理の業務経験があること
- コンピューターの基本的な操作方法を習得していること
- 基本ソフト（MS-Excel 及び MS-Word）の操作方法を習得していること
- 十分な研修時間がとれること（1 日 3 時間程度）
- 本研修に関する高い関心、意欲があること

2) WAL バルカ支所と地区事務所の連携

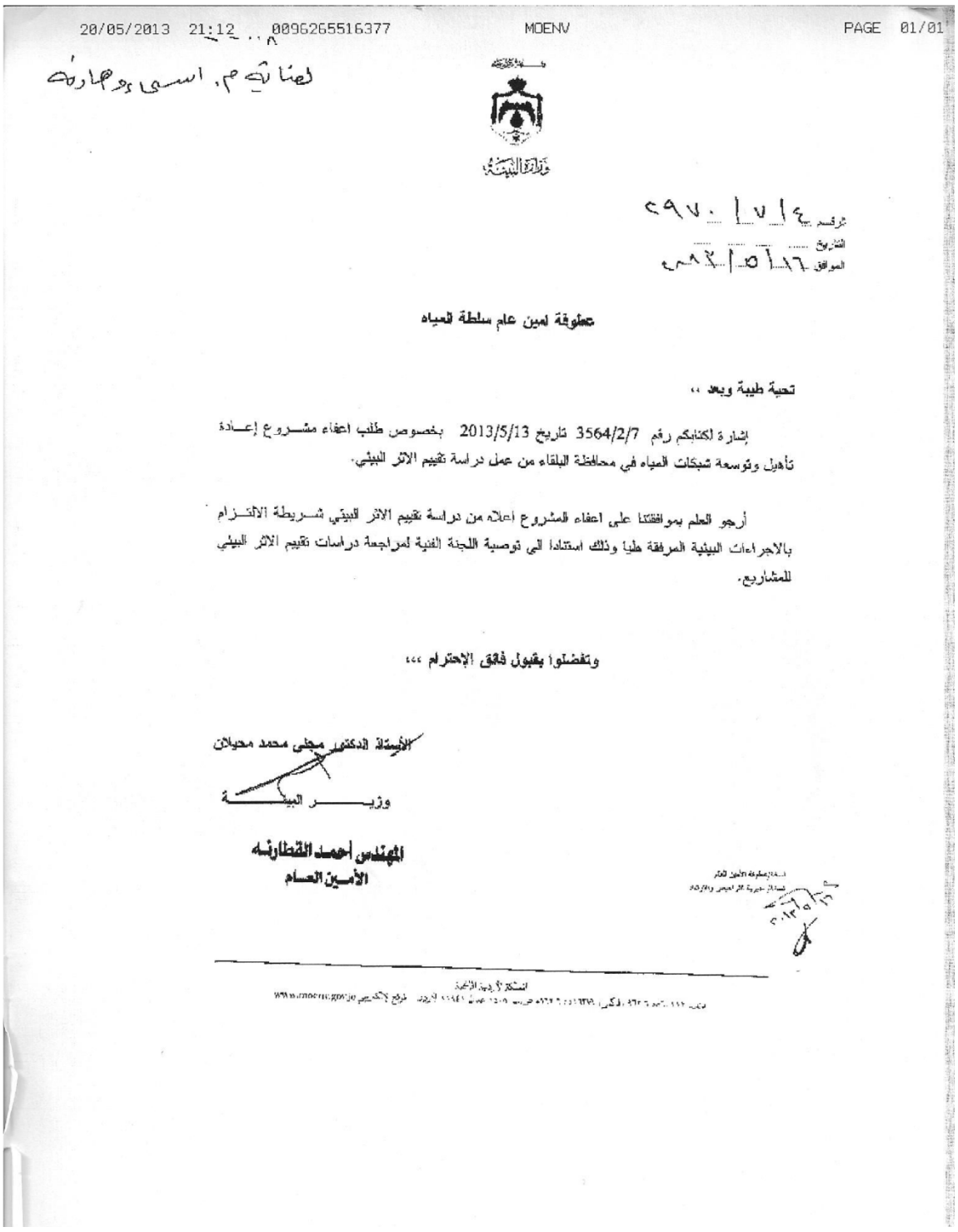
WAJ バルカ支所と地区事務所の管理責任範囲が明確ではなく、情報の共有化が充分にはかられていない。ソフトコンポーネントの成果が有効に生かされるためには、WAJ バルカ支所と各地区事務所の管理責任範囲を明確にするとともに、情報の流れの定式化をはかる必要がある。各組織

の管理責任範囲と組織間の情報の流れは密接に関係し、情報の流れは情報の種類、頻度とともに、問題に対する各組織の協議と対応方法を事前に確立しておくことが重要であり、プロジェクトによって整備された施設の適正な運営・維持管理の継続性にも役立つものと考える。

6　参考資料

6.1　環境社会配慮

(1) 環境省から WAJ へのレター



20/05/2013 21:12 0096265516377 MOENV PAGE 01/01

لصاحبه م. اسمى وهاريه

وزارة البيئة

الرقم ٤/٧/٥٩٧٠
التاريخ
الموافق ١٦/٥/٢٠١٣

معلوفة امين عام سلطة المياه

تحية طيبة وبعد ،،

إشارة لكتابكم رقم 3564/2/7 تاريخ 2013/5/13 بخصوص طلب اعفاء مشروع إعادة تأهيل وتوسعة شبكات المياه في محافظة البلقاء من عمل دراسة تقييم الاثر البيئي.

أرجو العلم بموافقتنا على اعفاء المشروع اعلاه من دراسة تقييم الاثر البيئي شريطة الالتزام بالاجراءات البيئية المرفقة طيا وذلك استنادا الى توصية اللجنة الفنية لمراجعة دراسات تقييم الاثر البيئي للمشاريع.

وتفضلوا بقبول فائق الإحترام ،،،

الأستاذة الدكتورة مجلى محمد محيلان
وزيـــــر البيئـــــة

المهندس أحمد القطارنه
الأمين العام

العنوان الأردنية
www.moenv.gov.jo

（翻訳）

The Hashemite Kingdom of Jordan
Ministry of Environment

No. : 4/7/2970
Date: 16/5/2013

His Excellency General Secretary of Water Authority

Greetings:

With reference to your letter No. 7/2/3564 of 13/5/2013 concerning the request of exemption of Rehabilitation and Expansion of Water Networks project in Balqa Governorate from undertaking an Environmental Impact Evaluation Study.

Please be informed of our approval to exempt the above project from the Environmental Impact Evaluation subject to adherence with the following environmental measures attached herewith based on the recommendation of the Technical Committee for Reviewing the Environmental Impact Evaluation for projects.

With kind regards.

p.p. Prof. Dr. Mujalli Mohammad Muhailan
(Signed)
Minister of Environment
(Original Signed by
Eng. Ahmad Qatarneh,
General Secretary)

Precautionary & Alleviation Measures

Precautionary & Alleviation Measures	Appearance Environment / Social Factor	No.
PUBLIC HEALTH		
Dust emission resulting from the establishment of water supply networks and water transmission lines must be reduced- particularly near the densely populated areas, by complying with the following:	**Quality of Air**	**1**
- Reduce motor vehicles speed on the unpaved roads so as not to exceed 20 km/h.		
- Piling of fine materials with minute particles should not be permitted at the places of work without its protection against flying away or movement due to wind.		
- The contractor should ascertain the cleanliness of motor vehicles and equipment leaving the project area.		
- The contractor should take measures to restrain the flying dust on the unpaved roads in the drilling areas, and to restrain the air carried particles during the transport of extracted drilling output near the densely populated areas or sensitive receivers during the blowing of wind and upon need.		
- The contractor should store cement and sand or other fine particles in a manner which would prevent its movement of dust due to wind.		
- The movement of equipment and machinery shall, at all times and when ever it is possible, be restricted to the routes specified thereto.		
- The areas and paved streets should be cleaned of dust caused by construction activities and according to the response plan, prevent spills which should be developed by the contractor as a part of environmental administration plan.		
Periodically monitor the emissions of machinery and construction vehicles and carry out the appropriate periodical maintenance in order to reduce the emission of pollutants therefrom so as to comply with the limits of the national specifications.		
The machinery should not be left running for long periods when not in use.		
The construction materials loaded in the trucks should be tightly covered during its transport in order to reduce the emission of dust therefrom.		
The appropriate work practices and engineering control methods should be followed to reduce the emission of vapours from asphalt during the asphalting operation. Also, the heated asphalt should be kept at the lowest possible temperature. The population living nearby the asphalting activities should be notified of such activities three days in advance.		
The areas should be linked to the new network during the none water distribution days as per the current water distribution programme so as the citizen will not suffer from additional water interruption.	**Availability of Water**	**2**
The contractor should take reasonable measures such as use of barriers in order to curtail the level of noise during work near the sensitive receivers. If such measures are not practical, the contractor should endeavor to attempt reducing noise through other means such as scheduling of activities accompanied by noise during times of less sensitiveness in consultation with the social sensitive receivers (such as consulting with schools in order to avoid the examination periods) or by use of alternative techniques which generate less level of noise.	**Noise and Vibration**	**3**
The execution activities shall continue, in the residential areas, from 8 am. until 5 pm. during the ordinary days of work in coordination with the engineer and work during Friday (week end) should be avoided .		
The contractor should carry out execution activities at night in the main business streets subsequent to obtaining an advance approval from the project engineer, police and local authority.		
The contractor shall bear the responsibility of rectifying the damages resulting from vibrations due to the use of equipment, machinery and transport vehicles.		
The contractor should use heavy equipment, engines and fuel according to the local		

Precautionary & Alleviation Measures	Appearance Environment / Social Factor	No.
instructions and should carry out the periodical maintenance on all equipment, machinery and sets for the prevention of noise.		
The contractor should restrain the use of engines if there is no need to curtail the level of noise.		
The contractor should prepare a plan for materials and solid refuse to the various work sites, so as to contain a system for recording the quantities of produced refuse, methods and locations of disposing of same. The plan should contain a plan to monitor the effectiveness of collection and methods of dealing with the refuse.	**Generated Garbage and Disposal Thereof**	**4**
The contractor should separate and store the different types of garbage such as hazardous, none hazardous recycles, building materials, plastic, paper and others to facilitate proper disposal thereof according to the garbage management plan.		
The contractor should provide a storage space for hazardous materials. A special poster should be used for hazardous materials which shows the hazardous nature and characteristics of such materials.		
The chemical refuse should be stored according to the provisions of MSDS document. The contractor should keep the papers of the MSDS document in the site.		
The contractor should provide refuse containers at every one of the execution sites in order to prevent throwing refuse in the project site and the surrounding areas.		
The contractor should collect the refuse at regular periods and dispose thereof according to the Garbage Department's plan.		
The organic waste and wastewater must be collected and disposed of on daily basis.		
The solid domestic refuse resulting from work should be collected in closed containers and transported to the garbage dump in coordination with the competent parties or by agreement with a contractor.		
The refuse may not be stored even on temporarily basis in places not assigned thereto such as valleys, canals, planted lands and farms.		
It is not permitted to dump any type of refuse in the open or incinerate same.		
The management of hazardous refuse should be made according to the instructions of the hazardous waste management and circulation of hazardous refuse for the year 2003 which was issued by the Ministry of Environment.		
The building materials rubbish and fill should be disposed on regular basis in coordination with the competent parties.		
The building materials remains should be disposed of on regular basis from the work sites to the licensed areas and in coordination with the municipalities. Also, the streets and roads from which work was finished should be cleaned immediately after the end of every day.		
The work should be executed in short sections (of a maximum length of 150 meters) or appropriate length for completing the work so as to complete it within one working day.	**General Safety**	**5**
The contractor should provide a maintenance team to deal with any breakdown in the water lines and wastewater lines which may be exposed to breakage during excavation. Also, he should coordinate with respect to such maintenance works with the ..... Water Directorate/ Water Authority.		
Pedestrian passages should be provided at a maximum distance of 30 meters.		
A 1.5 meter width should be left without obstacles to the pedestrian passages where ever it is possible in a manner that the free width of obstacles is one meter minimum. When ever it is not possible to provide the minimum passage width, a safe alternative road should be provided for the pedestrians and the width of the passage should not be less than one meter.		
For the protection of pedestrians from the traffic and machinery movement in addition to the excavations, solid barriers should be utilized to differentiate the temporary pedestrian passages. Lamps should be placed to light up the barriers at night . A barricade at (1) meter to 1.2 meters high over the ground surface should be placed and the bars should be fixed in the ground and the lower edge at 150 mm height above over		

Precautionary & Alleviation Measures	Appearance Environment / Social Factor	No.
the ground surface.		
A passage should be continuously provided without obstacles, safe and appropriate for pedestrians and vehicles to reach the fire extinguishing points, commercial and industrial installations, schools, mosques, car parks, service locations, police stations and hospitals.		
The priority of safety measures which can be employed are as follows: (1) Refill to the maximum possible extent (2) Bridges/fixed plates (for pedestrians protection in residential areas, facilitate the vehicles movement in the main streets) which should be placed over any open trench (3) In the cases where it is not possible to apply any of the aforesaid measures, barriers should be used together with supervision and monitoring.		
Watchman service should be provided at all trenches located near schools and houses irrespective of its width and throughout the period of schools work, direct supervision at all trenches is necessary in order to prevent any accidental falling down and sustaining of injuries by the public.		
The construction work should be stopped for half an hour during schooling days (Sunday up to Thursday) during school attendance and departure days at the work sites which are not farther more than 100 meters from schools. During this time, the health and safety official, who is appointed by the Contractor, may orientate workers of the general safety.		
The contractor should maintain safe passages to the public in the work sites.		
The contractor should ensure the proper training of workers on the topics of occupational health and safety.		
Prior to embarking on the construction activities, an orientation should be made of the traffic hazards and work sites for the public and workers. A plan for the Traffic Department should be prepared and applied by the contractor. It should comprise health matters and accompanying safety to the safe and effective movement for the public.		
The motor vehicles movement from and to the project area should be reduced to the maximum limit possible.		
Prior to embarking on construction activities at each site, a conspicuous notice should be posted in a manner enabling it to be seen by the public and comprised of the name and telephone of the concerned person to receive their complaints.		
When ever excavation works are in the main streets or highways, one lane should be kept open to the traffic movement at all times unless the contrary is received.		
The contractor should provide and maintain all the necessary barriers, warning signs, lights and other safety equipment according to the requirements of the Traffic Department for the protection of the traffic movement in the public and private streets.		
The barriers and obstacles should be lit at night, and lighting should be kept on from sunset up to sunrise. The Contractor should provide watchman service to such places and his measures should comply with the regulations relating to the safety of the traffic movement.		
The Representative of the Traffic Department should be permitted to reach to and monitor the traffic movement monitoring plan which was prepared by the contractor in order to make any changes when ever the field circumstances requires. Any modifications proposed by the Traffic Department should be implemented at the contractor's account.		
The contractor should remove all obstacles relating to the traffic movement when ever there is no need for them and all damages arising from its installation and removal, such as excavation and backfill, should be repaired.		
The contractor should give 3 days notification to the passage occupier in case of closing the road for more than 8 hours. The contractor should reduce the period during which the passage will be closed and must provide information to the passage user regarding the closure timing.		

Precautionary & Alleviation Measures	Appearance Environment / Social Factor	No.
The contractor should provide additional traffic lanes and traffic movement equipment (traffic signs, road signs) to prevent congestion and reduce the risk of occurrence of motor vehicle accidents at the cross road points.		
The traffic movement should remain smooth on the roads leading to the areas around the project particularly the residential and service buildings. Also, all barriers which may hinder the motor vehicles movement must be removed.		
The construction materials transport trucks must be driven be skilled drivers.		
The maintenance of motor vehicles must be maintained periodically and continually.		
The contractor must prepare a plan for managing and applying the traffic plan. The plan should contain: - Upon carrying out excavation works in multi lane streets, one lane must remain open in every direction. - The contractor should obtain prior approval in case of need to close down one of the streets during the construction works. Also, the contractor must suggest to the authorities to direct the alternative traffic and implement same.		
The building materials necessary for the project should not be placed in the roads and streets which would inflict harm on the safety of citizens particularly near the schools and worship places (the distance should not be less than 300 meters) and place the quantity required for use on daily basis.		
The work sites should be rehabilitated to its condition previous to the start up of work or to a condition better than same including re-asphalting of all the street in case more than half thereof has been excavated.		
Water Resources		
The contractor should use well cleaned and maintained machinery for excavation works and should be examined by an external approved party to minimize the spilling of oils on the soil.	**Dumping of Used Oils**	**6**
The contractor should conduct maintenance/change machinery and motor vehicles oil in designated places and not in the worksites. However, and due to an emergency event if the change of oil takes place at the work site, the contractor should take monitoring measures to prevent any leakage of oil on the ground through isolating the maintenance area at site and collect the used oils in closed containers.		
The contractor should provide tightly sealed containers and suitable for the collection and storage of used oils.		
The containers collected in the unapproved areas (i.e. valleys, sewer canals, muddy plains, farms and public areas) may not be stored.		
The contractor should comply with the instructions of the Ministry of Environment for managing and treating the used oils for the year 2003.		
The contractor should provide the necessary tools for removing the leaked oils as it contain absorbent materials, plastic bags and brooms for sucking oil leaks. Such contaminating materials should be dealt with and disposed of as hazardous refuse.		
The stored used oils should be handed over to the licensed collectors of used oils by the Ministry of Environment.		
A special record should be kept containing the quantities of used oils, dumping time and the receiving party thereof. All these records should be deposited in the project site.		
The following steps should be implemented with respect to dumping the water resulting from cleaning of pipes : - A quality test of water resulting from cleaning of pipelines in a water approved laboratory and compare the results with the Jordanian standard specification (JS 202: 2007) "Industrial Treated Waste Water". - In the event of acceptance of the test result, the contractor should prepare a plan for disposing of water in the canals, and the flow site should be designated.	**Dumping of Water Resulting from Pipeline Cleaning**	**7**

Precautionary & Alleviation Measures	Appearance Environment / Social Factor	No.
- The approval of the Ministry of Water & Irrigation should be obtained before disposing of the water in the valley/ water canals. - If the approval has been obtained, the contractor may not empty such waste water in the water canals during the rainy season. - The contractor should take control measures to restrict the soil erosion. By avoiding the flows which are expected to lead to soil erosion and increase the flow section in order to reduce the flow speed.		
The excavation waste should not be dumped inside the valley canals.		
The contractor should remove the silt at water discharge points.		
The contractor should formulate a response plan for emergency cases comprising alleviating measures of any probable leak into the water canals.		
The following steps should be implemented with respect to handling and dumping of domestic wastewater : - The contractor should place portable toilets which should be available at the work sites for use by workers and that the domestic wastewater be collected in a closed and insulated tank. - The wastewater collected in an environmental method to prevent any leak on the soil should be discharged subsequent to obtaining approval of the Water Authority of Jordan. - The disposed of quantities of wastewater, time of dumping and destination of dumping should be documented and such records be kept in a file.	**Handling and Dumping of Domestic Wastewater**	**8**
The following steps for management and control should be implemented in case of floods: - It is possible to control floods management by taking structural or none structural measures. The structural measures depend on the supporting walls, and earth barriers, transfer canals and small dams as effective examples to limit the impact of floods. - Ascertain the continued and successive monitoring of the height and drop of water level in the valley. - The building activities at the harmed discharge canals which are located near the valleys should be stopped and backfilled at an early time. - Transfer equipment, materiel and items existing in the hazardous points far from the two excavation banks to the high areas, if this is possible. - Fill sand bags and place them at certain distances from the excavation sites in order to alleviate the flow of water. - Pump water from the open trenches.	**Direct Impact on Surface Water Sources**	**9**
Bio Diversification		
As to the construction works within the boundaries of project sites along the strategic line, no excavations should be carried out within 8 meters from any tree or well without prior approval of the Engineer.	**Biodiversity**	**10**
Keep the surface soil layer along the strategic line in order to return same over the line after completing the construction works upon re-instating the situations to its original nature.		
Rehabilitate the construction areas and strategic line route by removing the construction debris and refuse as well as re-instate the situations to the same conditions as before the construction or better.		
Cultural Heritage & Antiquities		
The contractor should stop the excavation works in case of discovery of any antiquities	**Cultural Heritage &**	**11**

Precautionary & Alleviation Measures	Appearance Environment / Social Factor	No.
or antiques and follow the following : - Notify the Engineer immediately. - Notify the Antiquities Department immediately about any discoveries that appear according to article 15 of the Antiquities Department Law No. 21 for the year 1988. - Obtain a written approval from the General Antiquities Department before removing or moving any accidental antiquities discovery during work. Also, the discovered antiquities should be moved without causing any damage thereto and the General Antiquities Department should select and designate an appropriate location for subsequent utilization or in order to acquire this site or antiques which have appeared in favour of the General Antiquities Department. - Obtain written approval from the General Antiquities Department to continue work in the site after stoppage.	**Antiquities**	
To maintain the public safety, there are standard measures to which contractors should comply in order to alleviate the hazard on general safety, namely: - If it is discovered that the street width in the places where the pipes will be installed is not enough for excavation, consideration should be given for modifying the route particularly if the modification leads to reducing the impact on the population and commercial businesses. - The long pipelines should be divided to sub-sections of (150 m long as a maximum), complete the excavation and backfilling works in the sub-section prior to moving to the next one in order to avoid the open trenches existence for a long period of time. - A sufficient number of bridges with a barricade for the public for the entry of the excavated trenches in order to facilitate their movement so as the distance between every two bridges will not exceed 30 m. - In the cases where narrow roads or pavements are removed during the building stage, suitable temporary pavements should be placed and kept until completion of the work.	**Social & Economic Circumstances**	**13**
Remove soil, dust and excavations from road sides during the construction works particularly from the front of religious places, hospitals and schools.		
Utilize the road signs: Utilize the guiding, alerting and mandatory traffic signs as well as the reflecting pavement marks upon the need thereto during the construction works. Restrict the negative impacts on hospitals, schools and religious places by avoiding the carrying out of construction works near such places in as much as possible. If there is a need for conducting any excavations or any works in front of the religious places, hospitals and schools, the work should be carried out during the shortest possible time.		
The contractor should not tolerate any molestation (harassment) by his employees or consultants, provide orientation for all workers to prevent (physical, psychological and sexual) harassment amongst employees or directed towards members of the community (particularly women and children). Such training should educate employees on the Jordanian laws re sexual harassment and extent of contractor's response including the taking of penal actions against employees who take part in such type of conduct.		
Special attention should be given to the safety of male and female students who go to school on foot in so far as accidents. Additionally, safe lanes should be built for them to the school.		
The contractor should take into consideration the plants in the project area as it may be possible that the excavation works may be in front of some of these plants. The impact in such a case shall be towards the transport operations from and to such plants. For this reason, it is preferable that the final design be amended in a manner which would lead to the possibility of reaching to such plants continuously and without interruption.		

Precautionary & Alleviation Measures	Appearance Environment / Social Factor	No.
In the event of implementing part of the work in the houses, the foreign or local labour should respect the values and community traditions.		
The contractors should give priority of employment for the local population (if any) particularly those who are affected by the project and a clause will be inserted in the project documents requiring contractors to give priority of work opportunities to those qualified of unskilled and semi skilled labour of the local population including women and vulnerable categories when they possess the required qualifications and capability. In the event of their lack of skills, vocational training may be provided to them to enable them work during the construction stage.		
Health insurance and social insurance must be provided to employees according to Jordanian laws and relevant regulations.		
The method of tapping should be used to cut off the main streets and not the open excavation method for placing the main pipes.		
The contractor should coordinate with the service providers (electricity, telephones and water) and that a known a liaison officer be there for coordination and that a representative be at site when needed for cutting off one of the services.		
It is advisable, in the areas wherein it is expected that the pipeline will cut off the existing cables, to make explanatory holes by using manual excavation in order to avoid the occurrence of damage to these cables.		
Occupational Health & Safety		
A plan for occupational health & safety as well as an emergency plan must be prepared and then applied well. They should be reviewed periodically by management	**General Safety**	**15**
The contractor should complete evaluation of hazards at the work site prior to commencement of execution.		
The site of all facilities existing underground should be specified such as pipes, electric cables and the like, and isolate them if necessary.		
An excavation permit system must be applied.		
The contractor should draw out a system for entry into the restricted site.		
Endeavours must be made to prevent soil collapses by using means of support and the suitable excavation method and other methods according to the need.		
There should be facilities for the worker when working inside the trench.		
Provide clear and visible warning signs at a safe distance from the trenches to alert workers and visitors.		
The contractor should provide all work sites with first aid kits such as adhesive bandage, anti-biotic ointment, sterilized napkins, aspirin, none wax gloves, scissors, temperature scale …… and the like. All employees should be trained and qualified to carry out the work required from them.		
The contractor should provide a storage space for the dangerous items. A special poster for dangerous items should be used which shows the kind and dangerous characteristics of such items.		
The chemical materials should be stored according to the provisions of safety information document for MSDS item.		
All workers should be trained on how to deal with chemical materials.		
The safety signs and proper warnings should be used during the handling, storage and transport of hazardous materials.		
The suitable personal protection equipment must be utilized upon dealing with chemicals and entering into confined places.		
The personal general safety equipment must be maintained continuously and replaced after the expiry of its virtual life.		
The equipment operators should obtain the proper licenses and be able to operate the		

Precautionary & Alleviation Measures	Appearance Environment / Social Factor	No.
equipment efficiently.		
No work should be made on the live cables or near them if they pause a danger. However, if cutting off electricity from the cable is not practical, in this case, all necessary precautions should be taken to ensure safety.		
The carrying cables of over 65 volt tension other than those provided for welding purposes on a shield or metal casing to be effectively (well) earthed. As to the cable appropriated for connecting the electric power to the machines and moving equipment, such earthing should be in addition to the protection conductor which is originally existing on the cable.		
In the light of the risks of breakdown of electrical equipment, a fixed maintenance system should be formulated for all electrical equipment. It is important also that a periodical maintenance is carried out for the equipment according to the manufacturer's instructions.		
The contractor should ensure extinguishment of all equipment and machinery as well as separate them from the electricity source when not in use.		
Clothes with reflective and clear colours from remote distances should be provided to building workers.		
The contractor should formulate and apply precautionary measures in case of fire according to the health and safety plan.		
The contractor should provide fire fighting equipment at the work site such as fire extinguishers, and such equipment should be periodically maintained.		
Smoking should be prevented in all places where there may be a risk of fire.		
The contractor should notify the Civil Defense prior to commencing any activity which may pause potential fire.		
The contractor should apply the work permit system with respect to some of the construction works such as welding.		
The protection from fire program which is prepared by the contractor should be compatible with the local requirements and specifications.		
All workers must be provided with the necessary safety equipment such as masks, anti slip safety shoes, helmet, hearing protective, whereby the object will be the provision of additional protection for workers from work hazards in addition to other applicable safety measures. The safety equipment should be maintained periodically and replaced upon the expiry of its virtual life.		
All machinery and vehicles should make a sound when in reverse condition.		
Medical supplies should be available at the work sites during the construction stage as represented by first aid clinic and an ambullance car.		
The emergency telephone numbers should be placed on the employees notice board.		
A rest room for workers should, at work areas, be available by placing a portable office container at the work sites. Provide suitable facilities for men and women including toilets/ change rooms and separate prayers rooms, if required.		

(2) WAJ から環境省へのレター

وزارة المياه والري
سلطة المياه

الرقم ٢٥٦٤/٢/١٧
التاريخ .....
الموافق ٢٠٠٤/١٠/١٢

عطوفـــــة أميـن عـــام وزارة البيئة

المشـــروع: اعادة تأهيل وتوسعة شبكات المياه في محافظـــة البلقـــاء

الموضـوع : تقييـــــم الاثر البيئي

اشارة الى مشروع اعادة تأهيل وتوسعة شبكات المياه في محافظة البلقاء (عين الباشا ، دير علا) الممول من خلال منحة من الوكالـة اليابانيـة للتعاون الـدولي(JICA) والمحال على الاستشاري السـادة TEC INTERNATIONAL CO. لانجاز اعمال الدراسة لمشروع موضوع البحث.

يرجى الموافقة على اعفـاء المشروع المذكور اعلاه من عمل دراسة تقييم الاثـر البيئي حيث ان هذا المشروع والمبينـة مكوناتـه ومواقعه على المخططات المرفقـة طيا يهدف الى تـوفير الطاقـة وتقليـل نسبة فاقد المياه.

و اقبلـــوا الاحتـــرام ،،،،

امين عـــام سلطـة الميـاه

المهندس توفيق الحباشنه

مساعد الأمين العام
للشؤون الفنية
المهندس مالك الروشدة

نسخة: مساعد الامين العام للشؤون الفنية/مديرية الدراسات والتصاميم
نسخة: الوكالة اليابانية للتعاون الدولي/JICA .
نسخة :التداول
المرفقات: ملخص عن اعمال المشروع.

المملكة الأردنية الهاشمية
هاتف: ٥٦٨٠١٠٠ - ٥٦٨٣١٠٠ فاكس: ٥٦٧٩١٤٣ ص.ب: ٥٠١٢ عمان ١١١٨١ الأردن. الموقع الإلكتروني www.waj.gov.jo

Attachment

1. Objective of the Project

The objective of the Project is to reduce non-revenue water and electricity consumption for water supply in the target areas by controlling water pressure of distribution network.

2. Project site

Tentative site of the Project is Deir Alla and Ain Al-Basha in Balqa Governorate as shown in **Annex-1**.

3. Responsible and Implementing Agency

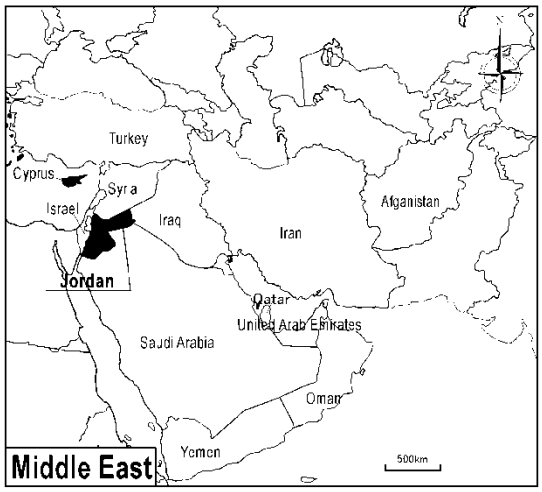
3-1) The Responsible Agency is the Ministry of Water and Irrigation (hereinafter referred to as “MWI”).

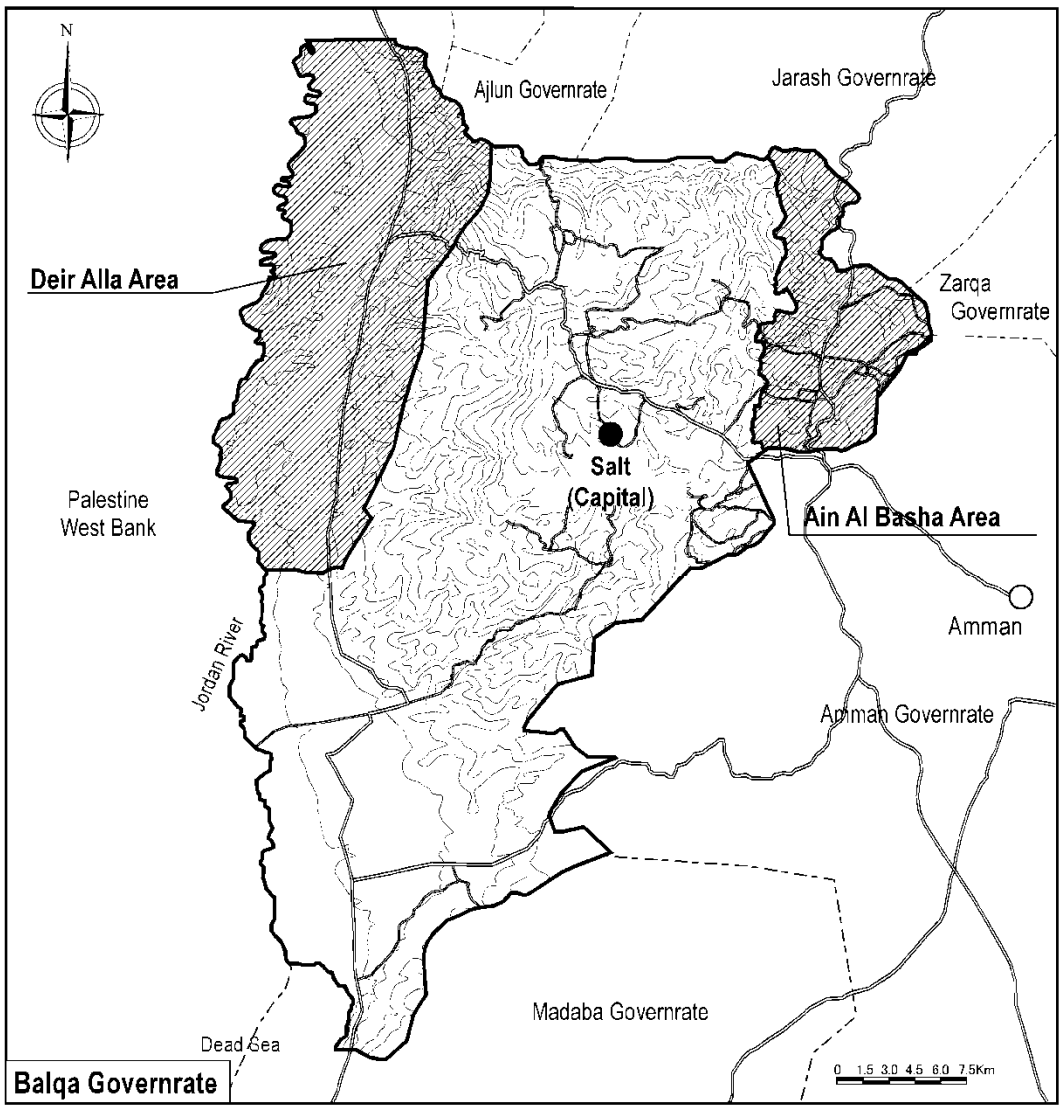
3-2) The Implementing Agency is the Water Authority of Jordan (hereinafter referred to as “WAJ”).

4. Project Components

The project components are shown in **Annex-2**.

Annex-1: Project Sites Map





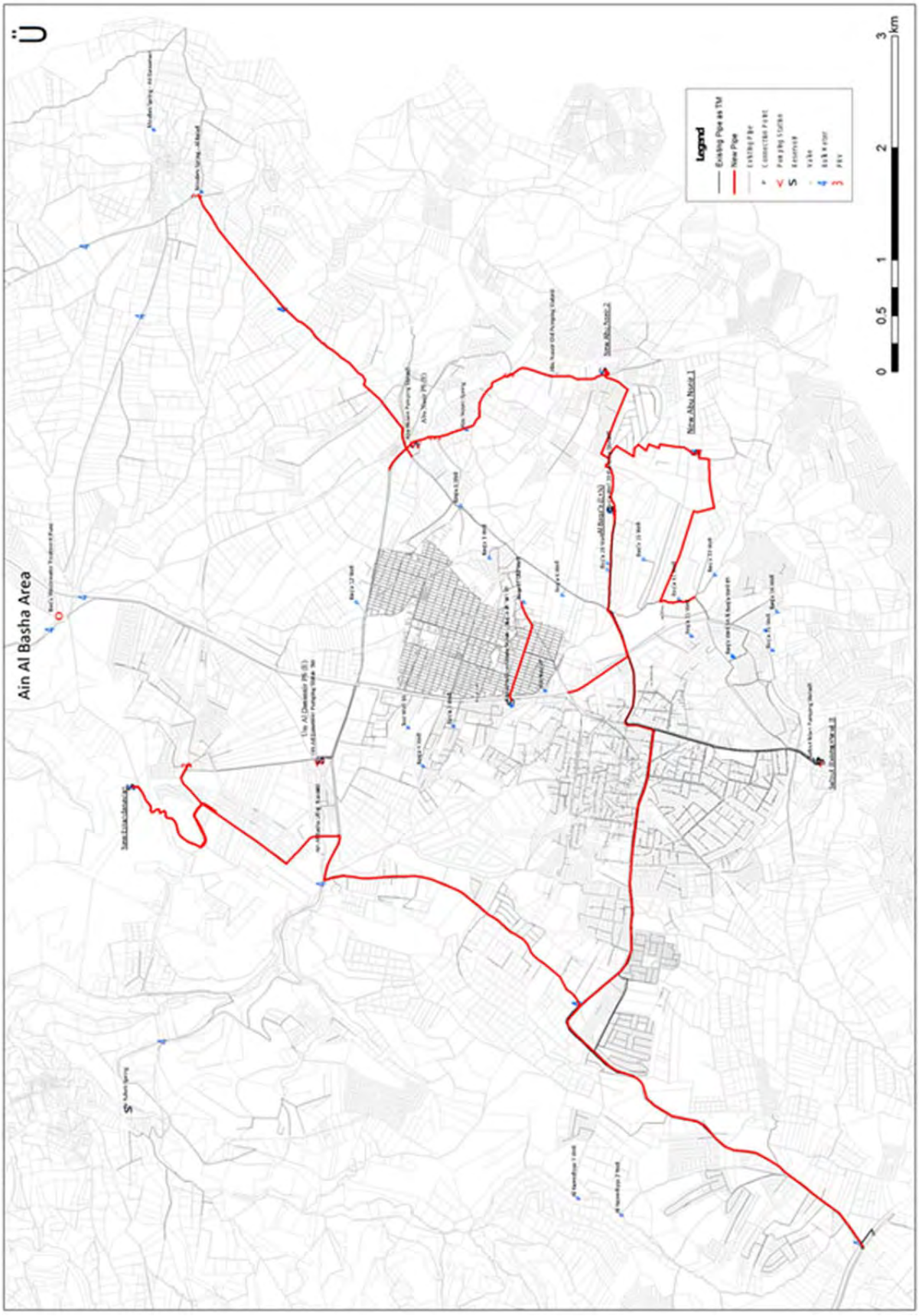
Annex-2: Project Components

Table1: Major Components in Ain Al Basha

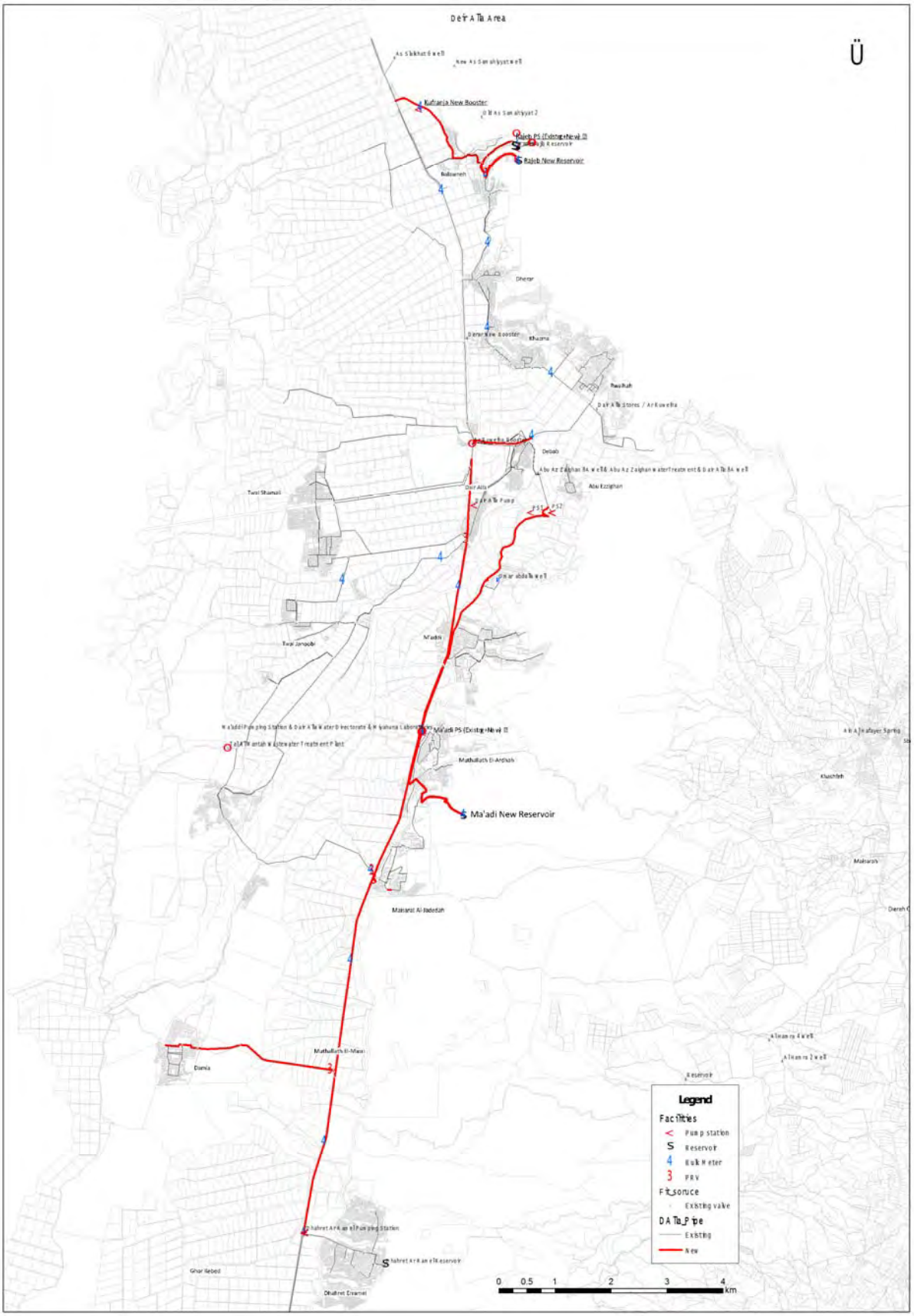
Major Components	Ain Al Basha				
	Baqqa Reservoir	Abu Nasir 1 Reservoir	Abu Nasir 2 Reservoir	Eskandanavian Reservoir	Safout Reservoir
Site Area	70m×70m ($4,900m^2$)	50m×50m ($2,500m^2$)	50m×40m ($2,000m^2$)	50m×50m ($2,500m^2$)	Within Existing Safout Pumping Station ($2,500m^2$)
Storage Capacity	$6,100m^3$	$900m^3$	$1,200m^3$	$900m^3$	$3,900m^3$
Reservoir Size	φ36.6m×H5.8m	16m×16m×H3.51m	25m×13m×H3.69m	16m×16m×H3.51m	φ18.0m×H15.33m

Table2: Major Components in Deir Alla

Major Components	Deir Alla				
	Slaikhat Pump Station	Rajib Existing Pump Station	Rajib High Reservoir	Maadi Reservoir	Maadi Pump Station
Site Area	($2,300m^2$)	Within Existing Rajib Pumping Station ($600m^2$)	60m×60m ($3,600m^2$)	60m×60m ($3,600m^2$)	Within Existing Maddi Pumping Station ($2,900m^2$)
Storage Capacity	-	-	$2,000m^3$	$3,300m^3$	-
Reservoir Size	-	-	26m×26m× H2.96m	28.5m×28.5m× H4.06m	-
Pump Capacity	$50m^3$/h, H=166m, 2 sets	$150m^3$/h, H=114m, 2 sets	-	-	$282m^3$/h, H170m, 2 sets



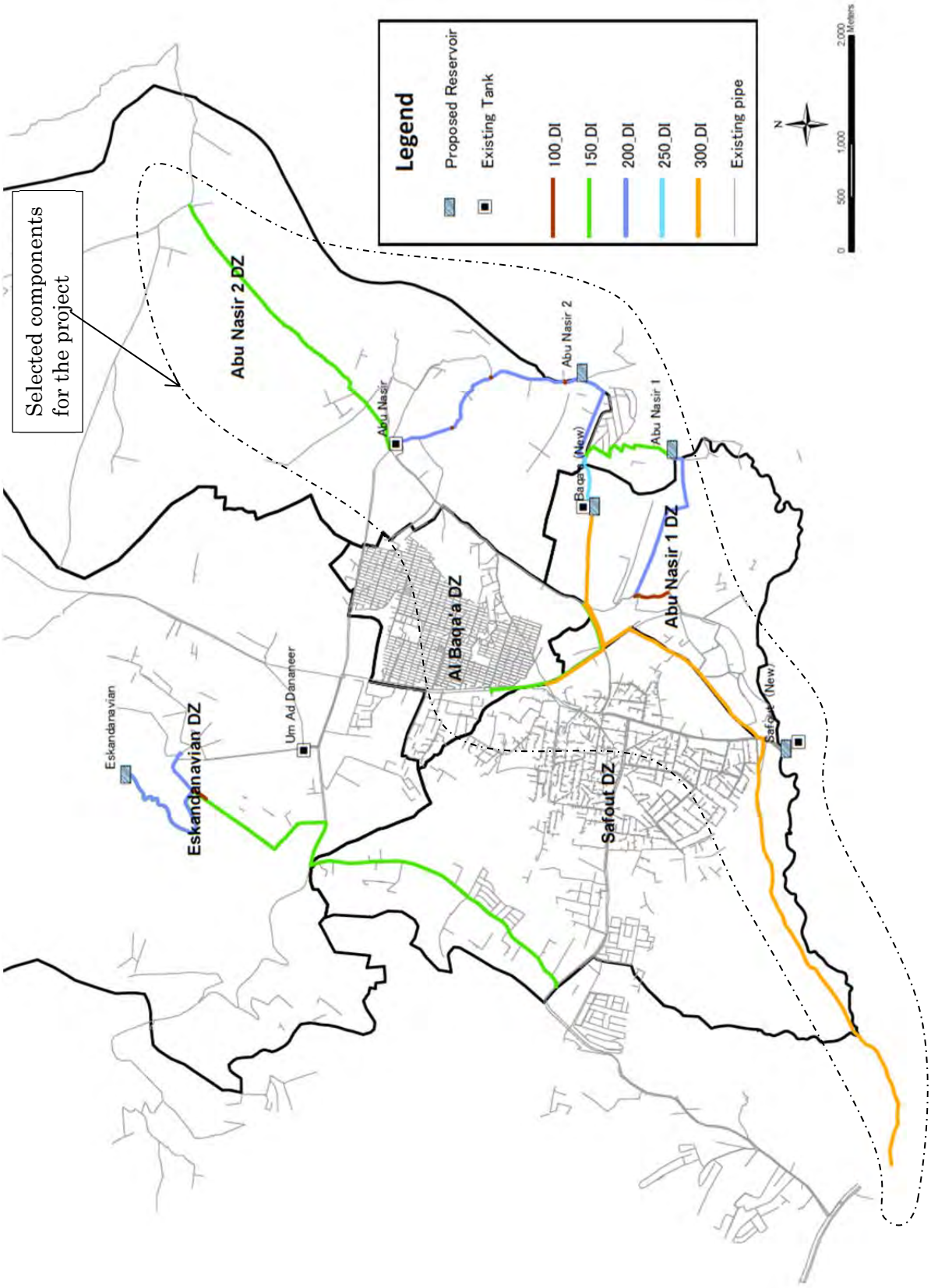
Ain Al Basha


Deir Alla Area
Ü
Ma'adi New Reservoir
Legend
Facilities
Pump station
Reservoir
Bulk Water
PRV
Fit_soruce
Existing valve
DATa_Type
Existing
New
0 0.5 1 2 3 4
km

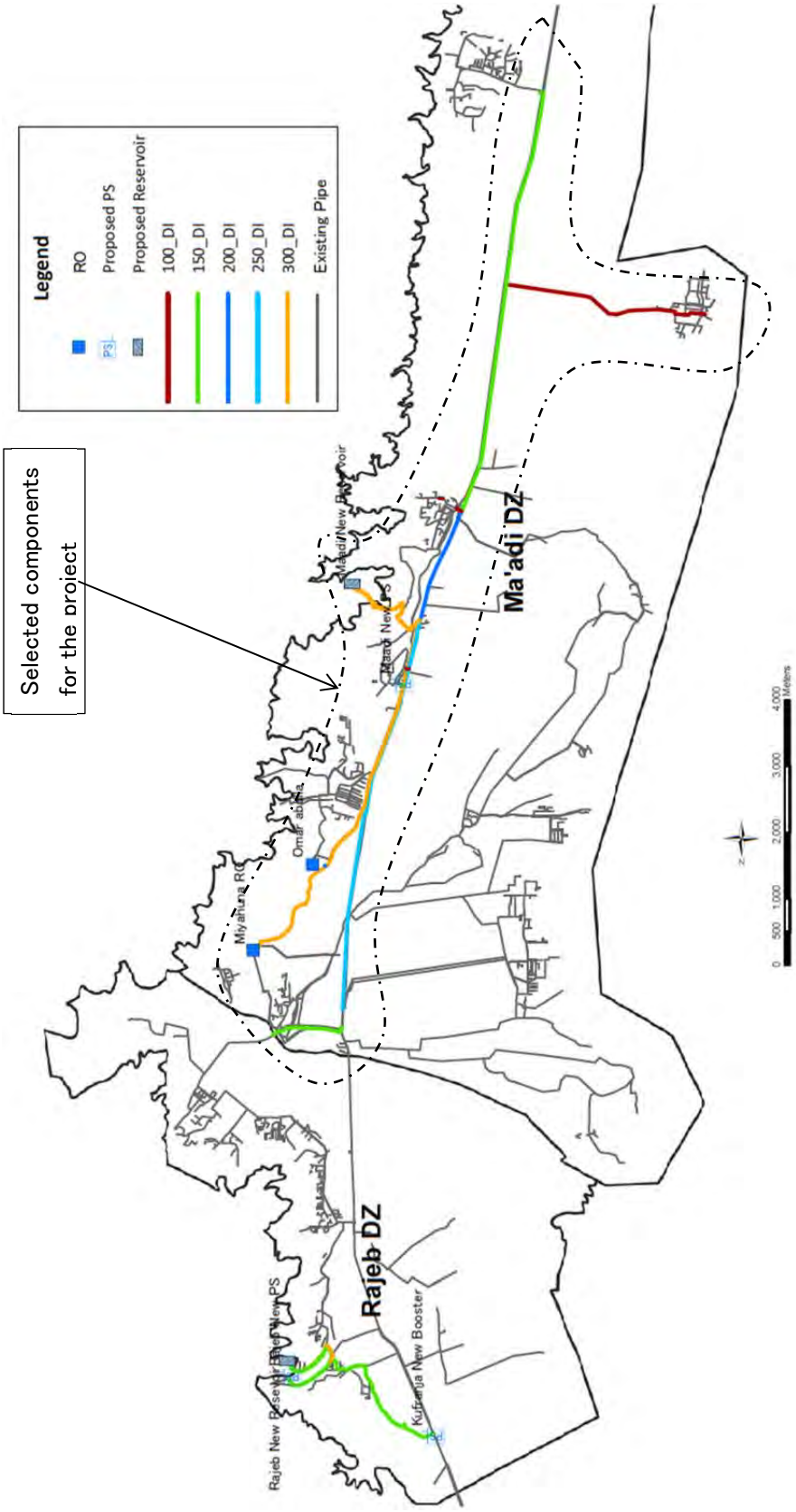
Deir Alla

6.2　全配水区の施設計画

(1) Ain Al Basha



(2) Deir Alla


Legend
RO
Proposed PS
Proposed Reservoir
100_DI
150_DI
200_DI
250_DI
300_DI
Existing Pipe
Selected components for the project
Ma'adi DZ
Rajeb DZ
Miyahuna RO
Omar abad
Kufranja New Booster
Rajeb New Reservoir & New PS
0 500 1,000 2,000 3,000 4,000
Meters

(1) Ain Al Basha

Distribution Zone	ID	Name	Water produced within and imported from outside in last three years (Data from WAJ Record)					
			2010		2011		2012	
			(m^3/year)	(m^3/day)	(m^3/year)	(m^3/day)	(m^3/year)	(m^3/day)
DZ01: Abu Nasir 1 DZ	AL2707	Baqa'a 15	221,038	606	225,473	618	190,946	523
	AL3131	Baqa'a 16	0	0	0	0	0	0
		From Zai-Dabouq line						
				606		**618**		**523**
DZ02: Abu Nasir 2 DZ	AL1428	Baqa'a1 (Canceled)	0	0	0		0	0
	AL1541	Baqa'a 9	219,655	602	101,660	279	202,678	555
	AL3311	Baqa'a 19	200,183	548	161,723	443	123,426	338
	AL1393	Abu Nasir well	258,088	707	348,884	956	310,755	851
		From Miyahuna (Karbet Abu Nasir)	98,672	270			123,783	339
		From Zarqa (Abu Hamad)					36,079	99
		From Zai-Dabouq line						
				2,127		**1,678**		**2,182**
DZ03: Al-Baqa'a DZ		From Safout PS						
	AL1433	Baqa'a 6	279,386	765	272,726	747	161,797	443
	AL3357	Baqa'a 20 (not operated)	0	0	0	0	0	0
	AL3500	Baqa'a 26	224,963	616	190,437	522	151,998	416
		From Zai-Dabouq line						
				1,381		**1,269**		**859**
DZ04: Eskandanavian DZ	AL3573	Baqa'a 2	39,916	109	108,739	298	152,807	419
	AL2719	Baqa'a 12	60,083	165	57,998	159	81,774	224
		From Zarqa (Sahab, Um-Rumana)	35,659	98	39,252	108	28,872	79
		From Zai-Dabouq line						
				372		**565**		**722**
DZ05: Safout DZ	AL3454	Baqa'a 5 (B)	120,478	330	183,061	502	203,486	557
	AL1539	Baqa'a 11	117,404	322	135,102	370	153,808	421
	AL3487	Baqa'a 21	176,200	483	150,874	413	179,529	492
	AL3456	Baqa'a 22	25,094	69	22,618	62	20,081	55
		Zai-Dabouq line						
				1,204		**1,347**		**1,525**
Import from Zai- Dabouq line			**4,403,450**	**12,064**	**3,897,800**	**10,679**	**4,770,855**	**13,071**
Grand total			6,480,269	**17,754**	5,896,347	**16,156**	6,892,674	**18,882**

Distribution Zone	ID	Name	**Planned (Scenario 1):** Wells currently supplying to Abu Nasir PS and Um Al Dananer PS are to be diverted to Baqa'a. Abu Nasir 1, Abu Nasir 2 and Eskandavanian to have only direct water from Zai-Dabouq line. Water from Zarqa and Miyahuna (Karbet Abu Nasir) to be discontinued. (For Daily Maximum Demand)					
			2015		2020		2025	
			(m^3/day)	(m^3/hr)	(m^3/day)	(m^3/hr)	(m^3/day)	(m^3/hr)
DZ01: Abu Nasir 1 DZ		From Zai-Dabouq line	1,780	74	1,859	77	1,920	80
			1,780	**74**	**1,859**	**77**	**1,920**	**80**
DZ02: Abu Nasir 2 DZ		From Zai-Dabouq line	2,007	84	2,096	87	2,164	90
			2,007	**84**	**2,096**	**87**	**2,164**	**90**
DZ03: Al-Baqa'a DZ	AL3311	Baqa'a 19	338	14	338	14	338	14
	AL1433	Baqa'a 6	443	18	443	18	443	18
	AL3500	Baqa'a 26	416	17	416	17	416	17
	AL3357	Baqa'a 20	0	0	0	0	0	0
	AL1428	Baqa'a 1	0	0	0	0	0	0
	AL1541	Baqa'a 9	555	23	555	23	555	23
	AL1393	Abu Nasir well	851	35	851	35	851	35
	AL3573	Baqa'a 2	419	17	419	17	419	17
	AL2719	Baqa'a 12	224	9	224	9	224	9
		From Zai-Dabouq line	12,186	508	12,867	536	13,403	558
			15,432	**641**	**16,113**	**669**	**16,649**	**694**
DZ04: Eskandanavian DZ		From Zai-Dabouq line	1,538	64	1,824	76	1,883	78
			1,538	**64**	**1,824**	**76**	**1,883**	**78**
DZ05: Safout DZ	AL3131	Baqa'a 16	0	0	0	0	0	0
	AL3456	Baqa'a 22	55	2	55	2	55	2
	AL1539	Baqa'a 11	421	18	421	18	421	18
	AL3487	Baqa'a 21	492	21	492	21	492	21
	AL3454	Baqa'a 5B	557	23	557	23	557	23
	AL2707	Baqa'a 15	523	22	523	22	523	22
		From Zai-Dabouq line	6,893	287	7,288	304	7,599	317
			8,941	**373**	**9,336**	**390**	**9,647**	**403**
Grand total			**29,698**		**31,228**		**32,263**	**1,345**
Quantity required from Zai-Dabouq line:			24,404	1,017	25,934	1,080	26,969	1,123
Additional quantity required compared to that of year 2012:			11,333	472	12,863	536	13,898	579

Additional water required from Zai compared to the quantity of year 2012:
(Considering transfer from Zarqa and Miyahuna (Karbet Abu Nasir) continues)
Additional water required from Zai compared to the quantity of year 2012:
(Considering transfer from Zarqa and Miyahuna (Karbet Abu Nasir) is stopped)

Distribution Zone	ID	Name	Water produced within and imported from outside in last three years (Data from WAJ Record)							**Planned (Scenario 0):** Continuation of all wells as in 2012, same amount from private wells (Omar Abdallah RO) and increased amount from Miyahuna-Zai (Abu Zeighan RO)					
			2010		2011		2012			2015		2020		2025	
			(m^3/year)	(m^3/day)	(m^3/year)	(m^3/day)	(m^3/year)	(m^3/day)	(m^3/hr)	(m^3/day)	(m^3/hr)	(m^3/day)	(m^3/hr)	(m^3/day)	(m^3/hr)
Rajeb DZ	AK1013	Wadi Rajeb	235,708	646	179,445	492	196,733	539	22	539	22	539	22	539	22
	AK1015	Wadi Rajeb 1b	235,708	646	179,445	492	196,733	539	22	539	22	539	22	539	22
	AK1018	Wadi Rajeb 8a	0	0	0	0	0	0	0	0	0	0	0	0	0
	AB3123	Wadi Rajeb 8	2,671	89	183,234	502	194,675	533	22	533	22	533	22	533	22
	AB3004	Samayet 2 new	345,177	946	411,982	1,129	464,162	1,272	53	1,272	53	1,272	53	1,272	53
	AB1357	Samayet al kadem	217,174	595	263,224	721	267,897	734	31	734	31	734	31	734	31
	AB1350	Krayymeh (Slaikhat) 4	405,351	1,111	411,556	1,128									
	AB1351	Krayymeh (Slaikhat) 5	97,138	266	126,825	347	219,912	1,047		1,047	44	1,047	44	1,047	44
	AB1377	Krayymeh (Slaikhat) 6	179,340	491	192,417	527									
		Sub-total		**4,790**		**5,338**		**4,664**		**4,664**	**194**	**4,664**	**194**	**4,664**	**194**
Zonal Demand										3,777		3,945		4,261	178
Surplus										887		719		403	17
Maadi DZ		Miyahuna (Abu Zeighan RO)	381,564	1,255	373,677	1,746	657,580	1,802	75	3,300	138	3,578	149	3,794	158
		Omar Abdallah RO	809,552	2,218	897,680	2,459	1,085,380	2,974	124	2,974	124	2,974	124	2,974	124
		Sub-total		**3,473**		**4,205**		**4,776**	**199**	**6,274**	**262**	**6,552**	**273**	**6,768**	**282**
Zonal Demand										6,274		6,552		6,768	
Surplus										0		0		0	
Additional water required from Zai compared to the quantity of year 2012:										1,498	62	1,776	74	1,992	83

6.4 管網解析結果の概要

(1) Network Analysis Result of Transmission Mains for Ain Al Basha

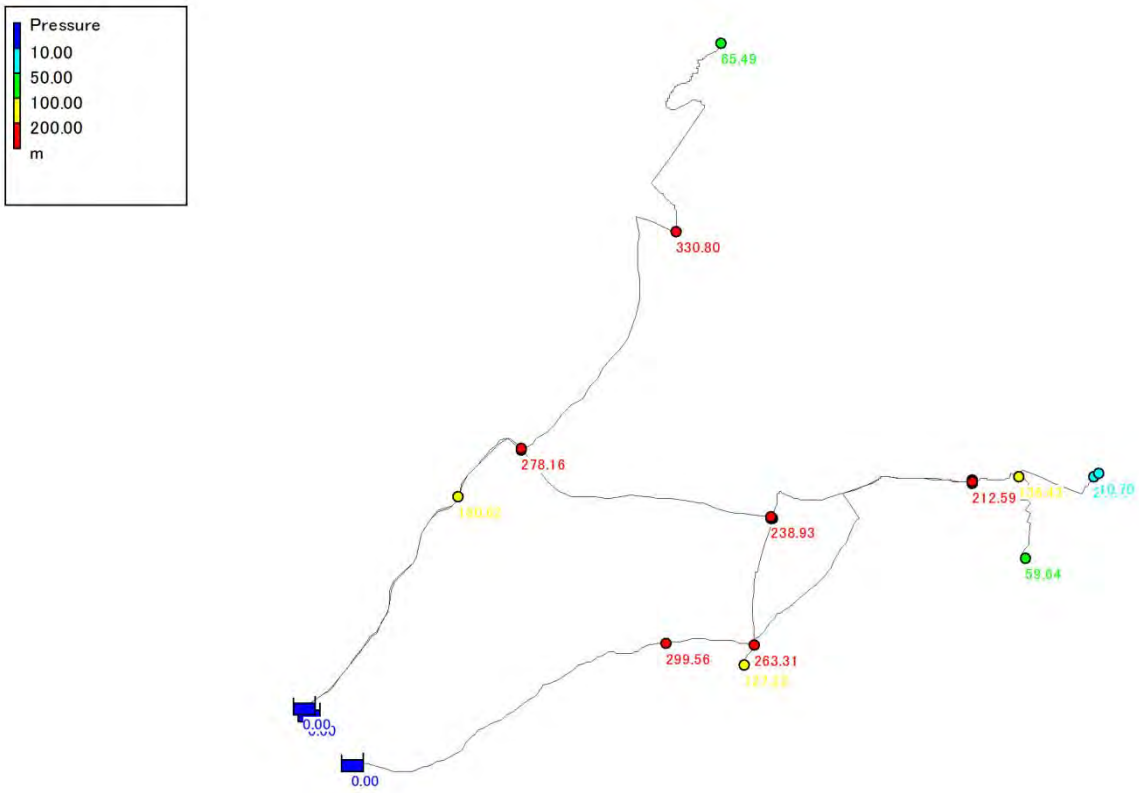
```
******************************************************************
*                          E P A N E T                           *
*                   Hydraulic and Water Quality                  *
*                   Analysis for Pipe Networks                   *
*                        Version 2.0                             *
******************************************************************

Input File: AABasha_TM_20140223.net

Link - Node Table:
------------------------------------------------------------------
Link            Start           End                Length   Diameter
ID              Node            Node                    m         mm
------------------------------------------------------------------
p1              n1              n2                  79.94        200
p2              n47             n4                1268.07        300
p3              R3              n6                2678.07        150
p4              n7              n4                  16.88        300
p5              n8              n9                  11.35        100
p6              n7              n10                 9.163        300
p9              R2              n14               3736.17        300
p10             n15             n33               3194.50        150
p15             n4              n8                2271.91        200
p18             n15             n21               2918.62        150
p19             n30             n16                  1103        150
p20             n30             n1                 970.71        200
p22             n14             n10                  2673        300
p24             n9              n30                520.97        250
p31             n6              n33                 969.9        150
p32             R1              J2                3500.11        300
p33             J3              J1                3285.82        300
p14             n47             n3                 314.21        300
p16             J1              n48                 23.00        300
p23             J1              n9                   9.72        300
p7              J2              J3                885.84        300

Node Results:
------------------------------------------------------------------
Node                Demand          Head      Pressure     Quality
ID                     CMH             m             m
------------------------------------------------------------------
n1                     0.00        940.98         20.98        0.00
n2                    90.00        940.70         10.70        0.00
n3                   317.00        899.22        127.22        0.00
n4                     0.00        908.54        238.54        0.00
n6                     0.00        970.62        160.62        0.00
n7                     0.00        908.79        238.79        0.00
n8                   208.00        864.35        125.35        0.00
n9                   350.00        946.46        212.46        0.00
n10                    0.00        908.93        238.93        0.00
n14                    0.00        948.99        268.99        0.00

Node Results: (continued)
------------------------------------------------------------------
Node                Demand          Head      Pressure     Quality
ID                     CMH             m             m
------------------------------------------------------------------
n15                    0.00        922.80        330.80        0.00
n16                   80.00        931.64         59.64        0.00
n21                   78.00        890.49         65.49        0.00
n30                    0.00        944.43        136.43        0.00
n33                    0.00        958.16        278.16        0.00
n47                    0.00        901.07        176.07        0.00
n48                    0.00        946.59        207.59        0.00
J1                     0.00        946.59        212.59        0.00
```

J2	0.00	999.56	299.56	0.00
J3	0.00	988.31	263.31	0.00
R1	-520.00	1044.00	0.00	0.00 Reservoir
R2	-525.00	1005.00	0.00	0.00 Reservoir
R3	-78.00	1005.00	0.00	0.00 Reservoir

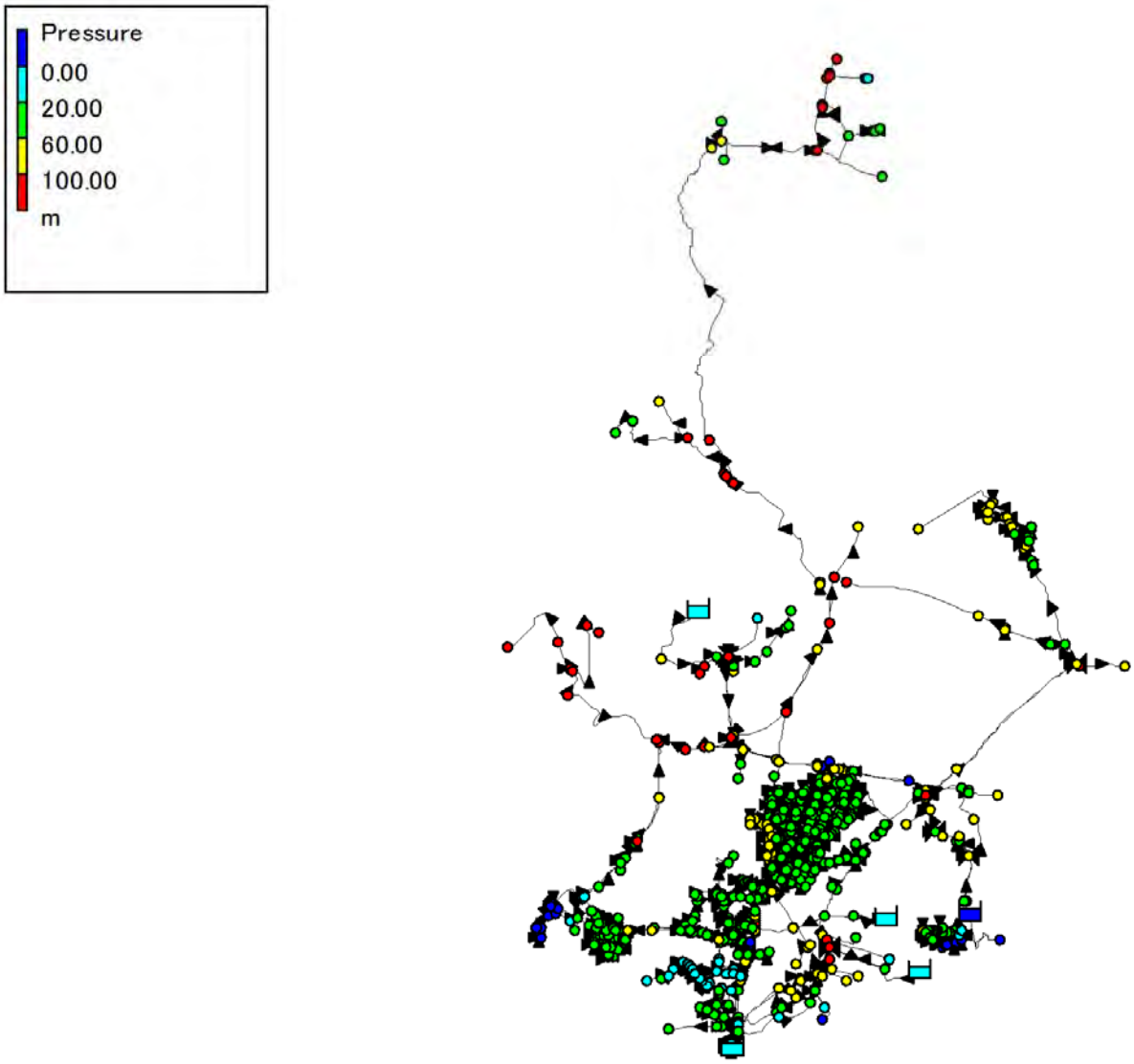
Link Results:

Link ID	Flow CMH	Velocity m/s	Unit Headloss m/km	Status
p1	90.00	0.80	3.55	Open
p2	-317.00	1.25	5.89	Open
p3	78.00	1.23	12.84	Open
p4	525.00	2.06	14.99	Open
p5	0.00	0.00	0.00	Closed
p6	-525.00	2.06	14.99	Open
p9	525.00	2.06	14.99	Open
p10	-78.00	1.23	11.07	Open
p15	208.00	1.84	19.45	Open
p18	78.00	1.23	11.07	Open
p19	80.00	1.26	11.60	Open
p20	90.00	0.80	3.55	Open
p22	525.00	2.06	14.99	Open
p24	170.00	0.96	3.89	Open
p31	78.00	1.23	12.84	Open
p32	520.00	2.04	12.70	Open
p33	520.00	2.04	12.70	Open
p14	317.00	1.25	5.89	Open
p16	0.00	0.00	0.00	Open
p23	520.00	2.04	12.70	Open
p7	520.00	2.04	12.70	Open

(2) Calculated Pressure of Transmission Mains for Ain Al Basha



(3) Calculated Pressure of Distribution Network for Ain Al Basha



(4) Network Analysis Result of Transmission Mains for Deir Alla

```
******************************************************************
*                          E P A N E T                           *
*                  Hydraulic and Water Quality                   *
*                  Analysis for Pipe Networks                    *
*                       Version 2.0                              *
******************************************************************
Link - Node Table:
-------------------------------------------------------------
Link            Start           End             Length  Diameter
ID              Node            Node                 m        mm
-------------------------------------------------------------
p2              J3              n4                2957       300
p4              J2              n5                2810       300
p7              R1              n3                   2       200
p8              R2              n1                   2       300
p10             n3              J3                1815       250
p12             J4              J5                3472       150
p13             n1              J1              391.75       200
p14             J1              J3                7.01       200
p1              n6              n7                1973       150
P6              T1              n6                #N/A       #N/A Pump
```

P9	T2	J2	#N/A	#N/A Pump
P11	T3	J4	#N/A	#N/A Pump

Node Results:

Node ID	Demand CMH	Head m	Pressure m	Quality
n1	0.00	-208.00	0.00	0.00
n3	0.00	-211.02	5.98	0.00
n4	282.00	-229.28	14.72	0.00
n5	282.00	-76.49	9.71	0.00
n6	0.00	54.00	164.00	0.00
n7	150.00	-19.33	0.67	0.00
J2	0.00	-65.00	179.00	0.00

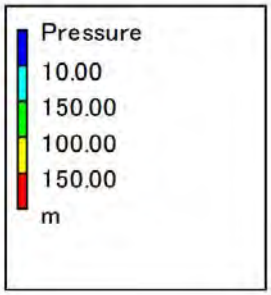
Node Results: (continued)

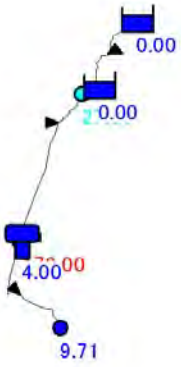
Node ID	Demand CMH	Head m	Pressure m	Quality
J3	-124.00	-217.19	17.81	0.00
J4	0.00	-2.50	210.00	0.00
J5	50.00	-19.37	0.63	0.00
J1	0.00	-208.00	27.00	0.00
R1	-158.00	-211.00	0.00	0.00 Reservoir
R2	0.00	-208.00	0.00	0.00 Reservoir
T1	-150.00	-106.00	4.00	0.00 Tank
T2	-282.00	-235.00	4.00	0.00 Tank
T3	-50.00	-208.50	4.00	0.00 Tank

Link Results:

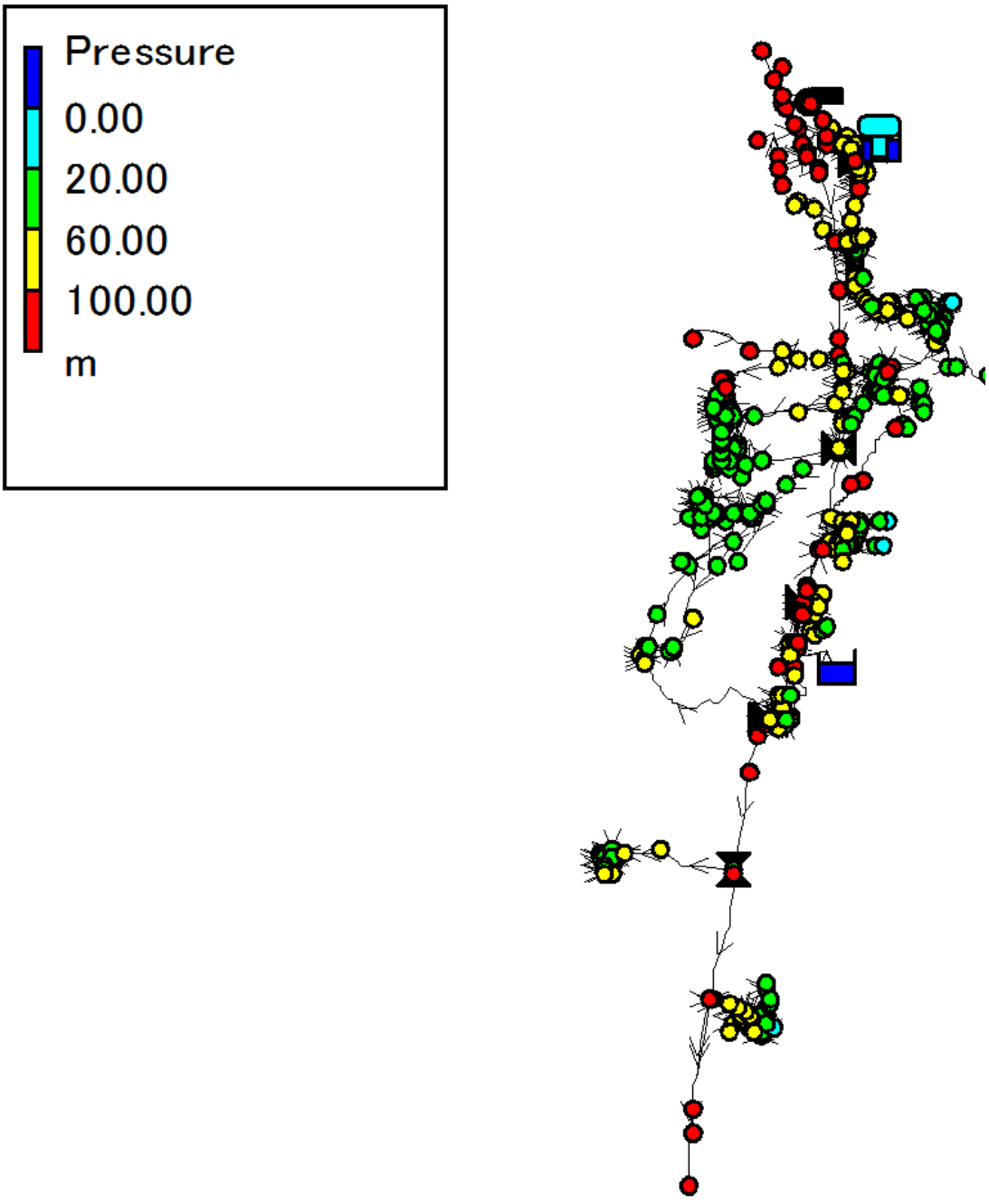
Link ID	Flow CMH	Velocity m/s	Unit Headloss m/km	Status
p2	282.00	1.11	4.09	Open
p4	282.00	1.11	4.09	Open
p7	158.00	1.40	8.79	Open
p8	0.00	0.00	0.00	Open
p10	158.00	0.89	3.40	Open
p12	50.00	0.79	4.86	Open
p13	0.00	0.00	0.00	Open
p14	0.00	0.00	0.00	Closed
p1	150.00	2.36	37.16	Open
P6	150.00	0.00	-160.00	Open Pump
P9	282.00	0.00	-170.00	Open Pump
P11	50.00	0.00	-206.00	Open Pump

(5) Calculated Pressure of Transmission Mains for Deir Alla





(6) Calculated Pressure of Distribution Network for Deir Alla



(7) Network Analysis Result of Transmission Mains for Zai-Dabouq Line

```
**************************************************************************
*                                E P A N E T                             *
*                        Hydraulic and Water Quality                     *
*                        Analysis for Pipe Networks                      *
*                              Version 2.0                               *
**************************************************************************

Input File: Zai-Dabouq_Model_Rev_08022014_9895CMH_HWC130.net

Link - Node Table:
--------------------------------------------------------------------
Link               Start              End                Length    Diameter
ID                 Node               Node                    m          mm
--------------------------------------------------------------------
p1                 n1                 n2                 172.36         150
p2                 n3                 n4                 220.33         150
p3                 n5                 n6                   5.53         100
p4                 n6                 n7                   9.07         100
p5                 n4                 n7                1269.82        1197
p6                 n8                 n9                  85.85         250
p7                 n9                 n10                 9.382         250
p8                 n10                n11                 4.973         250
p9                 n12                n13                 4.781         250
p10                n13                n14                 4.915         250
p11                n15                n14               1646.93        1197
p12                n15                n16               1638.59        1197
p13                n16                n17                  3375        1197
p14                n18                n28                  2729        1197
p15                n51                n21                 6.848         100
p16                n22                n23                  48.6         100
p17                n7                 n22                  5989        1197
p18                n16                n25                 15.01         250
p19                n25                n10                 10.42         250
p20                n11                n12                 4.538         250
p21                n14                n27                  4916        1197
p23                n29                n30                  3076        1197
p24                n21                n31                 61.26         100
p26                n1                 n29               1260.44        1197
p27                n30                n34                   322         150
p28                J2                 n27               2658.77        1197
p29                n37                n38                 40.63         300
p30                n28                n50                 36.46         150
p31                n38                n41                 3.568         100
p32                n27                n37                 1.521         300
p33                n44                n45                 12.39         150
p34                n46                n44                 51.22         150
p35                n18                n47                 46.54         100
p36                n30                n18                  2659        1197
p37                n46                n50                 168.1         200
p38                n51                n46                  14.1         200
p39                n52                n51                  18.6         200
p40                n50                n41                 10.48         100
p41                n5                 n54                 101.4         100
p42                n38                n56                 1.251         300
p43                n56                n57                 19.98         300
p44                n57                n58                 288.4         300
p45                n41                n60                 252.3         200
p46                n61                n1                  515.29        1197
p47                n62                n4                  242.48        1197
p50                J1                 n61                    10         1197
p51                J1                 n62                    10         1197
```

p53	n22	J2	113.70	1197
p54	J2	J3	52.71	300
p55	n28	J4	629.24	1197
p56	J4	n17	924.27	1197
P25	R1	J1	#N/A	#N/A Pump
P48	R1	J1	#N/A	#N/A Pump
P49	R1	J1	#N/A	#N/A Pump
P52	R1	J1	#N/A	#N/A Pump

Energy Usage:

Pump	Usage Factor	Avg. Effic.	Kw-hr /m^3	Avg. Kw	Peak Kw	Cost /day
P25	100.00	75.00	0.73	1795.89	1795.89	0.00
P48	100.00	75.00	0.73	1795.89	1795.89	0.00
P49	100.00	75.00	0.73	1795.89	1795.89	0.00
P52	100.00	75.00	0.73	1795.89	1795.89	0.00

Demand Charge: 0.00
Total Cost: 0.00

Node Results:

Node ID	Demand CMH	Head m	Pressure m	Quality
n1	0.00	1054.44	194.44	0.00
n2	0.00	1054.44	159.44	0.00
n3	0.00	1054.72	139.72	0.00
n4	0.00	1054.72	174.72	0.00
n5	0.00	1053.52	128.52	0.00
n6	0.00	1053.52	128.52	0.00
n7	0.00	1053.52	128.52	0.00
n8	0.00	1040.58	50.58	0.00
n9	0.00	1040.58	35.58	0.00
n10	0.00	1040.58	35.58	0.00
n11	0.00	1040.58	35.58	0.00
n12	0.00	1040.59	35.59	0.00
n13	0.00	1040.60	35.60	0.00
n14	0.00	1040.60	35.60	0.00
n15	9375.00	1039.12	0.12	0.00
n16	0.00	1040.54	35.54	0.00
n17	0.00	1043.33	128.33	0.00
n18	0.00	1047.46	167.46	0.00
n21	0.00	1044.86	144.86	0.00
n22	0.00	1047.83	167.83	0.00
n23	0.00	1047.83	162.83	0.00
n25	0.00	1040.56	35.56	0.00
n27	0.00	1045.20	155.20	0.00
n28	0.00	1044.74	154.74	0.00
n29	0.00	1053.18	97.18	0.00
n30	0.00	1050.11	105.11	0.00
n31	0.00	1044.86	144.86	0.00
n34	0.00	1050.11	60.11	0.00
n37	0.00	1045.20	155.20	0.00
n38	0.00	1045.20	155.20	0.00
n41	0.00	1045.11	155.11	0.00
n44	0.00	1044.86	144.86	0.00
n45	0.00	1044.86	144.86	0.00
n46	0.00	1044.86	144.86	0.00
n47	0.00	1047.46	162.46	0.00
n50	0.00	1044.86	154.86	0.00
n51	0.00	1044.86	144.86	0.00

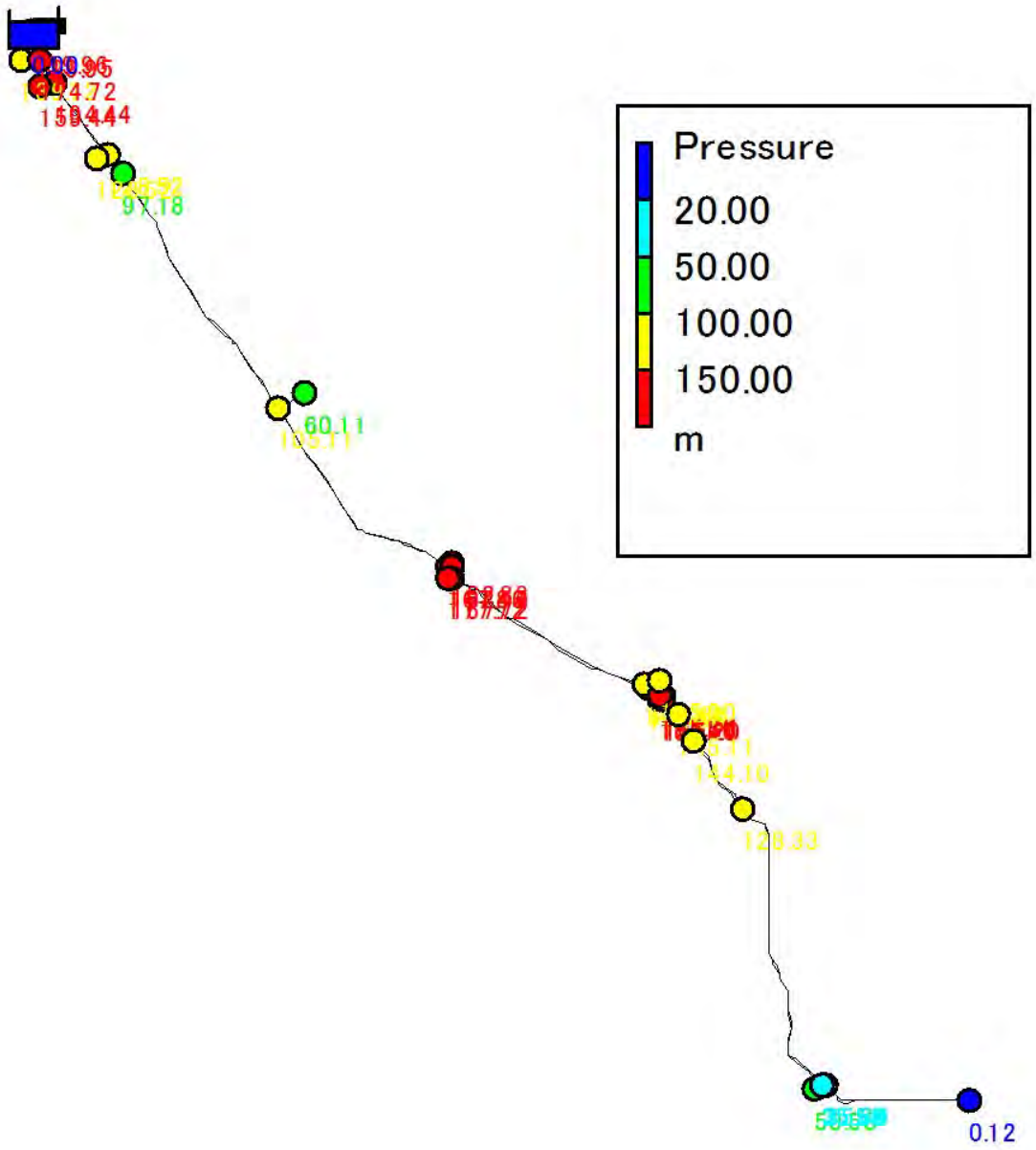
n52	0.00	1044.86	144.86	0.00
n54	0.00	1053.52	128.52	0.00
n56	0.00	1045.20	155.20	0.00
n57	0.00	1045.20	155.20	0.00
n58	0.00	1045.20	145.20	0.00
n60	0.00	1045.11	145.11	0.00
n61	0.00	1054.95	199.95	0.00
n62	0.00	1054.95	199.95	0.00
J1	0.00	1054.96	199.96	0.00
J2	0.00	1047.72	167.72	0.00
J3	0.00	1047.72	177.72	0.00
J4	520.00	1044.10	144.10	0.00
R1	-9895.01	855.00	0.00	0.00 Reservoir

Link Results:

Link ID	Flow CMH	Velocity m/s	Unit Headloss m/km	Status
p1	0.00	0.00	0.00	Open
p2	0.00	0.00	0.00	Open
p3	0.00	0.00	0.00	Open
p4	0.00	0.00	0.00	Open
p5	4881.17	1.20	0.95	Open
p6	0.00	0.00	0.00	Open
p7	0.00	0.00	0.00	Open
p8	-101.20	0.57	1.48	Open
p9	-101.20	0.57	1.49	Open
p10	-101.20	0.57	1.48	Open
p11	-4739.20	1.17	0.90	Open
p12	-4635.80	1.14	0.86	Open
p13	-4534.60	1.12	0.83	Open
p14	5013.83	1.24	1.00	Open
p15	0.00	0.00	0.00	Open
p16	0.00	0.00	0.00	Open
p17	4881.17	1.20	0.95	Open
p18	-101.20	0.57	1.49	Open
p19	-101.20	0.57	1.49	Open
p20	-101.20	0.57	1.49	Open
p21	-4840.40	1.19	0.93	Open
p23	5013.84	1.24	1.00	Open
p24	0.00	0.00	0.00	Open
p26	5013.84	1.24	1.00	Open
p27	0.00	0.00	0.00	Open
p28	4881.17	1.20	0.95	Open
p29	40.77	0.16	0.11	Open
p30	-40.77	0.64	3.33	Open
p31	40.77	1.44	23.98	Open
p32	40.77	0.16	0.15	Open
p33	0.00	0.00	0.00	Open
p34	0.00	0.00	0.00	Open
p35	0.00	0.00	0.00	Open
p36	5013.84	1.24	1.00	Open
p37	0.00	0.00	0.00	Open
p38	0.00	0.00	0.00	Open
p39	0.00	0.00	0.00	Open
p40	-40.77	1.44	23.99	Open
p41	0.00	0.00	0.00	Open
p42	0.00	0.00	0.00	Open
p43	0.00	0.00	0.00	Open
p44	0.00	0.00	0.00	Open
p45	0.00	0.00	0.00	Open
p46	5013.84	1.24	1.00	Open

p47	4881.17	1.20	0.95	Open
p50	5013.84	1.24	1.00	Open
p51	4881.17	1.20	0.95	Open
p53	4881.17	1.20	0.95	Open
p54	0.00	0.00	0.00	Open
p55	5054.60	1.25	1.01	Open
p56	4534.60	1.12	0.83	Open
P25	2473.75	0.00	-199.96	Open Pump
P48	2473.75	0.00	-199.96	Open Pump
P49	2473.75	0.00	-199.96	Open Pump
P52	2473.75	0.00	-199.96	Open Pump

(8) Calculated Pressure of Transmission Pipeline for Zai-Dabouq Line



6.5　マアディポンプ場の水撃防止の検討結果

検討結果

機場	無対策			フライホイール対策			
	Fig. No.	最大負圧	最大負圧地点	Fig. No.	GD^2	最大負圧	最大負圧地点
Ma'adi Pump Station	Fig.1	約 56m	約 2,510m	Fig.2	25.0kg･m^2	約 5m	約 1,970m

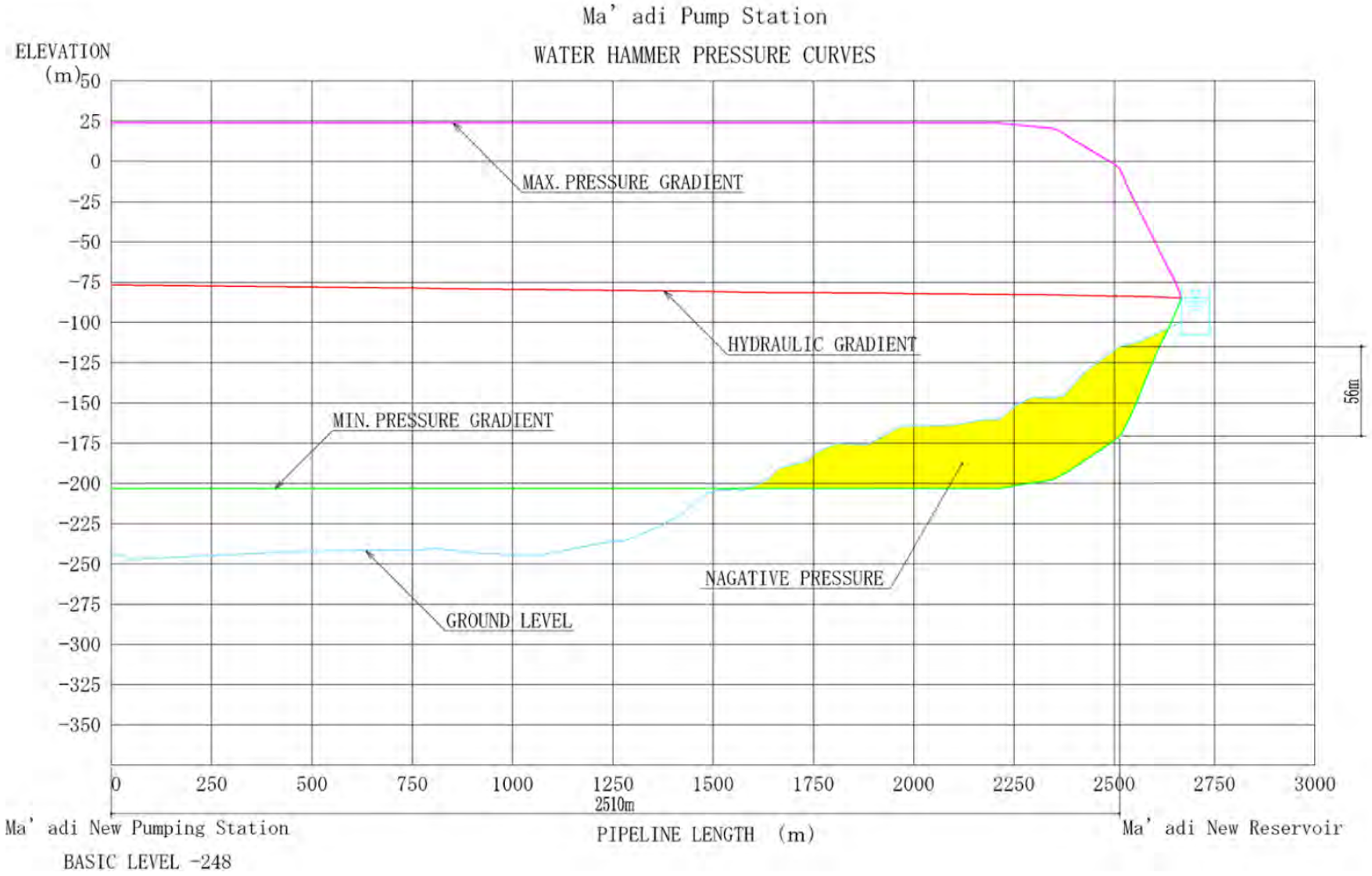


Fig.1　水撃防止対策無しの場合 (FW GD2=0.0kg･m^2)

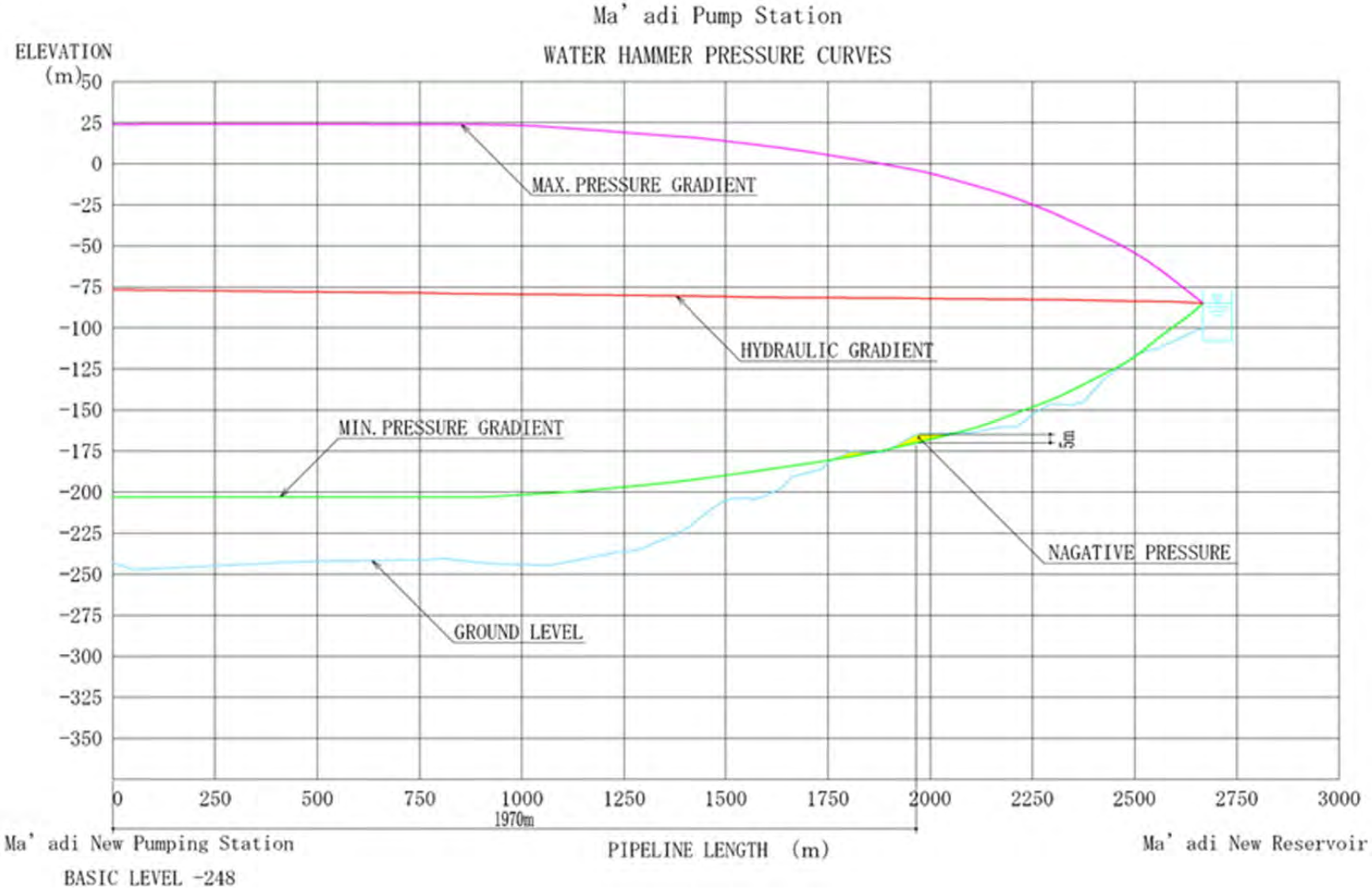
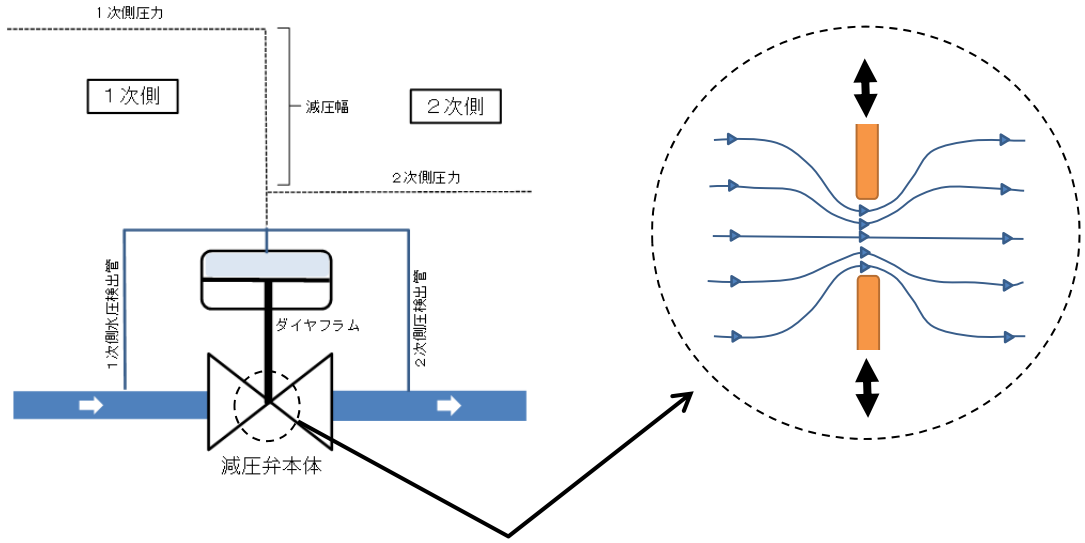


Fig.2　水撃防止対策（フライホイール対策）有りの場合（FW GD^2=25.0kg･m^2）

6.6　減圧弁の構造

減圧弁は弁体を絞って弁体を通過する流速を早め摩擦ロスを増やして減圧する。減圧弁の１次側圧力が変動しても２次側水圧を一定に保つため、１次側と２次側の水圧を検知して付帯するダイヤフラムにより弁棒を上下させ、減圧弁の絞り比率を変える機能を持たせている。



減圧弁の構造

弁体を絞り流速を早めると減圧幅を大きくとれるが、流速を早めれば水圧は低下し、飽和蒸気圧を下回れば水は沸騰し気泡が発生する。絞り部を通過すると流速は戻るとともに水圧も上昇し、気泡は激しく破裂して弁体を摩耗させる。これがキャビテーションである。減圧弁の計画ではキャビテーションが生じないよう減圧幅を適正に設定することが必要である。

減圧弁は特殊バルブであり、減圧弁のメーカーはキャビテーションへの特性を向上させるため減圧弁に独自の工夫を施しており弁体の形状はメーカーによって異なることが多く、各メーカーは自社製品の選定チャートを用意している。

本計画は、適用が想定される減圧弁メーカーの選定チャートをもとに、減圧弁の計画を行った。本計画で想定される減圧弁のメーカーは次の２社である。

Ａ社：ヨルダン国で広く採用されているドイツのメーカー。とくに、KfW/GIZ のプロジェクトで多い。アインアルバシャ地区でも使われている。

Ｂ社：日本のメーカー。日本の無償援助「ヨルダン渓谷中・北部上水道施設改善計画」および「南部地域給水改善計画」で採用されている。

6.7　電力量・CO_2削減効果の検討

現在の WAJ の財務状況はきわめて悪く、その大きな要因の１つは過剰な電力費の負担である。全国の電力消費量にしめる水道事業の比率は 16%に達し、WAJ においても、電力消費量を削減して、収支のバランスをはかり、財務の健全化をはかることが急務とされている。このような背景のもと、本プロジェクトは、既存の水道施設をエネルギー効率の高いシステムに改善し、電力消費量を削減することを目的の１つとしている。本資料は、プロジェクトを実施した場合(With Project)の電力量を算出し、プロジェクトを実施しない場合(Without Project)の電力量との差から削減量を求め、本プロジェクトの効果を検証するものとする。また、電力削減量から地球気候変動に関わる CO2 の削減量も併せて検証する。

１．With Project と Without Project

本プロジェクトは 2020 年を目標年に水道システムを再構築するものであり、人口増加に応じて給水量が増加する。現在（2012 年）と目標年（2020 年）の給水人口と配水量（日平均）は以下のとおりである。水道施設ではポンプ設備が電力消費量の多くをしめ、ポンプ設備の改善がエネルギー効率の高い水道システムの構築に寄与することになる。本プロジェクトの協力対象地区は一部のエリアを除き、配水ポンプ、あるいはブースターポンプによる直接配水方式である。配水区は細分化されて rationing system によって配水されているため、配水先によって流量が変動しポンプ運転点は変動する。このため、高いポンプ効率が維持できずに、電力消費量は大きくなる。

表 1 給水人口と配水量

項目	単位	アインアルバシャ		ディルアラ	
		2012 年	2020 年	2012 年	2020 年
給水人口	人	156,860	191,505	57,440	70,125
配水量(日平均)	m^3/日	20,027	27,225	8,932	10,497

1) With Project

配水ポンプ、あるいはブースターポンプの直接配水方式から配水池からの自然流下方式に切り替え、配水先の流量変動がポンプ効率へ影響を与えないシステムに改善する。必要なレベルに配水池を設けるため、必要に応じ送水ポンプを新規に設置する。基本的に配水ポンプと自然流下によるエネルギー消費量は同じである。しかしながら、配水ポンプによる直接配水方式は、流量変動に応じてポンプ効率が変動するが、送水ポンプは定流量運転になるため、ポンプ効率は一定な値を維持することができ、両者のポンプ効率の差分だけ、電力消費量は削減される。両地区の具体的なシステムの改善点は以下のとおりである。

<u>Ain Al-Bash</u>

2 カ所の配水池を建設することにより 2 カ所の既存配水ポンプ場は不要となる。また、1 カ所の配水ポンプ場は導水ポンプとして Baqa'a 配水池へ送水する。新規の配水池までは、①既存水源井戸は井戸ポンプを交換せずに新規の配水池まで送水、②Zai - Dabouq Line の分岐点からは残圧を利用して配水池まで送水するので新規の配水池までの送水ポンプは不要である。

Deir Alla

既存の水道システムは明確なゾーン分けはないものの水源の違いにより、2 つの配水システムから構成される。北部井戸群を水源とする配水システムは、井戸群から既存の Rajeb 配水池まで送水し自然流下により配水管網をとおして給水される。他の配水システムは、中部に位置する 2 カ所の脱塩プラントを水源とし、配水ポンプによって既存配水管網まで給水される。既存の Rajeb 配水池と脱塩プラントから全地区へ配水されているが、配水区の北端に位置する Rajeb 配水池および中部の RO プラントから全域に配水することは難しく、途中のブースターポンプ場で増圧し南端の配水区まで給水している。本プロジェクトは目標年次に必要な水量は RO プラントからの供給量を増やすことによって対応するものであり、公平な水供給を可能とするために、全体配水区を明確に 2 つのゾーンに分け、Rajeb 配水池が負担する配水区を狭め、他の配水区は中部の RO プラントを水源として、新規の New Rajeb 配水池を設けることにより、自然流下により配水を行うものである。

2) Without Project

既存施設を全く改修しない場合、たとえ、目標年の水供給量が確保されたとしても、表 1 に示す配水量の計画値を達成することは困難と考えられる。したがって、Without Project では、ポンプの増設など、何らかの既存施設の改修を行い、計画値を満足するものと想定する。この場合、With Project のように、水道システムを根本的に改善することにはならないので、現在のエネルー効率はそのまま変更がないと想定する。

2. 電力消費量と CO_2 換算量の算出

2.1 アインアルバシャ

アインアルバシャでは新規ポンプ場の計画はなく、電力量消費量の算定では既存ポンプ場のみを対象とする。

1) 現在（2012 年）の電力消費量と CO_2 換算量

現在の電力消費量と CO_2 換算量は、WAJ の実績値から以下のとおりである。

表 2 既存ポンプ場の電力量と CO2 換算量（2012 年）

ポンプ場名称	種別	電力量 (kWh/年)	電力費(*1) (JD/年)	CO_2(*2) (ton/年)	不要となるポンプ場
Abu Nasir P/S	配水ポンプ	1,109,571 (33%)	73,232	688	不要
Safout Reservoir P/S	配水ポンプ	487,502 (15%)	32,175	302	不要
計		1,597,073 (48%)	105,407	990	
Um Al Danannir P/S	配水ポンプ	1,751,935 (52%)	115,628	1,086	要
合 計		3,349,008 (100%)	221,035	2,076	

(WAJ 実績 2012 年)

注記)

(*1) : 電力料金 1kWh=0.066 JD

(*2) : CO_2 削減に関する排出ガス換算係数 (Emission Coefficient: tone CO_2 e/Mwh)。JICA プロジェクト研究進捗報告書（2008 年 12 月）による。同報告書では「ヨ」国は 0.62 kg-CO_2/kWh としている。

Without Project

- 電力量消費量：3,349,008 kWh/年
- 電力費：　　221,035 JD/年
- CO_2換算量：　　2,076 ton/年

With Project

プロジェクトを実施した場合、Um Al Danannir P/S の電力消費量が必要である。

- 電力量消費量：1,751,935 kWh/年
- 電力費：　　115,628 JD/年
- CO_2換算量：　　1,086 ton/年

2) 目標年（2020 年）の電力消費量と CO_2換算量の算定

配水ポンプ場での現在の 1m³ あたりの電力消費量を次のように想定する。

表 3　1m³ あたりの電力消費量（2012 年）

電力量 (kWh/年)	計画配水量 (m³/日)	計画配水量 (m³/年)	1m³ あたりの電力消費量 (kWh/m³)
3,349,008	20,027	7,309,855	0.46

Without Project

With Project のように、エネルギー効率を高めるための根本的な改善を行わなくても、ポンプの増設、運転時間の延長などによって、目標年の計画配水量を達成できるものとして Without Project を想定する。この場合、配水量 1m³ あたりの電力消費量は変わらないものと想定する。

表 4 Without Project の電力量と CO_2量（2020 年）

計画配水量 (m³/日)	計画配水量 (m³/年)	1m³ あたりの電力消費量 (kWh/m³)	電力消費量 (kWh/年)	電力費(*1) (JD/年)	CO_2(*2) (ton/年)
27,225	9,937,125	0.46	4,571,078	301,691	2,834

With Project

プロジェクトを実施により、Abu Nasir P/S と Safout Reservoir P/S の配水ポンプ場は不要となり、Um Al Danannir P/S のみが稼働し、この電力消費量を全電力消費量の 52%と想定する。

- 電力量消費量：2,376,961 kWh/年　(=4,571,078 kWh x 0.52)
- 電力費：　　156,879 JD/年　(=301,691 JD/年 x 0.52)
- CO_2換算量：　　1,474 ton/年　(=2,834 ton/年 x 0.52)

2.2 ディルアラ

ディルアラでは新規ポンプ場(Ma'adi P/S)の計画があり、電力量消費量の算定では既存ポンプ場と新規ポンプ場を対象に電力消費量を算定する。新規ポンプ場は 2020 年の目標年を対象に計画されているため、現在（2012 年）の電力消費量の算定は、計画配水量を現在の条件にあわせ補正

する。

1) 現在（2012 年）の電力消費量と CO2 換算量の算定

現在のポンプ場の電力消費量と CO2 発生量は、WAJ の実績値から以下のとおりである。

表 5 既存配水ポンプ場の電力消費量と CO2 換算量（2012 年）

ポンプ場名称	種別	電力量 (kWh/年)		電力費 (*1) (JD/年)	CO_2(*2) (ton/年)	不要となるポンプ場
Waji Rajeb P/S	配水ポンプ	175,840		11,605	109	要
Derra P/S	ブースターポンプ	273,100		18,025	169	要
計		448,940	20%	29,630	278	
Abu Ziegan P/S	ブースターポンプ	466,480		30,788	289	不要
Al Rueiah P/S	ブースターポンプ	452,320		29,853	280	不要
Ma'adi P/S	ブースターポンプ	474,240		31,300	294	不要
Dharet Al Ramel P/S	ブースターポンプ	91,280		6,024	57	不要
Miyahuna	配水ポンプ	48,180		3,180	30	不要
Omar Abdalla	配水ポンプ	262,800		17,345	163	不要
計		1,795,300	80%	118,490	1,113	
合 計		2,244,240	100%	148,120	1,391	

(WAJ 実績 2012 年)

Without Project

- 電力量消費量： 2,244,240 kWh/年
- 電力費： 148,120 JD/年
- CO_2換算量： 1,391 ton/年

With Project

既存システムを With Project のシステムに置き換えたとすると、2012 年における日平均配水量にあわせて Ma'adi 配水ポンプ場の送水量を調整することが必要である。新規の配水ポンプは 2020 年における計画配水量（日最大）と 24 時間連続運転をベースに計画されており、新規配水ポンプ場の電力消費量は運転時間を調整して求める必要がある。

表 6 新規送水ポンプ場の相当運転時間

項目	計画配水量 (日平均) (m^3/日)	計画配水量 (日最大) (m^3/日)	配水量 比率	相当運転時間 (日最大)	相当運転時間 (日平均)
現在（2012 年）	8,932	10,450	85%	20.4	17.4
目標年（2020 年）	10,497	12,281	100%	24.0	20.5

注）季節変動率（日最大/日平均）=1.17

相当運転時間をもとに新規配水ポンプ場の電力消費量と CO_2 換算量を求める。

表 7　新規送水ポンプ場の電力量と CO_2 換算量（2012 年）

ポンプ場名称	ポンプ仕様				L (*) (kW)	相当運転時間（時）	電力量 (kWh/日)	電力量 (kWh/年)	電力費 (JD/年)	CO_2(*) (ton/年)
	Q (m^3/時)	Q (m^3/分)	H (m)	kW						
New Ma'adi P/S (2duty+1stand-by)	141	2.35	170	110	100	17.4	1,743	636,258	41,993	394
	141	2.35	170	110	100	17.4	1,743	636,258	41,993	394
合　計	－	－	－	－	－	－	3,486	1,272,516	83,986	788

注）L (kW) = 0.163 x Q (m^3/min) x H (m) / η 、 η=ポンプ効率 x モーター効率=0.65

表 5 と表 7 から With Project は 8 のように示される。

表 8　電力削減量と CO_2 削減量（2012 年）

種別	電力消費量 (kWh/年)	電力費(*1) (JD/年)	CO_2(*2) (ton/年)
既存配水ポンプ場	448,940	29,630	278
新規送水ポンプ場	1,272,516	83,986	788
合　計	1,721,456	113,616	1,086

2) 目標年（2020 年）の電力消費量と CO_2 換算量

既存ポンプ場での 1m^3 あたりの電力消費量は以下のようになる。

表 9　1m^3 あたりの電力消費量（2012 年）

電力量 (kWh/年)	計画配水量 (m^3/日)	計画配水量 (m^3/年)	1m^3 あたりの電力消費量 (kWh/m^3)
2,244,240	8,932	3,260,180	0.69

Without Project

With Project のように、エネルギー効率を高めるための根本的な改善を行わなくても、ポンプの増設、運転時間の延長などによって、目標年の計画配水量を達成できるものとして Without Project を想定する。この場合、現在の 1m^3 あたりの電力消費量は変わらないと想定し、Without Project の 2020 年の電力消費量を推定すると以下のようになる。

表 10　Without Project の電力消費量と CO_2 削減量（2020 年）

計画配水量 (m^3/日)	計画配水量 (m^3/年)	1m^3 あたりの電力消費量 (kWh/m^3)	電力量 (kWh/年)	電力費(*1) (JD/年)	CO_2(*2) (ton/年)
10,497	3,831,405	0.69	2,643,669	174,482	1,639

With Project

プロジェクト実施後も 8 カ所の既存ポンプ場のうち 2 カ所は継続して利用することになり、ポンプ場の電力消費量にしめる比率を 20%と想定し、その値はいかのとおりである。

表 11　With Project に継続して利用するポンプ場の電力消費量と CO_2 削減量（2020 年）

電力量 (kWh/年)	電力費(*1) (JD/年)	CO_2(*2) (ton/年)
528,734	34,897	328

新規ポンプ場では相当運転時間が 20.5 時間となり電力消費量は以下のとおりとなる。

表 12　With Project の新規送水ポンプ場の電力量と CO_2 換算量（2020 年）

ポンプ場名称	ポンプ仕様				L (*) (kW)	相当運転時間（時）	電力量 (kWh/日)	電力量 (kWh/年)	電力費 (JD/年)	CO_2(*) (ton/年)
	Q (m^3/時)	Q (m^3/分)	H (m)	kW						
New Ma'adi P/S (2duty+1stand-by)	141	2.35	170	110	100	20.5	2,054	749,614	49,475	465
	141	2.35	170	110	100	20.5	2,054	749,614	49,475	465
合　計	-	-	-	-	-	-	4,108	1,499,228	98,950	930

注）L (kW) = 0.163 x Q (m^3/min) x H (m) / η、 η=ポンプ効率 x モーター効率=0.65

電力消費量と CO_2 換算量は、既存配水ポンプ場の電力消費量（表 10）と新規送水ポンプ場の電力消費量（表 12）から以下のとおりである。

表 13　電力消費量と CO_2 換算量（2020 年）

種別	電力消費量 (kWh/年)	電力費(*1) (JD/年)	CO_2(*2) (ton/年)
既存配水ポンプ場	528,734	34,897	328
新規送水ポンプ場	1,499,228	98,950	930
合　計	2,027,962	133,847	1,258

3.　電力削減量と CO_2 の削減量のまとめ

プロジェクト実施による電力量削減量と CO_2 削減量は以下のようにまとめられる。

表 14　電力削減量と CO_2 削減量

地区名	種別	現在（2012 年）			目標年（2020 年）		
		電力消費量（kWh/年）	電力費（JD/年）	CO_2（ton/年）	電力消費量（kWh/年）	電力費（JD/年）	CO_2（ton/年）
Ain Al Basha	Without Project	3,349,008	221,035	2,076	4,571,078	301,691	2,834
	With Project	1,751,935	115,628	1,086	2,376,961	156,879	1,474
	削減量	1,597,073	105,407	990	2,194,117	144,812	1,360
Deir Alla	Without Project	2,244,240	148,120	1,391	2,643,669	174,482	1,639
	With Project	1,721,456	113,616	1,086	2,027,962	133,847	1,258
	削減量	522,784	34,505	305	615,707	40,635	381

また、m^3 あたりの電力消費量は次のようになる。

表 15　m^3 あたりの電力削減量

地区名	種別	単位	現在（2012 年）	目標年（2020 年）
Ain Al Basha	配水量	m^3/日	20,000	27,200
	電力消費量	kWh/年	3,349,008	2,376,961
		kWh/日	9,175	6,512
	m^3 あたりの電力消費量	kWh/m^3	0.458	0.239
Deir Alla	配水量	m^3/日	8,900	9,100
	電力消費量	kWh/年	2,244,240	2,027,962
		kWh/日	6,149	5,556
	m^3 あたりの電力消費量	kWh/m^3	0.688	0.611

6.8　社会条件調査結果

(1)　Sampling

The number of samples is 165 for Ain Al Basha and 135 for Deir Alla, depending on the population of localities.

(2)　Social condition

1)　Population

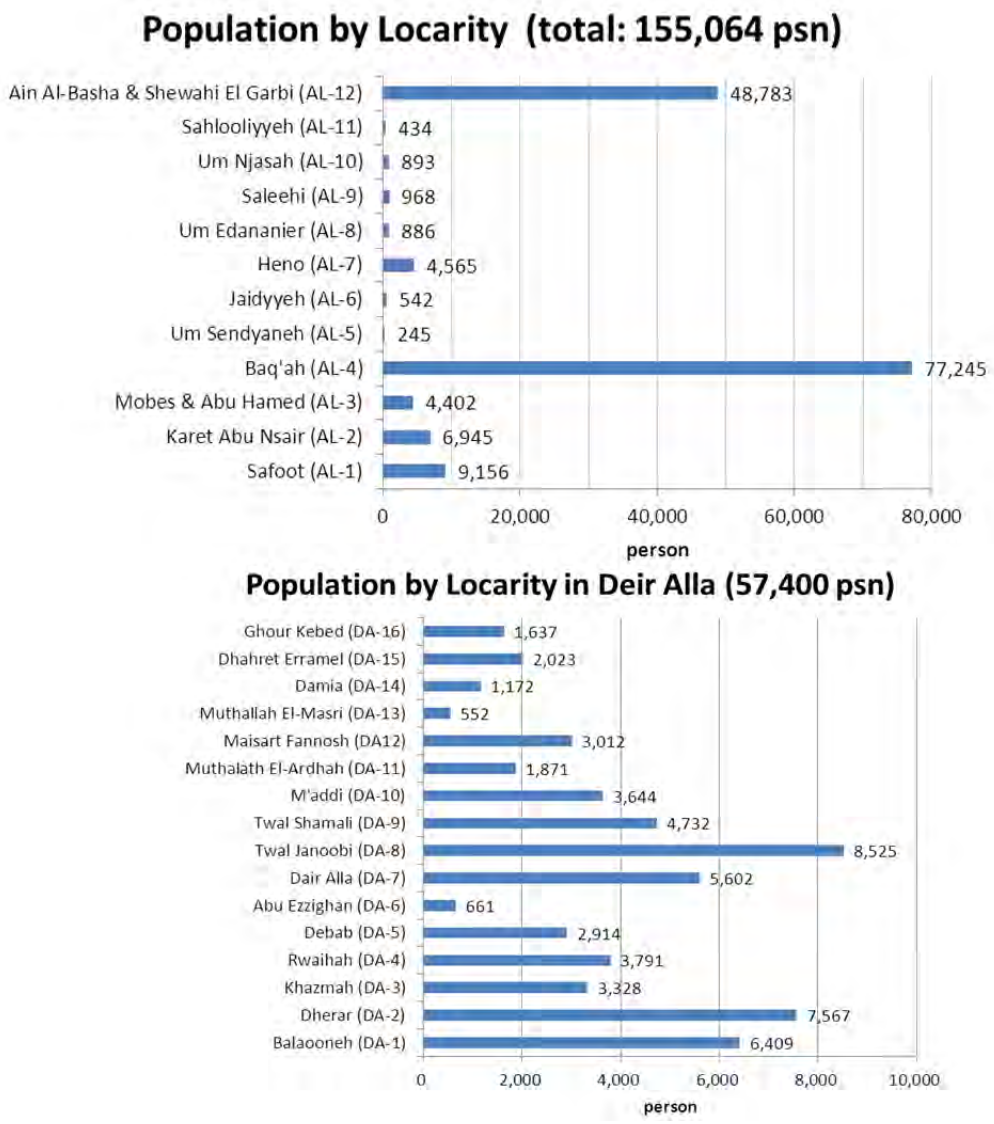


Figure 1:

2) Occupation

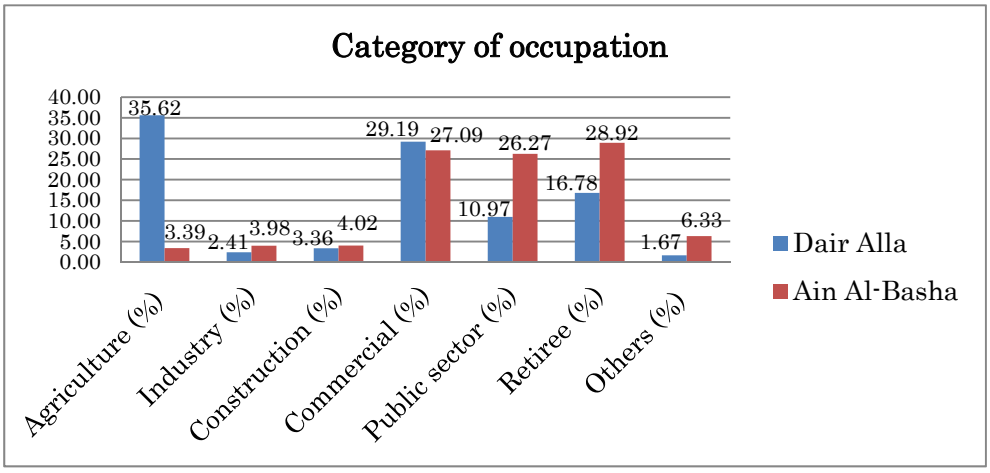


Figure 2:

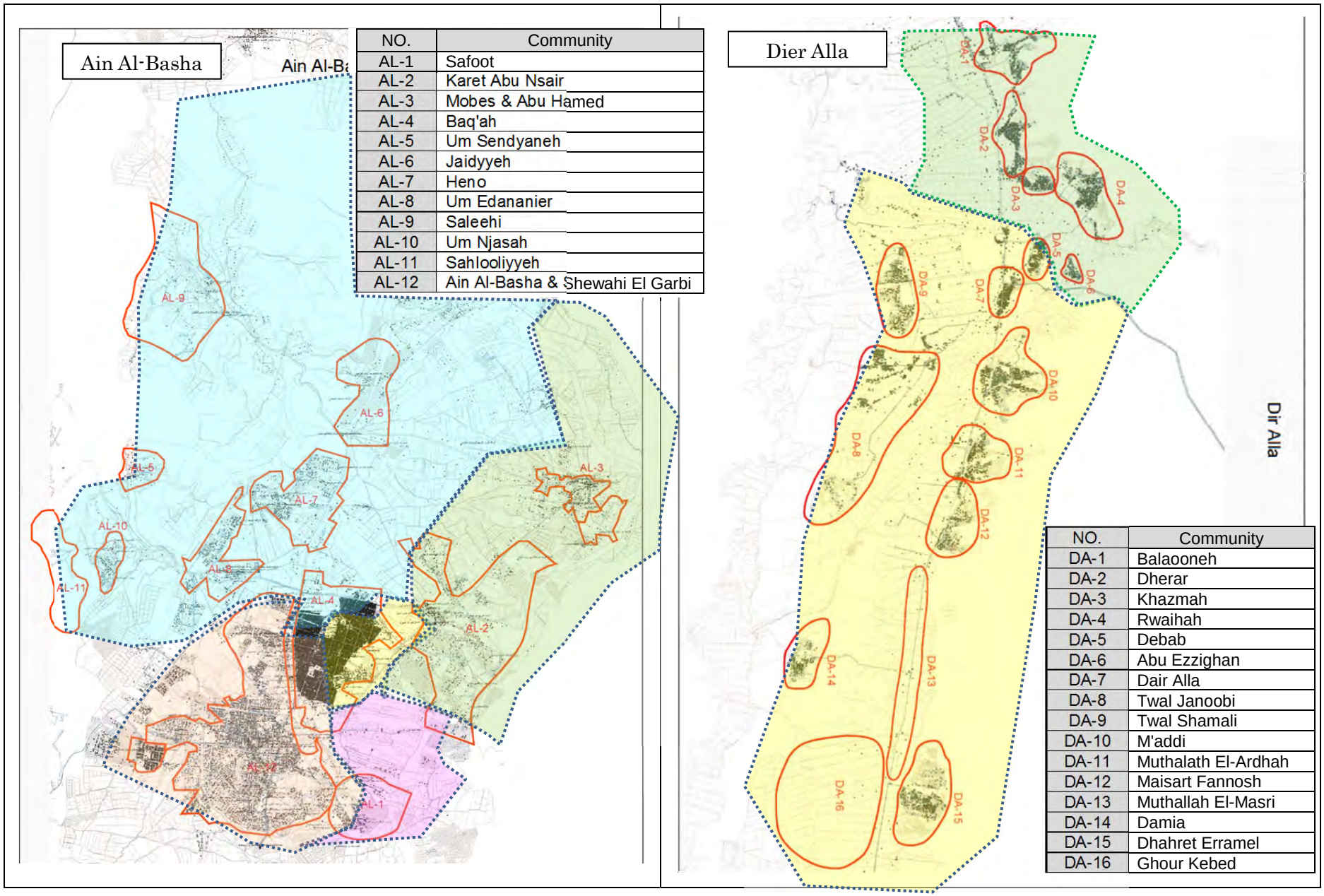

Ain Al-Basha
Ain Al-Ba
NO. | Community
AL-1 | Safoot
AL-2 | Karet Abu Nsair
AL-3 | Mobes & Abu Hamed
AL-4 | Baq'ah
AL-5 | Um Sendyaneh
AL-6 | Jaidyyeh
AL-7 | Heno
AL-8 | Um Edananier
AL-9 | Saleehi
AL-10 | Um Njasah
AL-11 | Sahlooliyyeh
AL-12 | Ain Al-Basha & Shewahi El Garbi
Dier Alla
Dir Alla
NO. | Community
DA-1 | Balaooneh
DA-2 | Dherar
DA-3 | Khazmah
DA-4 | Rwaihah
DA-5 | Debab
DA-6 | Abu Ezzighan
DA-7 | Dair Alla
DA-8 | Twal Janoobi
DA-9 | Twal Shamali
DA-10 | M'addi
DA-11 | Muthalath El-Ardhah
DA-12 | Maisart Fannosh
DA-13 | Muthallah El-Masri
DA-14 | Damia
DA-15 | Dhahret Erramel
DA-16 | Ghour Kebed

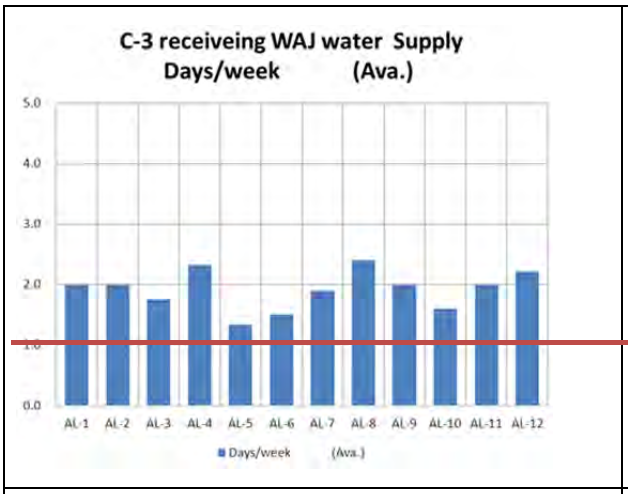
Figure 3:

(3) Rationing Supply

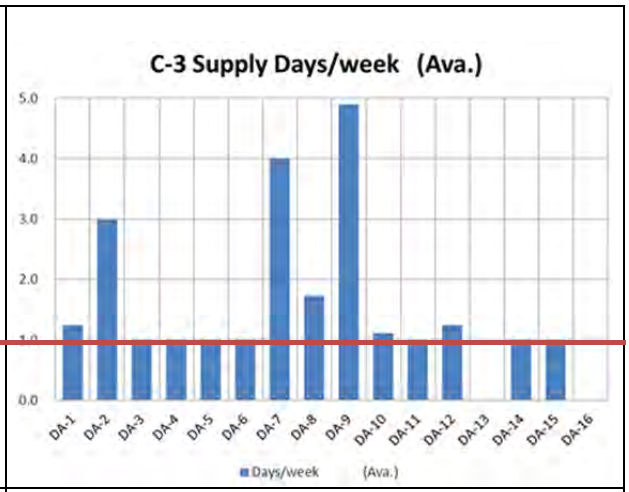
Rationing system adopted in the target area appears to be very complicated depending on the location and elevation of the houses. Its outline can be summarized as shown below according to the socio-economic survey by JICA Survey Team. The survey indicates that Deir Alla's water supply hours not equitable; some areas obtain water for 3-5 days, others only one day.ng water fairly.

Table 1: Average Water Supply Hours

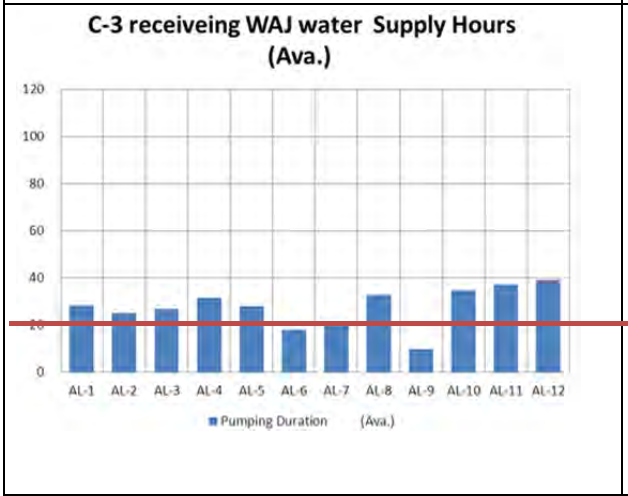
Directorate	Average days per week for water supply (days/week)	Average water supply hours (hours/week)
Ain Al Basha	2.1	31.1
Dier Alla	1.79	30.9



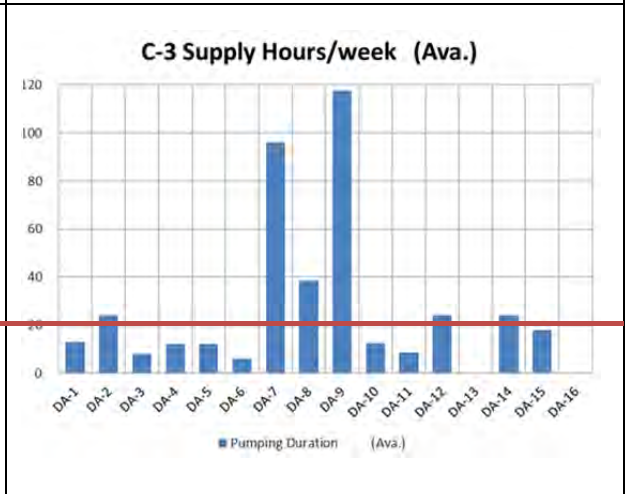
Ain Al Basha



Dier Alla



Ain Al Basha



Dier Alla

Figure 4:

(4) Condition of Water Usage

As an indicator of the public water supply in the areas, Deir Alla had 44% of the samples relies on the water tankers; this could lead to the fact that water supply is not satisfying the demand, bearing in mind that Deir Alla has areas that are not covered with the public water service as discussed before, which will also contribute in the high percentage of private water tankers.

On the other hand, 20% of the samples in Ain Al-Basha rely on the private water tankers, which, again gives an indicator that supply from the public system is not meeting the full households' demand in Ain Al-Basha. This fact is supported with the fact that more than 99% of the samples are connected to the public water network and has no other reason to use private tankers other than shortage in the supply.

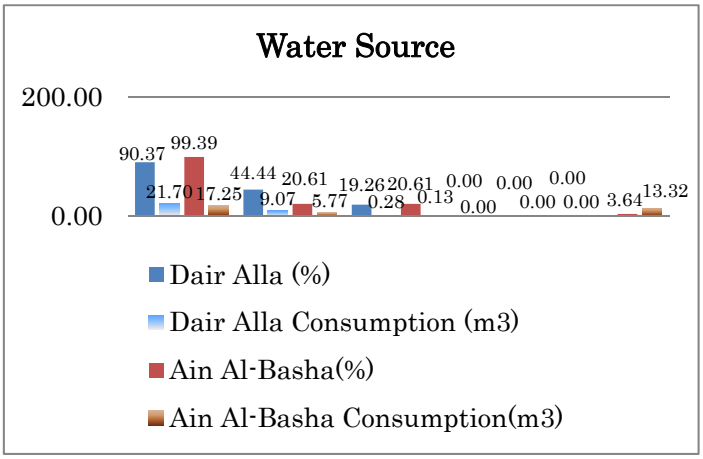


Figure 5:

The results indicated that number of days of supply was 1.79 for Deir Alla and 2.1 for Ain Al-Basha, whereas the supply hours were estimated as 31 hours per week for both. These numbers reflects latest supply during months in February and March.

Table 2:

District	Supply (days/week)	Supply (hrs/week)
Ain Al Basha	1.79	30.89
Dei Alla	2.1	31.1

Almost all households has storage tanks which is needed as the water supply in Jordan is not continuous (intermittent supply) and the consumer has to store the water for the days water is not supplied through the network.

Suction pump is used in 21% of the households in Deir Alla and in 14% of the households in Ain Al-Basha. Water Purifier is used in 67% of the households in Deir Alla and 52% in Ain Al-Basha. This indicated that great percentage of the households does not rely on the quality of water supplied from the public network.

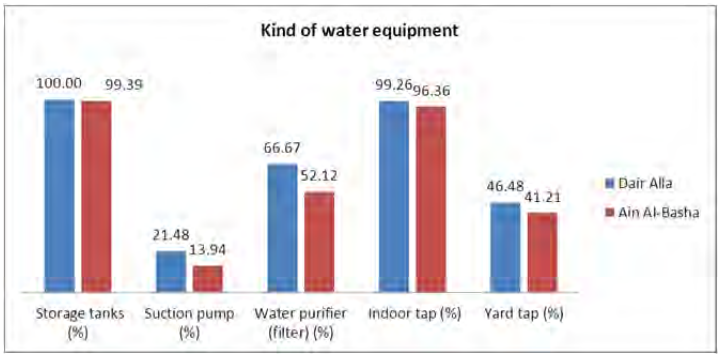


Figure 6:

(5) Awareness of People about Water Supply Services

98% of the households in Deir Alla are not satisfied with water supply services. While this percentage was 67% in Ain Al-Basha versus 33% are satisfied with water services delivered.

Figure 7:

Satisfaction will increase with increasing the level of service provided by reducing water leakages which will play a key role in enhancing water quality and implementing pressure management in the systems.

As shown in the figure below, 91% of the households in Deir Alla have a problem of water quality while about 49% of the households in Ain Al-Basha complained on the water quality issues. And this clarifies the high percentages of water Purifier used in the majority of homes. The reasons for complains are as follows:

- The residents complaint red colour water, or rusted colour water
  - This is usually caused by flushing after restart of water supply in intermittent water supply system, where pipe is old and rusty because internal surface is expose to air and easy to rust. The main material for this cause is galvanized iron pipe. Also in intermittent supply system, if suction pump is used to withdraw water from pipe, possibly dirty particles may be sucked through leakage holes.
- Other major reason is pollution or rusty in storage tank. WAJ recommend the tank cleaning

Also, 73% of the households in Deir Alla have a problem in amount of water supplied by the public network which was not enough to meet their demand and forces them to buy water from private water tankers. While in Ain Al-Basha 23% of households have a problem in water supply amount.

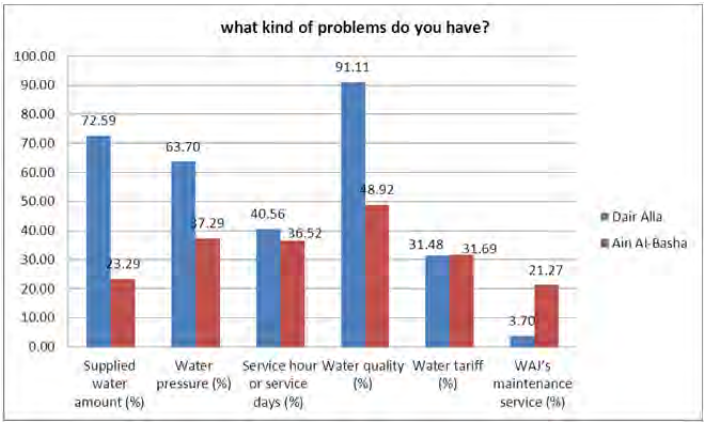


Figure 8:

64% of households in Deir Alla complained about low water pressures. Where 41% complained about supply duration and 31% complained about high water tariff.

In Ain Al-Basha district 37% complained on low water pressures. Where 37% complained about supply duration and 32% complained about high water tariff.

As discussed in previous item the major problems that facing the households in Deir Alla are water quality and supplied water quantities. While in Ain Al-Basha the major problems that face the households are water quality and water pressures. The table below summarizes the problems in each district according to the priority.

Table 3:

District	First Problem	Second Problem
Ain Al Basha	Water Quality	Water Pressure
Deir Alla	Water Quality	Water Amount

Willing to pay to water service depending on their conditions is shown as below. The residents are willing to pay more money for improved water supply conditions, especially in Dier Alla, where they willing to pay as much as 16 JD/month.

Table 4:

District	Current Service	Satisfied Service
Ain Al Basha	5.67 JDs/month	8.84 JDs/month
Deir Alla	6.83 JDs/month	16.18 JDs/month

The 43% of the households in Deir Alla will consume the same amount they currently consume, where 6% will consume 1.25 times of their current consumption, 34% will consume 1.50 times of their current consumption and 17% will consume twice amount of the current consumption.

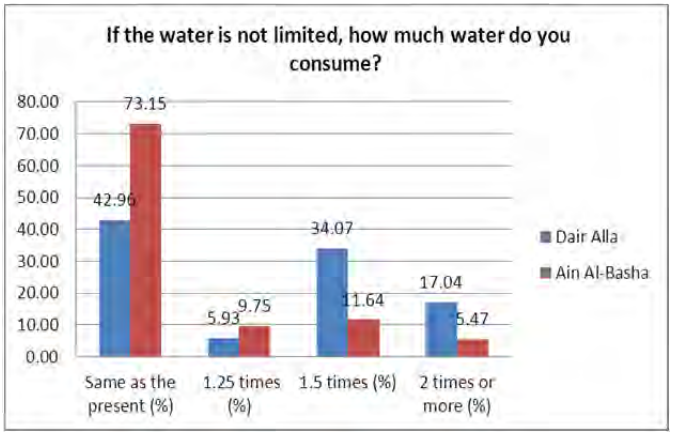


Figure 9:

In Ain Al-Basha district 73% of households will consume the same amounts they currently consume, 10% will consume 1.25 times of their current consumption, 12% will consume 1.50 times of their current consumption and 5% will consume twice amount of their current consumption.

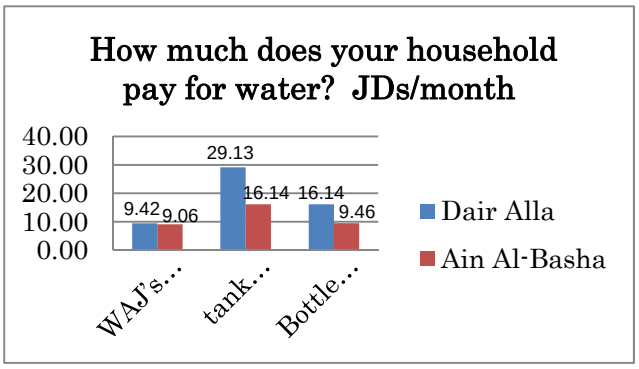


Figure 10:

The average value that paid for WAJ house connection in Deir Alla district is 9.42JDs/month, 29.13JDs/month for tank lorry and 16.14JDs/month for bottled water. While in Ain Al-Basha the average value that paid for WAJ house connection is 9.06JDs/month,16.14JDs/month for tank lorry and 9.46JDs/month for bottled water.

It can be noticed that the householders in Deir Alla pays for tank lorry triple amount than WAJ house connection, because the amount of water that is supplied by WAJ is not sufficient.

The average amount of income in Deir Alla was 425JDs/ month/family, while in Ain Al-Basha was 465JDs/month/family.

It can be noticed that the most expenses are on meals, Education and fuels expenditures respectively. Also, it can be noticed that the lowest expenses is on water.

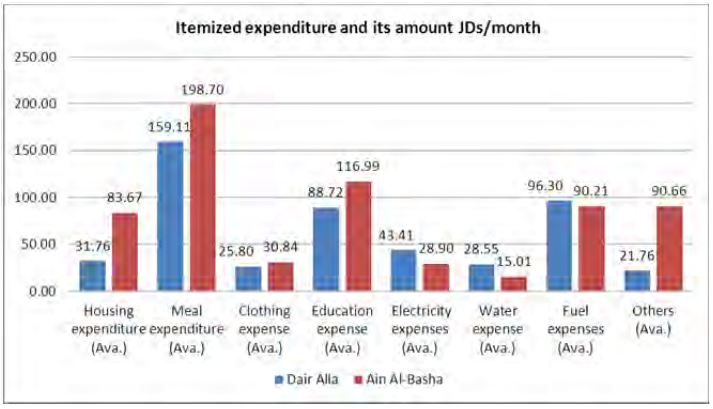


Figure 11:

(6) Condition of Toilet and Sanitary

The following figures show that majority of people have toilets in their homes, which means that hygienic conditions are maintained within the households and this will lead to a better health conditions within the families. The average cost that paid for public sewer in Ain Al-Basha is 13.5 JDs/year/household, and 0 JDs/year/household for Deir Alla since it is not served by public sewer network. The average cost that paid for private vacuum car in Deir Alla is 76 JDs/year, while in Ain Al-Basha is 50 JDs/year

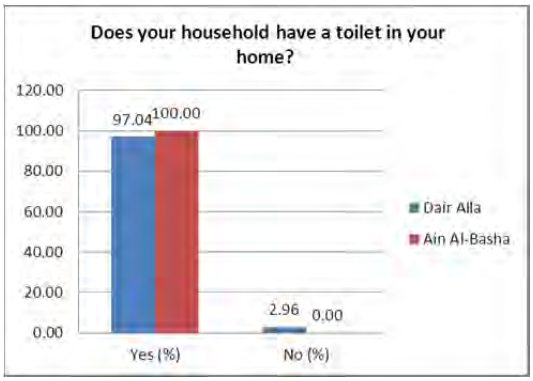


Figure 12:

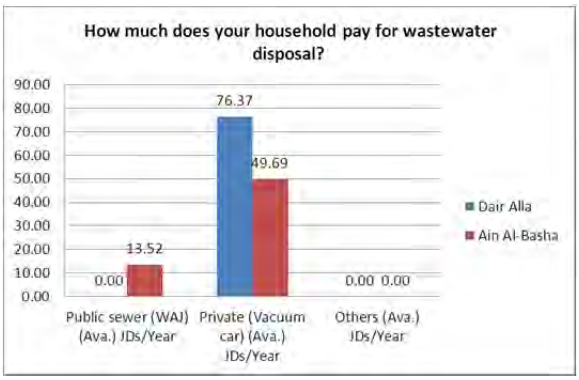


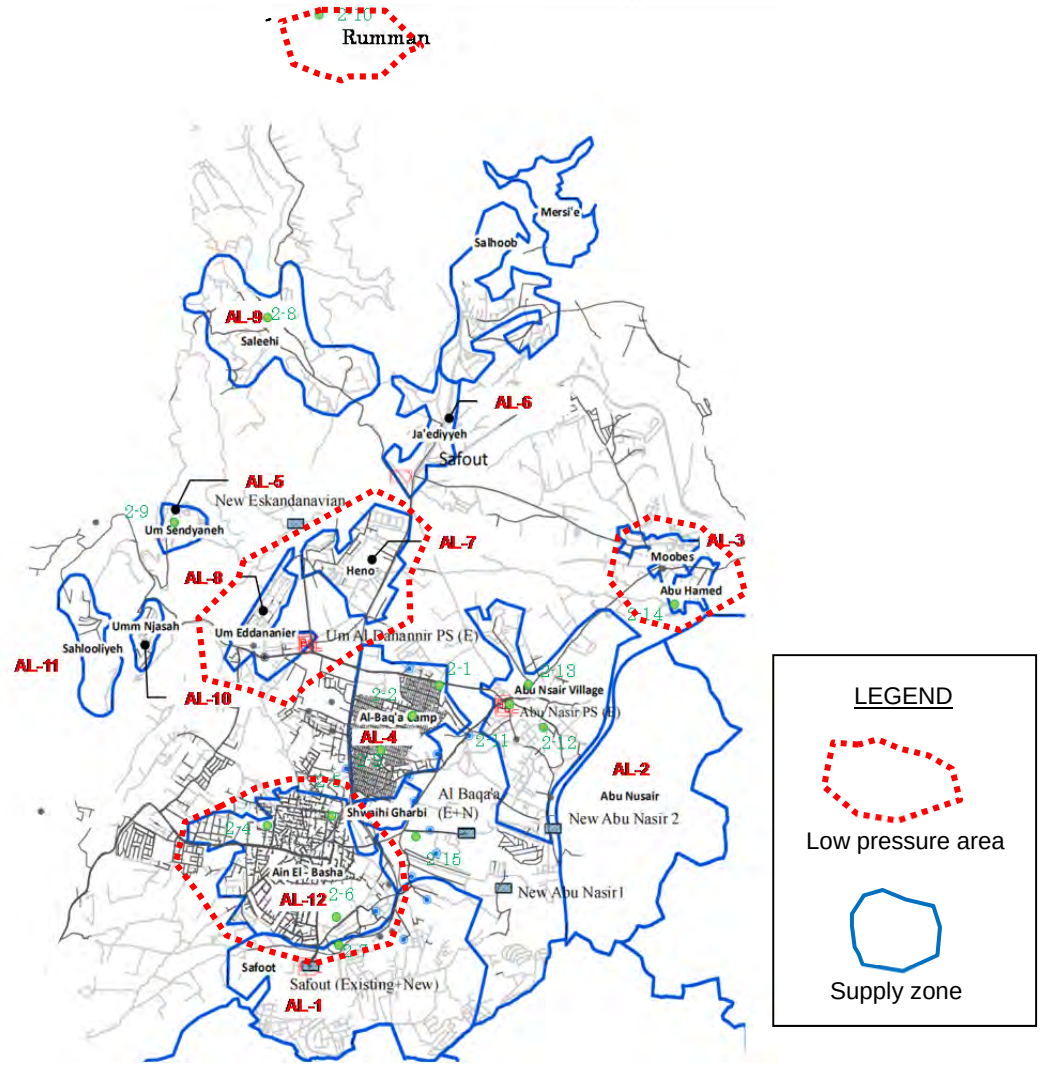
Figure 13:

6.9　給水圧調査結果

(1) Ain Al Basha

Table 1: Low Pressure Area (Ain Al Basha)

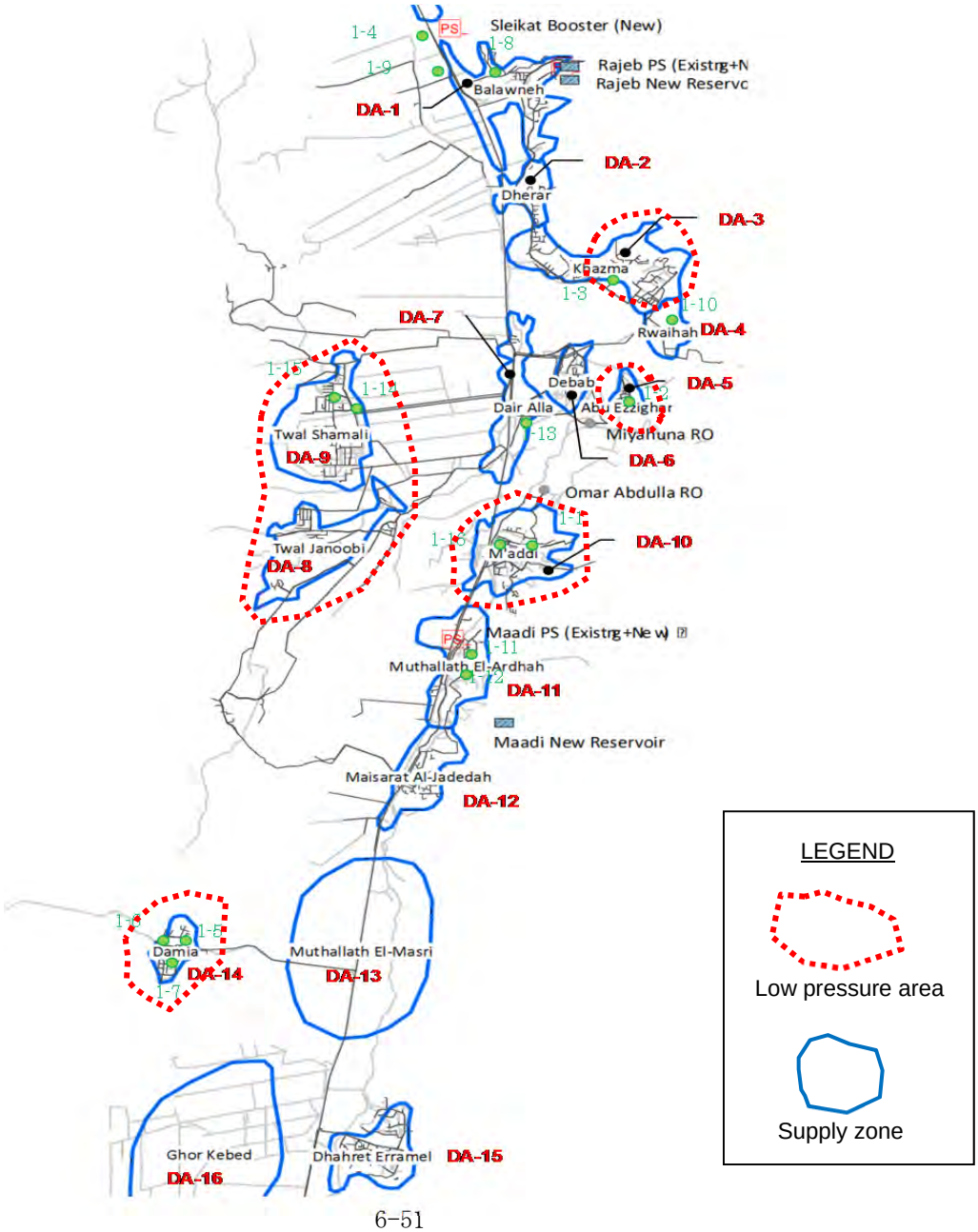
Location	NO	Elevation	Pressure (bar)	Status
Baqqa Camp	2-1	EL+712m	3.5	
	2-2	EL+719m	2.0 – 5.5	
	2-3	EL+707m	2.0	
Ain Al Basha	2-4	EL+700m	1.0	Low pressure
	2-5	EL+730m	0.1	
Safout	2-6	EL+758m	5.2	
	2-7	EL+795m	6.6	
Saleehi	2-8	EL+562m	1.2	
Um Sendyaneh	2-9	EL+613m	8.0	
Rumman	2-10	EL+624m	0.1	Low pressure
Abu Nasir	2-11	EL+777m	3.2	
	2-12	EL+810m	0.1	
	2-13	EL+775m	8.0	
Abu Hamed	2-14	EL+852m	0.1	Low pressure
Al Baqqa	2-15	EL+732m	2.5	



(2) Deir Alla

Table 2: Low Pressure Area (Deir Alla)

Location	No.	Elevation	Pressure (bar)	Status
Maadi	1-1		0.3	Low pressure
	1-16		0.8	
Abu Ezzighan	1-2		1.1	Low pressure
Khazma	1-3		0.7	Low pressure
Sleikat	1-4	EL-155m	1.5	
Damia	1-5		0.2	Low pressure
	1-6		0.1	
	1-7		0.1	
Balawneh	1-8	EL-134m	0.9	
	1-9	EL -159m	2.3	
Rwaihah	1-10	EL -123m	5.0	
Muthallath El-Ardhah	1-11	EL-123m	1.8	
	1-12	EL-123m	0.9	
Deir Alla	1-13	EL-156m	3.0	
Twal Shamali	1-14		0.2	Low pressure
	1-15		0.1	



6.10　公共事業省（MPWH)と管敷設工法についての現場協議結果

大統領令により主要道路の開削は認められなくなった。従って主要道路を横断する場合はトレンチレス工法を使用する必要がある。この例外は、トレンチレス機材が空間的にどうしても設置できない場合のみである。本プロジェクトの想定配管ルートを公共事業省と踏査し工法を確認した。踏査結果を次図に示す。

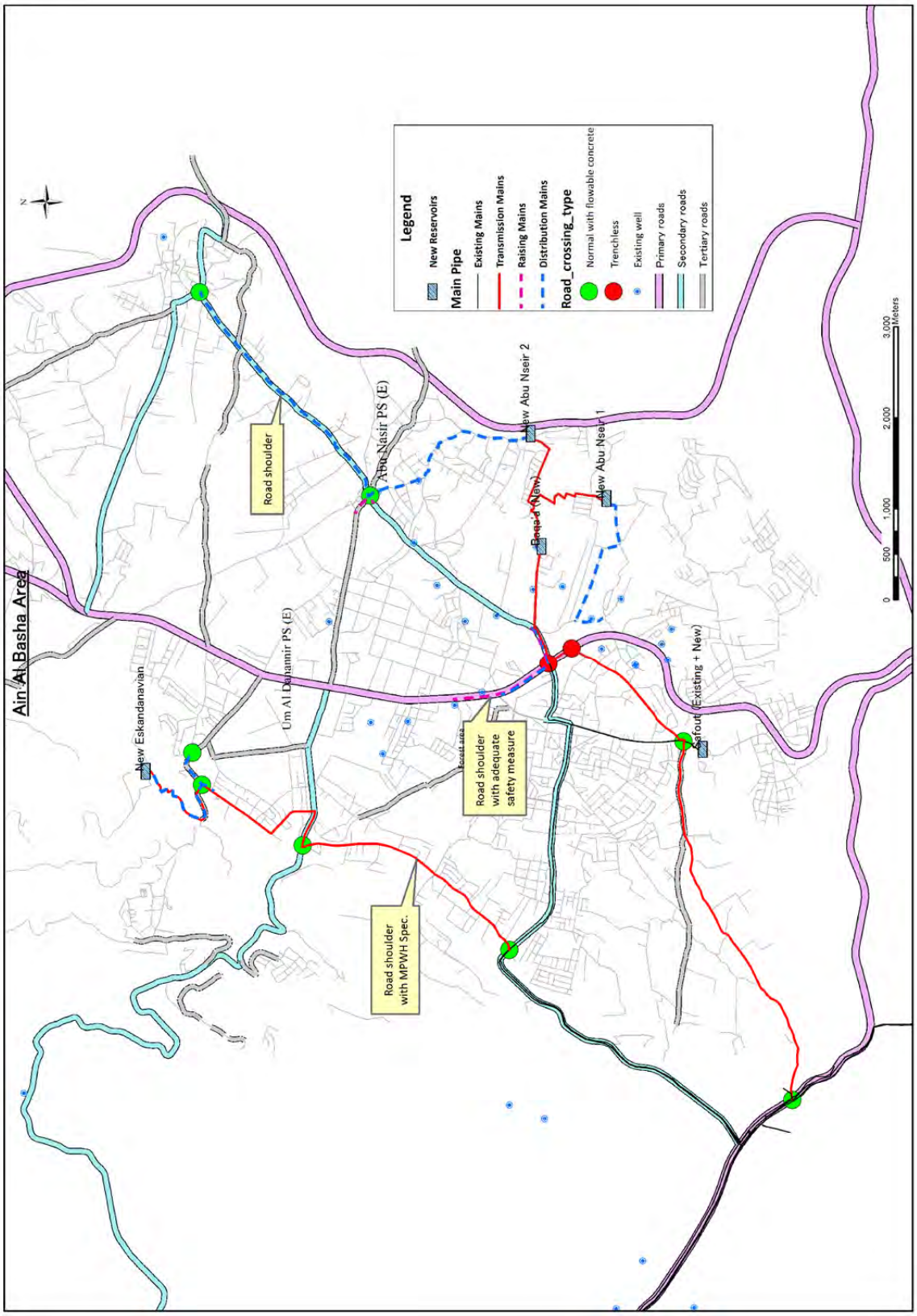


Figure 1: Road occupancy and Road crossing of transmission and distribution pipelines in Ain Al Basha

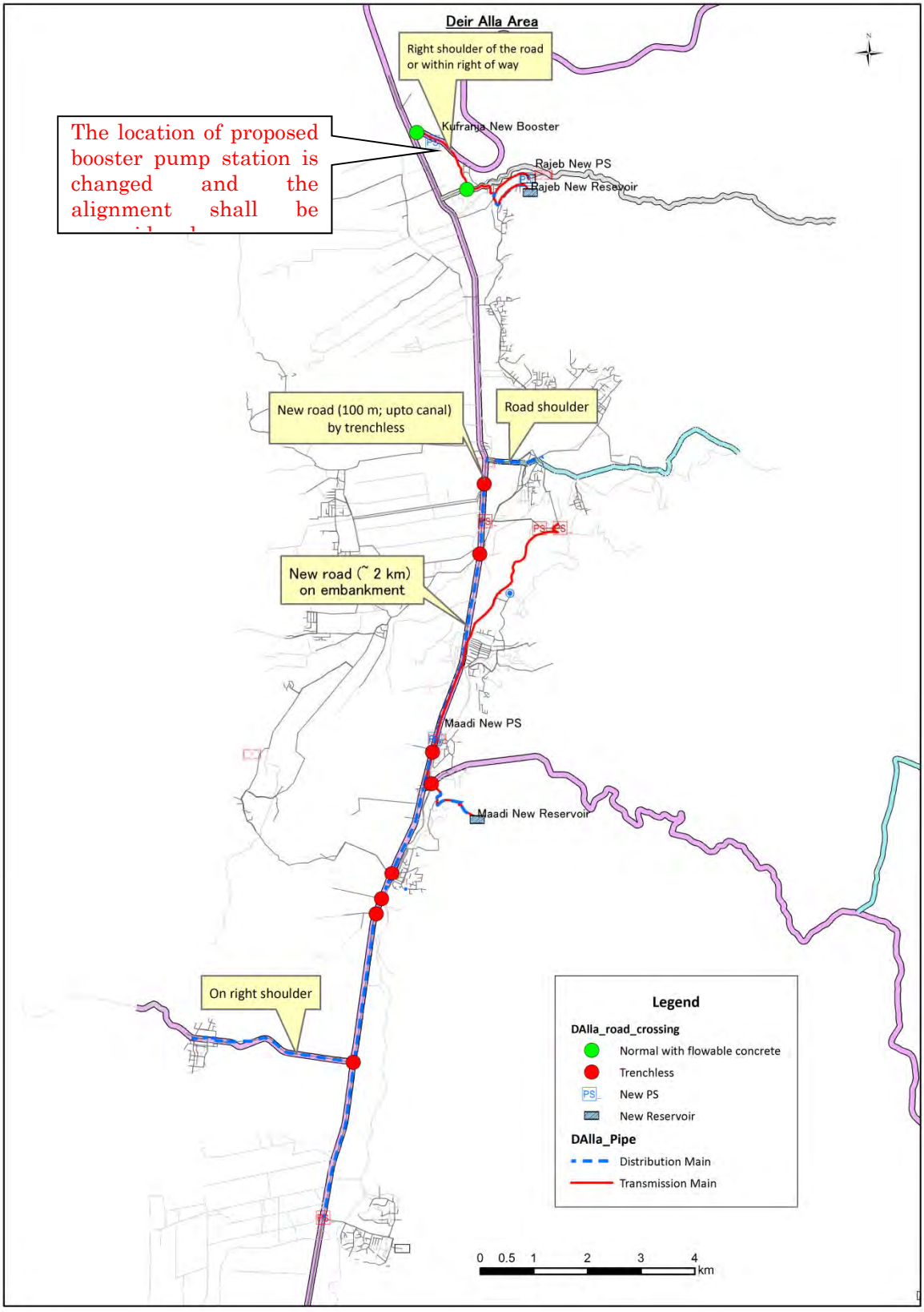


Figure 2: Road occupancy and Road crossing of transmission and distribution pipelines in Deir Alla

6.11 DMA 内の標高差と減圧弁の水理特性と新設管路の動水位

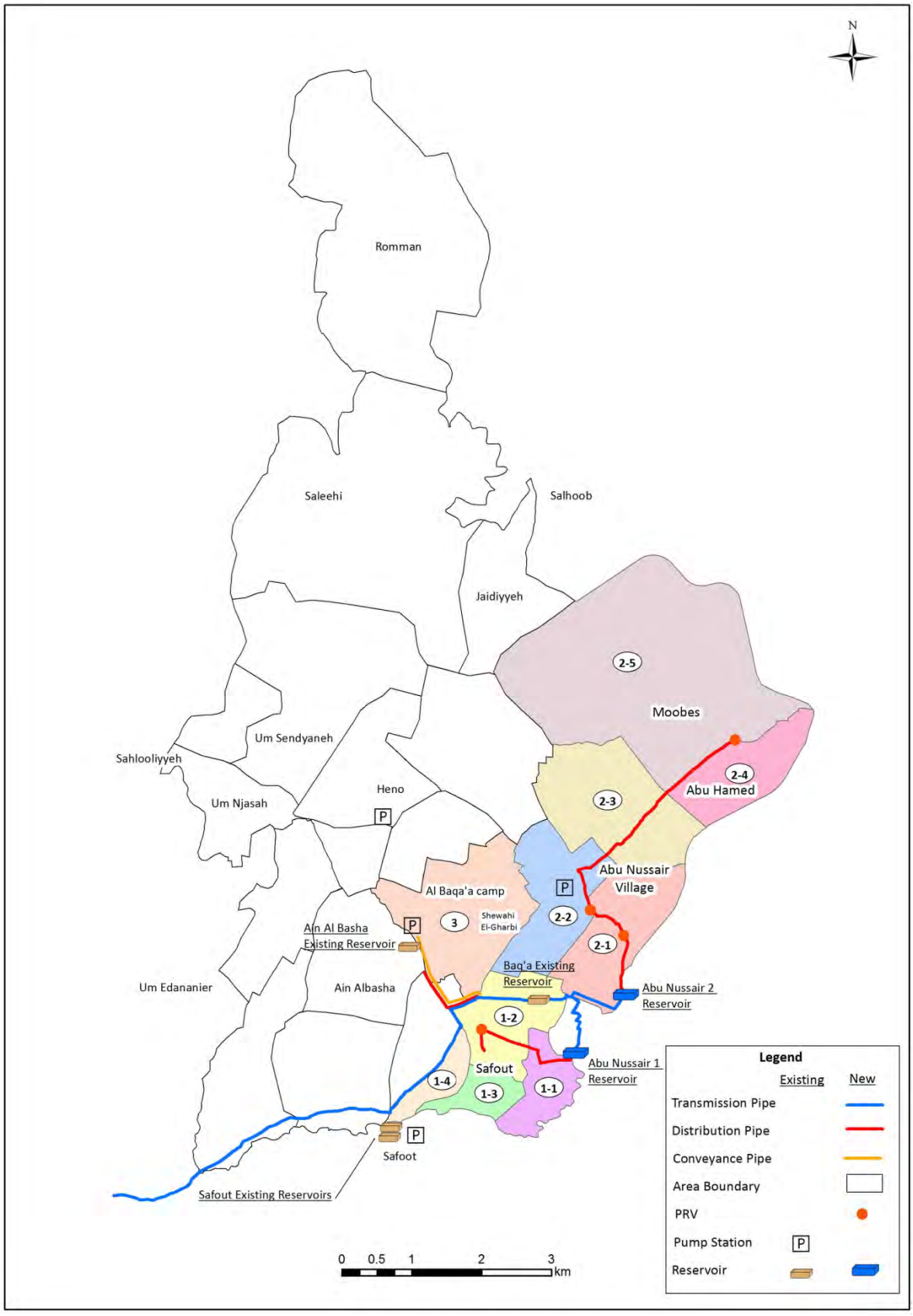
(1) DMA 内の標高差と減圧弁の水理特性

1) アインアルバシャ

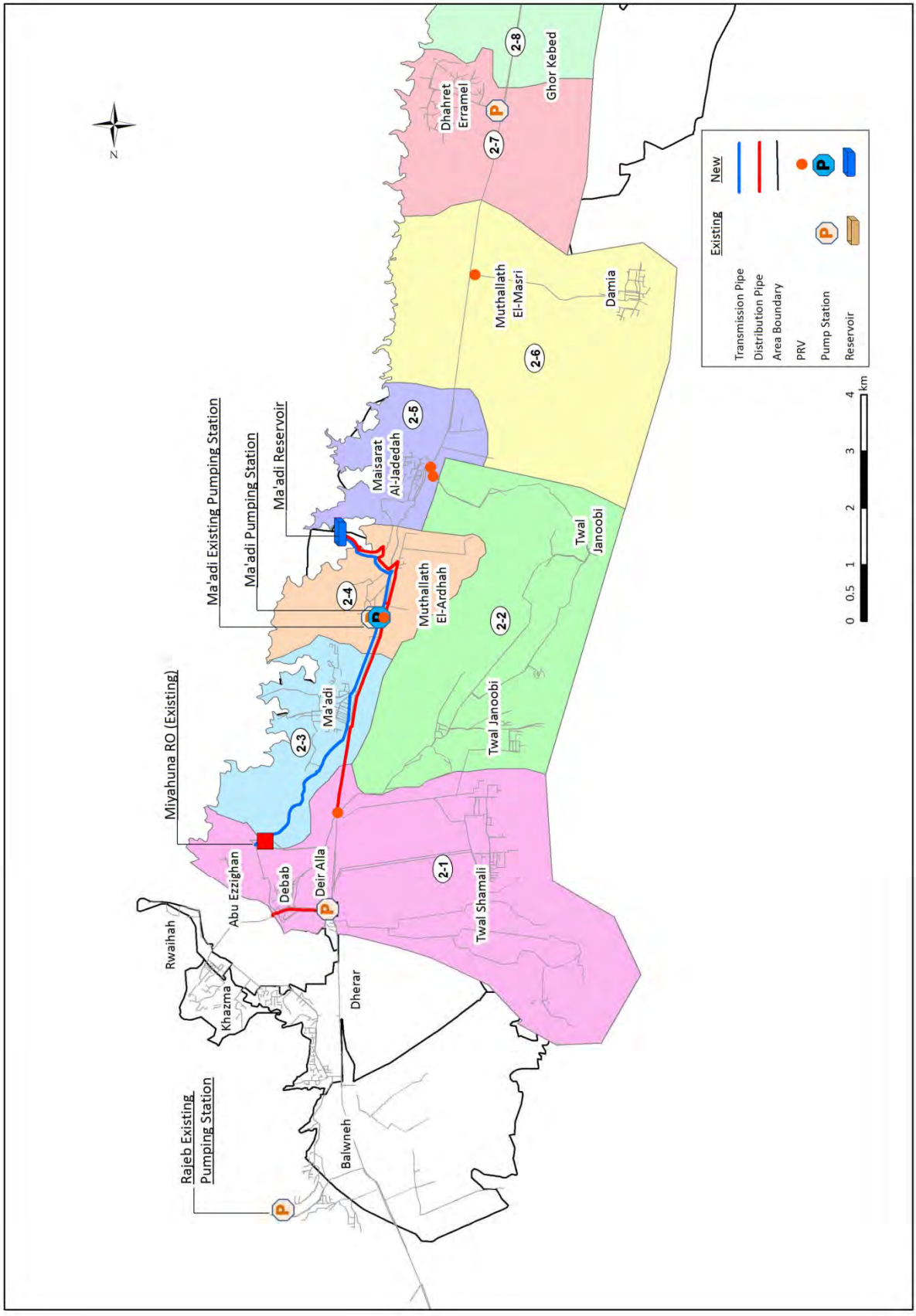
	Sub-zone	Locality Name	Elevation of Residential Area		PRV			Remarks
			High (m)	Low (m)	Elevation of PRV Location (m)	Dynamic Pressure at U/S (m)	Dynamic Pressure at D/S (m)	
Abu Nussair 1	1-1	Safout Part	840	760				Area before PRV
	1-2	Safout Part	760	680	696	165	120	
	1-3	Safout Part	815	730				The above PRV applies
	1-4	Safout Part	730	700				The above PRV applies
Abu Nussair 2	2-1	Abu NussairVillage Part	900	730	843	78	20	
	2-2	Abu NussairVillage Part	770	670	756	162	40	
	2-3	Abu NussairVillage Part	730	630	756	162	40	PRV same as of 2-2
	2-4	Abu Hamed*	830	690				
	2-5	Mobes	730	590	715	192	30	
Al Baqa'a	3	Al Baqa'a camp and Shewahi El-Gharbi	700	640				
Note:	*2-4 Abu Hamed can be divided into two parts as follows:							
		Abu Hamed Part	760	690	756	162	40	Same as of 2-2
		Abu Hamed Part	830	760				No PRV

2) ディルアラ

	Sub-zone	Locality Name	Elevation of Residential Area		PRV			Remarks
			High (m)	Low (m)	Elevation of PRV Location (m)	Dynamic Pressure at U/S (m)	Dynamic Pressure at D/S (m)	
Ma'adi	2-1	Twal Shamali	-240	-330	-213	61	25	
		Deir Alla	-220	-250				No PRV
		Debab	-200	-225				No PRV
		Abu Ezzighan	-180	-230				No PRV
	2-2	Twal Janoobi	-250	-300	-240	125	30	
			-240	-330	-226	81	40	PRVs not in series, from another side
	2-3	Ma'adi	-160	-240	-249	135	110	PRV same as of Muthalath El-Ardhah
	2-4	Muthalath El-Ardhah	-150	-260	-249	135	110	PRV same as of Ma'adi
	2-5	Maisarat Al-Jadedah	-190	-260	-238	116	80	
	2-6	Muthalath El-Masri	-250	-270				No PRV
		Damiya	-270	-290	-240	125	30	
	2-7	Dhahret Erramel	-160	-280				No PRV
	2-8	Ghor Kebed	-240	-290				No PRV


N
Romman
Saleehi
Salhoob
Jaidiyyeh
2-5
Moobes
Um Sendyaneh
Sahlooliyyeh
Heno
Um Njasah
2-4
Abu Hamed
2-3
Abu Nussair
Village
Al Baqa'a camp
3
Shewahi
El-Gharbi
2-2
2-1
Ain Al Basha
Existing Reservoir
Baq'a Existing
Reservoir
Abu Nussair 2
Reservoir
Um Edananier
Ain Albasha
1-2
Abu Nussair 1
Reservoir
Safout
1-4
1-3
1-1
Safoot
Safout Existing Reservoirs
0 0.5 1 2 3
km
Legend
Existing
New
Transmission Pipe
Distribution Pipe
Conveyance Pipe
Area Boundary
PRV
Pump Station
Reservoir

アインアルバシャ


N
Miyahuna RO (Existing)
Ma'adi Existing Pumping Station
Ma'adi Pumping Station
Ma'adi Reservoir
Rajeb Existing Pumping Station
Rwaihah
Abu Ezzighan
Debab
Deir Alla
Khazma
Dherar
Balwneh
Ma'adi
Twal Shamali
Twal Janoobi
Muthallath El-Ardhah
Maisarat Al-Jadedah
Muthallath El-Masri
Damia
Twal Janoobi
Dhahret Erramel
Ghor Kebed
2-1
2-2
2-3
2-4
2-5
2-6
2-7
2-8
Existing
New
Transmission Pipe
Distribution Pipe
Area Boundary
PRV
Pump Station
Reservoir
0 0.5 1 2 3 4 km

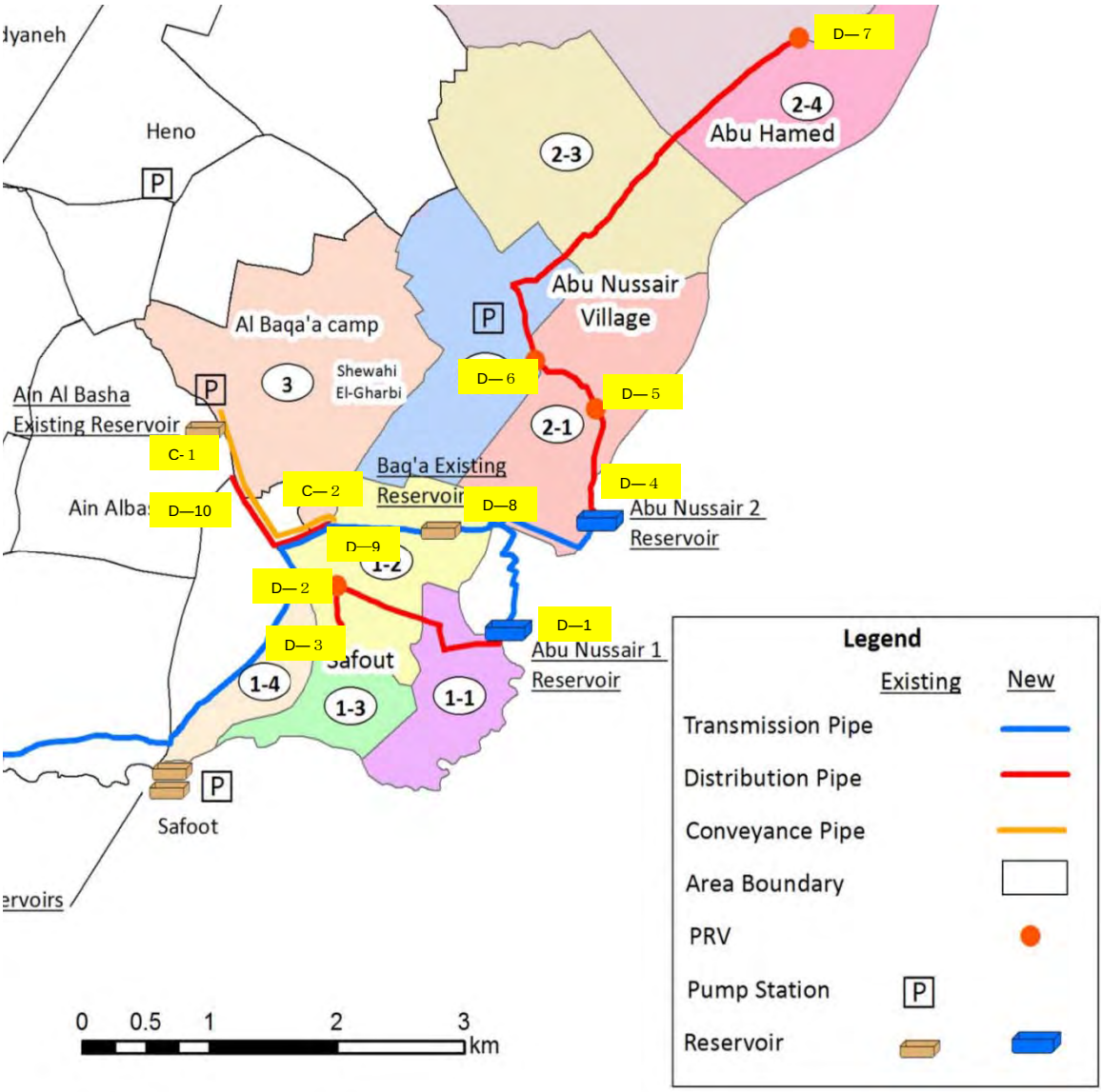
ディルアラ

(2) 新設管路（配水管と導水管）の動水位

1) アインアルバシャ

(unit: m)

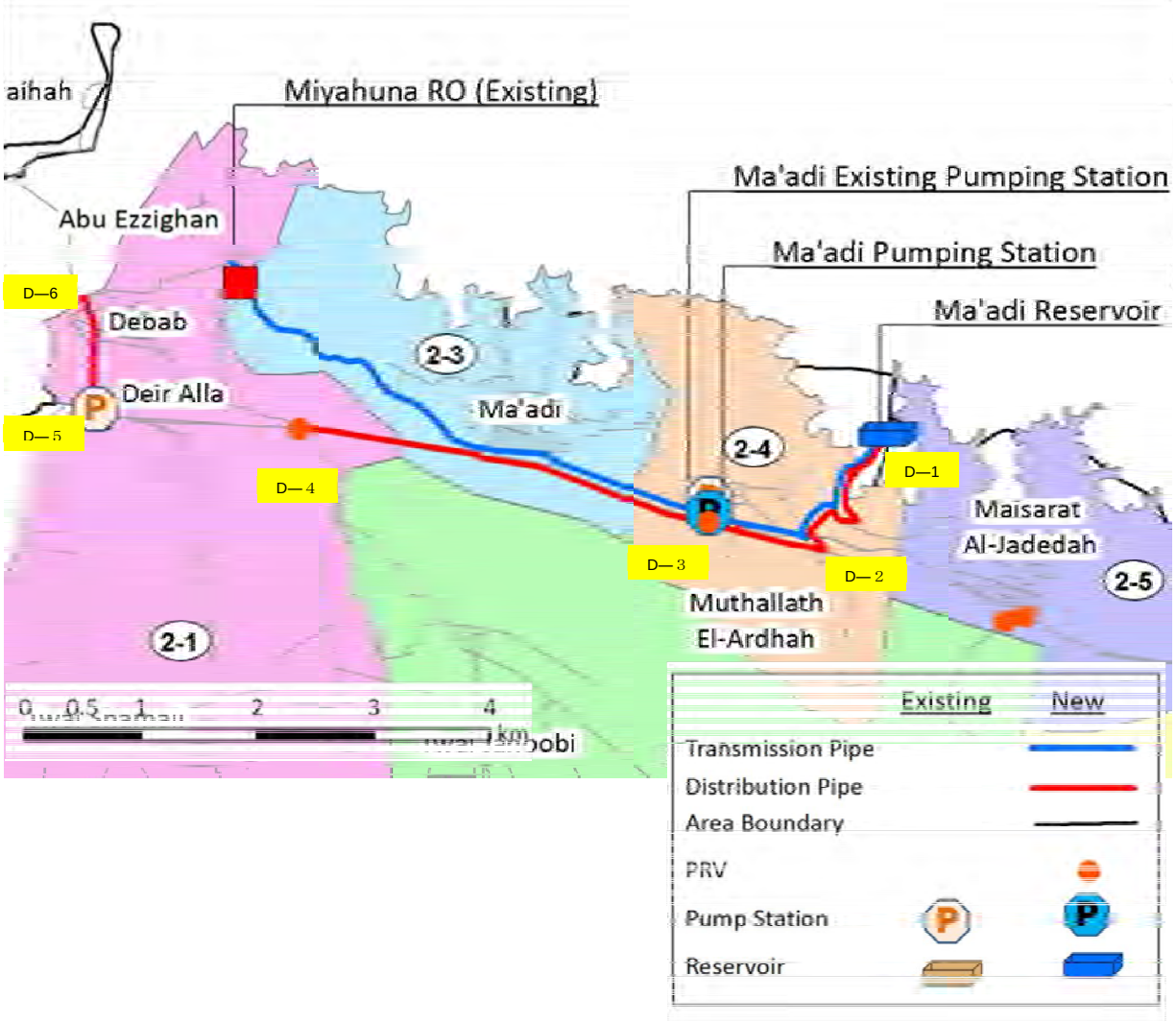
Node No.	Elevation	Total Head	Dynamic Water Pressure	Pressure after PRV	Remarks
D-1	867	-	-	-	Abu Nussair 1 reservoir
D-2	696	858	162	120	
D-3	711	804	93	-	
D-4	926	-	-	-	Abu Nussair 2 reservoir
D-5	842	919	77	20	
D-6	756	917	161	40	
D-7	715	905	190	30	
D-8	743	-	-	-	Al Baqa'a reservoir
D-9	680	738	58	-	
D-10	660	727	67	-	
C-1	641	791	150	-	Ain Al Bash Directorate Office P/S
C-2	680	790	110	-	


Heno
Al Baqa'a camp
Shewahi
El-Gharbi
Ain Al Basha
Existing Reservoir
Ain Alba
Baq'a Existing
Reservoir
Abu Nussair
Village
Abu Hamed
Abu Nussair 2
Reservoir
Abu Nussair 1
Reservoir
Safoot
D— 7
D— 6
D— 5
D— 4
D—8
D—9
D— 2
D— 3
D—1
C- 1
C— 2
D—10
2-4
2-3
2-1
1-2
1-4
1-3
1-1
3
P
0 0.5 1 2 3
km
Legend
Existing
New
Transmission Pipe
Distribution Pipe
Conveyance Pipe
Area Boundary
PRV
Pump Station
Reservoir

2) ディルアラ

(unit: m)

Node No.	Elevation	Total Head	Dynamic Water Pressure	Pressure after PRV	Remarks
D-1	-91	-	-	-	Ma'adi reservoir
D-2	-241	-105	136	-	
D-3	-250	-116	134	110	
D-4	-227	-145	81	40	
D-5	-224	-78	146	-	
D-6	-205	-92	113	-	



6.12　地質調査結果

Report No.: 79/S/05/2013

Date: 02/06/2013

Geotechnical Investigation for the Proposed Site at Ain Al Basha District

IMPROVEMENT AND EXPANSION OF THE WATER DISTIBUTION NETWORK IN BALQA

AIN AL BASHA DISTRICT

Submitted to

JICA STUDY TEAM / TEC INTERNATIONAL CO., LTD.(TECI)

Amman – Jordan

1- INTRODUCTION

The following report summarizes the results of the in situ investigation and lab tests conducted at the request of our client for his projected site for the purpose of determining the geotechnical parameters and soil conditions needed for guiding the designer of a safe and economic design.

The investigation consisted of the following sequence stage:

- Obtaining and studying the available maps and information concerning the site and the proposed project.
- Reconnaissance stage which include site visit, survey the geotechnical & geological features (rock out crops existing , present facilities used in the site).
- Bore holes drilling as fixed by our client .
- Making test pits that fixed by our client .
- Collecting undisturbed and disturbed samples from different bore holes and at different depths.
- Conducting the required tests on representative samples
- Analyses and evaluation of field & lab tests results

Conclusions & recommendations for the design

2- PROJECT CHARACTERISTICS AND DESCRIPTION

The Project is Improvement and expansion of the water distribution network in Balqa /Ain Al Basha District .As a general the project is composed of water pipe lines and water tanks.

3- GEOLOGY OF THE SITE

3-1- Lithology

As we have mentioned before boreholes and test pits were executed in the site at the locations fixed on the attached site plan .lithology and detailed lithological description of the obtained samples were shown on the attached boreholes s and test pits log sheets , within appendix no.1 .

We wish to emphasize that the results obtained from the boreholes are only representing the boreholes . These results are only representing the lithology at the depths indicated on the attached log sheets.

3-2Ground Water and Cavities

Neither ground water nor cavities were encountered under the drilled bore holes and test pits .

4- FIELD EXPLORATION

4-1 Drilling Boreholes :

Three boreholes were drilled at the site, at the locations shown on the site map enclosed within appendix .They were numbered as BH1 thru BH3 inclusive. The depths and elevations of the drilling were fixed on the attached log sheets within appendix no.1 and as follows in table 1.

Table 1: Boreholes Depths and Elevations

Borehole No.	Borehole Depth (m)
BH1	15
BH2	15
BH3	15

*Number, location and depths of the drilled boreholes were fixed by our client and consultant.

The drilling were carried out with Atlas Copco Rotary drilling rig. The advance of the drilling operation was carried out through rotary air flush drilling method.

4-2Making Test Pits:

Fifteen test pits were drilled at the site, at the locations shown on the site map enclosed within appendix .They were numbered as TP1 thru TP15 inclusive. The depths for each test pit is 1.5m and the lithology of the digged test pits were fixed on the attached log sheets within appendix no.1

*Number, location and depths of the digged Test Pits were fixed by our client and consultant.

4-3 Sampling

Depending on type of material encountered during drilling operation undisturbed & disturbed samples were obtained .

All obtained samples are visual inspected and classified in the site by our geologist and then they were marked , placed in proper way in water –proof plastic bags and placed in wooden boxes to transport them to our lab for conducting the requested tests.

5- FIELD TESTS:

Depending on the type of encountered material standard penetration test (SPT) and according to ASTM:D 1586 were conducted at different boreholes and different depths .Results of these tests are shown on table No.2

Table 2: Standard Penetration Test

Boreholes No.	Depth (m)	Test Type	Penetration (cm)		Number of Blows(N)		Material
BH1	1.0	SPT	15		6		Silty Clay
			15	**30cm**	7	**13**	
			15		6		
	2.0	SPT	15		6		
			15	**30cm**	6	**14**	
			15		8		
	3.0	SPT	15		8		
			15	**30cm**	9	**19**	
			15		10		
	4.0	SPT	15		8		
			15	**30cm**	8	**16**	
			15		8		

Boreholes No.	Depth (m)	Test Type	Penetration (cm)			Number of Blows(N)			Material
BH1	5.0	SPT	15			10			Silty Clay
			15	**30cm**		9	**19**		
			15			10			
	6.0	SPT	15			9			
			15	**30cm**		12	**22**		
			15			10			
	7.0	SPT	15			8			
			15	**30cm**		7	**15**		
			15			8			
	8.0	SPT	15			10			
			15	**30cm**		11	23		
			15			12			
	9.0	SPT	15			9			
			15	**30cm**		10	**21**		
			15			11			
BH2	1.0	SPT	15			6			Silty Clay
			15	**30cm**		7	**15**		
			15			8			
	2.0	SPT	15			8			
			15	**30cm**		10	**20**		
			15			10			
	3.0	SPT	15			9			
			15	**30cm**		11	21		
			15			10			

6-LABORATORY TESTS

Depending on the type of the encountered materials during digged test pits , following lab tests were conducted on the representative samples: (see table 3)

Table 3: Summary of Lab Tests Carried on Obtained Samples

Test No.	Test Type		Method of Testing
1.	Moisture Content Determination		ASTM: C566-97
2.	Seive Analysis of Aggregates		ASTM:C 136-93
3.	Dry and Bulk Densities		ASTM: D854
4.	Atterberg Limits		ASTM:D4318-10
5.	Determination of Specific Gravity		ASTM: C127 & C128
6.	Chemical Tests	Sulfate Content	BS: 1377-75
		Chloride Content	
7.	Unconfined compressive strength of Rock Cores		ASTM: D2938-86

The lab test Results attached in Appendix II.

Summary of the lab test Results shown in the following table , (table no.4)

Table(4) : Summary of Lab Test Results

Test Pit No.	Material	Depth (m)	M.C	Bulk & Dry Density		Atterberg Limits			Seive analysis					Specific Gravity	ASHTOO CLASS.
				γ_b	γ_d	LL	PL	PI	Cobbles	gravels	Sand	Silt	Clay		
T.P.1	Artificial fill material	**0.0-0.3**	--	--	--	--	--	--	--	--	--	--	--	--	--
	fill material	**0.3-1.0**	--	--	--	--	--	--	--	--	--	--	--	--	--
	Silty clay	1.0-1.5	6.3	1.72	1.62	47	23	24	0	5	12	28	55	2.16	A7
T.P.2	fill material	0.0-0.7	--	--	--	--	--	--	--	--	--	--	--	--	--
	limestone	0.7-0.9	2.1	2.32	2.27	--	--	--	--	--	--	--	--	2.57	--
T.P.3	Silty clay	0.0-0.2	5.8	1.76	1.66	39	20	19	0	9	15	24	52	2.17	A6
	Sand	0.2-1.5	2.3	1.87	1.83	Non PI			0	0	90	5	5	2.13	A3
T.P.4	Silty clay	0.0-0.8	7.3	1.80	1.68	43	23	20	0	12	14	23	51	2.18	A7
	limestone	0.8-1.0	1.1	2.27	2.25	--	--	--	--	--	--	--	--	2.33	--
T.P.5	Silty clay	0.0-0.3	5.4	1.72	1.63	39	21	17	0	10	17	25	48	2.15	A6
	Marly Limestone	0.3-0.4	1.7	2.33	2.29	--	--	--	--	--	--	--	--	2.54	--
T.P.6	Sandy Clayey Silt	0.0-0.7	3.8	1.68	1.62	30	18	12	4	6	16	43	31	2.26	A6
	Sand	0.7-1.5	2.5	1.64	1.6	Non PI			0	5	86	3	6	2.2	A3
T.P.7	Silty clay	0.0-0.7	6.3	1.74	1.64	35	16	19	0	16	8	20	56	2.19	A6
	limestone	0.7-1.5	1.2	2.34	2.31	--	--	--	--	--	--	--	--	2.51	--
T.P.8	fill material	0.0-0.3	--	--	--	--	--	--	--	--	--	--	--	--	--
	Silty clay	0.3-1.5	5.0	1.73	1.65	39	18	21	0	8	14	28	50	2.23	A6
T.P.9	fill material	0.0-0.6	--	--	--	--	--	--	--	--	--	--	--	--	--
	fill material	0.6-1.30	--	--	--	--	--	--	--	--	--	--	--	--	--
	Silty clay	1.3-1.5	4.8	1.77	1.69	41	18	23	0	5	10	25	60	2.21	A7
T.P.10	fill material	0.0-0.3	--	--	--	--	--	--	--	--	--	--	--	--	--
	Silty clay	0.3-0.7	5.4	1.75	1.66	44	18	26	0	6	9	21	64	2.11	A7
	Marly Limestone	0.7-1.5	**1.5**	2.34	**2.3**	--	--	--	--	--	--	--	--		--

Test Pit No.	Material	Depth (m)	M.C	Bulk & Dry Density		Atterberg Limits			Seive analysis					Specific Gravity	ASHTOO CLASS.
				γ_b	γ_d	LL	PL	PI	Cobbles	gravels	Sand	Silt	Clay		
T.P.11	fill material	0.0-0.3	--	--	--	--	--	--	--	--	--	--	--	--	--
	Silty clay	0.3-1.1	4.8	1.76	1.68	47	22	25	0	4	13	25	58	2.13	A7
	Clayey Marl	1.1-1.5	4.1	1.95	1.87	--	--	--	--	--	--	--	--	2.35	--
T.P.12	fill material	0.0-0.2	--	--	--	--	--	--	--	--	--	--	--	--	--
	Silty clay	0.2-0.5	4.7	1.77	1.69	43	23	20	0	16	11	22	51	2.11	A7
	Chalky Limestone	0.5-0.7	**2.2**	1.97	**1.9**	--	--	--	--	--	--	--	--	--	--
T.P.13	fill material	0.0-0.15	--	--	--	--	--	--	--	--	--	--	--	--	--
	Silty clay	0.15-0.5	6.5	1.76	1.65	33	18	15	0	14	9	28	49	2.17	A6
	fill material	0.5-1.5	--	--	--	--	--	--	--	--	--	--	--	--	--
T.P.14	fill material	0.0-1.5	--	--	--	--	--	--	--	--	--	--	--	--	--
T.P.15	fill material	0.0-0.5	--	--	--	--	--	--	--	--	--	--	--	--	--
	fill material	0.5-0.9	--	--	--	--	--	--	--	--	--	--	--	--	--
	fill material	0.9-1.3	--	--	--	--	--	--	--	--	--	--	--	--	--
	Silty clay	1.3-1.5	4.7	1.75	1.67	40	21	19	0	9	11	23	57	2.14	A6
BH1	Silty clay	0.0-1.0	3.4	1.71	1.65	38.0	18.0	20.0	0.0	7.0	13.0	27.0	53.0	2.16	A6

7- SIESMIC ACTIVITY

As far as seismic activities are concerned the investigated site lies within zone"2B"as noticed in the Jordanian Seismic Activities map.(see figure1).The following seismic parameters can be used in designing the proposed project:

Table 5 : Seismic Factors for the Proposed Site

Seismic Zone	2B	
Seismic Zone Factor (Z)	0.20	
Seismic Soil Type	Silty Clay	Marl Interbedded with Marly Limestone
Seismic Soil Section Name	S_D	Sc
Seismic Factor Related to Acceleration (Ca)	0.28	0.24
Seismic Factor Related to speed (Cv)	0.40	0.32

If the external walls of the proposed building are bearing walls the effect of the earthquake is practically nil taking into account all considerations mentioned in the JORDANIAN BUILDING CODE table (2-6).

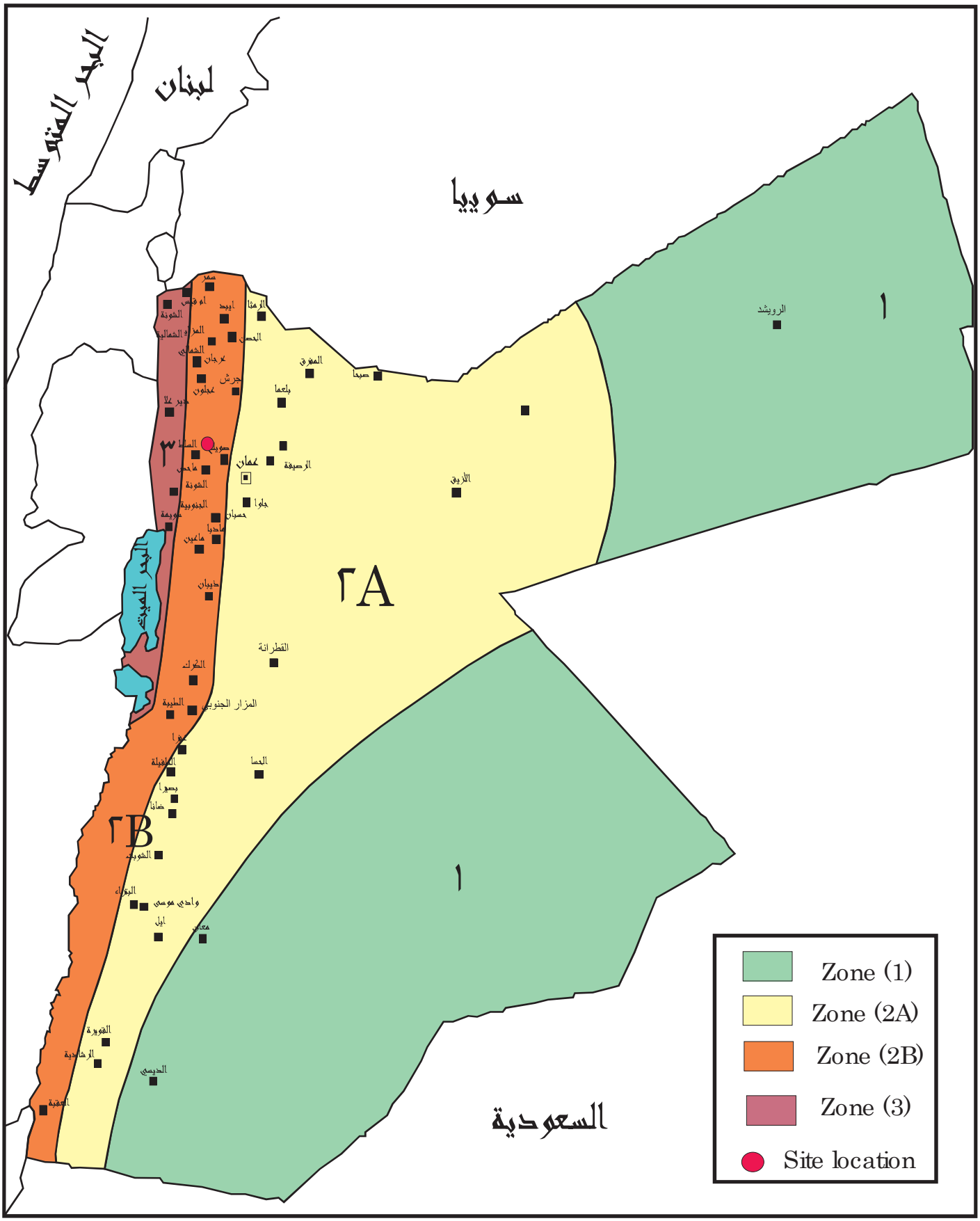
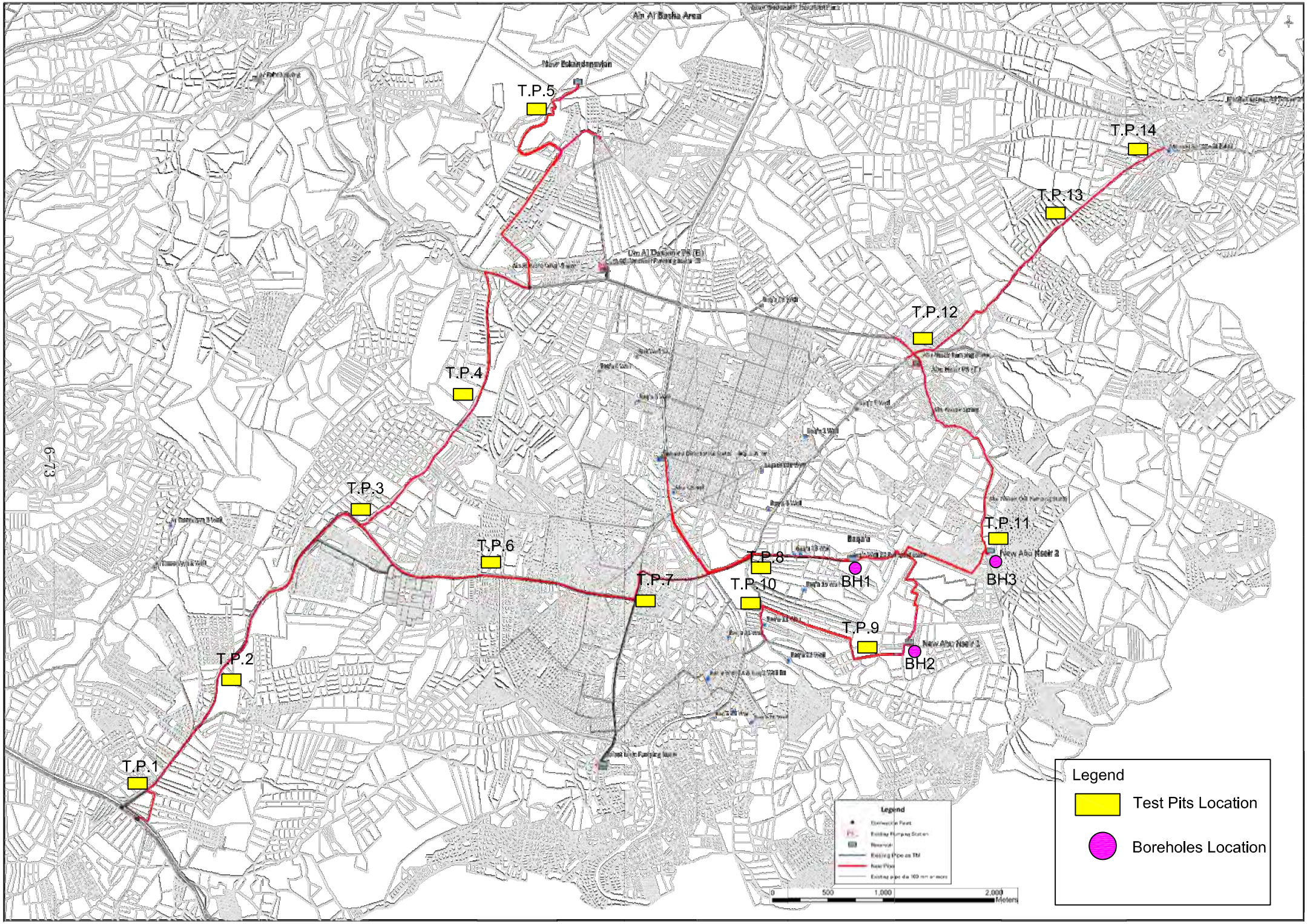


Figure No. (1) : Jordan Seismic Map


T.P.1
T.P.2
T.P.3
T.P.4
T.P.5
T.P.6
T.P.7
T.P.8
T.P.9
T.P.10
T.P.11
T.P.12
T.P.13
T.P.14
BH1
BH2
BH3
Legend
Test Pits Location
Boreholes Location
0
500
1,000
2,000
Meters

Report No.: 90/S/06/2013

Date: 18/06/2013

Geotechnical Investigation for the Proposed Site at Safoot District

IMPROVEMENT AND EXPANSION OF THE WATER DISTIBUTION NETWORK IN BALQA / SAFOOT DISTRICT

Submitted to

JICA STUDY TEAM / TEC INTERNATIONAL CO., LTD.(TECI)

Amman – Jordan

1- INTRODUCTION

The following report summarizes the results of the in situ investigation and lab tests conducted at the request of our client for his projected site for the purpose of determining the geotechnical parameters and soil conditions needed for guiding the designer of a safe and economic design.

The investigation consisted of the following sequence stage:

- Obtaining and studying the available maps and information concerning the site and the proposed project.
- Reconnaissance stage which include site visit, survey the geotechnical & geological features (rock out crops existing , present facilities used in the site).
- Bore holes drilling as fixed by our client .
- Making test pits that fixed by our client .
- Collecting undisturbed and disturbed samples from different bore holes and at different depths.
- Conducting the required tests on representative samples
- Analyses and evaluation of field & lab tests results

Conclusions & recommendations for the design

2- PROJECT CHARACTERISTICS AND DESCRIPTION

The Project is Improvement and expansion of the water distribution network in Balqa /Safoot District .As a general the project is composed of water pipe lines and water tanks.

3- GEOLOGY OF THE SITE

3-1- Lithology

As we have mentioned before boreholes and test pits were executed in the site at the locations fixed on the attached site plan .lithology and detailed lithological description of the obtained samples were shown on the attached boreholes s and test pits log sheets , within appendix no.1 .

We wish to emphasize that the results obtained from the boreholes are only representing the boreholes . These results are only representing the lithology at the depths indicated on the attached log sheets.

3-2Ground Water and Cavities

Neither ground water nor cavities were encountered under the drilled bore holes and test pits .

4- FIELD EXPLORATION

4-1 Drilling Boreholes :

One borehole was drilled at the site, at the location shown on the site map enclosed within appendix .It was numbered as BH1. The depth of the drilling was fixed on the attached log sheets within appendix no.1 and as follows in table 1.

Table 1: Boreholes Depths and Elevations

Borehole No.	Borehole Depth (m)
BH1	15

*Number, location and depths of the drilled borehole was fixed by our client and consultant.

The drilling were carried out with Atlas Copco Rotary drilling rig. The advance of the drilling operation was carried out through rotary air flush drilling method.

4-2Making Test Pits:

Three test pits were drilled at the site, at the locations shown on the site map enclosed within appendix .They were numbered as TP1 thru TP3 inclusive. The depths for each test pit are fixed in the following table (no.2) and the lithology of the digged test pits were fixed on the attached log sheets within appendix no.1

Test Pit No.	Test Pits Depth (m)
TP1	1.5
TP2	0.5
TP3	1.5

*Number, location and depths of the digged Test Pits were fixed by our client and consultant.

4-3 Sampling

Depending on type of material encountered during drilling operation undisturbed & disturbed samples were obtained .

All obtained samples are visual inspected and classified in the site by our geologist and then they were marked , placed in proper way in water –proof plastic bags and placed in wooden boxes to transport them to our lab for conducting the requested tests.

5- FIELD TESTS:

Depending on the type of encountered material standard penetration test (SPT) and according to ASTM:D 1586 were conducted at different boreholes and different depths .Results of these tests are shown on table No.3

Table 3: Standard Penetration Test

Boreholes No.	Depth (m)	Test Type	Penetration (cm)	Number of Blows(N)	Material
BH1	1.0	SPT	15	6	Silty Clay
			15 / 15 **30cm**	6 / 8 **14**	
	2.0	SPT	15	5	
			15 / 15 **30cm**	7 / 9 16	
	3.0	SPT	15	7	
			15 / 15 **30cm**	8 / 7 **15**	

- **For the rock strata "Marly Limestone " The estimated SPT "N " Value will be 100 .**

6-LABORATORY TESTS

Depending on the type of the encountered materials during digged test pits , following lab tests were conducted on the representative samples: (see table 4)

Table 4: Summary of Lab Tests Carried on Obtained Samples

Test No.	Test Type	Method of Testing
1.	Moisture Content Determination	ASTM: C566-97
2.	Seive Analysis of Aggregates	ASTM:C 136-93
3.	Dry and Bulk Densities	ASTM: D854
4.	Atterberg Limits	ASTM:D4318-10
5.	Determination of Specific Gravity	ASTM: C127 & C128
6.	Unconfined compressive strength of Rock Cores	ASTM: D2938-86

The lab test Results attached in Appendix II.

Summary of the lab test Results shown in the following table , (table no.5)

7- SIESMIC ACTIVITY

As far as seismic activities are concerned the investigated site lies within zone"2B"as noticed in the Jordanian Seismic Activities map.(see figure1).The following seismic parameters can be used in designing the proposed project:

Table 5 : Seismic Factors for the Proposed Site

Seismic Zone	2B
Seismic Zone Factor (Z)	0.20
Seismic Soil Type	Marly Limestone
Seismic Soil Section Name	S_B
Seismic Factor Related to Acceleration (Ca)	0.20
Seismic Factor Related to speed (Cv)	0.20

Report No.: 70/S/05/2013

Date: 02/06/2013

Geotechnical Investigation for the Proposed Site at Deir Alla District

IMPROVEMENT AND EXPANSION OF THE WATER DISTIBUTION NETWORK IN BALQA / DEIR ALLA DISTRICT

Submitted to

JICA STUDY TEAM / TEC INTERNATIONAL CO., LTD.(TECI)

Amman – Jordan

1- INTRODUCTION

The following report summarizes the results of the in situ investigation and lab tests conducted at the request of our client for his projected site for the purpose of determining the geotechnical parameters and soil conditions needed for guiding the designer of a safe and economic design.

The investigation consisted of the following sequence stage:

- Obtaining and studying the available maps and information concerning the site and the proposed project.
- Reconnaissance stage which include site visit, survey the geotechnical & geological features (rock out crops existing , present facilities used in the site).
- Bore holes drilling as fixed by our client .
- Making test pits that fixed by our client .
- Collecting undisturbed and disturbed samples from different bore holes and at different depths.
- Conducting the required tests on representative samples
- Analyses and evaluation of field & lab tests results
- Conclusions & recommendations for the design .

2- PROJECT CHARACTERISTICS AND DESCRIPTION

The Project is Improvement and expansion of the water distribution network in Balqa /Deir Alla District .As a general the project is composed of water pipe lines and water tanks.

3- GEOLOGY OF THE SITE

3-1- Lithology

As we have mentioned before boreholes and test pits were executed in the site at the locations fixed on the attached site plan .lithology and detailed lithological description of the obtained samples were shown on the attached boreholes s and test pits log sheets , within appendix no.1 .

We wish to emphasize that the results obtained from the boreholes are only representing the boreholes . These results are only representing the lithology at the depths indicated on the attached log sheets.

3-2Ground Water and Cavities

Neither ground water nor cavities were encountered under the drilled bore holes and test pits .

4- FIELD EXPLORATION

4-1 Drilling Boreholes :

Two boreholes were drilled at the site, at the locations shown on the site map enclosed within appendix .They were numbered as BH1 thru BH2 inclusive. The depths and elevations of the drilling were fixed on the attached log sheets within appendix no.1 and as follows in table 1.

Table 1: Boreholes Depths and Elevations

Borehole No.	Borehole Depth (m)
BH1	15
BH2	15

*Number, location and depths of the drilled boreholes were fixed by our client and consultant.

The drilling were carried out with Atlas Copco Rotary drilling rig. The advance of the drilling operation was carried out through rotary air flush drilling method.

4-2Making Test Pits:

Ten test pits were drilled at the site, at the locations shown on the site map enclosed within appendix .They were numbered as TP1 thru TP10 inclusive. The depths for each test pit is 1.5m and the lithology of the digged test pits were fixed on the attached log sheets within appendix no.1

*Number, location and depths of the digged Test Pits were fixed by our client and consultant.

4-3 Sampling

Depending on type of material encountered during drilling operation undisturbed & disturbed samples were obtained .

All obtained samples are visual inspected and classified in the site by our geologist and then they were marked , placed in proper way in water –proof plastic bags and placed in wooden boxes to transport them to our lab for conducting the requested tests.

5- FIELD TESTS:

Depending on the type of encountered material standard penetration test (SPT) and according to ASTM:D 1586 were conducted at different boreholes and different depths .Results of these tests are shown on table No.2

Table 2: Standard Penetration Test

Boreholes No.	Depth (m)	Test Type	Penetration (cm)		Number of Blows(N)		Material
BH1	0.5	SPT	15		7		Clayey Silt
			15	**30cm**	7	**15**	
			15		8		
BH2	1.0	SPT	15		13		Clayey Sandy Silt
			15	**30cm**	15	**34**	
			15		19		
	2.0	CPT	15		12		Alluvial Material
			15	**30cm**	13	**29**	
			15		16		

Boreholes No.	Depth (m)	Test Type	Penetration (cm)			Number of Blows(N)			Material
BH2	3.0	CPT	15			14			Alluvial Material
			15	15	**30cm**	14	17	**31**	
			15						
	4.0	CPT	15			13			
			15	15	**30cm**	14	15	**29**	
			15						
	5.0	CPT	15			15			
			15	15	15	15	16	**31**	
			15						
	6.0	CPT	15			12			
			15	15	**30cm**	11	14	**25**	
			15						
	7.0	CPT	15			12			
			15	15	**30cm**	12	12	**24**	
			15						
	8.0	CPT	7cm			50 blows			
			15	15	**30cm**				
			15						
	9.0	CPT	15			13			
			15	15	**30cm**	15	17	**32**	
			15						

Boreholes No.	Depth (m)	Test Type	Penetration (cm)		Number of Blows(N)		Material
BH2	10	CPT	15		13		Alluvial Material
			15	**30cm**	14	**29**	
			15		15		
	11	CPT	15		12		
			15	**30cm**	14	**28**	
			15		14		
	12	CPT	10cm		50 blows		
			15	**30cm**			
			15				
	13	CPT	15		12		
			15	**30cm**	13	**29**	
			15		16		
	14	CPT	15		17		
			15	**30cm**	18	**36**	
			15		18		

6-LABORATORY TESTS

Depending on the type of the encountered materials during digged test pits , following lab tests were conducted on the representative samples: (see table 3)

Table 3: Summary of Lab Tests Carried on Obtained Samples

Test No.	Test Type		Method of Testing
1.	Moisture Content Determination		ASTM: C566-97
2.	Seive Analysis of Aggregates		ASTM:C 136-93
3.	Dry and Bulk Densities		ASTM: D854
4.	Atterberg Limits		ASTM:D4318-10
5.	Determination of Specific Gravity		ASTM: C127 & C128
6.	Chemical Tests	Sulfate Content	BS: 1377-75
		Chloride Content	
7.	Unconfined compressive strength of Rock Cores		ASTM: D2938-86

The lab test Results attached in Appendix II.

Summary of the lab test Results shown in the following table , (table no.4)

Table(4) : Summary of Lab Test Results

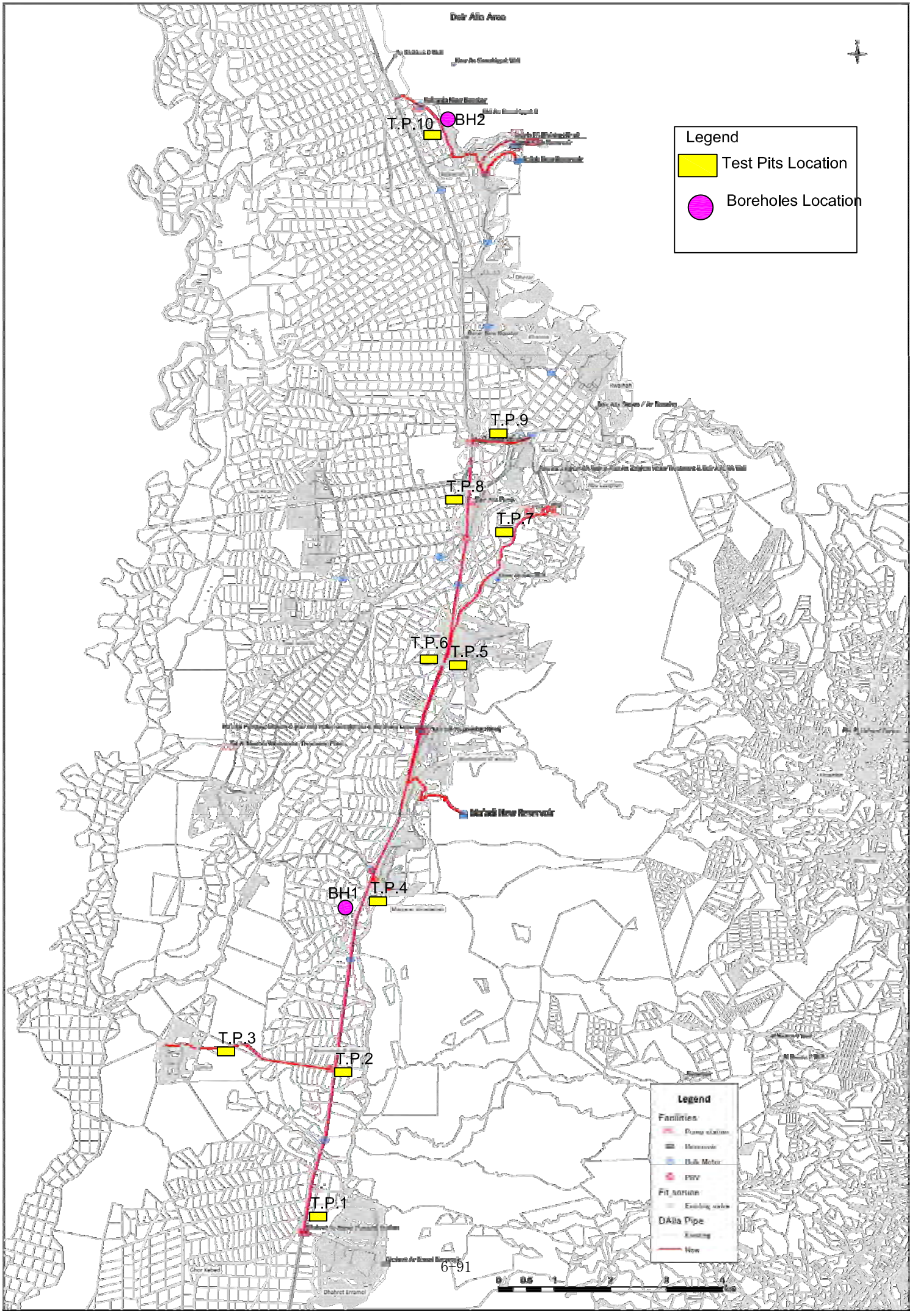
Test Pit No.	Material	Depth (m)	M.C	Bulk & Dry Density		Atterberg Limits			Seive analysis					Specific Gravity	ASHTOO Class.
				γ_b	γ_d	LL	PL	PI	Cobbles	gravels	Sand	Silt	Clay		
T.P.1	Clayey Sandy silt	0.0-1.5	5.8	1.81	1.71	29	18	11	0	3	23	65	9	2.34	A6
T.P.2	Wadi material	0.0-0.4	3.0	0.00		non PI			7	46	29	12	6	2.23	--
	Clayey Sandy silt	0.4-1.5	4.7	1.76	1.68	32	19	13	0	5	27	61	7	2.31	A6
T.P.3	Silty sand	0.0-1.5	5.2	1.83	1.74	19	16	3	0	7	45	37	11	2.27	A3
T.P.4	Asphaltic Pavement	0.0-0.05	Thichness of the layer is 5 cm												
	Silty Sandy Clay	0.05-0.50	6.2	1.79	1.69	39	21	18	0	25	15	29	31	2.29	A6
	Clayey Sandy silt	0.50-1.5	5.1	1.76	1.67	30	17	13	0	10	17	45	28	2.25	A6
T.P.5	Silty Clay	0.0-1.5	7.3	1.75	1.63	45	21	24	0	2	7	28	63	2.21	A7
T.P.6	silty clay	0.0-0.5	7.0	1.79	1.67	48	23	25	0	5	12	31	52	2.23	A7
	marl to clayey marl	0.5-1.5	11.7	1.95	1.75	57	20	27	--	--	--	--	--	2.3	--
T.P.7	Fill Material (silty sandy clay)	0.0-0.8	--	--	--	--	--	--	--	--	--	--	--	--	--
	Fill Material (Marland limestone)	0.8-1.5	--	--	--	--	--	--	--	--	--	--	--	--	--
T.P.8	Silty Clay	0.0-1.5	8.4	1.81	1.67	46	25	21	0	3	9	26	62	2.17	A7
T.P.9	Silty Clay	0.0-1.5	9.0	1.84	1.691	42	23	19	0	4.5	6.5	34	54	2.2	A7
T.P.10	Silty Clay	0.0-1.5	8.6	1.85	1.7	44	20	24	4	10	7	37	42	2.23	A7

7- SIESMIC ACTIVITY

As far as seismic activities are concerned the investigated site lies within zone"3"as noticed in the Jordanian Seismic Activities map.(see figure1).The following seismic parameters can be used in designing the proposed project:

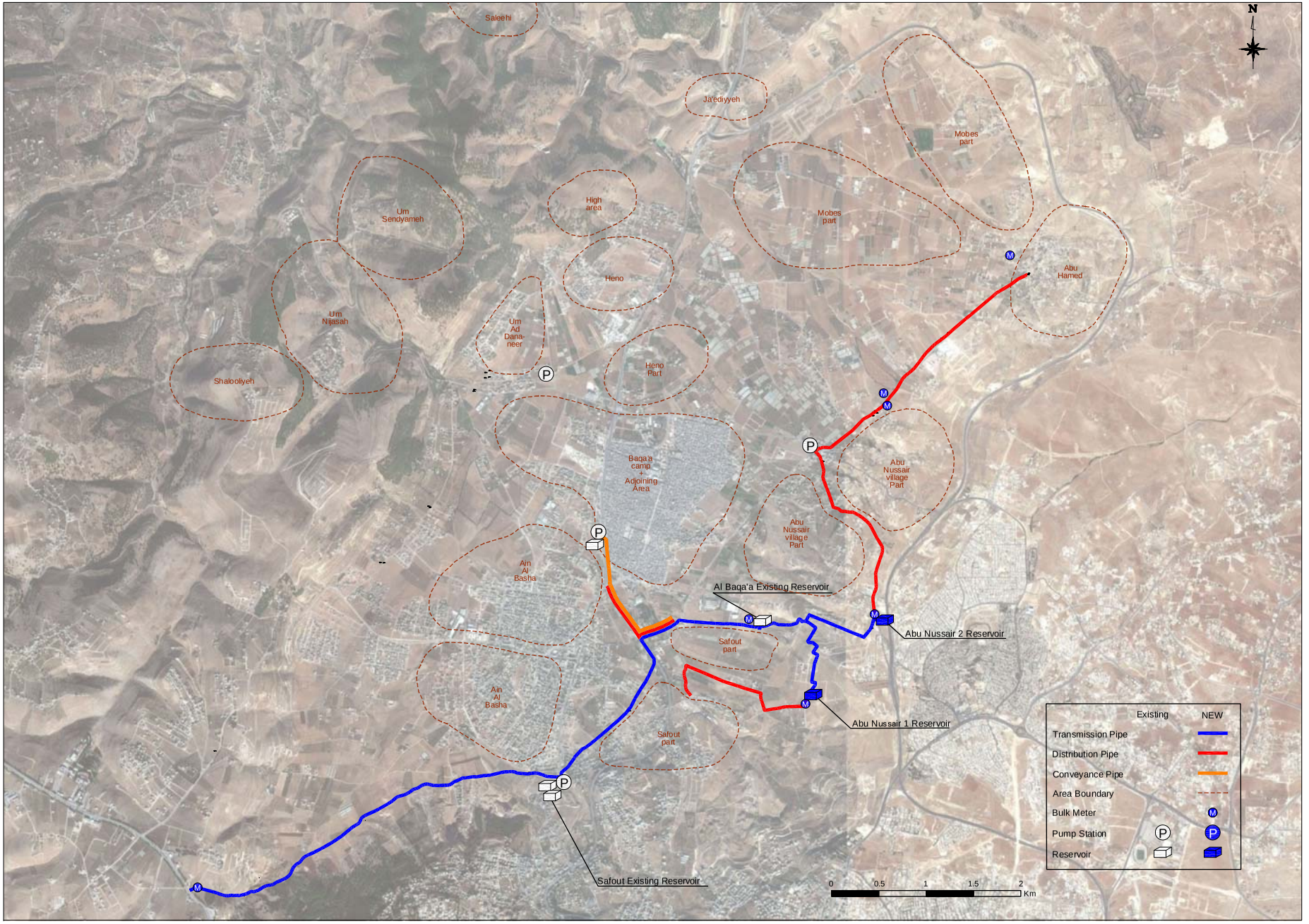
Table 4 : Seismic Factors for the Proposed Site

Seismic Zone	3	
Seismic Zone Factor (Z)	0.30	
Seismic Soil Type	Marly Limestone (as BH1)	Alluvial Material (as BH2)
Seismic Soil Section Name	S_B	S_C
Seismic Factor Related to Acceleration (Ca)	0.30	0.33
Seismic Factor Related to speed (Cv)	0.30	0.45

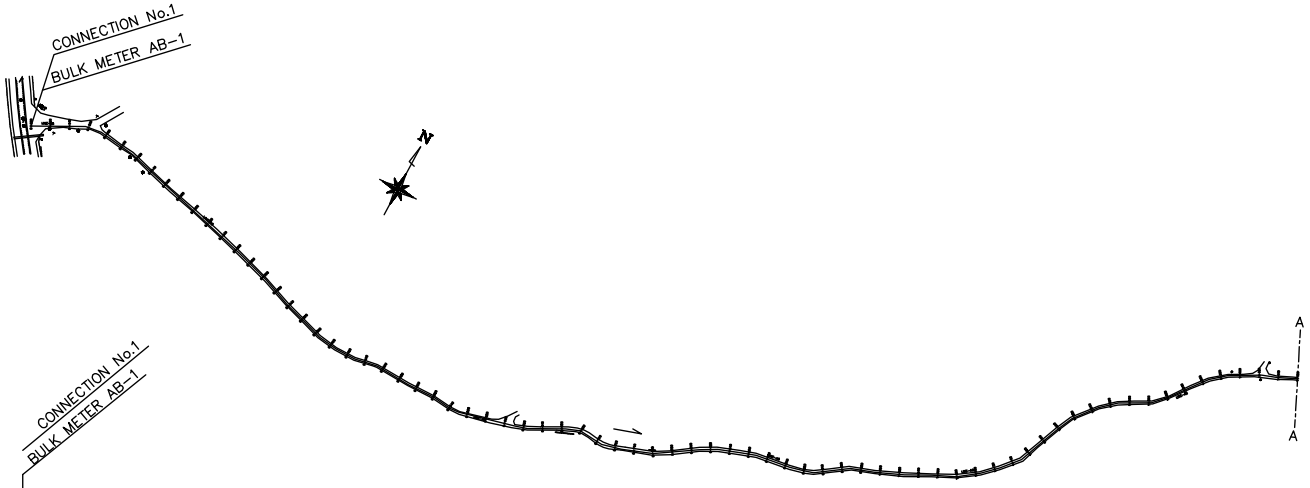

Deir Alla Area
Legend
Test Pits Location
Boreholes Location
T.P.10
BH2
T.P.9
T.P.8
T.P.7
T.P.6
T.P.5
Mahadi New Reservoir
BH1
T.P.4
T.P.3
T.P.2
T.P.1
Legend
Facilities
Pump station
Reservoir
Bulk Meter
PRV
Pit sanitary
Existing water
DAlla Pipe
Existing
New
6-91
0 0.5 1 2 3 4 Km

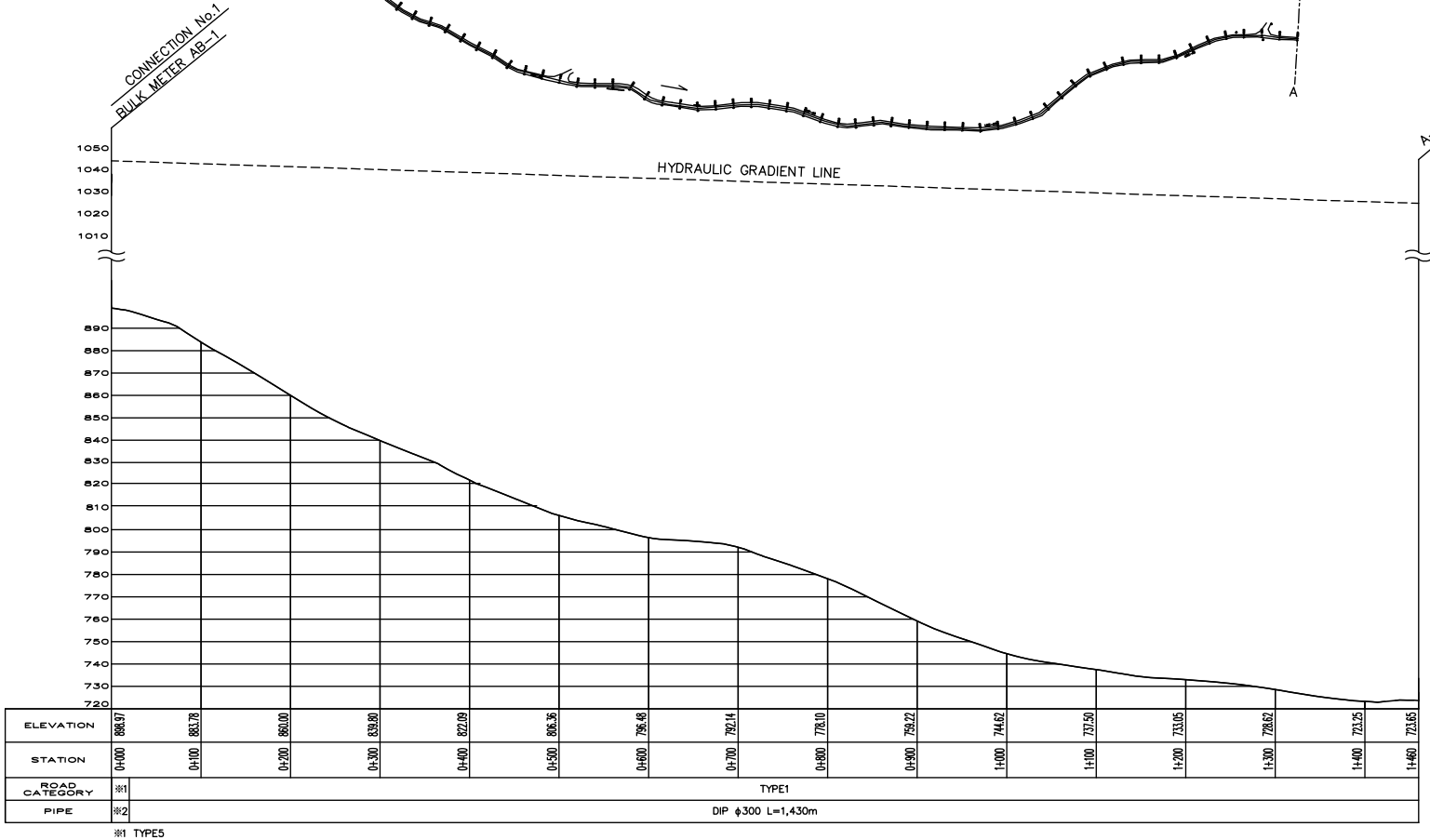
付　属　資　料

付属資料-1



AL-GN-01	GENERAL SITE PLAN (AIN AL BASHA)
	全体計画施設配置図（アインアルバシャ地区）

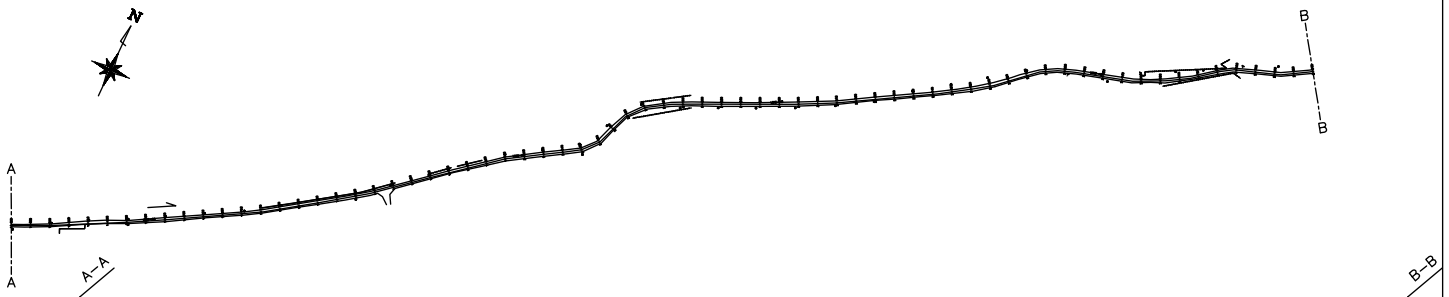


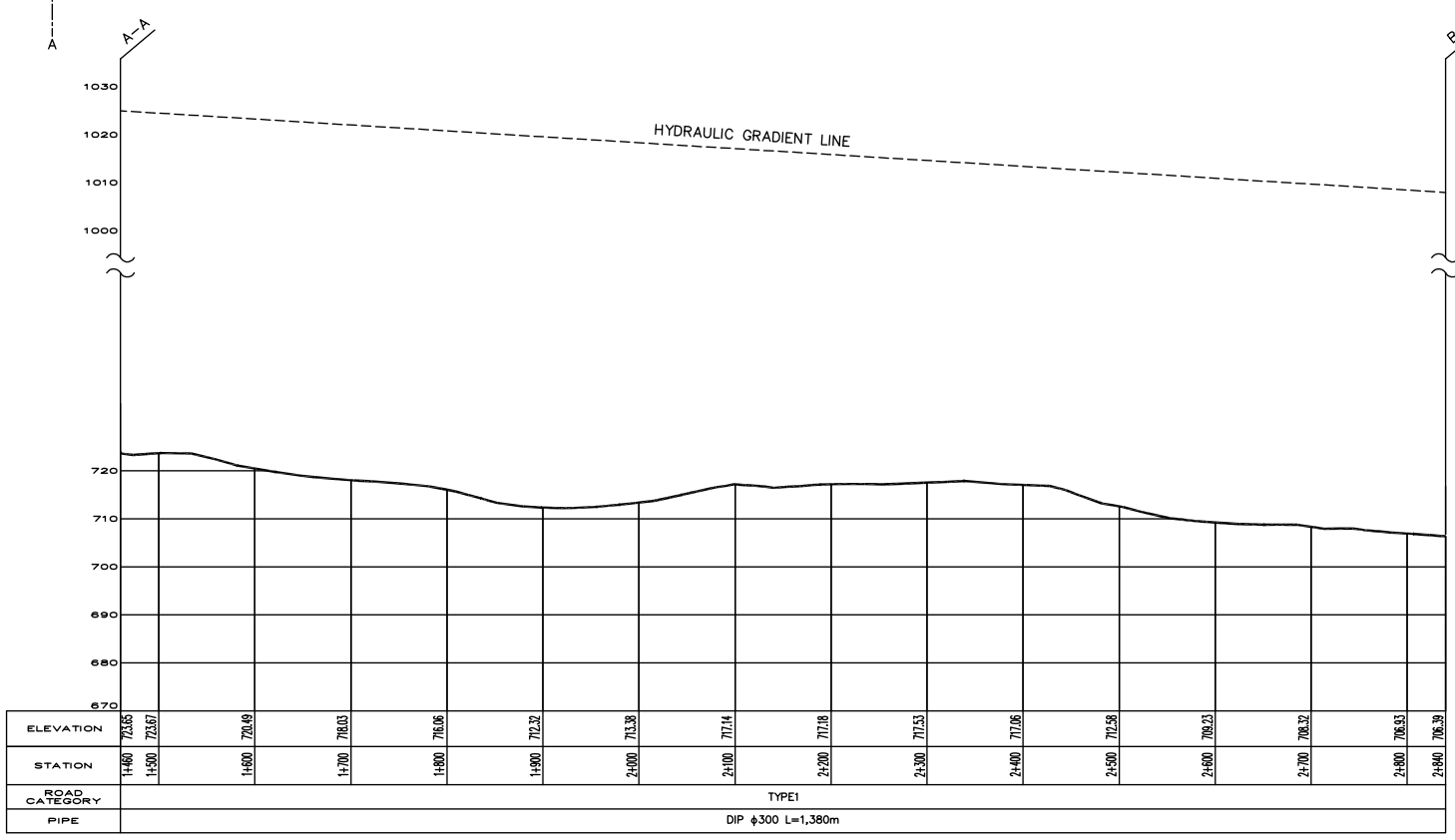


ELEVATION	888.97	883.78	860.00	839.80	822.09	806.36	796.48	792.14	778.10	759.22	744.62	737.50	733.05	728.62	723.25	723.65
STATION	0+000	0+100	0+200	0+300	0+400	0+500	0+600	0+700	0+800	0+900	1+000	1+100	1+200	1+300	1+400	1+460
ROAD CATEGORY	※1	TYPE1														
PIPE	※2	DIP ϕ300 L=1,430m														

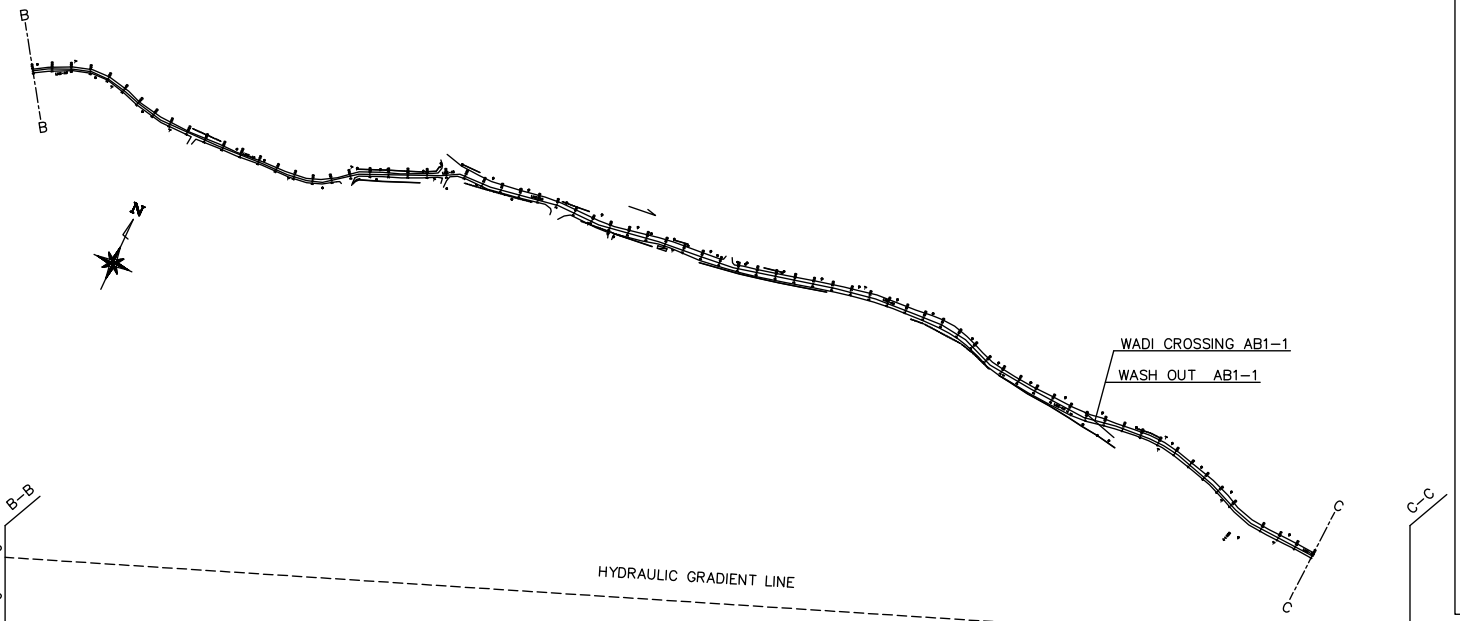
※1 TYPE5
※2 DIP ϕ300 L=30m

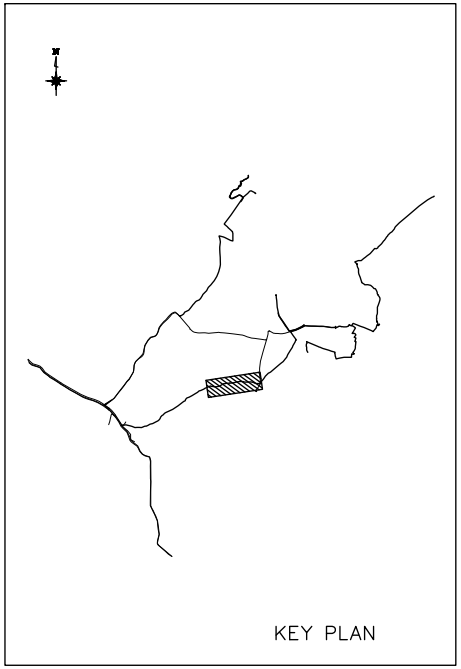
AL-TP-01	PLAN AND PROFILE OF TRANSMISSION LINE FROM CONNECTION No.1 TO AL-BAQA'A EXISTING RESERVOIR (1/5)
送水管 平面図・縦断図（送水管分岐点 No.1 ～アルバカ既存配水池）(1/5)	

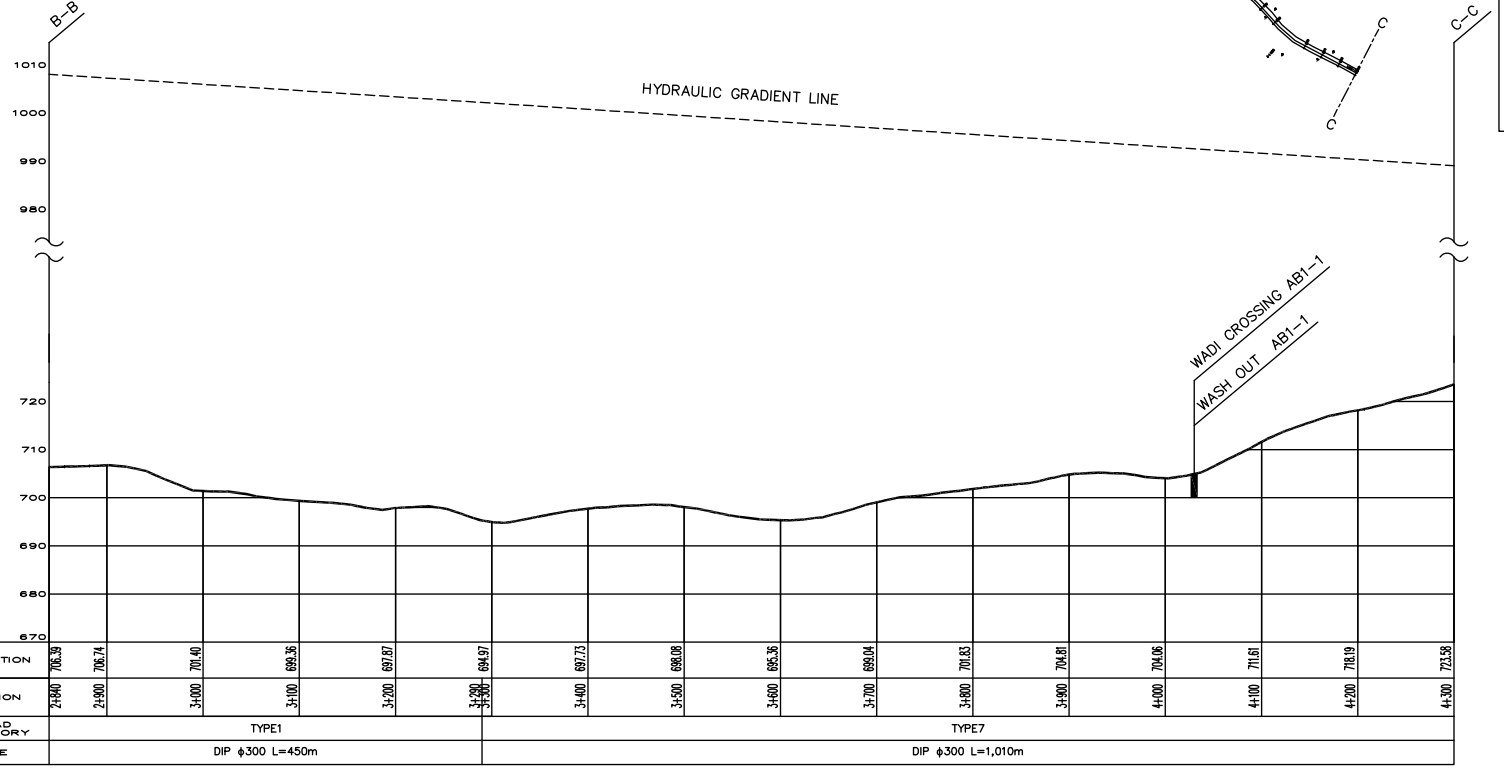




AL-TP-02	PLAN AND PROFILE OF TRANSMISSION LINE FROM CONNECTION No.1 TO AL-BAQA'A EXISTING RESERVOIR (2/5)
送水管　平面図・縦断図（送水管分岐点 No.1 ～アルバカ既存配水池）（2/5）	

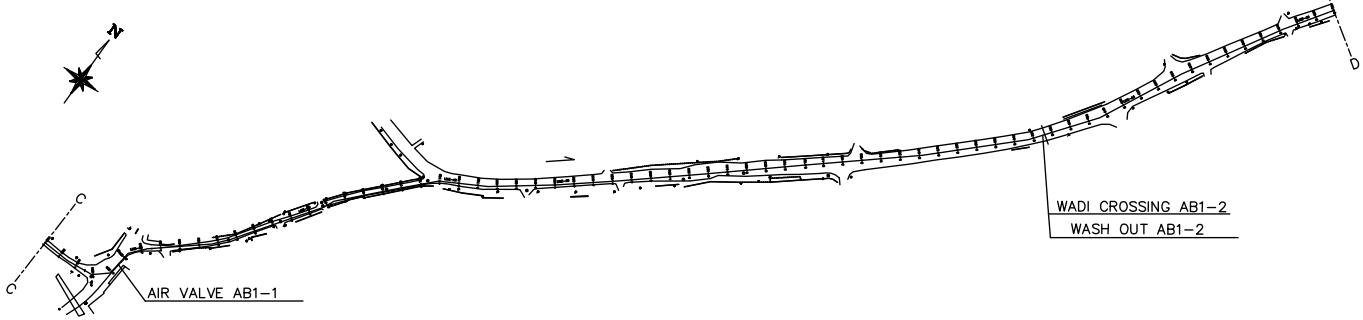


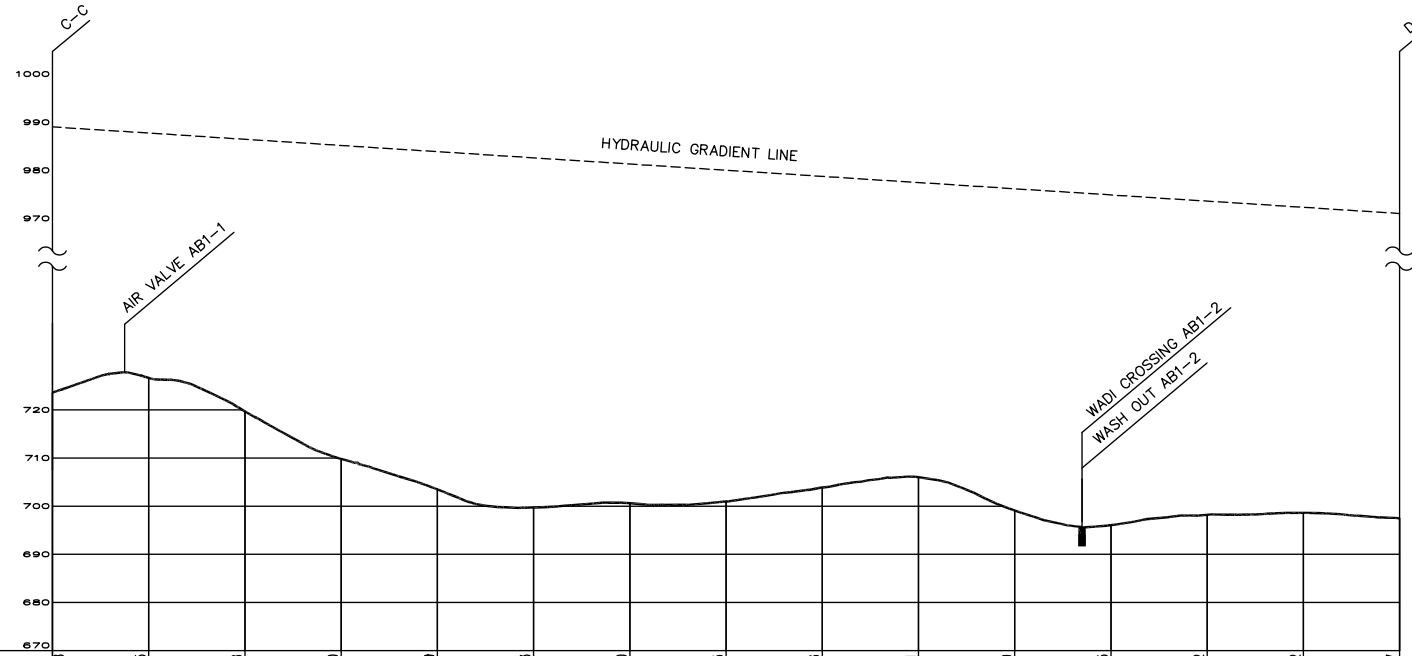




ELEVATION	706.39	706.74	701.40	699.36	697.87	694.97	697.73	698.08	695.36	699.04	701.83	704.81	704.06	711.61	718.19	723.58
STATION	2+840	2+900	3+000	3+100	3+200	3+280	3+400	3+500	3+600	3+700	3+800	3+900	4+000	4+100	4+200	4+300
ROAD CATEGORY	TYPE1						TYPE7									
PIPE	DIP ϕ300 L=450m						DIP ϕ300 L=1,010m									

AL-TP-03	PLAN AND PROFILE OF TRANSMISSION LINE FROM CONNECTION No.1 TO AL-BAQA'A EXISTING RESERVOIR (3/5)
送水管　平面図・縦断図（送水管分岐点 No.1 ～アルバカ既存配水池）（3/5）	

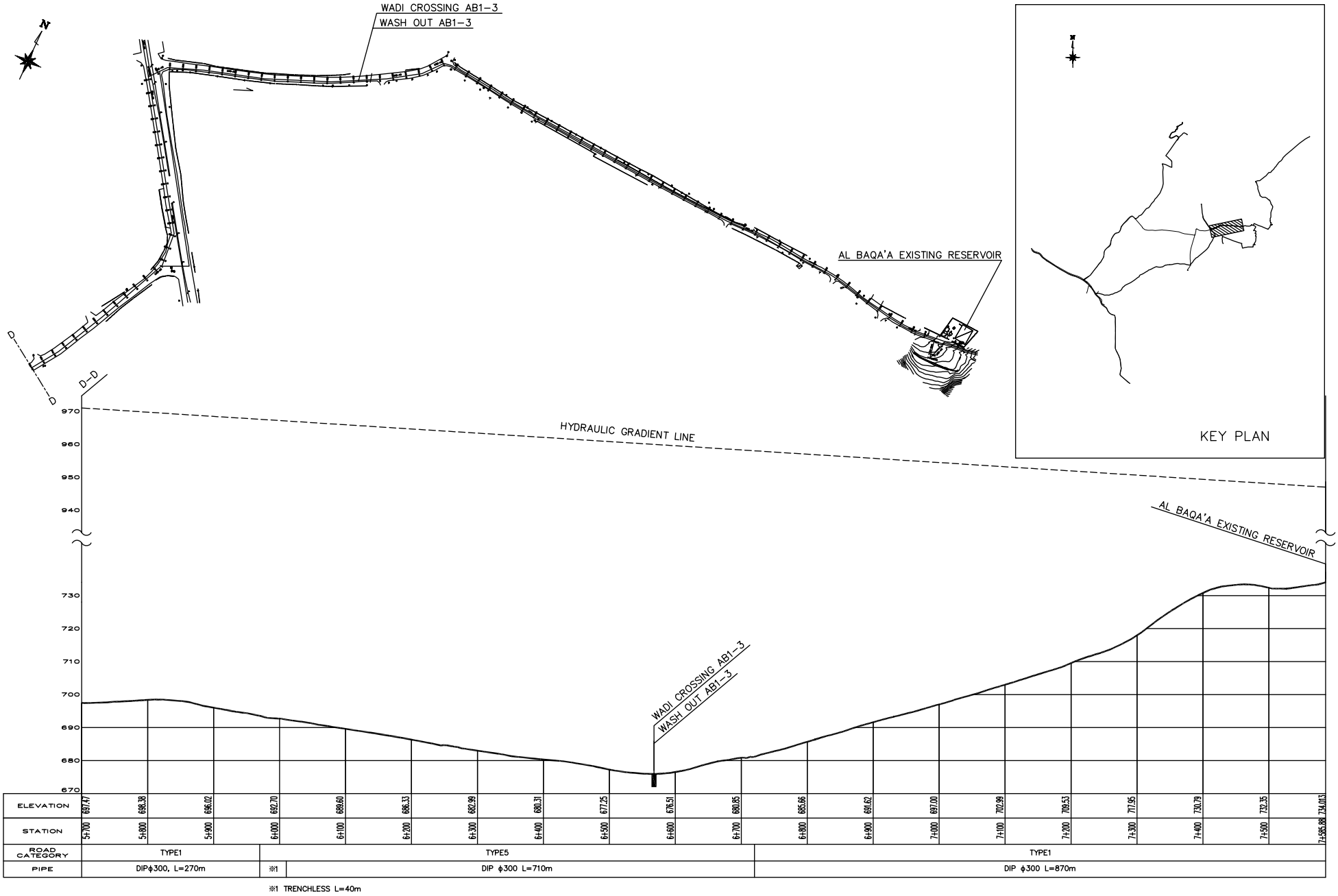




ELEVATION	723.38		726.65	719.88	709.80	703.49	699.73	700.60	700.95	703.86	706.01	699.09	696.05	698.22	698.62	697.47
STATION	4+300	4+340	4+380	4+400	4+500	4+600	4+700	4+800	4+900	5+000	5+100	5+200	5+300	5+400	5+500	5+600	5+700
ROAD CATEGORY	TYPE7				TYPE1												
PIPE	L=48m	※1	L=50m	DIP φ300 L=1,270m													

※1 TRENCHLESS L=32m

AL-TP-04	PLAN AND PROFILE OF TRANSMISSION LINE FROM CONNECTION No.1 TO AL-BAQA'A EXISTING RESERVOIR (4/5)
送水管　平面図・縦断図（送水管分岐点 No.1～アルバカ既存配水池）（4/5）	

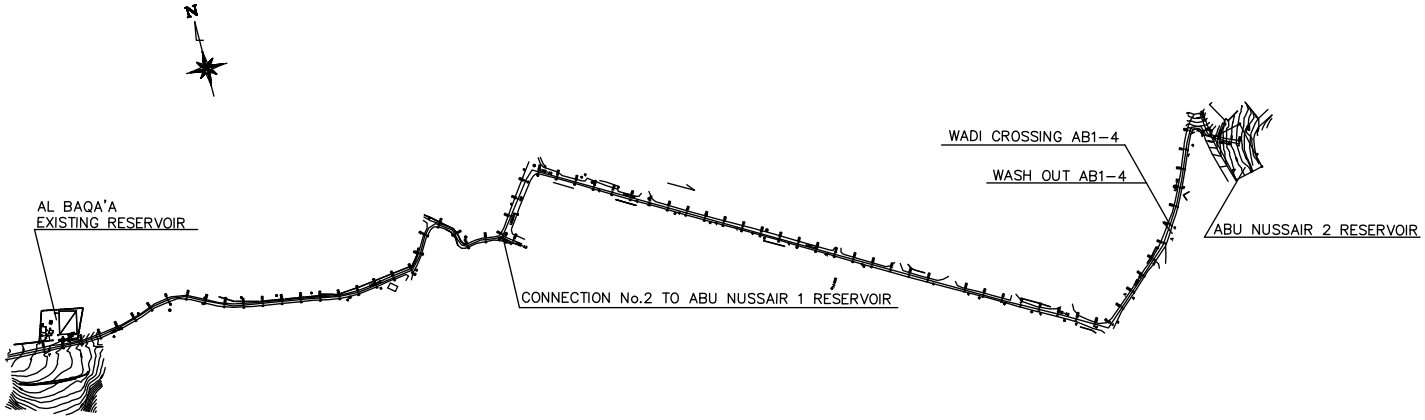


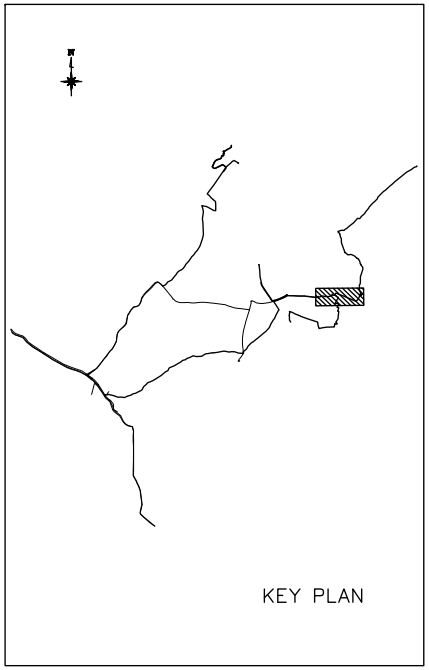
ELEVATION	697.47	698.38	696.02	692.70	689.60	686.33	682.99	680.31	677.25	676.51	680.85	685.66	691.62	697.00	702.99	709.53	717.95	730.79	732.35	734.013	
STATION	5+700	5+800	5+900	6+000	6+100	6+200	6+300	6+400	6+500	6+600	6+700	6+800	6+900	7+000	7+100	7+200	7+300	7+400	7+500	7+595.88	
ROAD CATEGORY	TYPE1			TYPE5												TYPE1					
PIPE	DIPφ300, L=270m			※1	DIP φ300 L=710m											DIP φ300 L=870m					

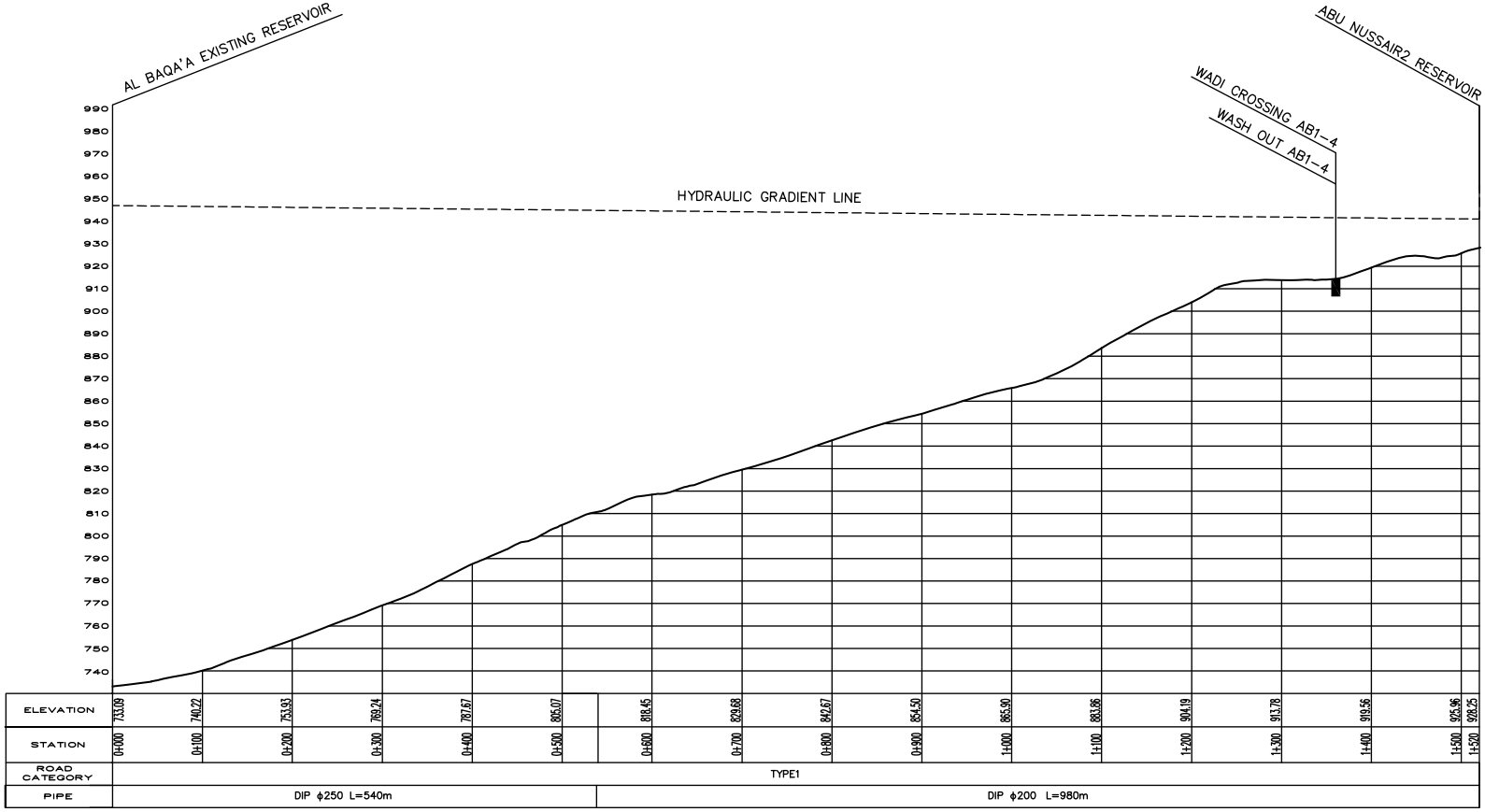
※1 TRENCHLESS L=40m

AL-TP-05	PLAN AND PROFILE OF TRANSMISSION LINE FROM CONNECTION No.1 TO AL-BAQA'A EXISTING RESERVOIR (5/5)

送水管　平面図・縦断図（送水管分岐点 No.1 ～アルバカ既存配水池）（5/5）

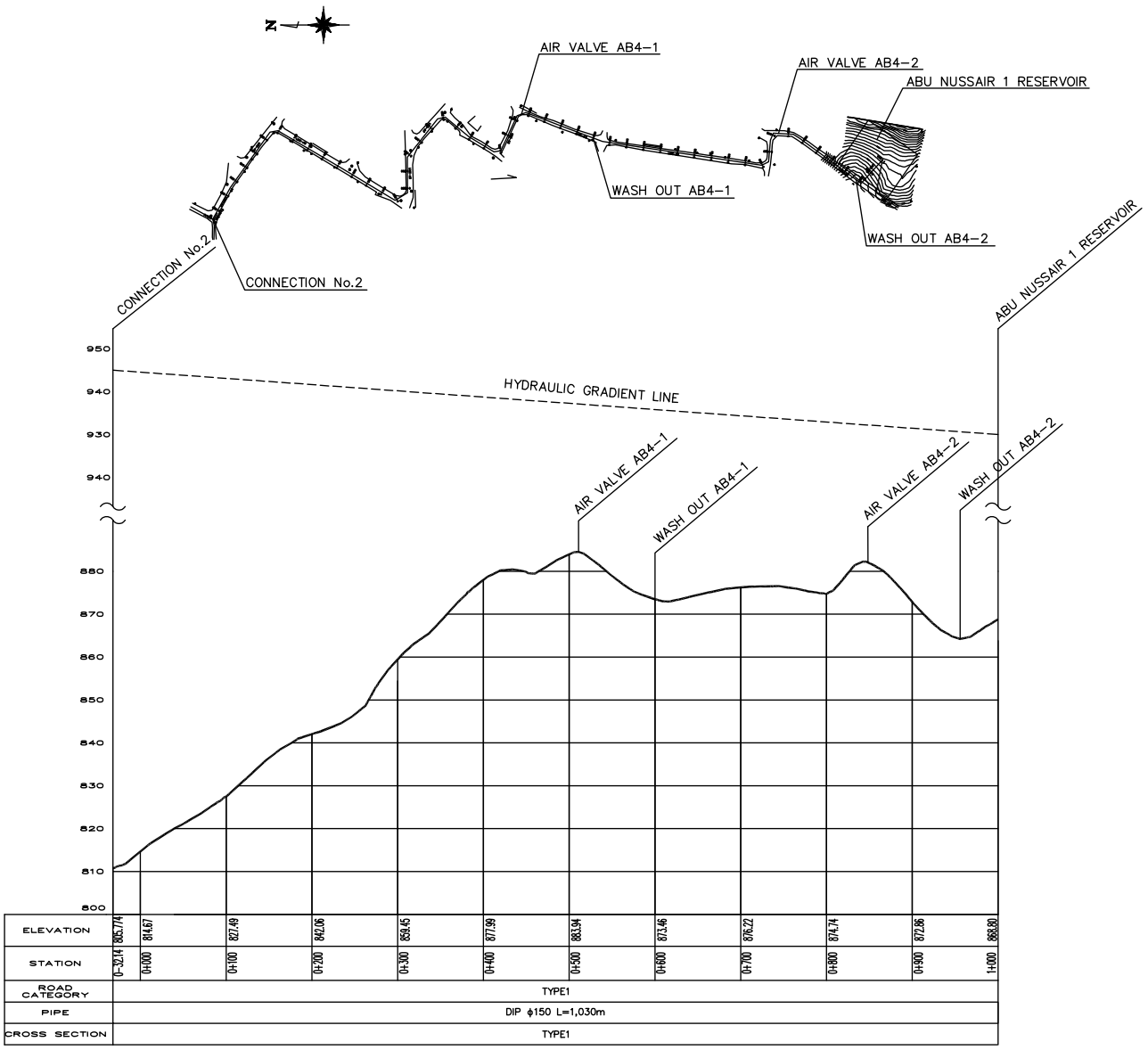


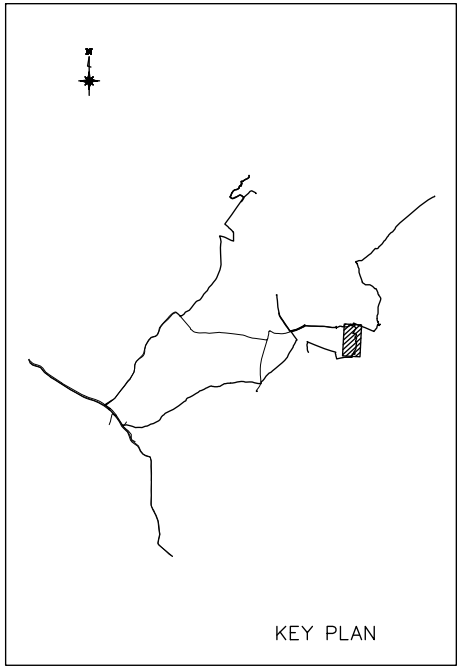




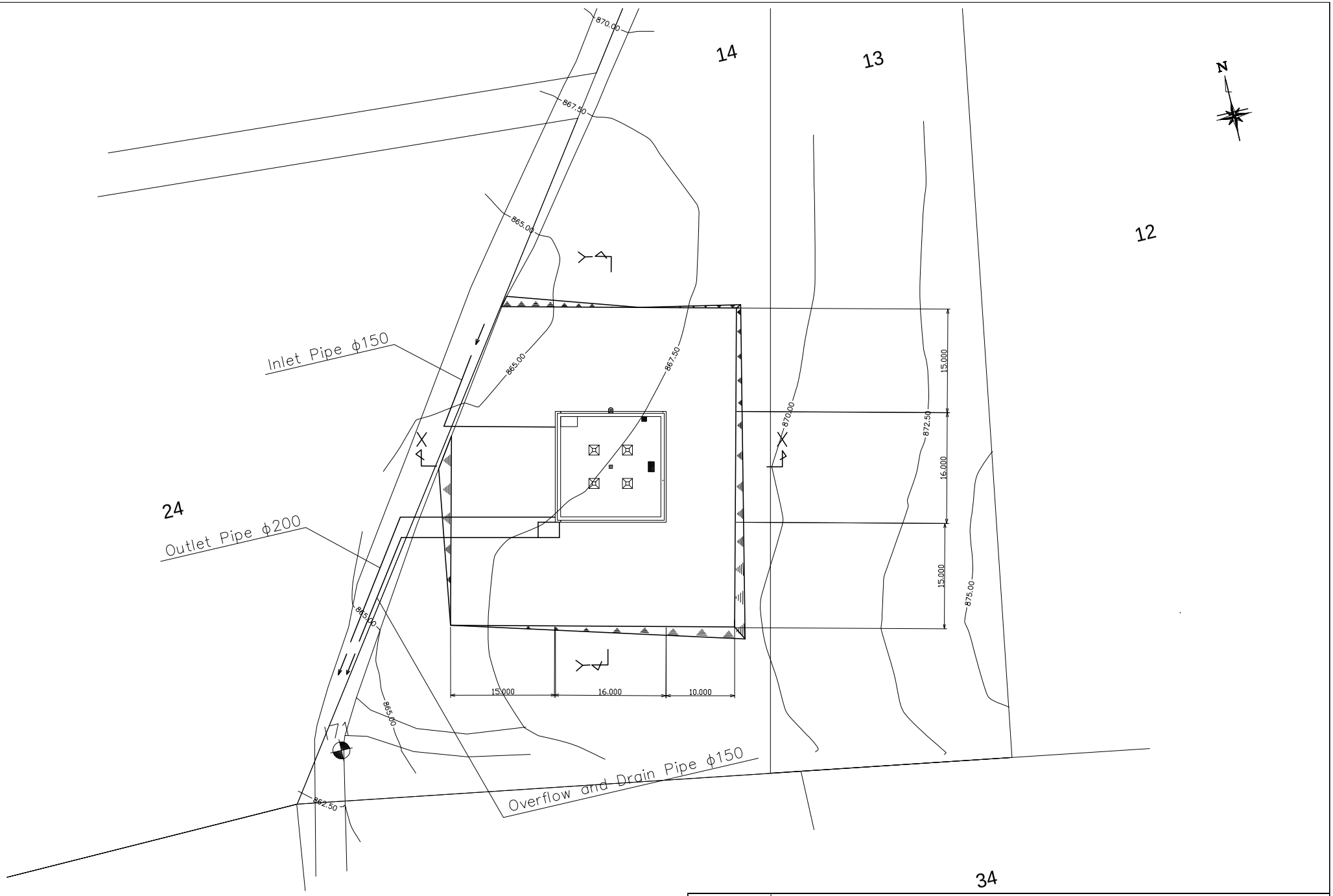
AL-TP-06	PLAN AND PROFILE OF TRANSMISSION LINE FROM AL-BAQA'A EXISTING RESERVOIR TO ABU NUSSAIR 2 RESERVOIR

送水管　平面図・断面図（アルバカ既存配水池～アブナシール2 配水池）



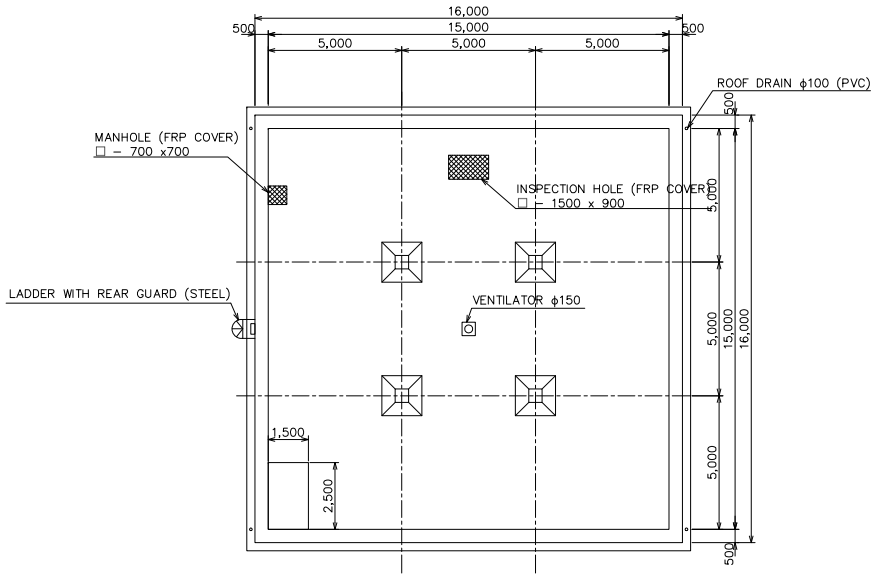


AL-TP-07	PLAN AND PROFILE OF TRANSMISSION LINE FROM CONNECTION No.2 TO ABU NUSSAIR 1 RESERVOIR
送水管　平面図・断面図（送水管分岐点 No.2～アブナシール 1 配水池）	

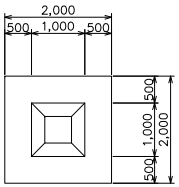


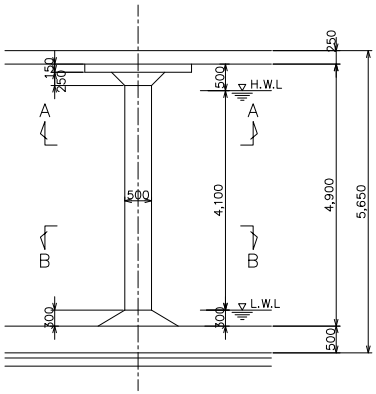
AL-RV-01	LAYOUT OF ABU NUSSAIR 1 RESERVOIR (900m³)
	配水池一般平面図（アブナシール1配水池） 900m³

PLAN S=1/200

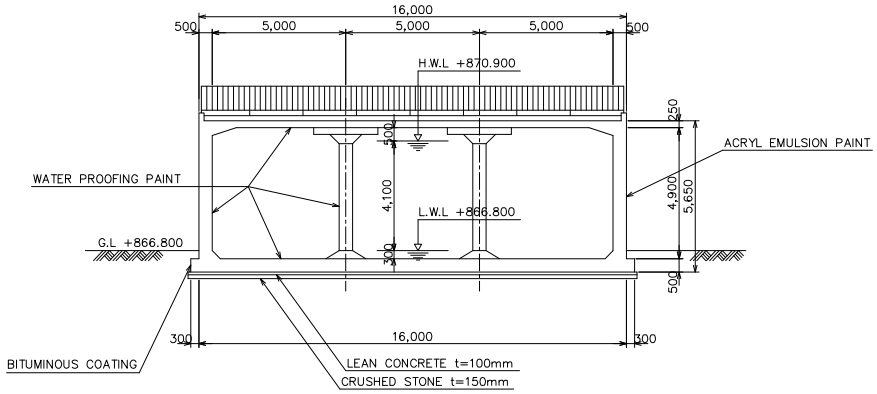


SECTION A–A S=1/100

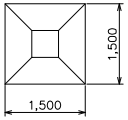




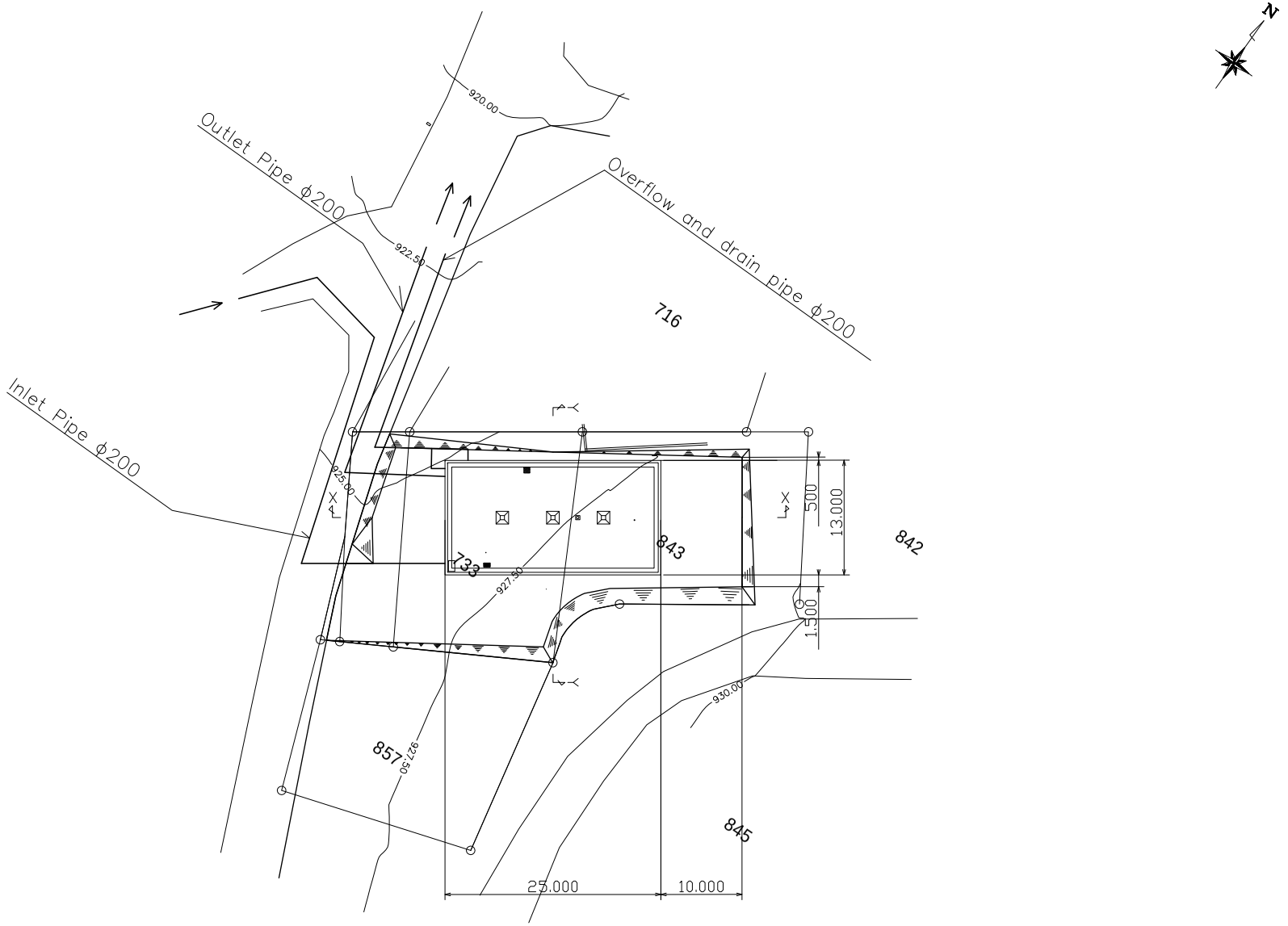
SECTION S=1/200



SECTION B–B S=1/100

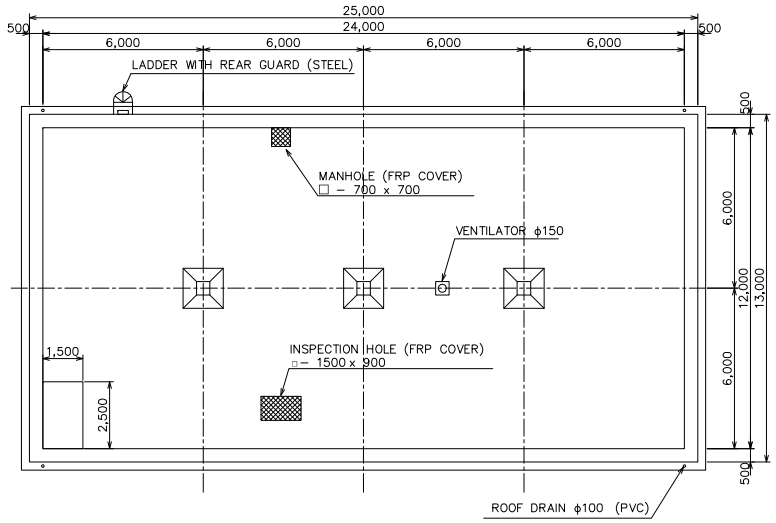


AL-RV-02	STRUCTURAL PLAN AND SECTION VIEW OF ABU NUSSAIR 1 RESERVOIR (900m³)
	配水池構造図（アブナシール1配水池） 900m³

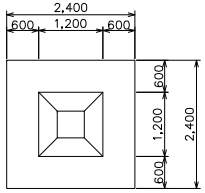


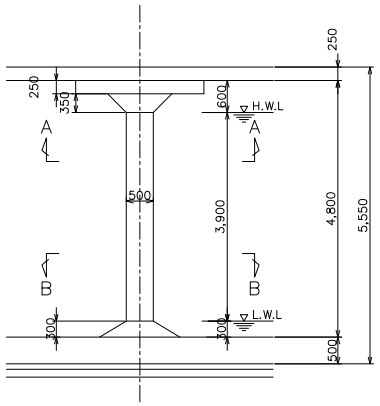
AL-RV-03	LAYOUT PLAN OF ABU NASIR 2 RESERVOIR (1,100m³)
配水池一般平面図（アブナシール2配水池） 1,100m³	

PLAN S=1/200

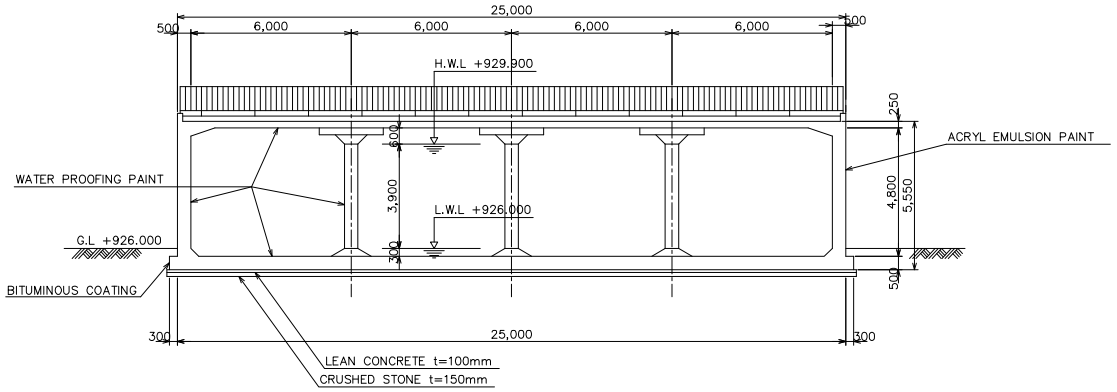


SECTION A–A S=1/100

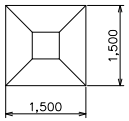




SECTION S=1/200

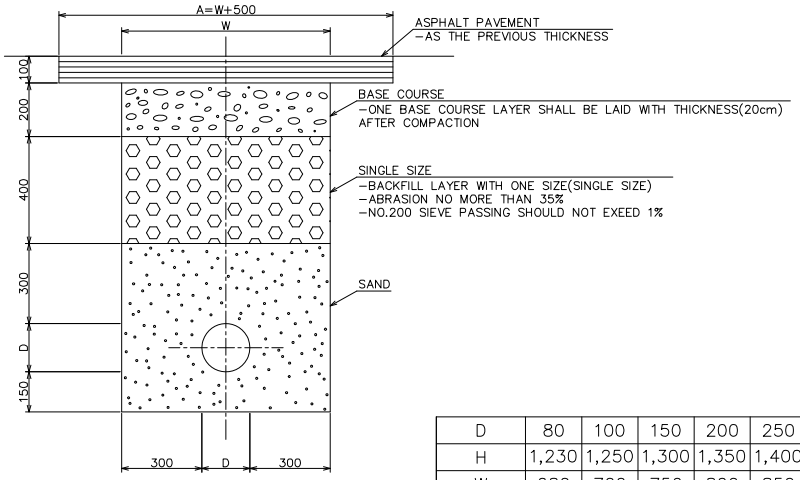


SECTION B–B S=1/100



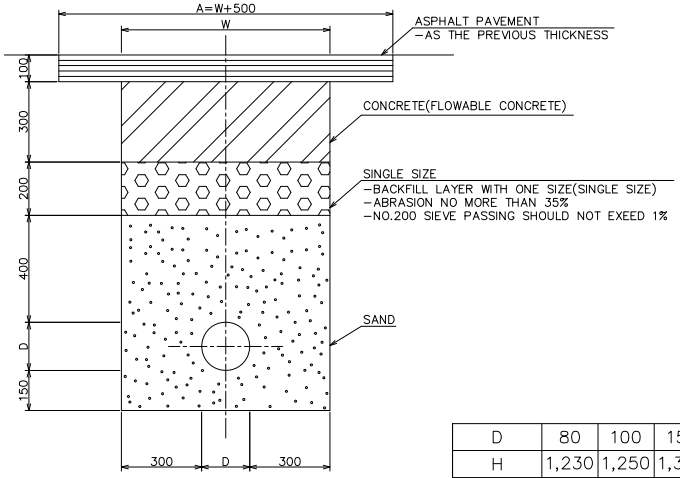
AL-RV-04	STRUCTURAL PLAN AND SECTION VIEW OF ABU NASIR 2 RESERVOIR (1,100m³)
配水池構造図（アブナシール2配水池） 1,100m³	

TYPE: 1 ALONG ASPHALT STREET FOR MAIN ROAD S=1/20



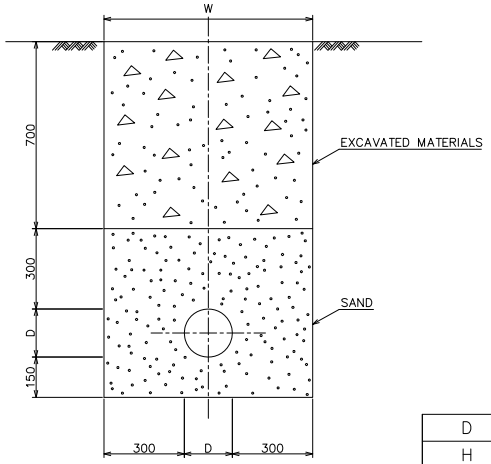
D	80	100	150	200	250	300	400
H	1,230	1,250	1,300	1,350	1,400	1,450	1,550
W	680	700	750	800	850	900	1,000
A	1,180	1,200	1,250	1,300	1,350	1,400	1,500

TYPE: 2 CROSS SECTION FOR ASPHALT STREET FOR MAIN ROAD S=1/20



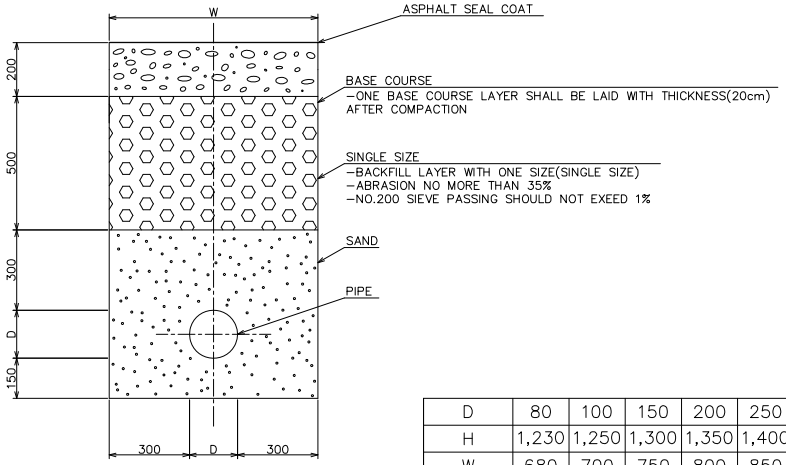
D	80	100	150	200	250	300	400
H	1,230	1,250	1,300	1,350	1,400	1,450	1,550
W	680	700	750	800	850	900	1,000
A	1,180	1,200	1,250	1,300	1,350	1,400	1,500

TYPE: 3 CROSS SECTION OF NON PAVEMENT ROAD S=1/20



D	80	100	150	200	250	300	400
H	1,230	1,250	1,300	1,350	1,400	1,450	1,550
W	680	700	750	800	850	900	1,000
A	–	–	–	–	–	–	–

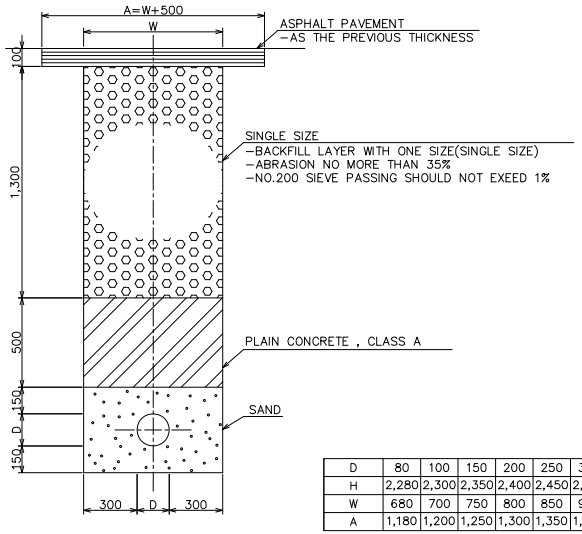
TYPE: 4 TYPICAL SECTION OF AGRICULTURAL ROAD S=1/20



D	80	100	150	200	250	300	400
H	1,230	1,250	1,300	1,350	1,400	1,450	1,550
W	680	700	750	800	850	900	1,000
A	–	–	–	–	–	–	–

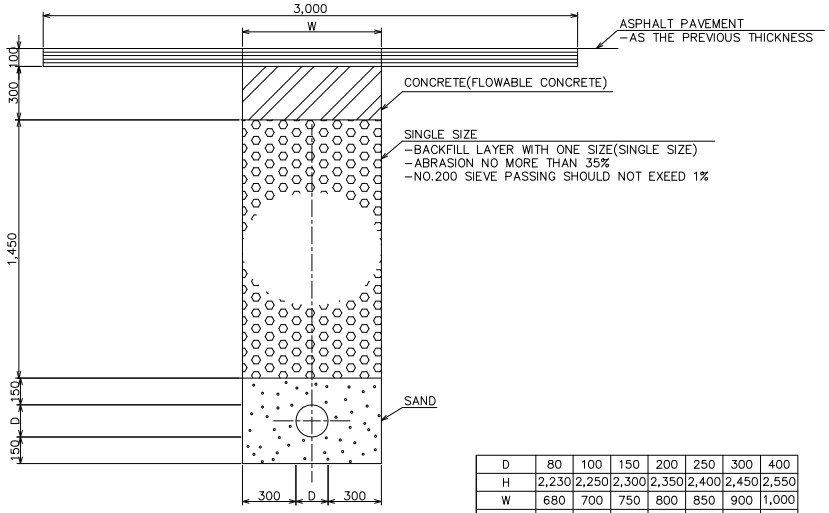
TD-01	TYPICAL TRENCH CROSS SECTION FOR PIPELINE IN THE ROAD UNDER MUNCIPALITY
	送配水管路掘削標準断面図 1

TYPE: 5 LONGITUDINAL FOR MAIN AND SECONDARY ROAD S=1/30



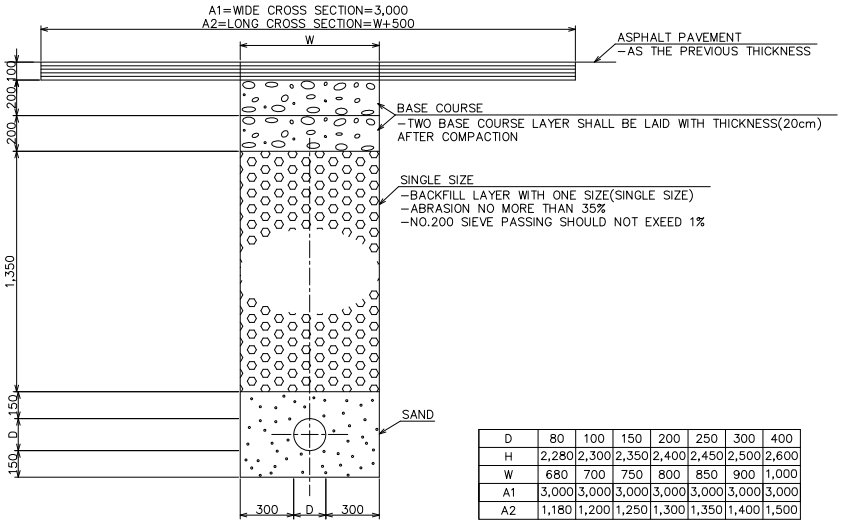
D	80	100	150	200	250	300	400
H	2,280	2,300	2,350	2,400	2,450	2,500	2,600
W	680	700	750	800	850	900	1,000
A	1,180	1,200	1,250	1,300	1,350	1,400	1,500

TYPE: 6 CROSS SECTION FOR SECONDARY ROAD S=1/30



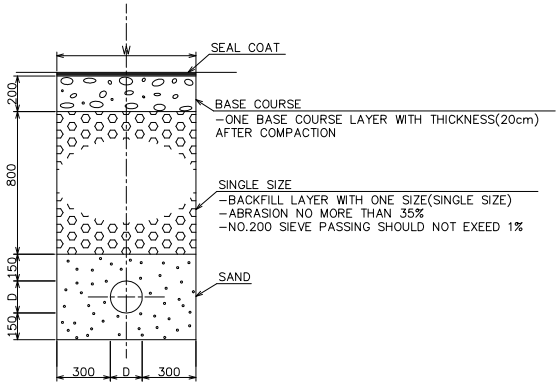
D	80	100	150	200	250	300	400
H	2,230	2,250	2,300	2,350	2,400	2,450	2,550
W	680	700	750	800	850	900	1,000
A	3,000	3,000	3,000	3,000	3,000	3,000	3,000

TYPE: 7 LONG AND CROSS SECTION FOR THE RURAL ROAD S=1/30



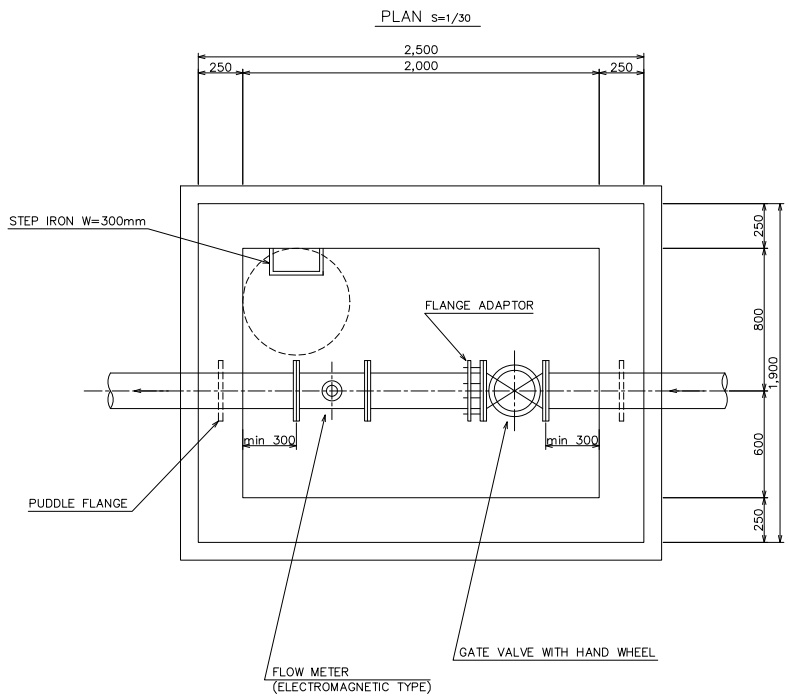
D	80	100	150	200	250	300	400
H	2,280	2,300	2,350	2,400	2,450	2,500	2,600
W	680	700	750	800	850	900	1,000
A1	3,000	3,000	3,000	3,000	3,000	3,000	3,000
A2	1,180	1,200	1,250	1,300	1,350	1,400	1,500

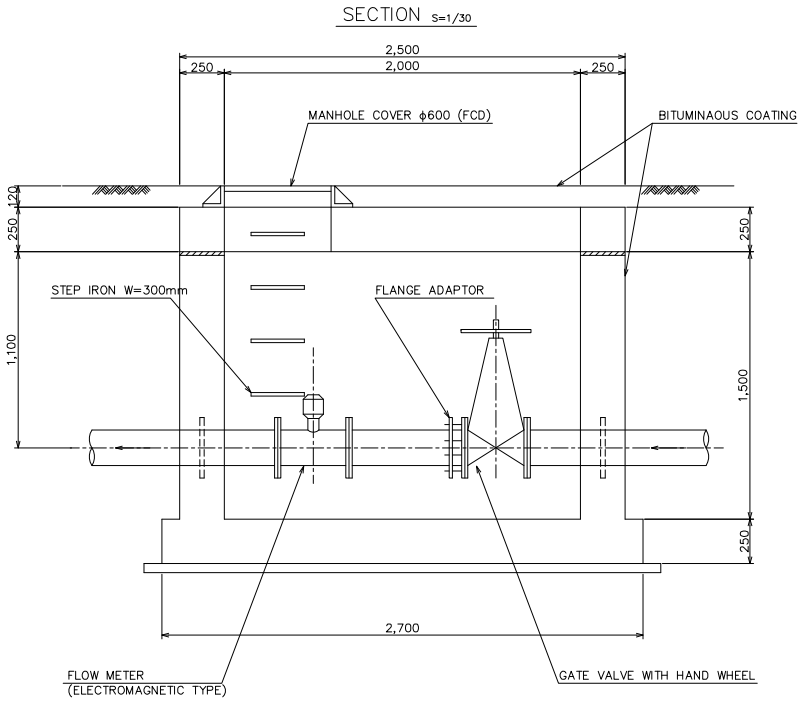
TYPE: 8 LONG & CROSS SECTION FOR THE AGRICULTURAL ROAD(SEAL COAT) S=1/30



D	80	100	150	200	250	300	400
H	2,280	2,300	2,350	2,400	2,450	2,500	2,600
W	680	700	750	800	850	900	1,000
A	–	–	–	–	–	–	–

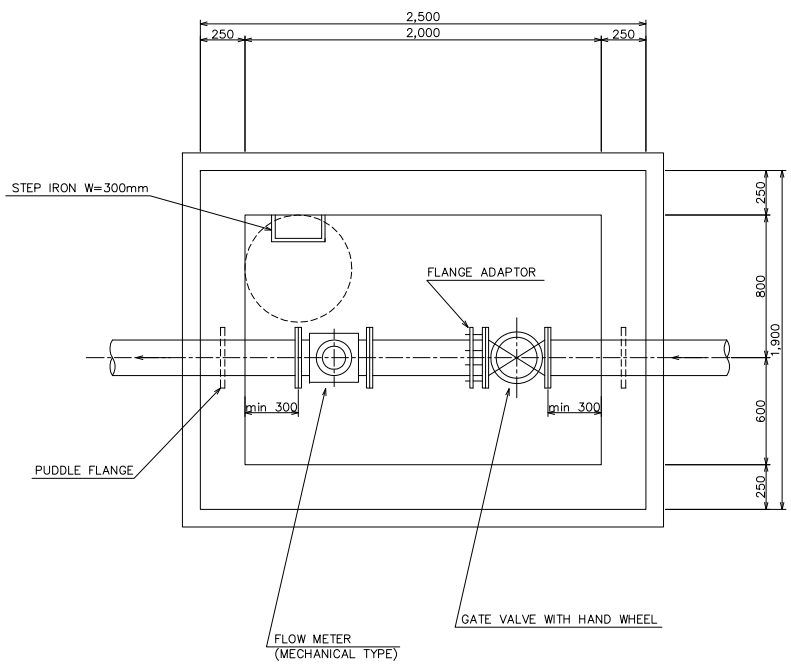
TD-02	TYPICAL TRENCH CROSS SECTION FOR PIPELINE IN THE ROAD UNDER MPWH
	送配水管路掘削標準断面図 2



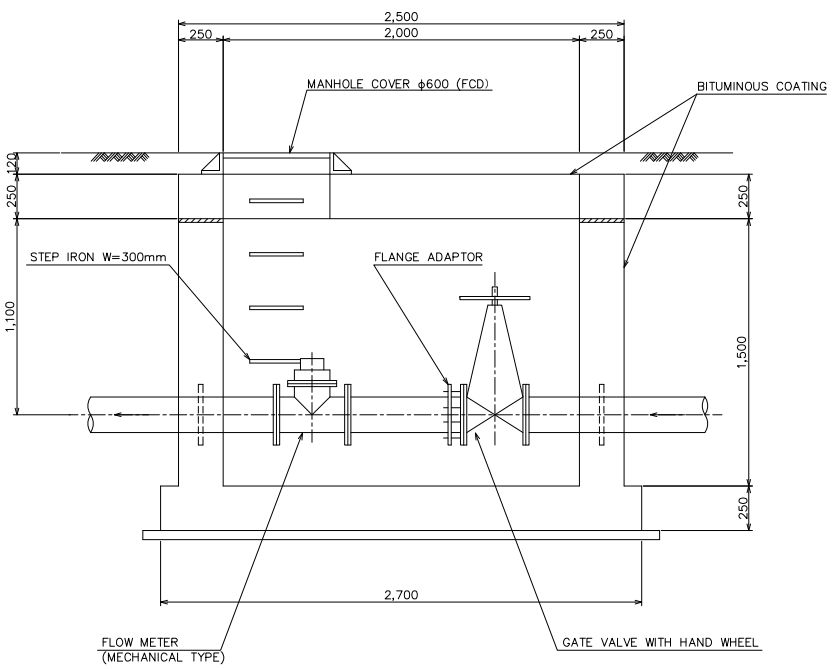


TD-03	DETAILS OF FLOW METER CHAMBER (ELECTROMAGNETIC TYPE)
	標準流量計室(電磁式)

PLAN S=1/30



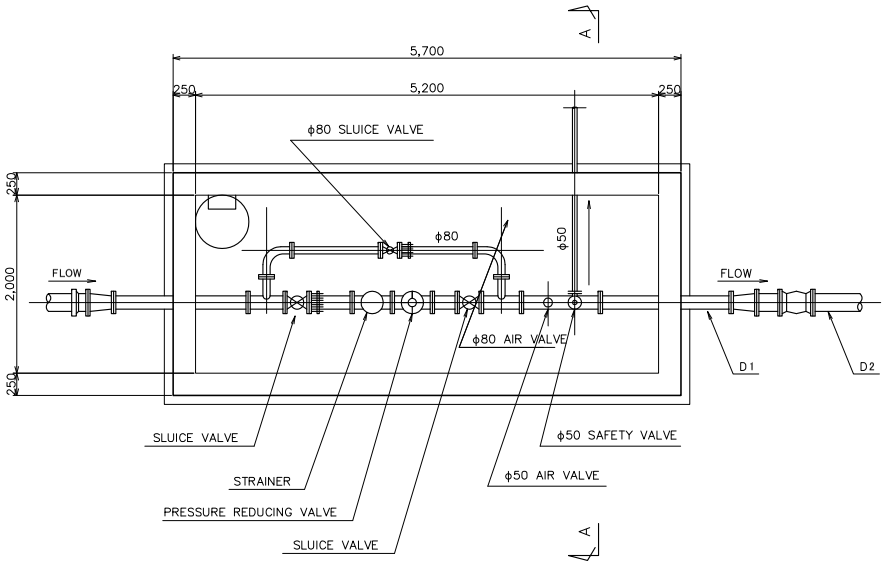
SECTION S=1/30



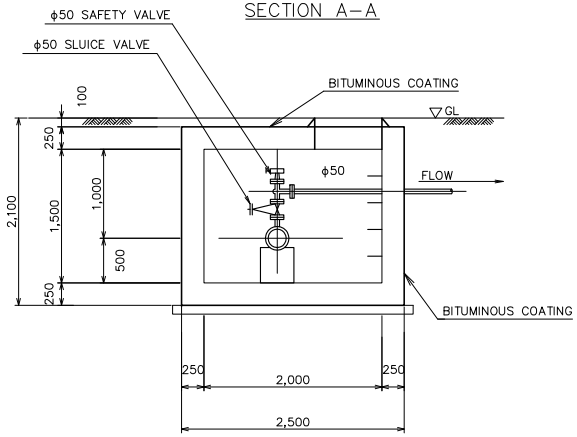
TD-04	DETAILS OF FLOW METER (MECHANICAL TYPE)
	標準流量計室(機械式)

P.R.V CHAMBER

PLAN



SECTION A–A

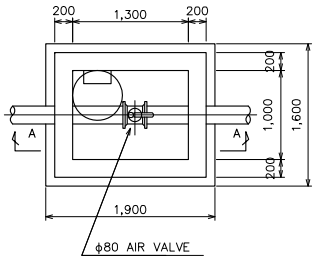


SIZE OF PIPES & PRV

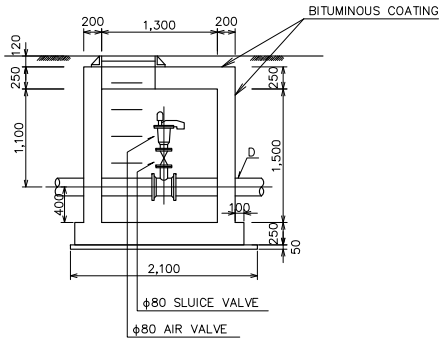
D1	D2
φ100	φ100
φ100	φ150
φ100	φ200
φ200	φ300

AIR VALVE CHAMBER

PLAN



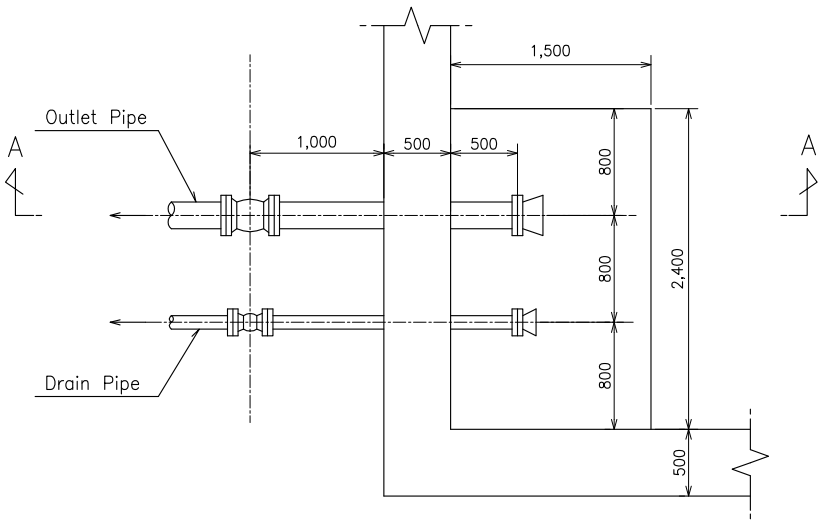
SECTION A–A



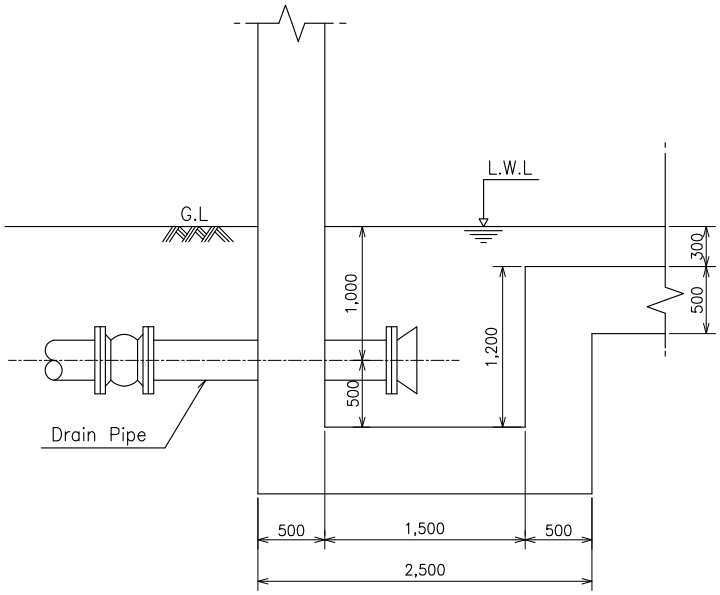
TD-05	TYPICAL DRAWING OF PRESSURE REDUCING VALVE CHAMBER AND AIR VALVE CHAMBER
	減圧弁室及び空気弁室

TYPICAL DRAWING OF PIT FOR OUTLET & DRAIN PIPE

PLAN

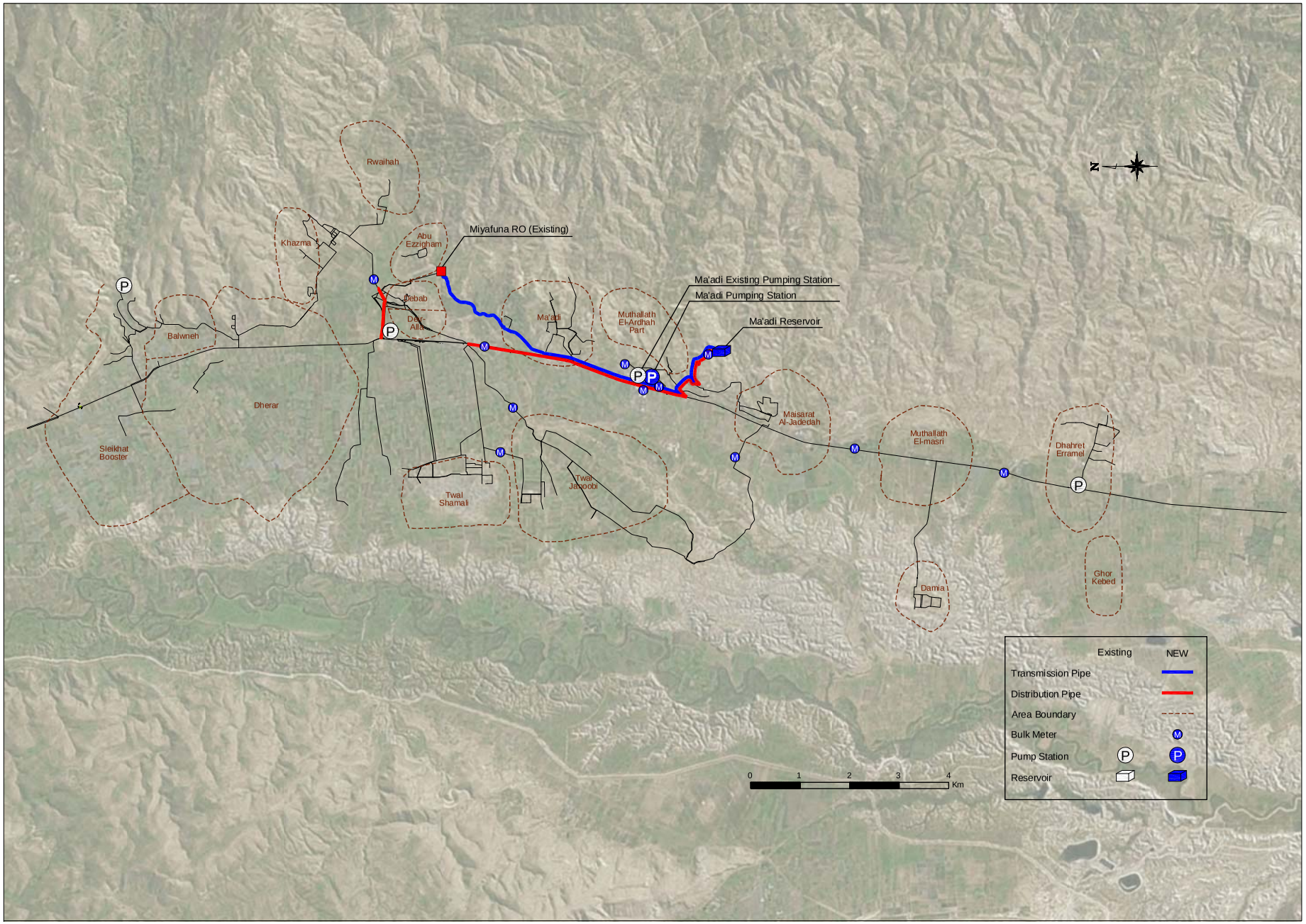


SECTION A–A

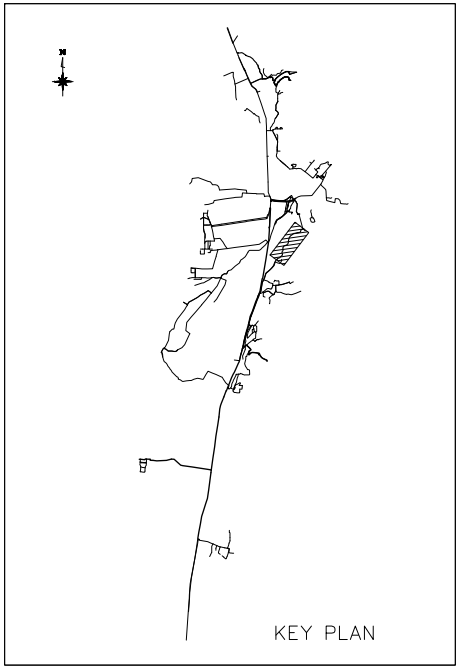


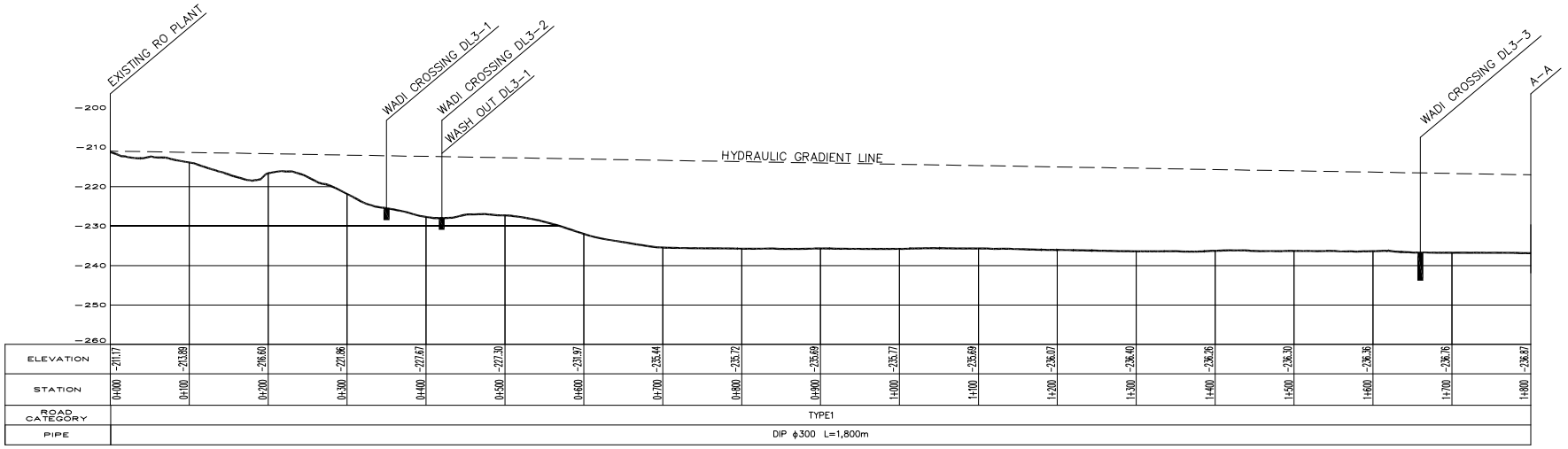
	NAME OF RESERVOIRS		
	MAADI Res.	ABU–NUSSAIR Res. NO.1	ABU–NUSSAIR Res. NO.2
OUTLET PIPE SIZE	ϕ300	ϕ200	ϕ200
DRAIN PIPE SIZE	ϕ100	ϕ100	ϕ100

TD–06	TYPICAL DRAWING OF PIT FOR OUTLET & DRAIN PIPE
	配水池流出ピット詳細図



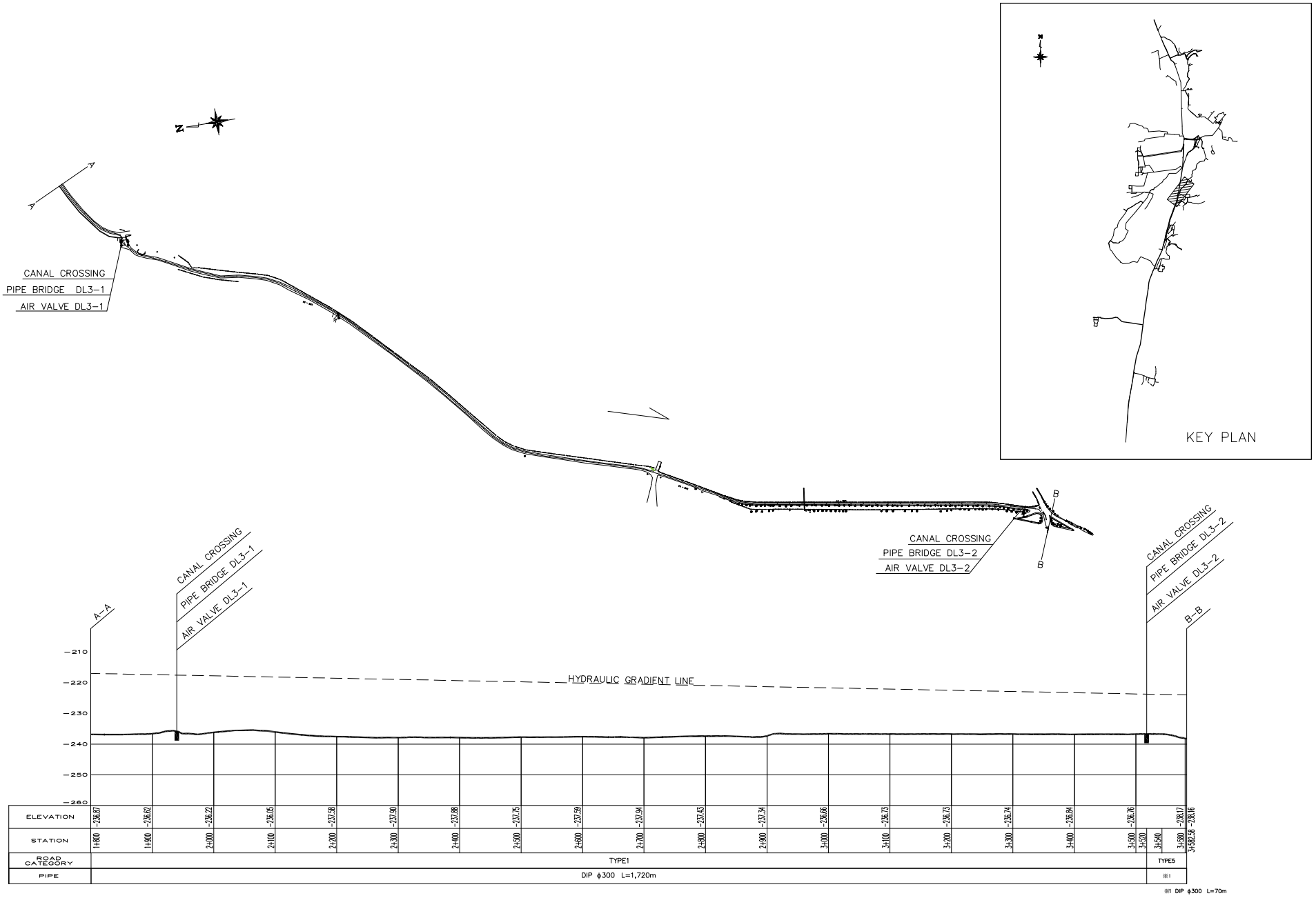
DA-GN-01	GENERAL SITE PLAN (DEIR ALLA)
	全体計画施設配置図（デルアラ地区）



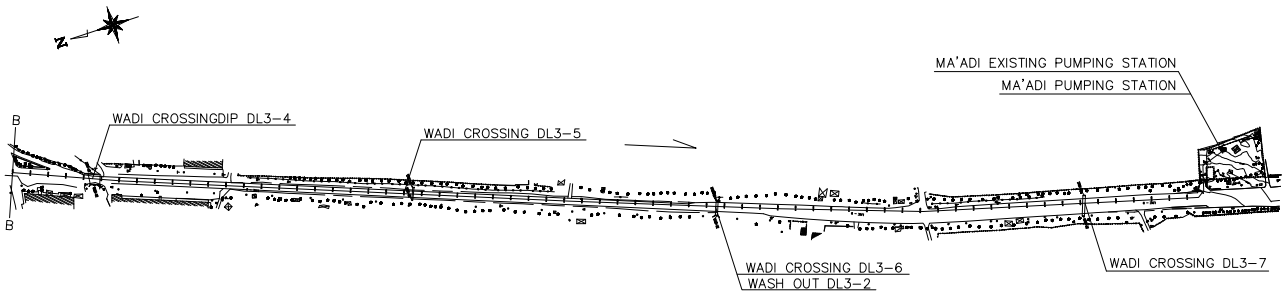


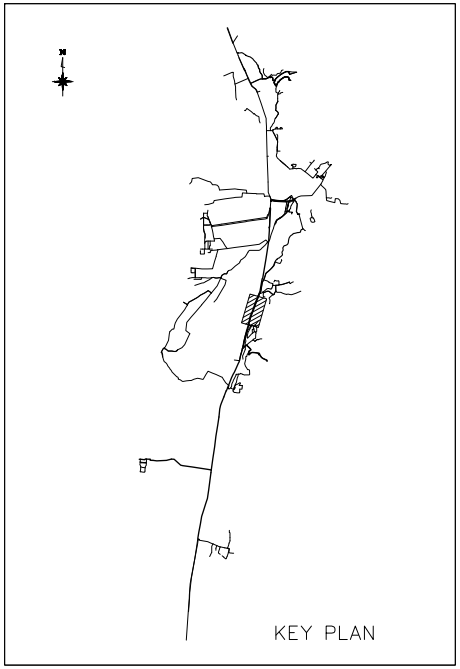
DA-TP-01	PLAN AND PROFILE OF TRANSMISSION LINE FROM EXISTING RO PLANT TO MA'ADI PUMPING STATION (1/3)

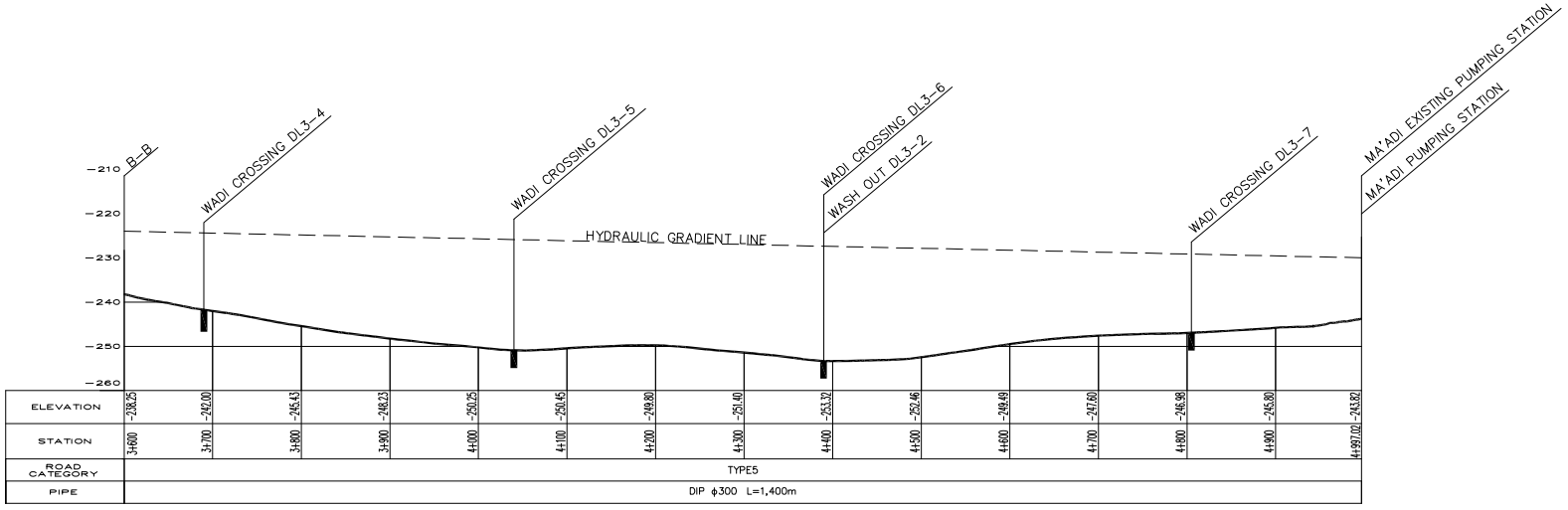
送水管　平面図・断面図（既存RO施設～マアディポンプ場）（1/3）



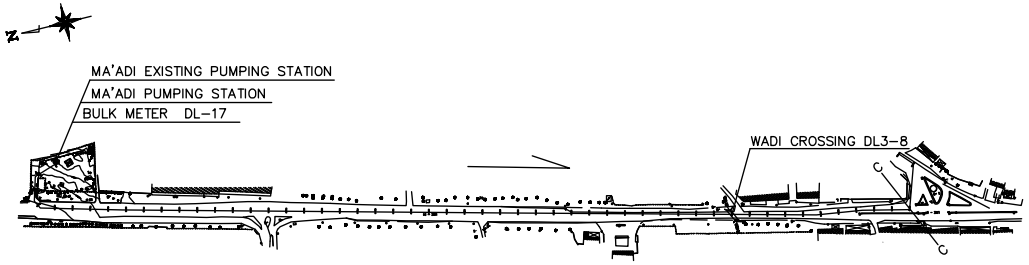
DA-TP-02	PLAN AND PROFILE OF TRANSMISSION LINE FROM EXISTING RO PLANT TO MA'ADI PUMPING STATION (2/3)
送水管　平面図・断面図（既存RO施設～マアディポンプ場）（2/3）	

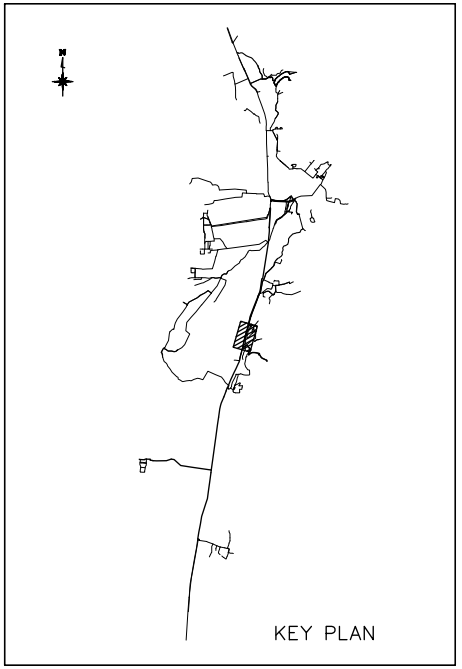


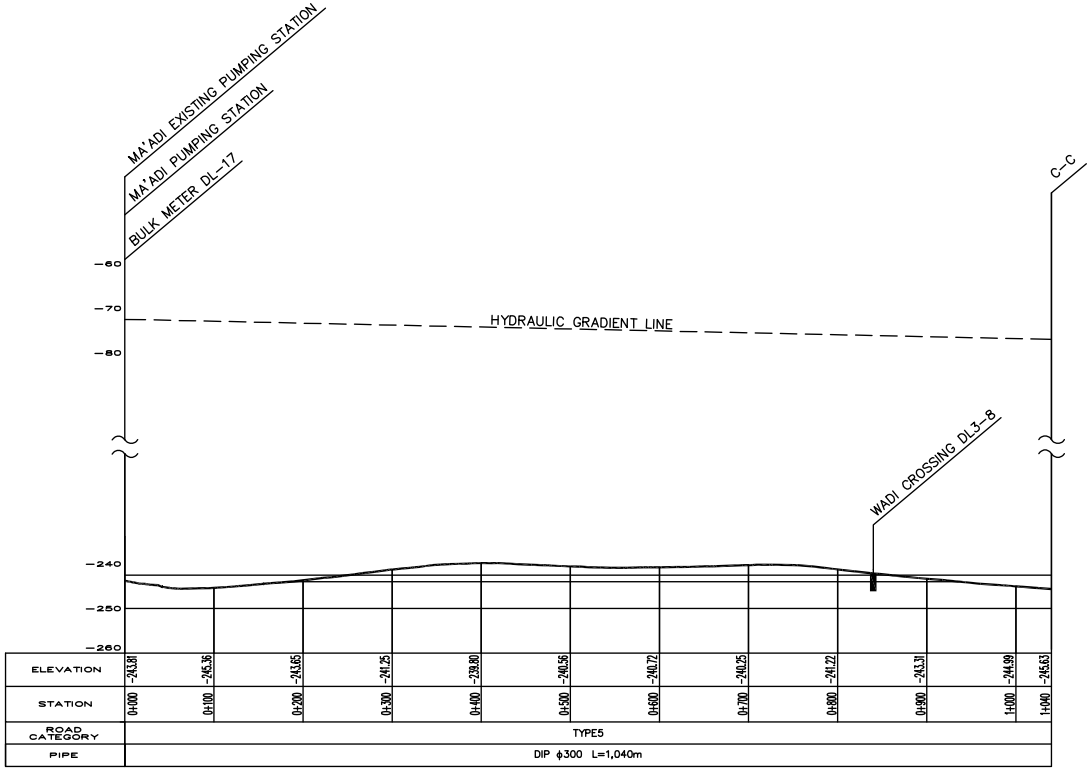




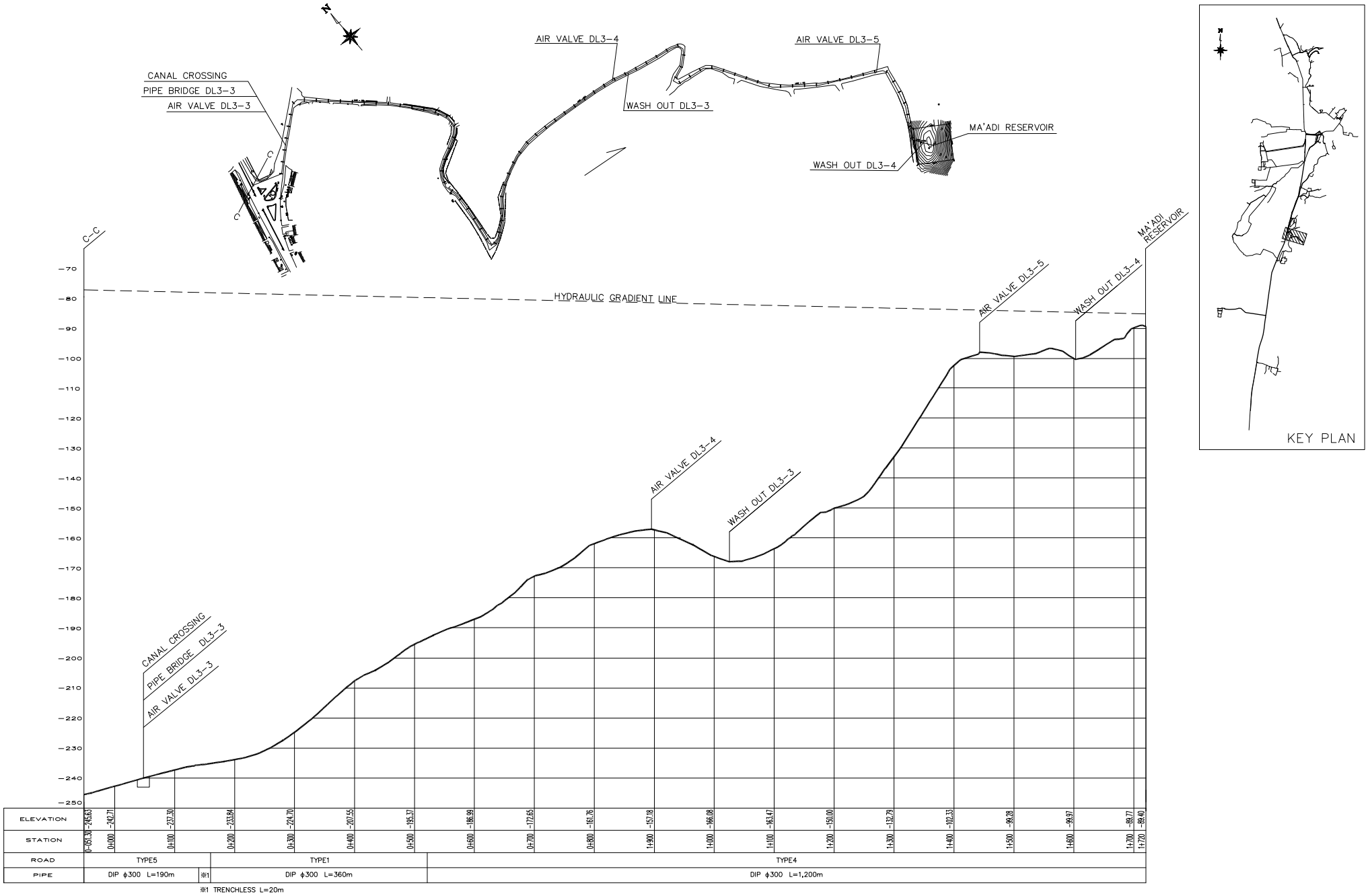
DA-TP-03	PLAN AND PROFILE OF TRANSMISSION LINE FROM EXISTING RO PLANT TO MA'ADI PUMPING STATION (3/3)
送水管　平面図・断面図（既存RO施設～マアディポンプ場）（3/3）	





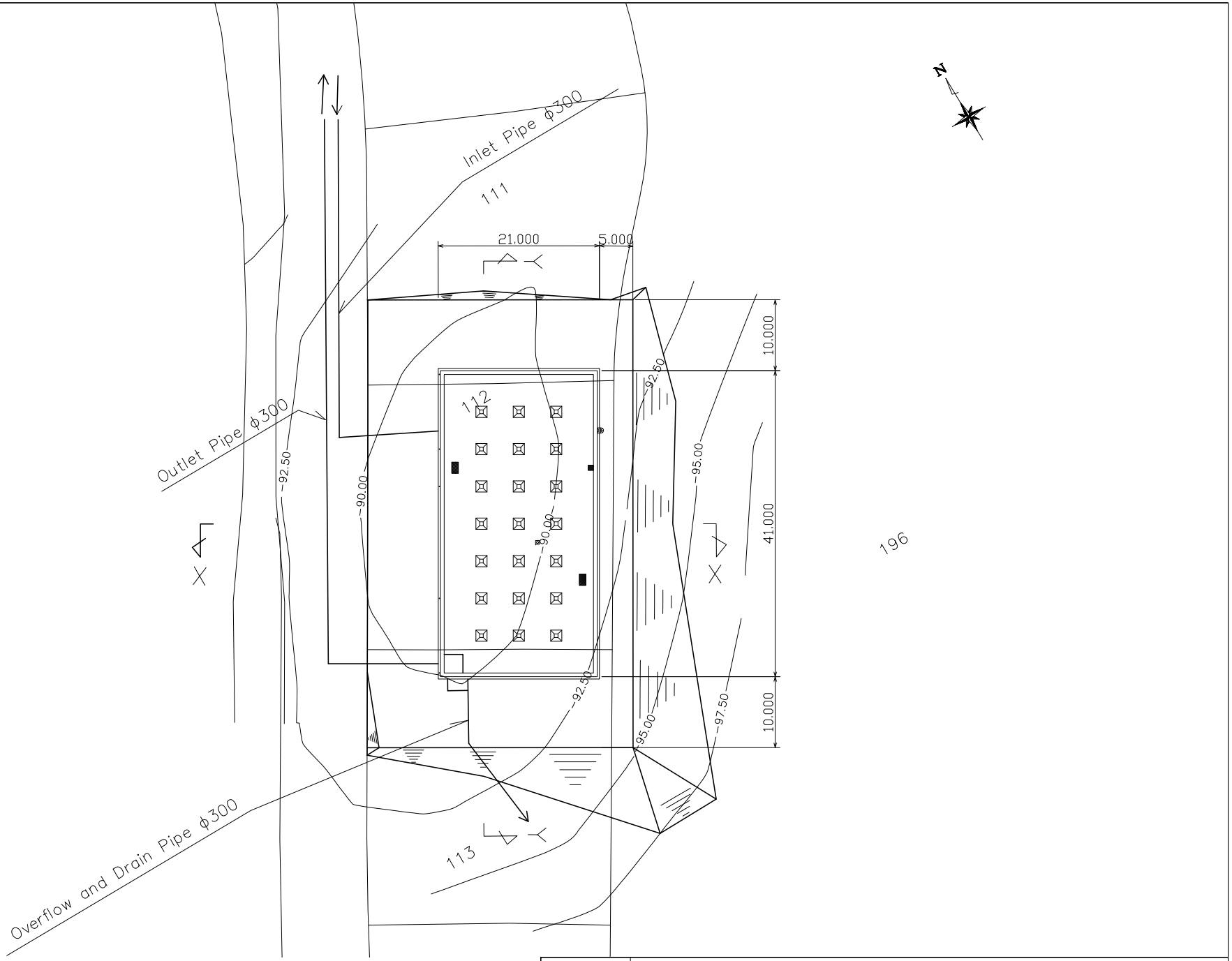


DA-TP-04	PLAN AND PROFILE OF TRANSMISSION LINE FROM MA'ADI PUMPING STATION TO MA'ADI RESERVOIR (1/2)
送水管 平面図・断面図（マアディポンプ場～マアディ配水池）(1/2)	



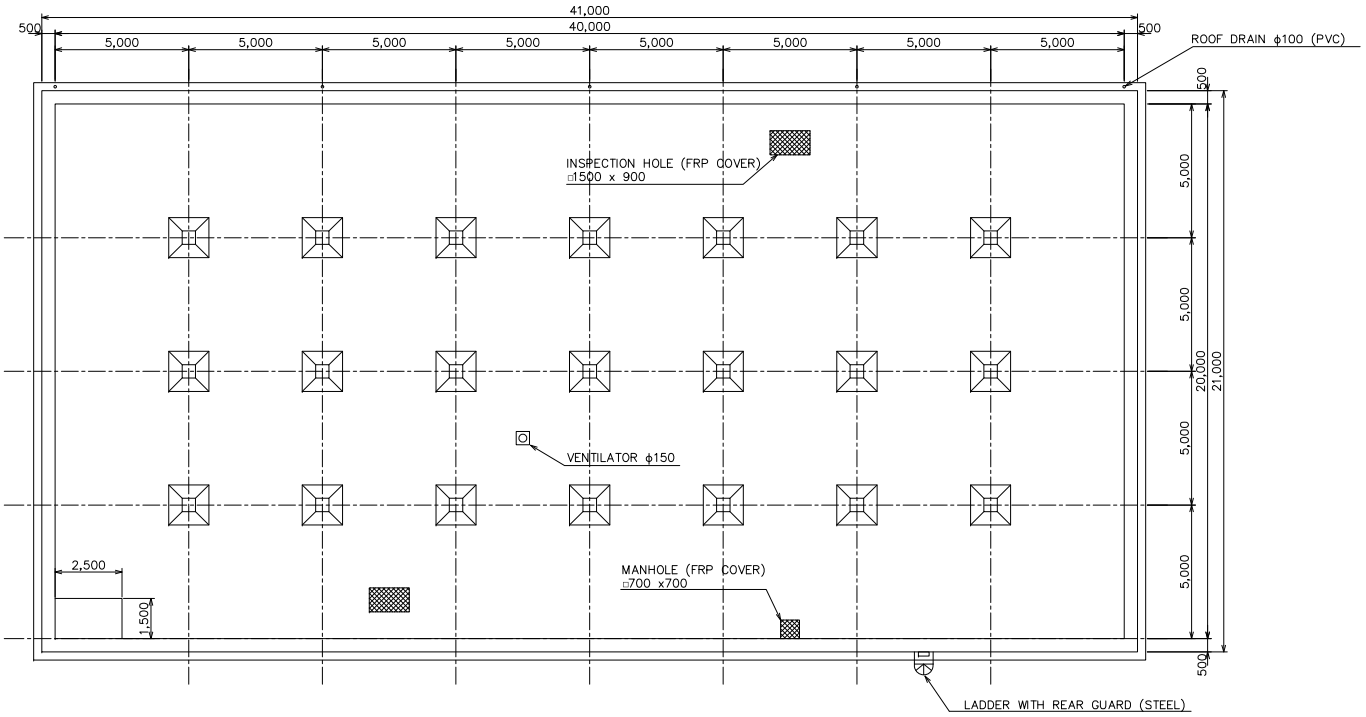
DA-TP-05	PLAN AND PROFILE OF TRANSMISSION LINE FROM MA'ADI PUMPING STATION TO MA'ADI RESERVOIR (2/2)

送水管　平面図・断面図（マアディポンプ場～マアディ配水池）(2/2)

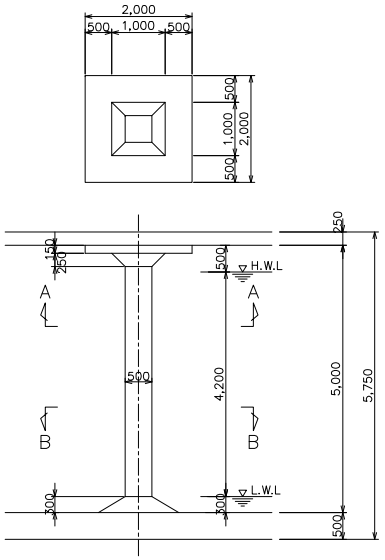


DA-RV-01	LAYOUT PLAN OF MA'ADI RESERVOIR (3,300m³)
	配水池一般平面図（マアディ配水池） 3,300m³

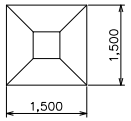
PLAN S=1/200



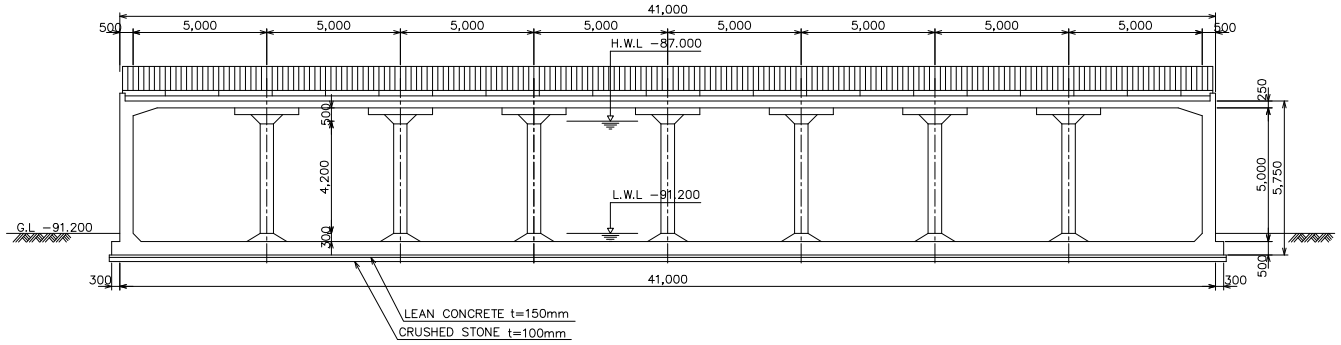
SECTION A−A S=1/100



SECTION B−B S=1/100



SECTION S=1/200



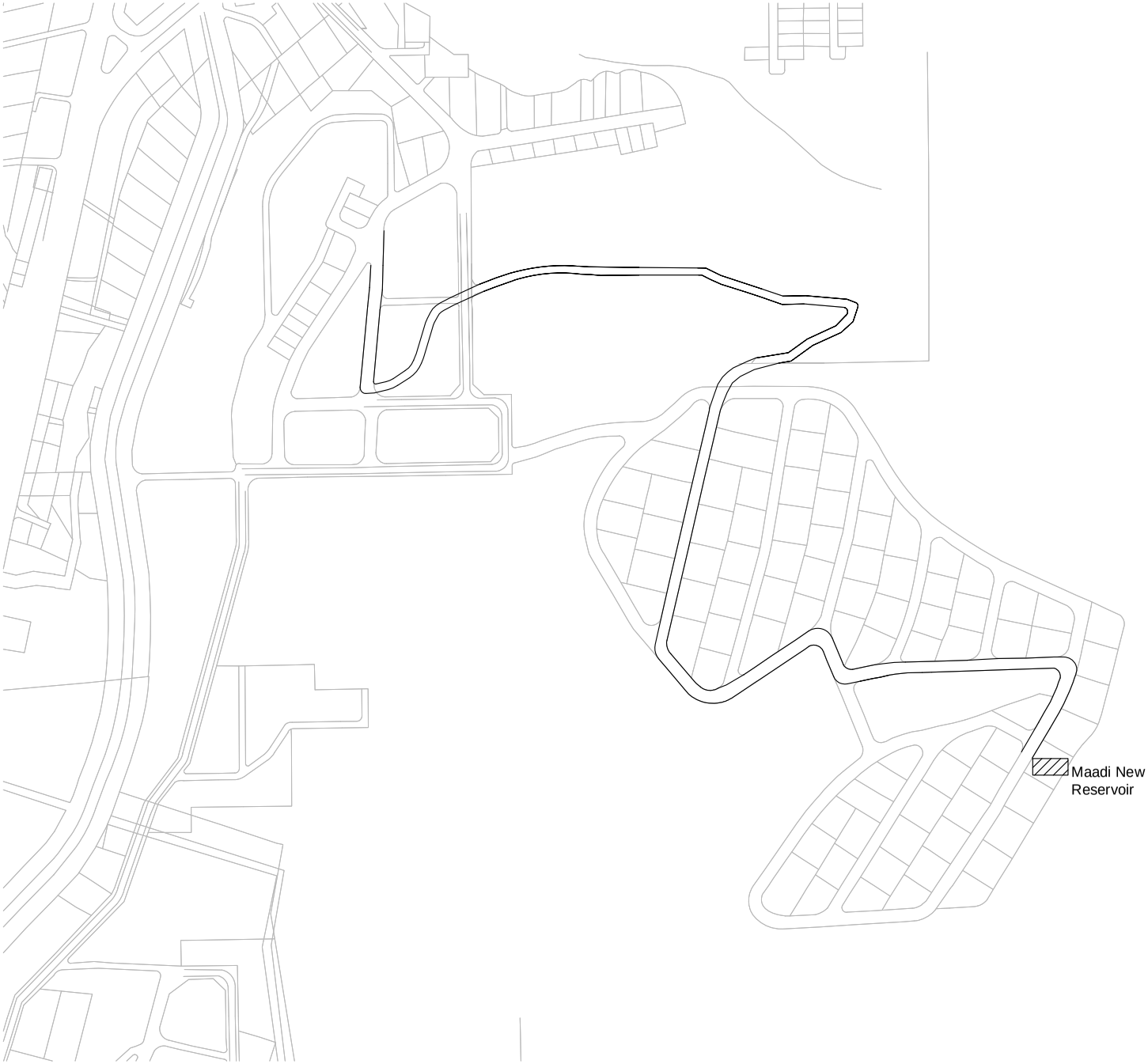
EXTERIOR FINISHING

ITEM	FINISHING/SPECIFICATION
EXTERIOR WALL ABOVE G.L	ACRYL EMULSION PAINT ON EXPOSED CONCRETE
EXTERIOR WALL & BASE BELOW G.L	BITUMINOUS COATING ON EXPOSED CONCRETE

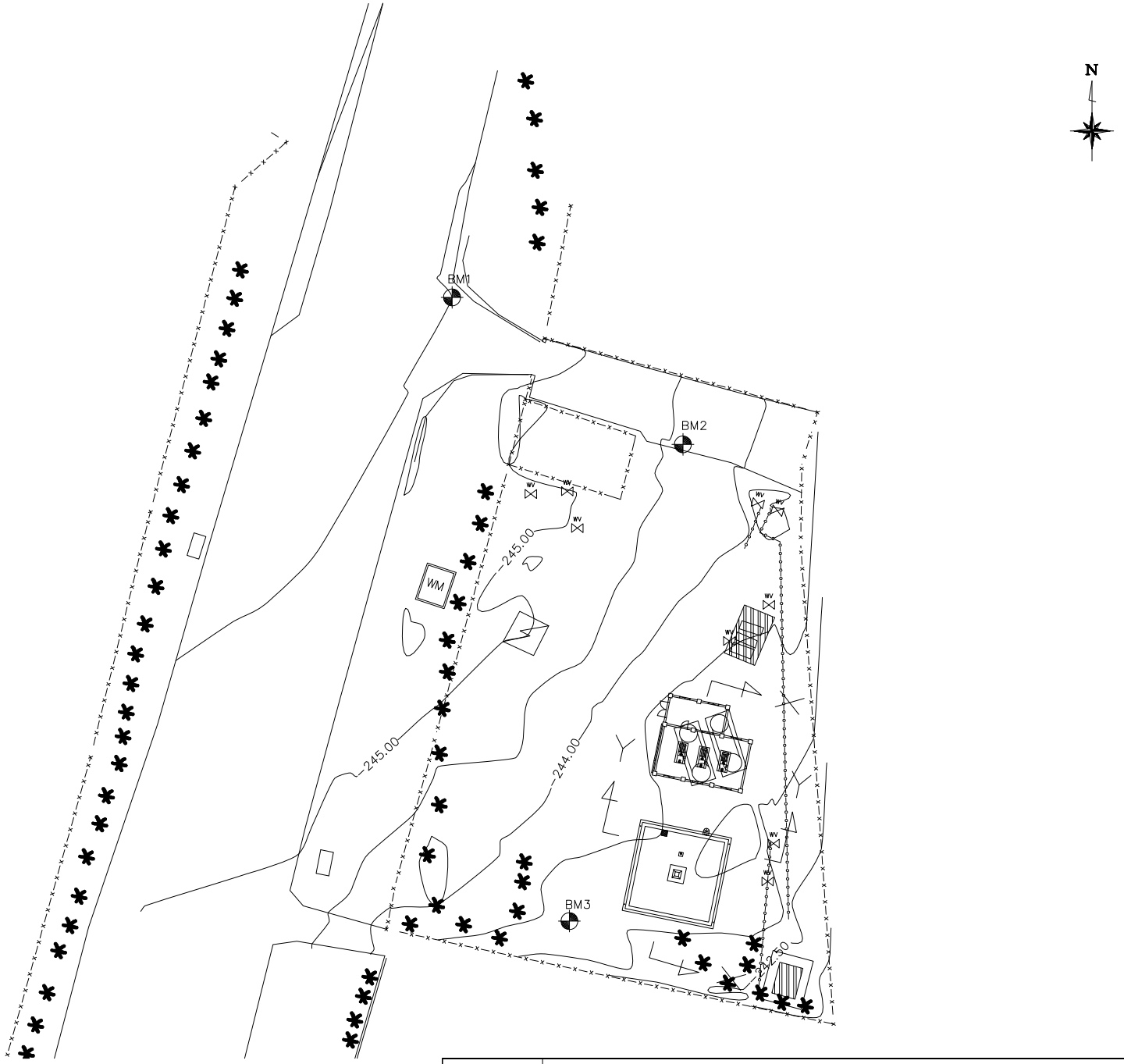
INTERIOR FINISHING

ITEM	FINISHING/SPECIFICATION	
DISTRIBUTION RESERVOIR	BASE	WATER PROOFING PAINT
	WALL	WATER PROOFING PAINT
	CEILING	WATER PROOFING PAINT
	COLUMN	WATER PROOFING PAINT

DA-RV-02	STRUCTURAL PLAN AND SECTION VIEW OF MA'ADI RESERVOIR (3,300m³)
	配水池構造図（マアディ配水池） 3,300m³

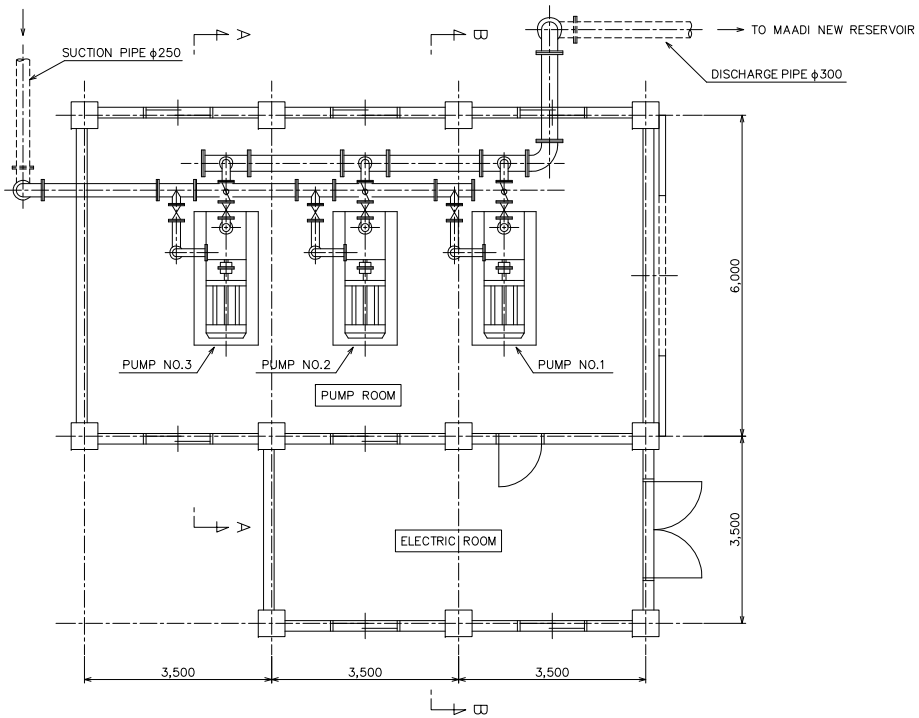


DA-RV-03	ACCESS ROAD OF MA'ADI RESERVOIR
配水池アクセス道路（マアディ配水池）	



DA-PS-01	LAYOUT PLAN OF MA'ADI PUMPING STATION
ポンプ場一般平面図（マアディポンプ場）	

PLAN S=1/100

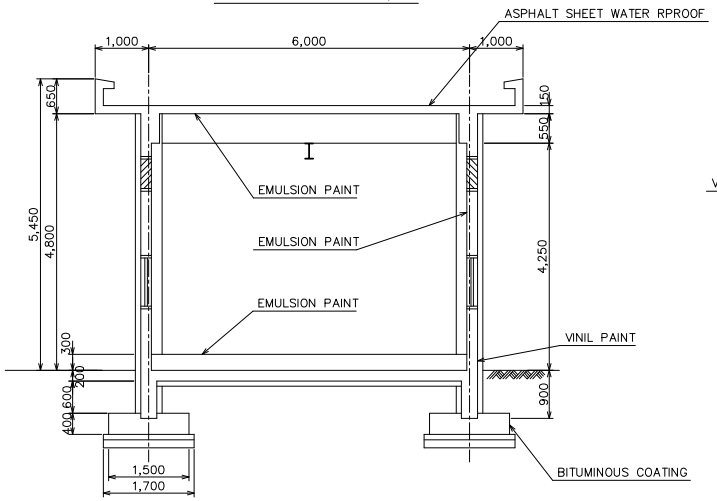


PUMP NO.1			
PUMP		MOTOR	
TYPE	MULTI STAGE HORIZONTAL CENTRIFUGAL PUMP	TYPE	HORIZONTAL SQUIRREL CAGE INDUCTION MOTOR
SUCTION DIA	150 mm	RATED OUTPUT	110 KW
DISCHARGE DIA	125 mm	VOLTAGE	400 V
TOTAL HEAD	170 m	FREQUENCY	50 Hz
CAPACITY	141 m^3/min	NO. OF POLE	4 P
REVOLUTION	1,450 min^{-1}		

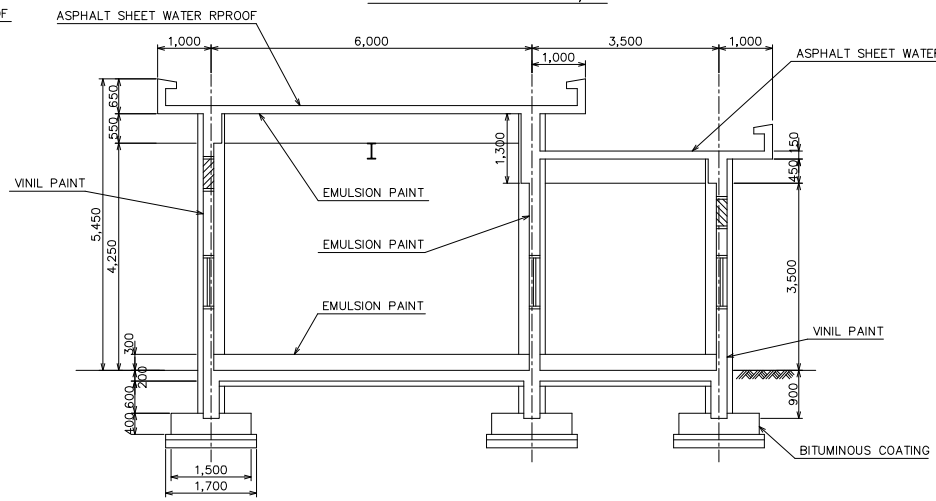
PUMP NO.2			
PUMP		MOTOR	
TYPE	MULTI STAGE HORIZONTAL CENTRIFUGAL PUMP	TYPE	HORIZONTAL SQUIRREL CAGE INDUCTION MOTOR
SUCTION DIA	150 mm	RATED OUTPUT	110 KW
DISCHARGE DIA	125 mm	VOLTAGE	400 V
TOTAL HEAD	170 m	FREQUENCY	50 Hz
CAPACITY	141 m^3/min	NO. OF POLE	4 P
REVOLUTION	1,450 min^{-1}		

PUMP NO.3			
PUMP		MOTOR	
TYPE	MULTI STAGE HORIZONTAL CENTRIFUGAL PUMP	TYPE	HORIZONTAL SQUIRREL CAGE INDUCTION MOTOR
SUCTION DIA	150 mm	RATED OUTPUT	110 KW
DISCHARGE DIA	125 mm	VOLTAGE	400 V
TOTAL HEAD	170 m	FREQUENCY	50 Hz
CAPACITY	141 m^3/min	NO. OF POLE	4 P
REVOLUTION	1,450 min^{-1}		

SECTION A–A S=1/100

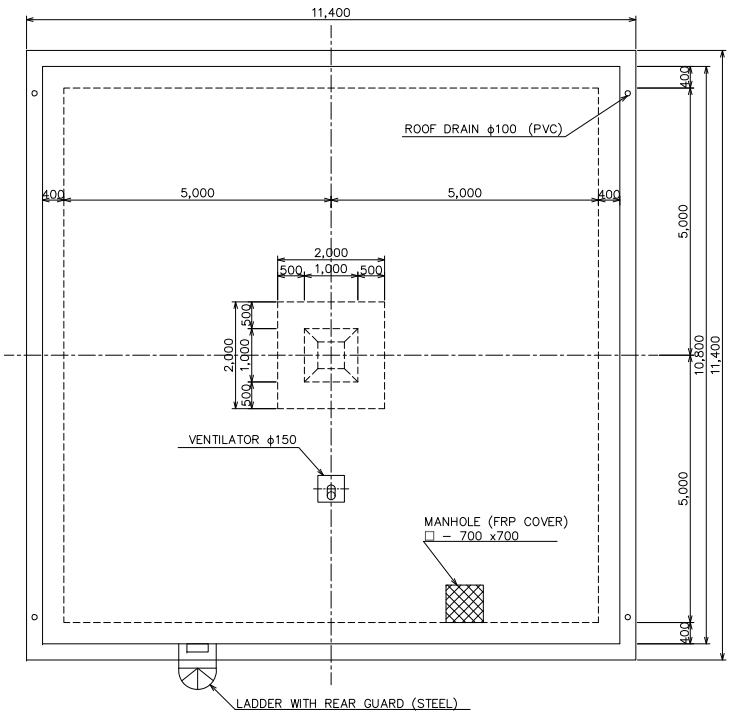


SECTION B–B S=1/100

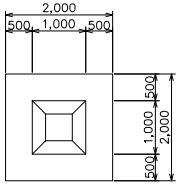


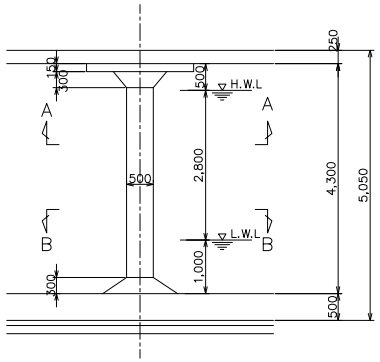
DA-PS-02	STRUCTURAL PLAN AND SECTION VIEW OF MA'ADI PUMPING STATION
	ポンプ場構造図（マアディポンプ場）

PLAN S=1/100

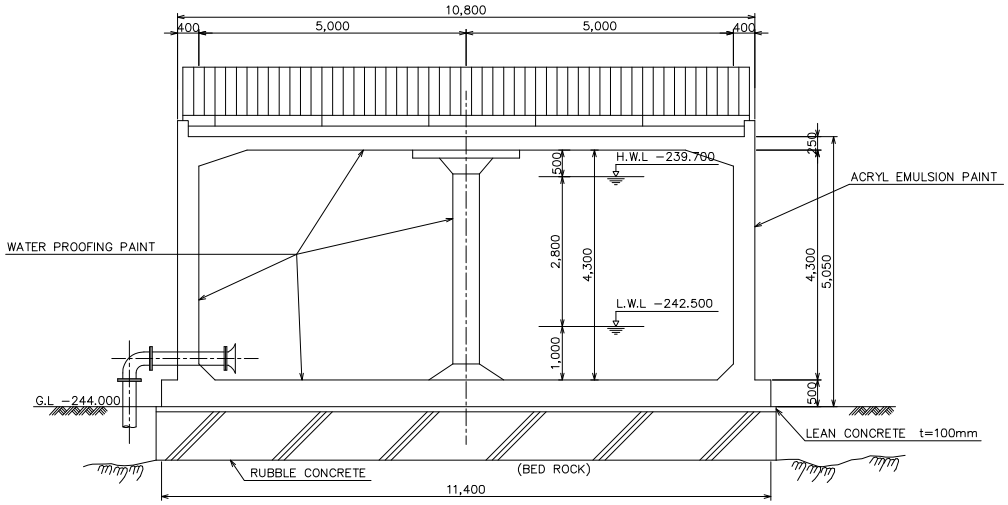


SECTION A–A S=1/100

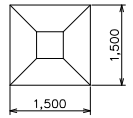




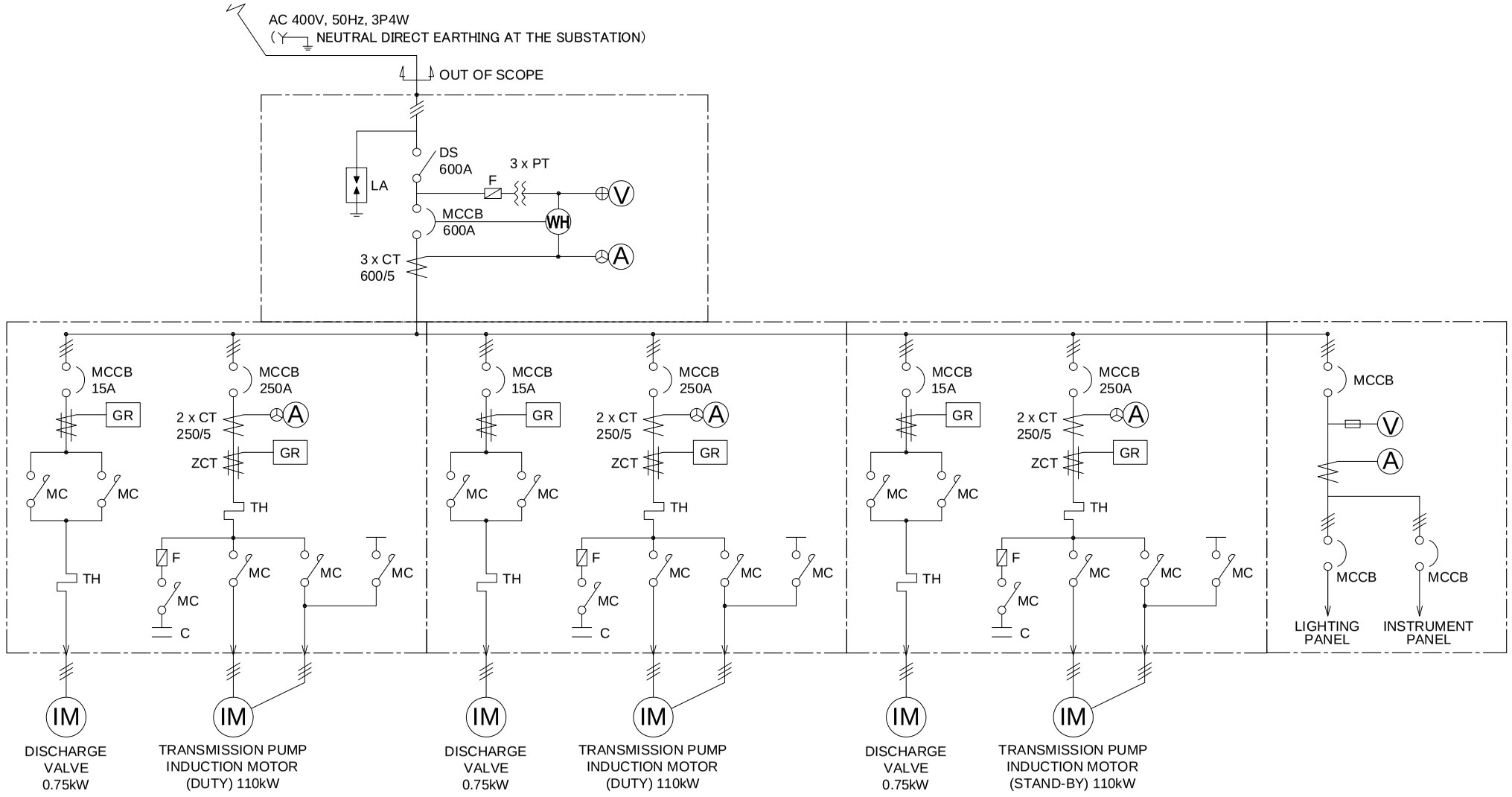
SECTION S=1/100



SECTION B–B S=1/100

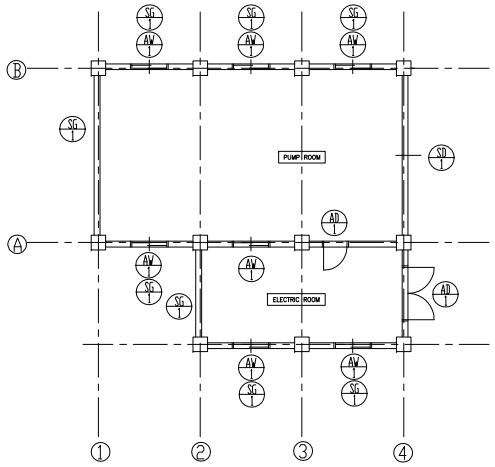


DA-PS-03	STRUCTURAL PLAN AND SECTION VIEW OF MA'ADI PUMP SUCTION TANK
	ポンプ井構造図（マアディポンプ場）

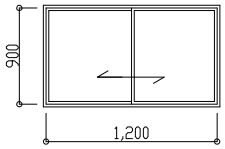


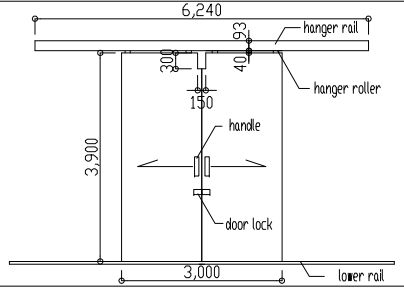
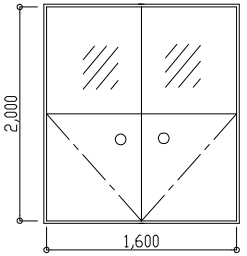
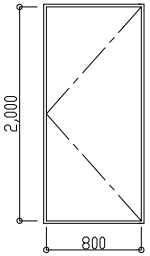
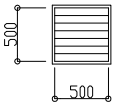
DA-PS-04	SINGLE LINE DIAGRAM OF MA'ADI P/S
	ポンプ場単線結線図（マアディポンプ場）

DOOR AND WINDOWS SCHEDULE IN MAADI PUMP STATION



KEY PLAN

MARK QUANTITY	AW 1 Double sliding window	7 P.C.S				
FIGURE						
ROOM	PUMP ROOM & ELECTRIC ROOM					
MATERIAL FINISH	Aluminum frame					
FRAME WIDTH	70					
GLASS	Clear Float Glass t=6mm					
HARDWARE	Aluminum sash accessories					
REMARK						

MARK QUANTITY	SD 1 both sliding door	1 P.C	AD 1 double swing door	1 P.C	AD 2 double swing door	1 P.C	SG 1 Louver	8 P.C.S
FIGURE								
ROOM	PUMP ROOM		ELECTRIC ROOM		PUMP ROOM		PUMP ROOM ELECTRIC ROOM	
MATERIAL FINISH	steel / oil paint						steel / oil paint	
FRAME WIDTH			70		70		70	
GLASS			Frosted Glass t=6mm					
HARDWARE	handle door lock hanger rail hanger roller 60φ lower rail		cylinder lock with grip ball hinge / door closer		cylinder lock with grip ball hinge / door closer			
REMARK	bracket :L-90×90							

DA-PS-05	DOOR AND WINDOWS SCHEDULE IN MAADI PUMP STATION
	ポンプ場建具表（マアディポンプ場）