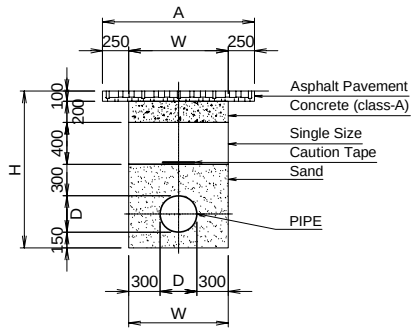
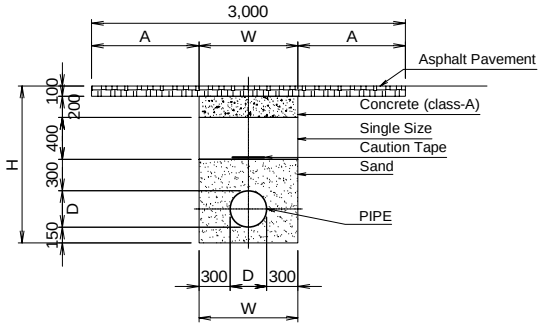
TYPICAL SECTION A-1
for Main Road



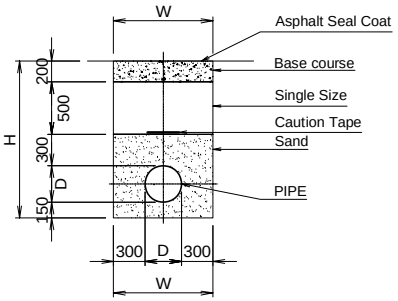
D	80	100	150	200	250	300	350
H	1,230	1,250	1,300	1,350	1,400	1,450	1,500
W	680	700	750	800	850	900	950
A	1,180	1,200	1,250	1,300	1,350	1,400	1,450

TYPICAL SECTION A-2
for Main Road Crossing



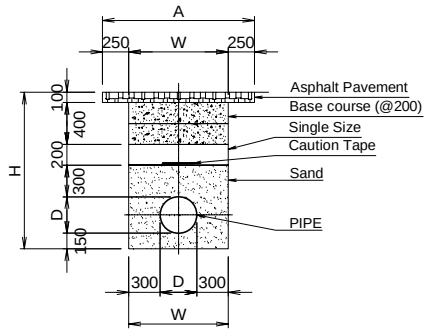
D	80	100	150	200	250	300	350
H	1,230	1,250	1,300	1,350	1,400	1,450	1,500
W	680	700	750	800	850	900	950
A	1,160	1,150	1,125	1,100	1,075	1,050	1,025

TYPICAL SECTION D
for Agricultural Road / Side Walk



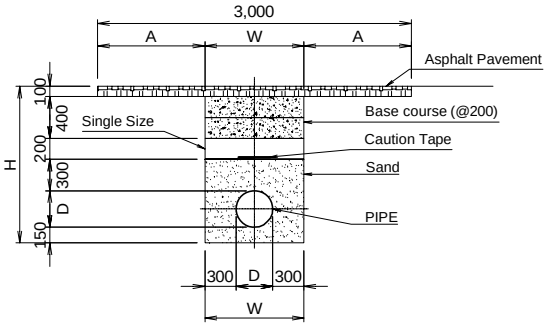
D	80	100	150	200	250	300	350
H	1,230	1,250	1,300	1,350	1,400	1,450	1,500
W	680	700	750	800	850	900	950

TYPICAL SECTION B-1
for Minor Road



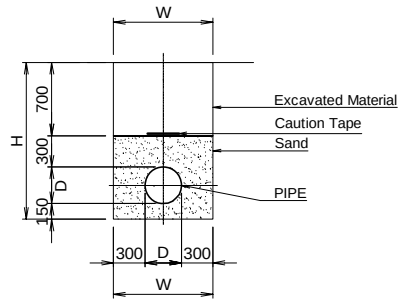
D	80	100	150	200	250	300	350
H	1,230	1,250	1,300	1,350	1,400	1,450	1,500
W	680	700	750	800	850	900	950
A	1,180	1,200	1,250	1,300	1,350	1,400	1,450

TYPICAL SECTION B-2
for Minor Road



D	80	100	150	200	250	300	350
H	1,230	1,250	1,300	1,350	1,400	1,450	1,500
W	680	700	750	800	850	900	950
A	1,160	1,150	1,125	1,100	1,075	1,050	1,025

TYPICAL SECTION E
for Non pavement Area

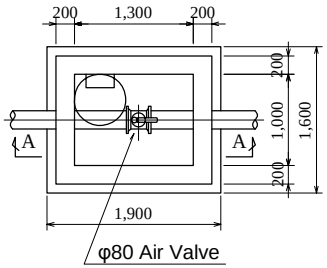


D	80	100	150	200	250	300	350
H	1,230	1,250	1,300	1,350	1,400	1,450	1,500
W	680	700	750	800	850	900	950

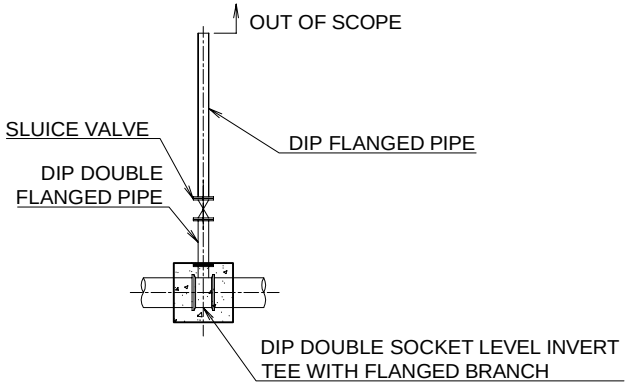
JTMP - TD - 01

Main Pipeline Typical Section Drawings

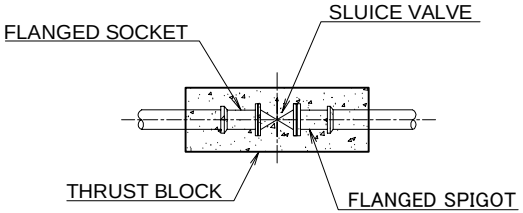
PLAN



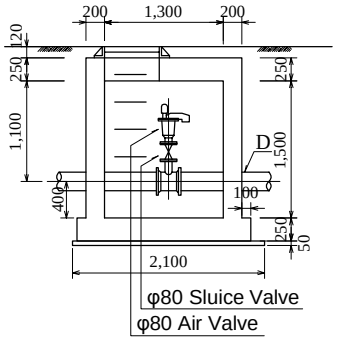
WASH OUT PLAN



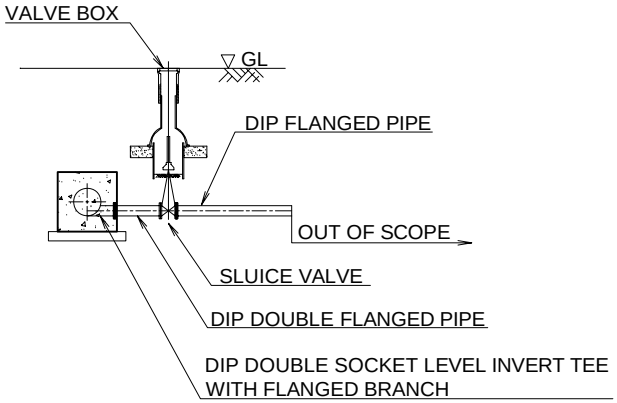
SLUICE VALVE



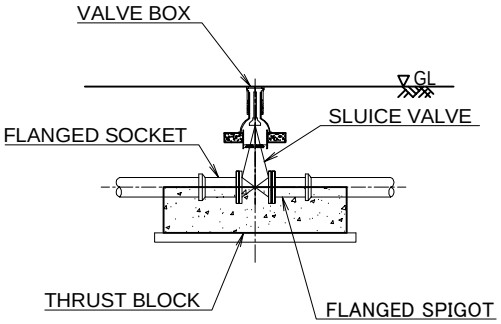
SECTION A-A



SECTION



SECTION

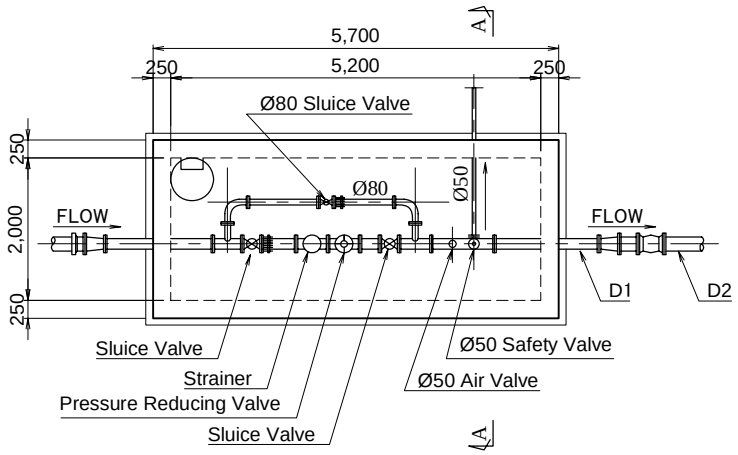


JTMP – TD – 02

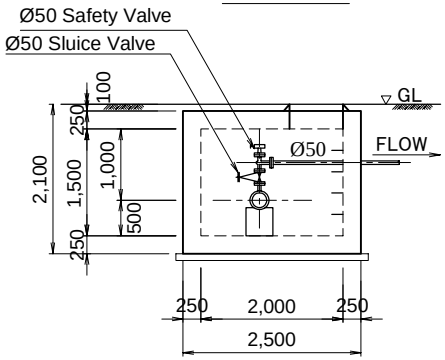
Typical Installation Drawings of Valves

PRESSURE REDUCING VALVE CHAMBER

PLAN



SECTION A-A

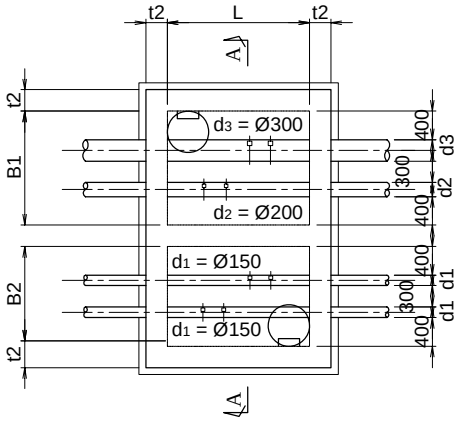


Size of Pipes & PRV

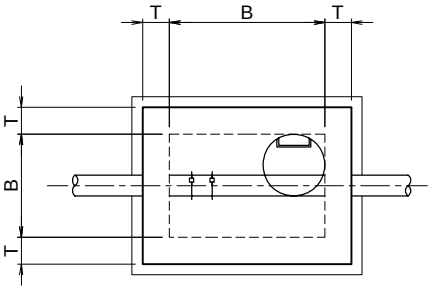
D1	D2
φ80	φ80
φ80	φ100
φ100	φ150
φ150	φ200

FLOW METER CHAMBER

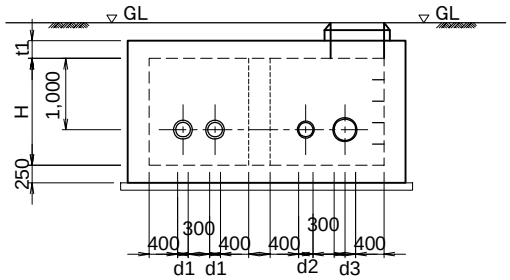
PLAN



PLAN

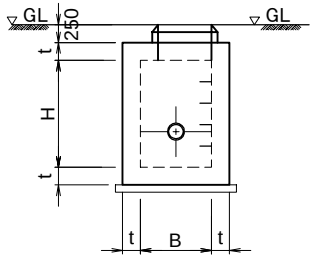


SECTION A-A



d1	d2	d3	B1	B2
Ø150	Ø200	Ø300	1600	1400
t1	t2	t3	L	H
250	250	300	2000	1400

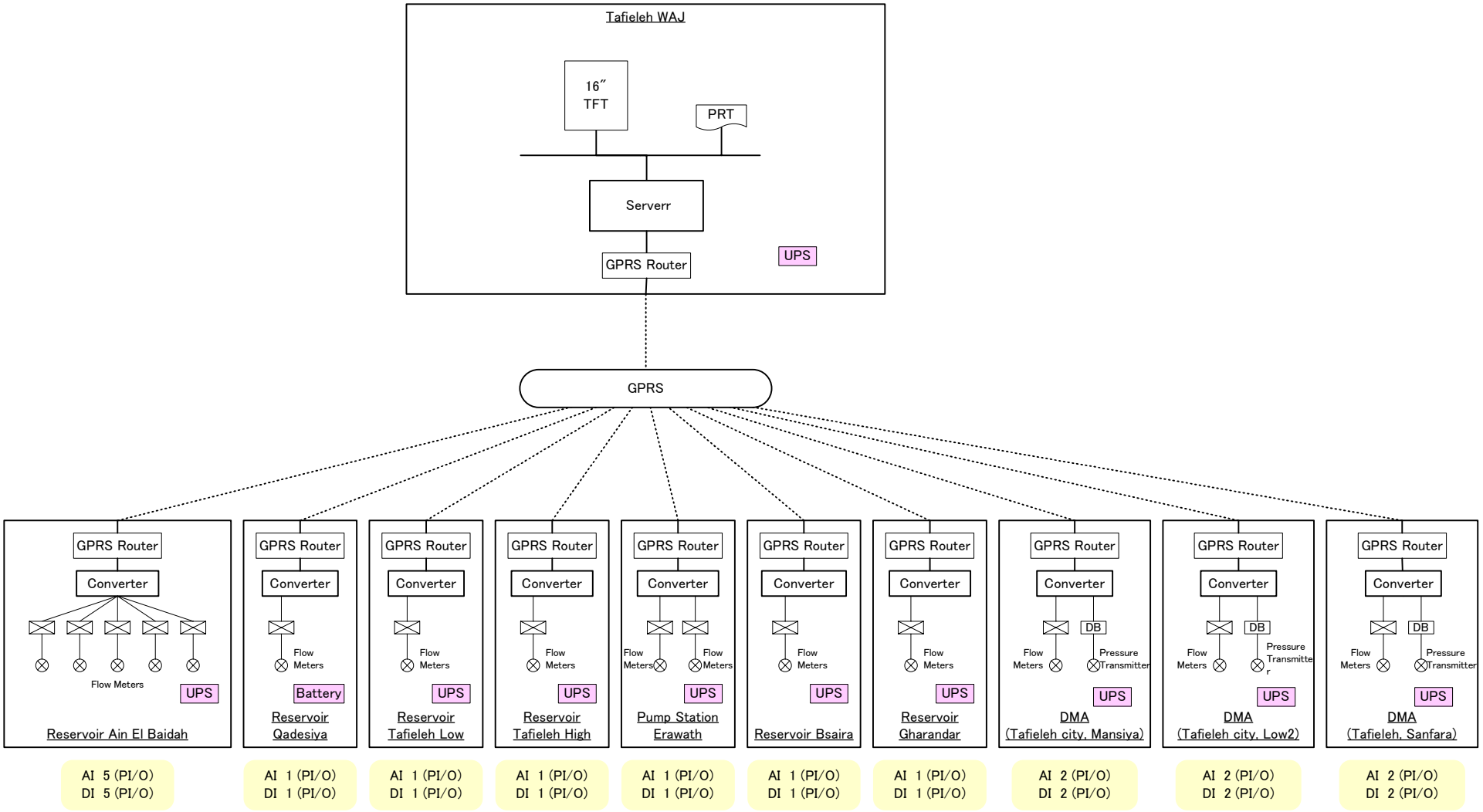
SECTION A-A



D	t	L	B	H
Ø100	250	1500	1000	1300
Ø150	250	1500	1000	1300
Ø200	250	1500	1000	1400
Ø250	250	1500	1000	1400
Ø300	250	1500	1200	1500
Ø400	250	1500	1200	1500

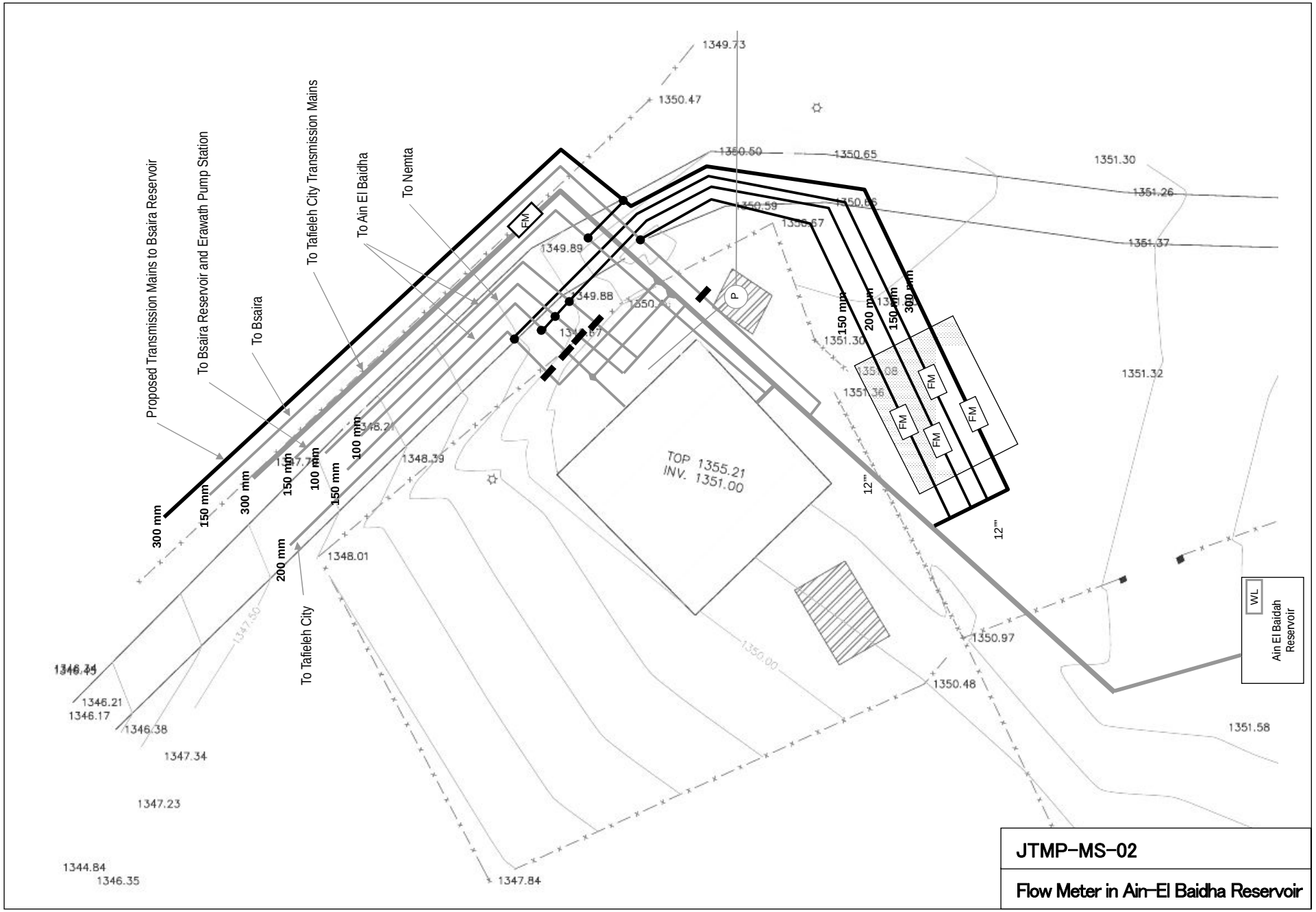
JTMP - TD - 03

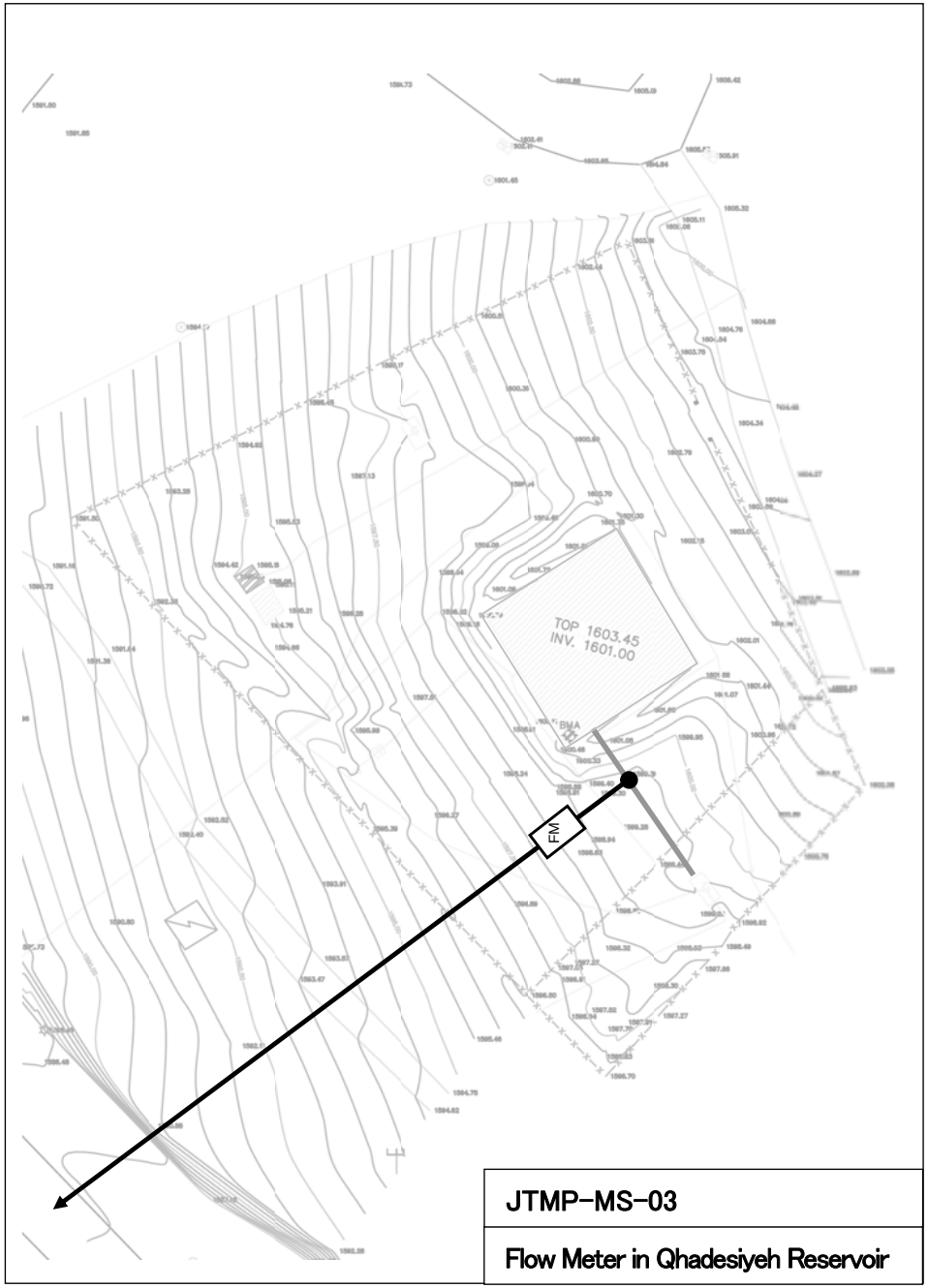
Typical Drawings of PRV Chamber and FM Chamber



JTMP – MS – 01

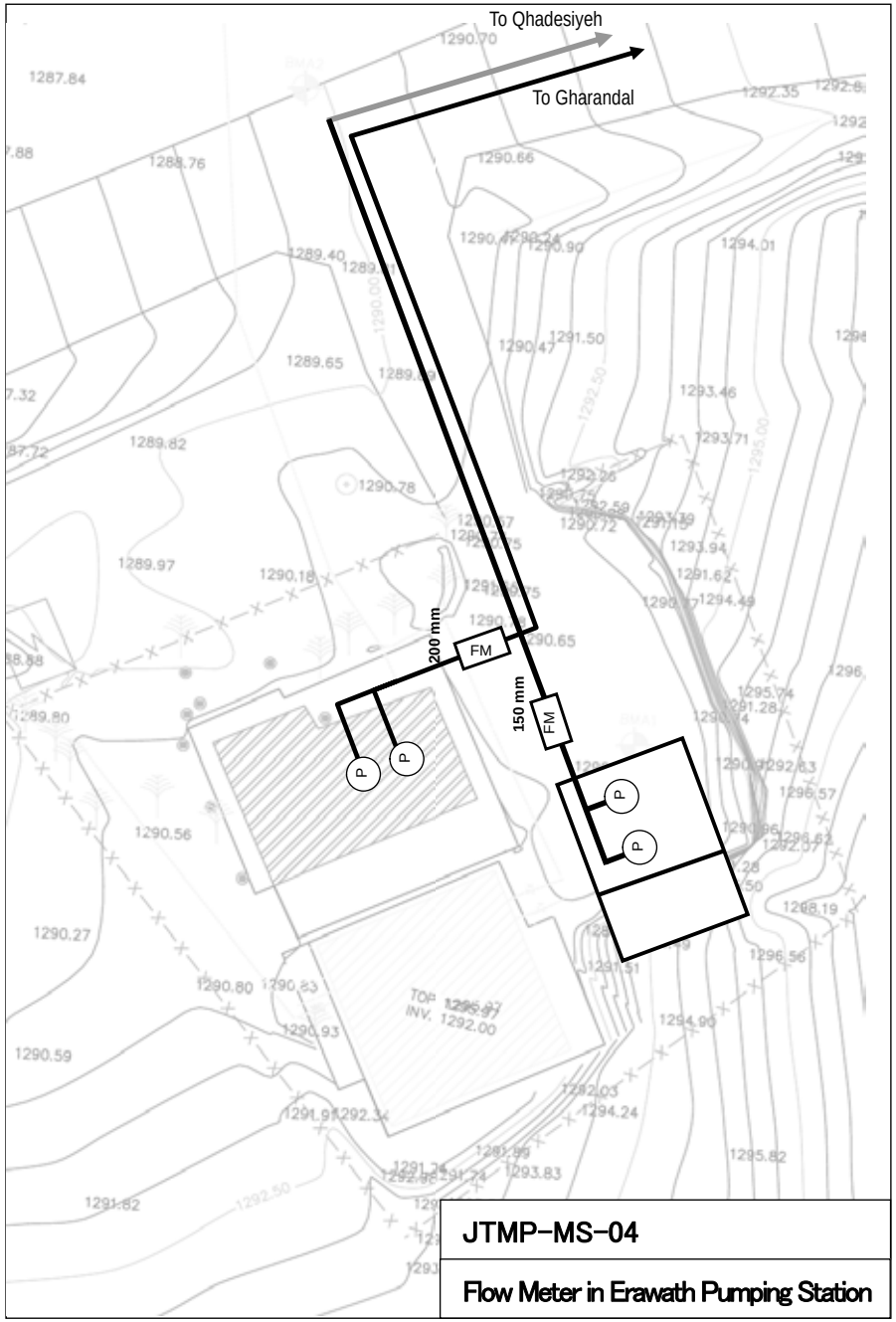
Distribution Monitoring Equipment


Proposed Transmission Mains to Bsaira Reservoir
To Bsaira Reservoir and Erawath Pump Station
To Bsaira
To Tafileh City Transmission Mains
To Ain El Baidha
To Nemta
To Tafileh City
300 mm
150 mm
300 mm
150 mm
100 mm
150 mm
100 mm
200 mm
150 mm
200 mm
150 mm
300 mm
FM
P
TOP 1355.21
INV. 1351.00
WL
Ain El Baidah Reservoir
1349.73
1350.47
1350.50
1350.65
1351.30
1351.26
1350.59
1350.66
1350.67
1351.37
1349.89
1349.88
1351.30
1351.32
1351.36
1348.21
1348.39
1348.01
1350.97
1350.48
1351.58
1350.00
1347.50
1346.21
1346.17
1346.38
1347.34
1347.23
1344.84
1346.35
1347.84
JTMP-MS-02
Flow Meter in Ain-El Baidha Reservoir



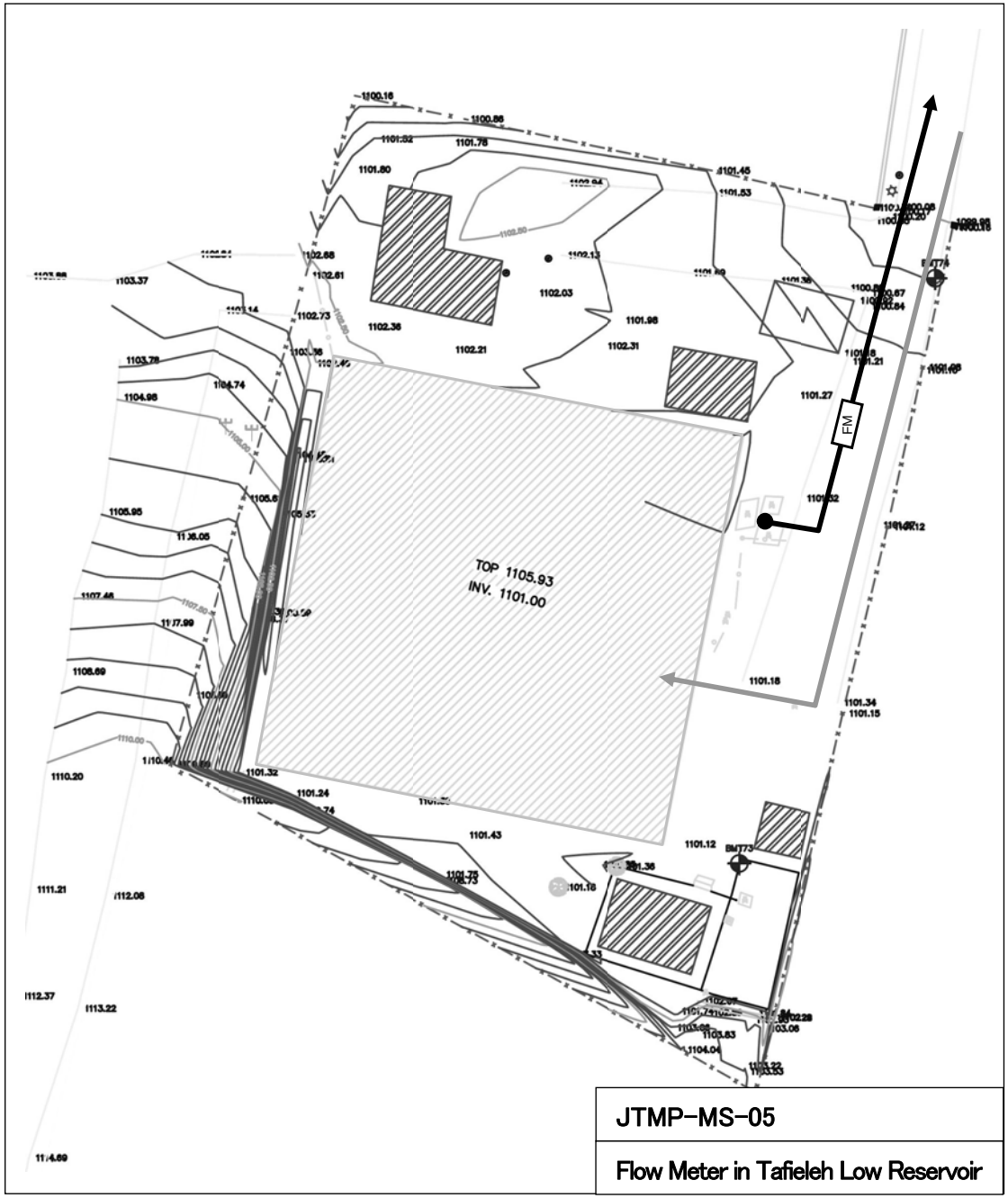
JTMP-MS-03

Flow Meter in Qhadesiyeh Reservoir



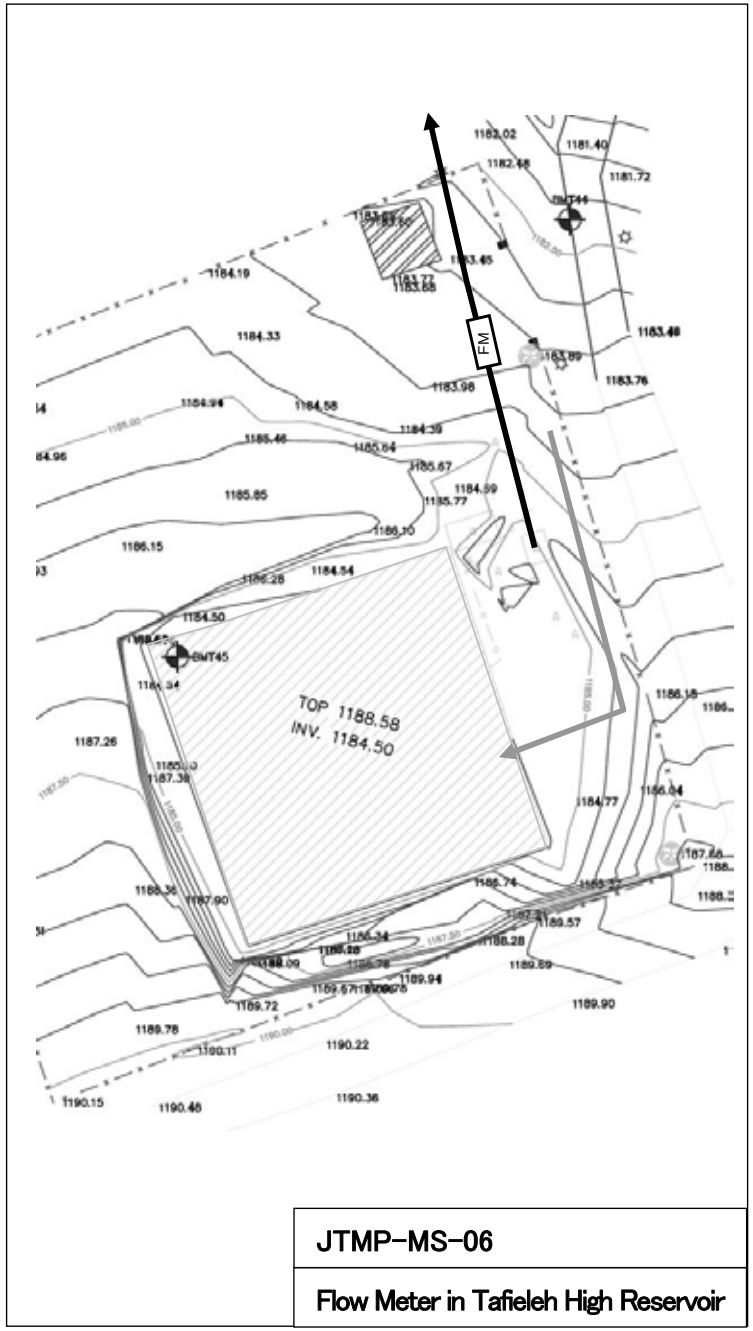
JTMP-MS-04

Flow Meter in Erawath Pumping Station



JTMP-MS-05

Flow Meter in Tafieleh Low Reservoir



JTMP-MS-06

Flow Meter in Tafieleh High Reservoir

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

This project will be implemented in accordance with the framework of Japan's grant aid scheme. Following approval by the Governments of Jordan and Japan, the Exchange of Notes (E/N) regarding the detail design will be signed to initiate the actual implementation process of the project. Subsequently, Water Authority of Jordan (WAJ); the implementation agency of the Government of Jordan, will conclude a contract with a Japanese consultant and construction company, and the detail design and construction work will be implemented.

Considering the framework of grant aid and the content of construction of facilities, the construction plan will be formulated for the project to which aid is applicable, in accordance with the basic guidelines below.

(1) Project Implementing Entity

The national organization in Jordan responsible for the supervision related to this project will be the Ministry of Water and Irrigation (MWI). The WAJ will take up the role of the organization implementing the project under this Ministry. The WAJ is responsible for the water supply and sewerage project of the whole country. It consists of 8 Directorates. The responsible department related to design and construction work in this project is the Technical Affairs Directorate, and the operation and management after completion of the facilities will be implemented by the WAJ Tafieleh office, belonging to South Water Administration.

(2) Consultant

The Japanese consultant company will conclude an agreement with the project-implementing agency of the Government of Jordan, and will perform the detail design and work supervision. The consultant will also prepare the tender documents, will examine the tenderer’s qualifications, and assist in the tendering work for selecting the contractor by open tender. After the start of construction of the facilities, the consultant will supervise the construction from an objective standpoint and also ensure that the grant aid is being appropriately utilized.

(3) Contractor

In accordance with the framework of Japan’s grant aid scheme, the Japanese contractor selected through open tendering will carry out the construction of facilities according to the construction plan.

As the construction work is to be performed at a remote site quite different from the social environment and social background in Japan, the contractor is required to possess adequate capability to complete the work overseas. Furthermore, since this plan requires the use of locally-procured materials and equipment, and work in congested urban areas, the contractor shall be adequately aware of the local market, local labor laws, the geography of the place, and the local customs and acceptable practices.

The contractor will maintain a proper communication system even after handing over the facilities after completion of the project since after sales services such as response to breakdowns and procurement or replacement parts will be necessary during maintenance and management after completion of the project.

2-2-4-2 Implementation Condition

The precautions to be taken related to the formulation of the construction plan are as given below.

(1) Construction of Transmission and Distribution Pipelines

The routes for laying the pipelines include main trunk roads and service roads where the traffic volume is high; thus, third-party safety measures, measures against effects of traffic, and measures against existing buried objects become important. Considerations are necessary for preventing any adverse effects on the activities of the local industries and businesses as far as possible.

The work of laying pipelines in sections other than main trunk roads and urban areas should be performed during the daytime by the open-cut method. The work of laying pipelines in sections within the urban areas and main trunk roads will be performed by the open-cut method at night time considering the industrial and business activities at the site.

The work of laying pipelines will be critical path in the project due to the long length. Therefore, the effective construction sequence of the work of laying pipelines in each area is considered and the necessary and rational construction period is calculated.

(2) Renewing pump station equipment

The work of renewing the pumping equipment will be implemented while the existing Erawath pumping station is operating, therefore, the plan will be made to renew pumps so that water cut to water supply areas are avoided.

Before the work of renewing the pumping equipment, the work of expansion pumping station will be

completed and new pumping station should be operable. During the work of renewing the pump equipment, water shall be transmitted to Gharandal and Qhadesiyeh from new pumping station and the work of renewing of the pumping equipment can be made by stopping the existing pump equipment.

(3) Procurement of materials

Basic materials, such as cement, aggregate and reinforcement bars etc. is able to be procured in the local markets. However, ductile iron pipes for transmission and distribution pipelines is not possible to be procured in the local markets; thus, it should be imported from the third countries or Japan. The pump equipments also should be imported from third countries or Japan.

Basic labor force and construction machines is able to be procured in the local markets, however, the contractors which has ability to meet with specifications and quantity of the project have an office in Amman. Therefore, the procurement of engineers and construction materials is assumed to take in Amman.

2-2-4-3 Scope of Works

The scope of works by Japan and by Jordan is shown in Table 2-41.

Table 2-41 Demarcation of Construction Works of Facilities between the Two Countries

Construction/Procurement & Installation	Japan	Jordan
1. Construction work of distribution reservoir		
(1) To acquire the land for reservoir construction sites and to reclaim and level the land before the start of construction work by Japanese side		●
(2) To construct distribution reservoirs	●	
(3) To supply primary power of required capacity		●
(4) To acquire land for access road of reservoirs in Gharandal and Bsaira before August 2011		●
(5) To construct access road to the reservoirs in Gharandal and Bsaira before the start of construction work by Japanese side		●
(6) To construct road paving, lighting, vegetation, fencing, gates, etc., within the site		●
(7) To lay drain pipe from the site to discharge place (Japanese side will lay it within the site boundary.)		●
2. Renewing and expansion work of pumping station		
(1) To renew existing pump equipment	●	
(2) To provide, reclaim, level the land for expansion pumping station in the site of existing pumping station		●
(3) To construct expansion pumping station	●	
(4) To supply primary power of required capacity and install a transformer with a transformer panel or replace existing ones		●
3. Installation work of transmission and distribution pipeline		
(1) To install transmission pipelines	●	
(2) To install distribution pipelines (Diameter more than 100 mm)	●	
(3) To procure pipe materials (Outer diameter 63 mm)	●	
(4) To design pipelines to be installed by Jordanian side		●
(5) To install distribution pipelines to be procured by Japanese side (Outer diameter 63 mm)		●
(6) To install house connections (diameter 25 mm and 20 mm) and customer water meters		●
(7) To coordinate for required approvals and permissions to implement construction works, procedure for traffic control during construction period in the road		●
(8) To cooperate in piping work, such as coordination in water cut off, communication for water cut, presence at site in piping works when required, etc.		●
4. Installation work of distribution monitoring system		
(1) To secure the land for installation of equipment		●
(2) Installation work of monitoring system for distribution flow	●	
(3) To supply primary power of required capacity		●
5. Soft-component		
(1) To provide required equipment for implementation of soft component and training room		●
(2) Implementation of soft-component	●	
6. Common items for construction works		
(1) To provide temporary stock yards for construction materials and machineries and lands for temporary works		●
(2) To take all necessary measures to secure disposal sites for excavation debris and drains for wastewater from construction works		●
(3) To provide necessary water and chemicals (chlorine) for trial operation of the facilities constructed		●

2-2-4-4 Construction Supervision Plan

(1) Work supervision system of consultant

The consultant will supervise and offer guidance to the contractor to achieve "completion of construction of facilities within the predetermined work period," "the work indicated in the contractual drawings," and "implementation of safe work." Furthermore, the consultant also has the role of supervising and confirming from a neutral standpoint that the construction of the facilities is being implemented appropriately under the framework of grant aid.

1) Main supervisory duties of consultant

The description of the main supervisory duties that the consultant is required to perform is given below.

a) Progress control

The consultant will confirm the validity of the progress chart submitted by the contractor, compare the actual progress of construction of facilities with the progress shown in the progress chart, and confirm the progress status of the work daily, monthly and weekly. If delay is a cause for concern, the consultant will issue a warning to the contractor. If a delay occurs, the consultant will study and investigate the causes and measures together with the contractor, and will guide the contractor in the adoption of the required measures. The work supervision will include the following:

- Checking the amount of work done
- Results of input and output of important materials and equipment
- Results of input and output of engineers, workers, etc.

b) Quality control

The quality of facilities and work specified in the agreement is ensured. If there is concern about ensuring quality, the consultant will issue a warning to the contractor and also request that the required modifications and measures be adopted. Quality supervision will be implemented using the measures below.

- Verification of catalogs, specifications, and manufacturing drawings of materials and equipment
- Site inspections, such as inspection of rolling, reinforcing bar arrangement, and concrete strength during work
- Site checks of work implementation status, work methods, etc., and guidance
- Witnessing of trial operation and inspection of performance

c) Safety control

The consultant will perform the validity check of the safety control plan of the contractor and check its implementation status. The consultants will supervise the work on site beforehand to prevent accidents at work and accidents to a third party. Quality control will be implemented using the measures below.

- Confirm the measures for safety control plan and the presence of a safety control manager appointed by contractor
- Confirm the validity of the safety control plan proposed and the safety manager appointed by contractor
- Confirm the status of progress of the safety control plan
- Check the scheduled operating route of work vehicles, confirm the validity of precautions during operation, and adherence to the plan
- Check the content of the benefit system for workers and confirm that holidays and recesses are being enforced

The routes for bringing in construction materials and equipment, and the time of transporting the same will be appropriately arranged. Measures such as arranging adequate watchmen during day and night times will be adopted.

2) Work supervision system

The consultant will build the necessary work supervision system for implementing work supervision with the focus on quality control and safety control of the processes mentioned above, and will aim to implement work in the plan smoothly. In this case, work supervision considering the gist of the basic design is necessary, therefore, a system consistent with the series of tasks of basic design, detail design and work supervision will be built. The consultant will build the supervision systems mentioned below since work supervision needs to be implemented in both Japan as well as at the site.

a) On-site work supervision

Since it is important to confirm that the construction work is being performed appropriately under the framework of grant aid, the work supervision on site needs to be performed by Japanese engineers who thoroughly understand the grant aid scheme. The Japanese work supervision system on site considered necessary for this plan is shown in the table below. During the work period, the quality of work will be confirmed by engineers in charge of design and the chief consultant, who hold together the entire project including work within Japan, and who will give instructions such as warnings to the work supervisors at the appropriate time. The consultant will also employ local engineers, and

implement work supervision using the local engineers together with the Japanese engineers.

Table 2-42 Japanese Supervision Organization in the Site

Job title	Field	No. of travels	Responsible for
Work supervision engineer (Chief consultant)	1.5	3	Overall work supervision, checking kick-off meetings, site conditions, delivery on site, construction overview in each year, client communication and defect liability inspection
Resident representative supervision engineer	22.5	3	Resident supervision in the period of construction
Civil construction work supervision (Structure)	10.0	1	Supervision during the construction of reservoirs and pumping station.
Mechanical equipment work supervision (Pump equipments)	2.0	2	Supervision work for mechanical equipments of pump and its final inspection
Electrical equipment work supervision (Pump equipments)	2.0	2	Supervision work for electrical equipments of pump and its final inspection
Electrical equipment work supervision (Monitoring system)	1.0	1	Supervision work of monitoring system for distribution
Completion inspection	0.23	1	Inspection for completion
Total	39.23	13	

b) Work supervision in Japan

Systems necessary for overall supervision of the project mentioned below will be maintained in Japan, and the overall work supervision including work at site and work in the country will be supervised.

- Checking the contents of the agreement and the process, progress, and quality
- Studies to resolve issues that have occurred on site and instructions to contractors
- Technical and financial assistance for consultant's local offices

(2) Contractor's work control system

Part of the work on distribution reservoir and installation of transmission and distribution pipelines can be given to on-site subcontractors also, but PC work must be performed by Japanese experts and skilled technicians. Laying of transmission and distribution pipelines are performed in trunk roads near important facilities and buildings, therefore, strict safety controls are necessary.

For this reason, contractors with extensive overseas experience in similar work with overall quality, process and safety controls must be selected. The resident and short term engineers of contractors required according to the scale and type of the facilities of the project may be as assumed below.

Table 2-43 Contractor's Work Control System

Job title	Responsible for
On-site representative	As a responsible person in the large scale project in the Tafieleh Governorate, on-site representative is in charge of discussions with national organizations of Jordan and with relevant constriction companies, checks and adjustments of various work ranges and processes, formalities such as work permits, overall work control including contraction work, labor, and safety.
Office Manager	On-site labor control, financial control, procurement of materials and equipment, transportation control, and general administrative aspects related to fulfilling the contract.
Chief Engineer (Pipelines) Test pit, Southern areas, overall	Responsible for test pit survey, laying work in Bsaira, Gharandal and Qhadesiyeh, progress control, quality control and safety control related to distribution pipeline work. The engineer who has throughout experience of urban civil engineering and laying work of pipelines should be dispatched since laying work of distribution pipelines is implemented in urban area, and should manage construction work in plural sites. Construction site is distant place from Amman where WAJ and government office of approval and license place, therefore, chief engineer supervises and assists on-site representative.
Civil engineer (Distribution reservoirs and pumping station)	Responsible for construction work of Bsaira reservoir and Gharandal reservoir, and renewing and expansion work of Erawath pumping station, and responsible for quality control.
Civil engineer (Pipeline) Tafieleh city	Responsible for laying work of distribution pipelines in Tafieleh. The engineer who has a through experience of urban civil engineering and laying work of pipelines should be dispatched since laying work of distribution pipelines is implemented in urban area, and should manage construction work in plural sites
Civil engineer (Pipeline) Transmission pipeline	Responsible for quality control of construction for transmission pipeline, schedule management and safety management and for management of construction work in plural sites
Mechanical and electrical equipment engineer	Responsible for installation of pump equipment, electrical equipment, instrumentation equipment and pipelines in the pumping station, implementation of trial operation and OJT. Mechanical and electrical equipment engineers are required throughout experience of mechanical and electrical works including the technical acknowledge for verification performance of wire, electrical cable, gauge.

The contractor will also employ local engineers, and implement work control using the local engineers together with the Japanese engineers mentioned above.

2-2-4-5 Quality Control Plan

This plan requires quality control of various works such as pipe laying work in congested urban areas, distribution reservoir work that requires high water-tightness and durability. The control items to be implemented for quality control of important works are shown in Table 2-44.

Table 2-44 Quality Control Plan

Type of work	Control item	Method	Standard
Pipe materials	Strength and size Lining and painting	Factory inspection Visual inspection	Japanese standards
Pipe laying work	Joint accuracy Leakage	Clearance gauge measurement Leak test	Japanese standards
Paving work	Base course	CBR test	Japanese standards
Foundation work	Soil bearing capacity	Plate bearing test	Japanese standards
Concreting work	Concrete quality	Mixing test Compressive strength test Air test Aggregate test	Japanese standards
Reinforcement	Strength Reinforcing bar arrangement	Tensile test, bending test Reinforcing bar arrangement test	Japanese standards
Waterproofing work	Paint quality Paint film thickness Leakage	Confirmation of quality control certificate Film thickness test Water filling test	Japanese standards
Machinery installation work	Installation accuracy Functions	Measurement of installed position Actual load operation test	Japanese standards
Electrical equipment installation work	Installation accuracy Functions	Measurement of insulation resistance Sequence interlocking test	Japanese standards

2-2-4-6 Materials and Equipment Procurement Plan

(1) Locations for procurement of materials and equipment

1) Labor

Ordinary laborers and general skilled laborers (carpenters, plumbers, etc.) will be hired locally by the contractor.

2) Materials and equipment

General construction materials and equipment such as cement and reinforcing bars can be procured locally. Ready-mixed concrete can be supplied from the ready-mixed concrete plant in Ma'an city. Since ductile cast iron pipes and valves are not being manufactured in Jordan, these items will be

procured from Japan or third countries. Pump equipments and monitoring equipments for distribution water are also not manufactured in Jordan and these equipments will be procured from Japan or third countries.

3) Construction machinery

No companies that lease construction machinery exist in Jordan, but general construction machinery such as large breakers, backhoes, bulldozers, dump trucks and truck cranes can be leased from local construction companies. Procurement companies that offer construction machinery at economic prices will be scheduled considering the lease rate, transportation cost, and number of days for which the machinery is offered.

Considering the local conditions mentioned above, the procurement items of main materials and equipment to be used in the project are shown in Table 2-45.

Table 2-45 Procurement Plan for Main Materials and Equipment

Item	Local	Japan	Third Country	Remark
Materials and equipment				
Cement	O			
Reinforcing bars	O			
Aggregate	O			
Concrete form materials and timbering work materials		O		
Scaffolding and support materials		O		
Polyethylene pipe	O			
Ductile cast iron pipe		O	O	
Valves		O		
Base course material	O			
Asphalt	O			
Mechanical equipments (Pump)		O		
Electrical equipment (Power receiving, control equipment)	O	O	O	
Instrument equipment (flow meter, water level gauge)		O	O	
Construction machinery				
Backhoes	O			
Breaker	O			
Truck cranes	O			
Trucks with crane	O			
Dump truck	O			
Road sprinkler	O			
Motorgrader	O			
Compactor	O			
Concrete pump vehicles	O			
Vibrating roller	O			
Tamper	O			
Concrete cutter	O			
Engine generator	O			
Air compressor	O			

(2) Transportation plan

Machinery and electrical parts the quality of which may deteriorate during transportation will be adequately packaged in cases, straight pipes and large-sized materials and equipment will be packaged in bundles or as bare packages, considering long-term transportation by sea, loading and unloading at ports, and transport on land to the project area of the materials and equipment procured from Japan and third countries. The unloading port in Jordan is only Aqaba port. Accordingly, the imported materials and equipment will be unloaded at Aqaba port and transported over land to the project area.

2-2-4-7 Operational Guidance Plan

The contractor shall prepare for the operation and maintenance manual for the facilities and equipment, and implement the operational guidance.

- Renewing and expansion pumping station (1 month each)
- Monitoring system for distribution water

In addition to basic operational guidance for equipment of distribution monitoring system, the distribution management for the entire water supply system should be implemented through soft-component. The detail of soft-component is mentioned below.

2-2-4-8 Soft Component Plan (Technical Assistance Plan)

(1) Study guidelines for soft component plan

In JICA's technical cooperation project to improve non-revenue water measures, the reinforcement of maintenance capability with the focus on improving non-revenue water measures has been implemented since 2005, and is currently in Phase 2 (February 2009 to July 2011). The description of the technical cooperation project is given below.

Description of JICA technical cooperation project

Phase 1: 2005 to 2008

- Basic technology transfer related to non-revenue water measures (reduce leakage, replace meters)
- Technology transfer of implementation and formulation of measures for non-revenue water in the pilot zone
- Improvement in public awareness

Phase 2: 2009 to 2011

- Reinforcement of water distribution network management ability as a measure against non-revenue water
- Provision of system for installing service pipes and water meters
- Reinforcement of relationship between WAJ and residents in relation to measures for non-revenue water

During the study of soft components in this project, the use of results of the technical cooperation project and synergy effects may be anticipated.

When this grant aid project is implemented, a waterworks system with the features below will be completed capable of effectively implementing non-revenue water measures.

- Water transmission and distribution system will be separated, water distribution zones under each distribution reservoir will be clearly defined, and the distribution pressure will be correctly controlled
- The water distribution zones will be clarified, pressure reducing facilities (pressure-reducing valves) will be installed, and water supply pressure will be controllable
- Flow meters will be installed at the entrance of each water distribution zone, and monitoring and control of distribution amount from each water distribution zone will be enabled.

Currently, the water supply system is operated and water is being transmitted and distributed by experience and intuition, but because of the grant aid facility, management of transmission and distribution amounts of each water distribution zone, and management and control of water distribution pressure will become possible, thus enabling efficient water operations.

As a result, the technology acquired through the pilot project, which is a part of the technical cooperation project, can be applied to the entire system. However, the ability of WAJ staff has not improved to a level that can be used in the entire water supply system; therefore, the soft components must be used to support the improvement of skills to adopt non-revenue measures that can be applied to the entire water supply system.

Moreover, distribution pipeline network data, maintenance data and customer data are all important data for efficiently implementing non-revenue water measures. During this outline design survey, topographic data, elevation data, cadastral map data and waterworks data (year of construction, performance, capacity, pipelines, etc.) were collected after preparing the GIS base map, and the GIS distribution pipeline network database was prepared. The utilization of GIS is effective in implementing and managing effective non-revenue water measures. Using this GIS database, support can be given to managing water distribution and adopting effective non-revenue water measures.

The relationship among the improvements of the technical cooperation project, utilization of GIS distribution network data prepared in the outline design survey, the planned facilities of the grant aid project and the soft components are conceptually shown below.

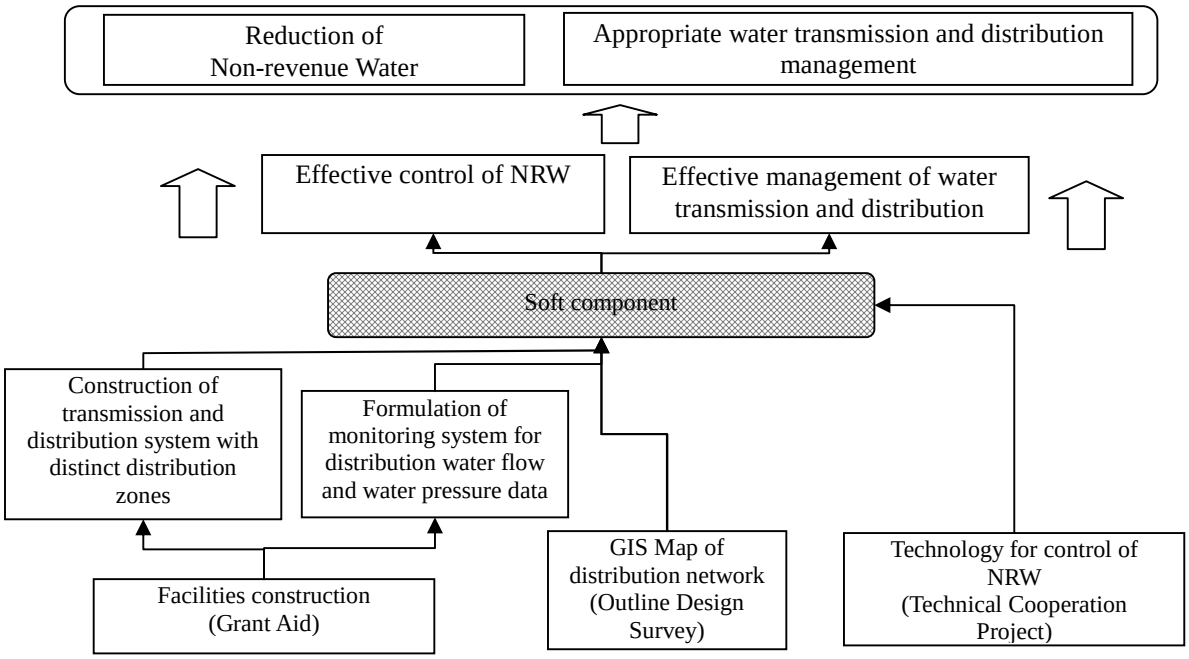


Figure 2-17 Relation between Various Components

(2) Necessity of introducing soft component

1) Problems in non-revenue water management and water distribution management

The problems in non-revenue water management and water distribution management for the target zones are as shown in Figure 2-18 (problem analysis tree). The main problems are as below.

a) Since the water transmission and distribution system is not appropriate, non-revenue water management and distribution management are not effective. (covered by construction of facilities in the grant aid project)

b) Non-revenue water management technology is inadequate. (covered by skills improved in the technical cooperation project)

c) Water distribution management skills are lacking.

- Water distribution data management skills are lacking.
- Skills for analyzing hydraulic conditions in the water distribution pipeline network are lacking.

Of the above, a) will be improved by construction of facilities (hard component) in the grant aid project. With regard to b), there are plans to improve skills in the technical cooperation project being

currently implemented. c) is likely to remain as a topic for improvement; therefore, it will be supported by soft components for improving the skills

Causes of lack of water distribution management skills include inability to manage distribution pressures in distribution zone, inability to adopt preventive measures for water leakage, and inability to propose and implement plans for non-revenue water management. Furthermore, as a consequence, other causes include inappropriately high supply pressure, frequent leakage accidents, existence of unsatisfactory water supply areas, high leakage ratio and non-revenue water ratio, inability to distribute water fairly. Finally, sound development of the water supply works is being hindered.

2) Necessity and role of soft component

In this project, new water transmission and distribution system will be built. However, the implementation effects of this plan cannot be demonstrated continuously and to the maximum extent if daily distribution control of each water distribution zone, management and utilization of water distribution data, periodic renewal of distribution pipeline network data, maintenance and renewal of appropriate distribution networks are not continuously implemented. The existing technical skills of WAJ Tafieleh are not sufficient for implementing such work continuously. Therefore, the staff of the implementing organizations in Jordan (WAJ Tafieleh) should be trained and their water distribution management skills should be upgraded.

More specifically, support for activities related to effective water distribution management and formulation of plans may be considered by managing water leakage through preparation of GIS database for leakage locations, repair locations, and unsatisfactory water supply locations, and by utilizing GIS and pipeline network analyses. Moreover, a system of distribution zoning, and recording and transmitting of the distribution amount (including water pressure to some extent) to WAJ Tafieleh will be constructed. In addition to the utilization of GIS, this system is to be used to support transfer of technology so that non-revenue water and distribution management including leakage management can be effectively implemented.

3) Objectives of soft component

In the soft component, “the project for improvement of distribution management capacity,” composed of following 3 programs, will be implemented to improve distribution management capability of WAJ Tafieleh.

a) Program to upgrade GIS management skills for water distribution pipeline network data
b) Program to upgrade water distribution data management skills
c) Program to upgrade planning skills for water transmission and distribution and non-revenue water management using distribution data

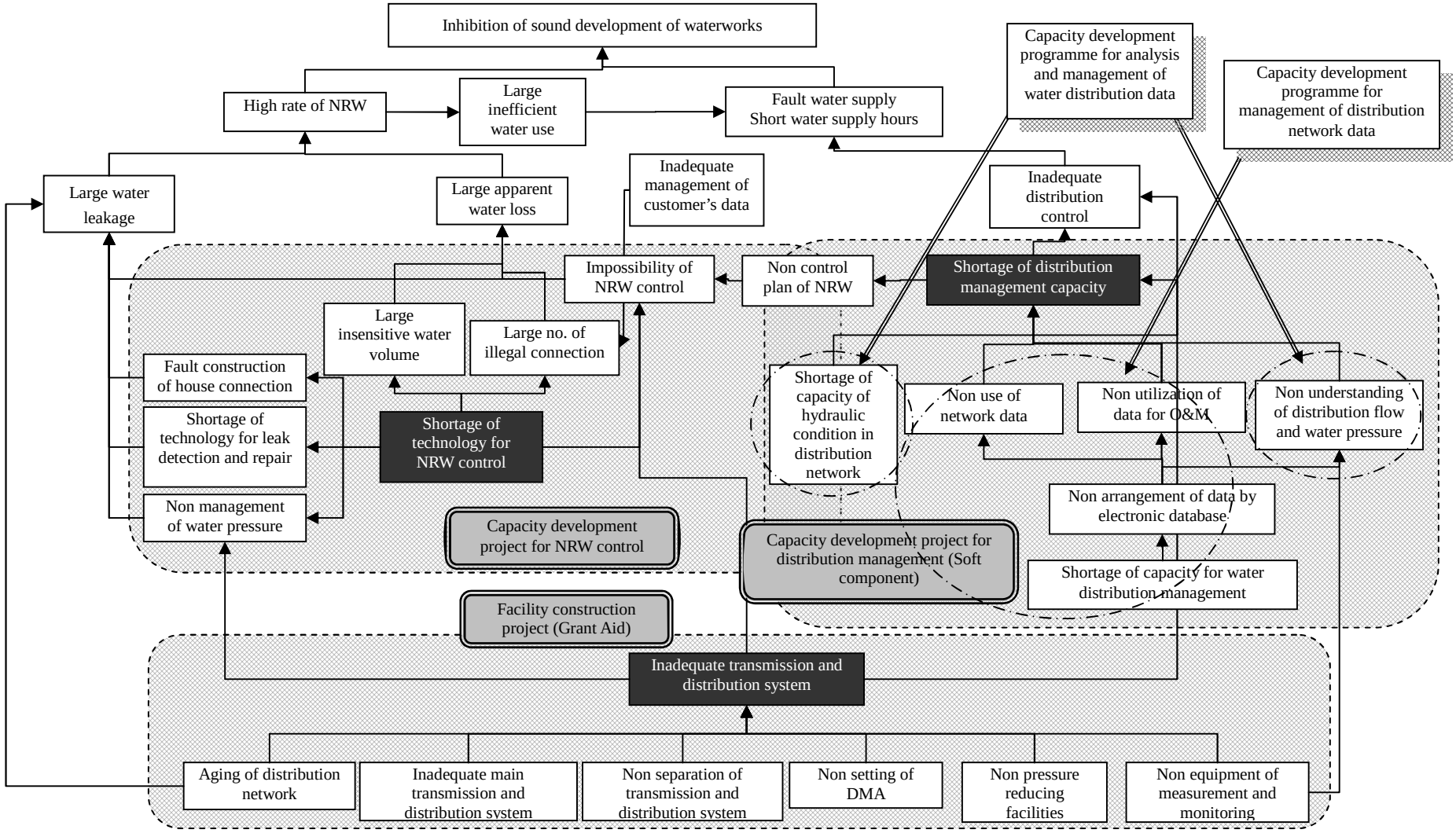


Figure 2-18 Problem Analysis Tree and Goal Chart

(3) Project planning

1) Objectives

The objectives of soft component are to upgrade skills so that water distribution management and non-revenue water management can be efficiently implemented by upgrading skills related to management of distribution pipeline network data and operation and maintenance data, distribution management including management and analysis of water distribution data. The overall goal is to reduce non-revenue water and to fairly distribute water in the service areas.

2) Outputs

The outputs of implementation of soft components may be classified as below. Skills related to water distribution management will be upgraded by achieving the three results mentioned below.

a. The conditions of distribution pipeline network can be better understood using GIS.
   ① Updated information on pipelines will be reflected on GIS maps.
   ② Operation and maintenance data will be reflected on GIS maps. (Water leak complaints, leak repair locations, unsatisfactory water supply locations, meter replacement locations, illegal connection locations, etc.)

b. Hydraulic conditions of water transmission and distribution systems can be better understood.
   ① Water transmission and distribution amounts and distribution pressure data can be managed by computer.
   ② Technology of network analysis can be transferred, and hydraulic conditions can be understood by simulating distribution pipeline networks.

c. Water transmission and distribution data can be utilized in managing water distribution management and non-revenue water management.
   ① Using the data in water distribution management
   ② Using the data in non-revenue water management

3) Activities

The detailed activities include the items indicated below.

Table 2-46 Detailed Activities of Soft Component

No.	Activity
1)	Preparations
①	Domestic preparations
D-1	Preparation of transfer of technology plans
D-2	Test preparation, questionnaire preparation, training text (draft) preparations
②	Implementation preparations and introductory technical briefing
②-1	Training room establishment, C/P meeting, implementation preparations, briefing preparations
②-2	Selection of trainees (pre-test training, questionnaire, evaluation, selection)
②-3	Implementation briefing
2)	Distribution pipeline network data GIS management
①	Pipeline network data update
①-1	Explanations and input method for pipeline network mapping input data
①-2	Input of pipeline network data updates (OJT)
①-3	Tabulation, charts and analyses of pipeline networks
②	GIS visualization of operation and maintenance data
②-1	Preparation of input format for operation and maintenance data
②-2	Input of operation and maintenance data (OJT)
②-3	Analysis and utilization of operation and maintenance
3)	Water transmission and distribution management data
①	Analysis and utilization of water transmission and distribution data
①-1	Collection of water transmission and distribution data (OJT)
①-2	Analysis (OJT) and utilization of water transmission and distribution data
②	Pipeline network model construction and simulation
②-1	Simulation method for water transmission and distribution pipeline network (EPANET2)
②-2	Construction of new water distribution zone model
②-3	Pipeline network analysis (water pressure, water amount, flow direction) and analysis of results of new water distribution zone
4)	Water transmission and distribution management
①	Using data for water transmission and distribution management
②	Using data for non-revenue water management
5)	General report
①	Technology transfer seminar
①-1	Technology transfer seminar preparations
①-2	Technology transfer seminar
②	Preparation of reports and provision of manual
② -1	Soft component evaluation
② -2	Preparation and submission of general report

4) Staff and organization

The following staff members are to be assigned for implementing the soft component:

Table 2-47 Staff Assignment Plan

Field	No. of persons	Belonging to	Description
Water distribution management experts	1	Japan	The water distribution management technology of Japan is to suit the technical level of the trainees and conditions on site. The following items are to be implemented: ・ Preparation of text for training, implementation of training ・ Preparation and evaluation of tests and homework reports ・ Provision of various formats ・ Implementation of seminars ・ Data collection, editing and modeling ・ Evaluation
Trainees	3	WAJ Tafieleh office	To be selected from the candidates by WAJ persons in charge and Japanese experts

The necessary qualifications of water distribution management expert to be dispatched to Jordan are as below.

- Can use proposed mapping GIS software and pipeline network analysis software
- Has fully understood pipeline network hydraulics
- Can propose water transmission and distribution operation plans
- Has the skills to manage training programs.

5) Soft component implementing stages

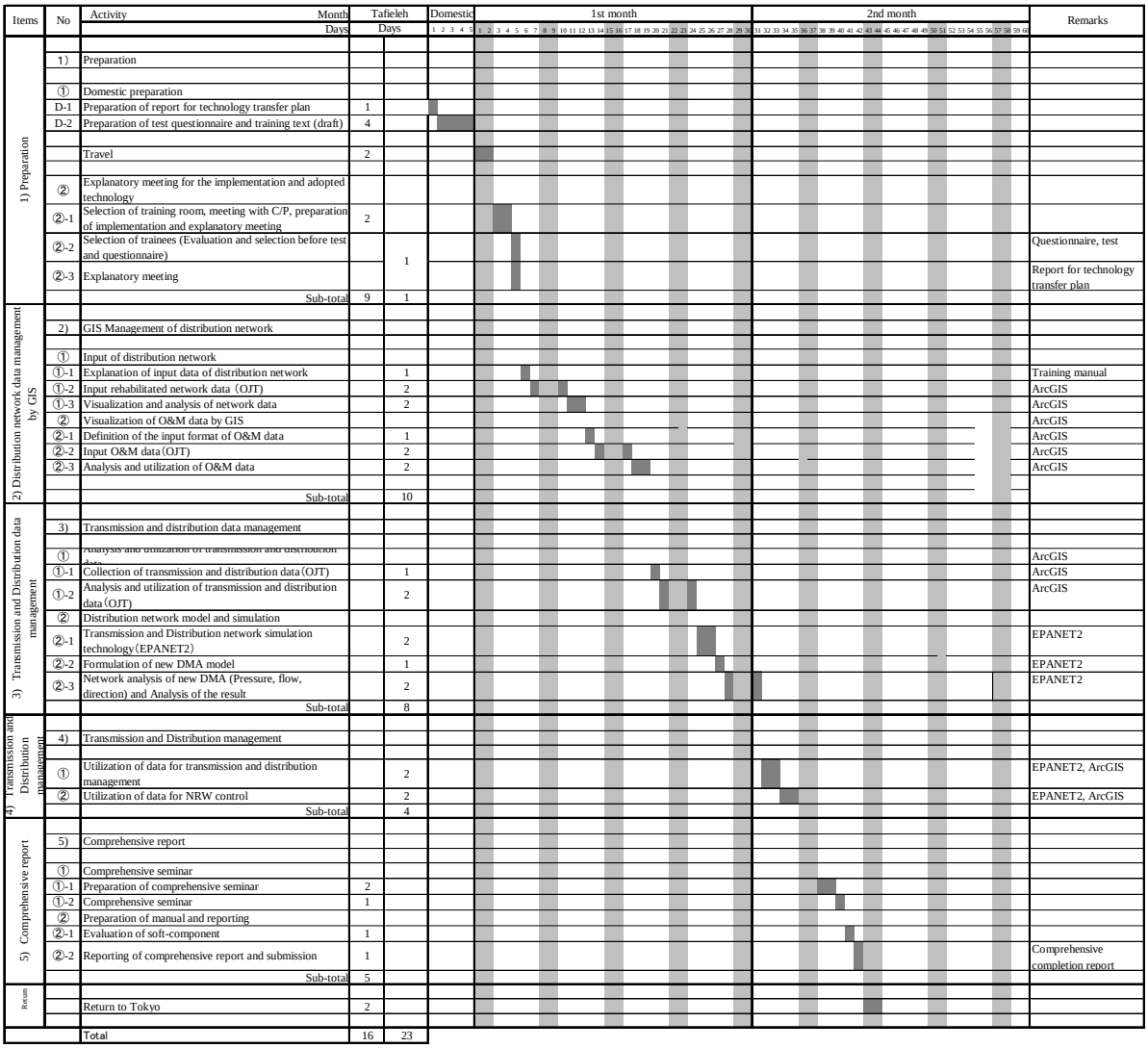
The construction work of the main facilities will be implemented in twenty two and half months. The implementation of the soft component will require distribution amount and water pressure data measured in the planned facilities. Accordingly, the soft component will be implemented after facilities for which data can be collected are completed. The entire stage will take approximately one and half months. The implementation plan is shown in Figure 2-19, while the detailed activity plan is shown in Figure 2-20. The number of required man-days shown in the table of detailed activity plan is as given below.

・No. of actual work days: 39 days (domestic preparations 5 days; on-site 34 days)

・Equivalent man-months: Domestic preparation time: 0.17 MM; dispatch period: 1.47 MM

NO.	Activities	Japan	In Jordan 1st month	In Jordan 2nd month
1)	**Preparations**			
①	Domestic preparations	▬		
②	Implementation preparations and introductory technical briefing		▬	
2)	**Distribution pipeline network data GIS management**			
①	Pipeline network data update		▬▬	
②	GIS visualization of operation and maintenance data		▬	
3)	**Water transmission and distribution management data**			
①	Analysis and utilization of water transmission and distribution data		▬	
②	Pipeline network model construction and simulation		▬	
4)	**Water transmission and distribution management**			
①	Using data for water transmission and distribution management			▬
②	Using data for non-revenue water management			▬
5)	**General report**			
①	Technology transfer seminar			▬
②	Preparation of reports and provision of manual			▬

Figure 2-19 Implementation Plan of Soft Component



Items	No	Activity	Month	Tafieleh	Domestic	1st month	2nd month	Remarks
			Days	Days		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 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60	
1) Preparation	1)	Preparation						
	①	Domestic preparation						
	D-1	Preparation of report for technology transfer plan	1					
	D-2	Preparation of test questionnaire and training text (draft)	4					
		Travel	2					
	②	Explanatory meeting for the implementation and adopted technology						
	②-1	Selection of training room, meeting with C/P, preparation of implementation and explanatory meeting	2					
	②-2	Selection of trainees (Evaluation and selection before test and questionnaire)		1				Questionnaire, test
	②-3	Explanatory meeting						Report for technology transfer plan
		Sub-total	9	1				
2) Distribution network data management by GIS	2)	GIS Management of distribution network						
	①	Input of distribution network						
	①-1	Explanation of input data of distribution network		1				Training manual
	①-2	Input rehabilitated network data（OJT)		2				ArcGIS
	①-3	Visualization and analysis of network data		2				ArcGIS
	②	Visualization of O&M data by GIS						ArcGIS
	②-1	Definition of the input format of O&M data		1				ArcGIS
	②-2	Input O&M data（OJT)		2				ArcGIS
	②-3	Analysis and utilization of O&M data		2				ArcGIS
		Sub-total		10				
3) Transmission and Distribution data management	3)	Transmission and distribution data management						
	①	Analysis and utilization of transmission and distribution data						ArcGIS
	①-1	Collection of transmission and distribution data（OJT)		1				ArcGIS
	①-2	Analysis and utilization of transmission and distribution data（OJT)		2				ArcGIS
	②	Distribution network model and simulation						
	②-1	Transmission and Distribution network simulation technology（EPANET2）		2				EPANET2
	②-2	Formulation of new DMA model		1				EPANET2
	②-3	Network analysis of new DMA (Pressure, flow, direction) and Analysis of the result		2				EPANET2
		Sub-total		8				
4) Transmission and Distribution management	4)	Transmission and Distribution management						
	①	Utilization of data for transmission and distribution management		2				EPANET2, ArcGIS
	②	Utilization of data for NRW control		2				EPANET2, ArcGIS
		Sub-total		4				
5) Comprehensive report	5)	Comprehensive report						
	①	Comprehensive seminar						
	①-1	Preparation of comprehensive seminar	2					
	①-2	Comprehensive seminar	1					
	②	Preparation of manual and reporting						
	②-1	Evaluation of soft-component	1					
	②-2	Reporting of comprehensive report and submission	1					Comprehensive completion report
		Sub-total	5					
Return		Return to Tokyo	2					
		Total	16	23				

Figure 2-20 Detailed Activity Plan

6) Implementation location

The training is to be implemented in a room arranged with GIS computer and flow monitoring computer in the WAJ Tafieleh office. The provision of these training rooms is the responsibility of Jordan.

7) Equipment and software

- Counterpart
  - ① 3 computers and basic software; other accessories – 1 set (responsibility of Jordan)
  - ② Laser printer and Plotter (use printer and plotter owned by implementing organization)
  - ③ Mapping GIS software ArcView (use equipment (equipment donated by the Technical Cooperation Project) owned by implementing organization)

- Japanese side
  ① Pipeline network analysis software EPANET2

8) Method of confirming outcome achievement level

The outcome achievement level by soft component can be verified by the methods below. Out of 3 trainees, 2 are to satisfy all the achievement levels listed below. The target is to be approved as a water distribution management manager.

Program	Method of verifying outcomes	Indicator of outcome achievement level
Level before training	Grasp the level before training by a small test	None
Mapping of distribution pipeline network	Small test on mapping technique Tabulation of pipeline network data, drawing charts, submission of interpreted reports	70 points and above 70 points and above
Management of water distribution data	Tabulation of water distribution data, drawing charts, submission of interpreted reports	70 points and above
Analysis of distribution pipeline network	Submission of EPANET2 case study report	70 points and above
General water distribution management	Submission of reports on water distribution management and operation plans	70 points and above

9) Outcomes

The following reports and outcomes are to be prepared and submitted:

Report	Description	Timing
Transfer of technology plan (in English)	Description, achievement target, detailed schedule, implementation method, etc. of soft component	At the start
Completion Report (in English with Japanese summary)	General report including description of transfer of technology, results of upgrading skills, training evaluation, etc., transfer of technology manual, photos, GIS, and pipeline network data	At completion
Outcomes		
Pipeline network data	One set of GIS pipeline network mapping data	At completion
Pipeline network analysis model	EPANET2 pipeline network analysis model	At completion
Distribution data collection	Input distribution data	At completion
Manuals	Mapping manual Pipeline network analysis manual Distribution data input and management manual	At completion
Others	Teaching records, outputs, training texts	At completion

10) Implementation of lectures, training and seminars

Lectures and training are to be planned by Japanese experts, documents prepared and then implemented. On the other hand, in case of seminars, Japanese experts will present the overview and evaluation, but case studies and description of training will always be presented by trainees after they prepare documents based on lectures, training materials and reports. Japanese experts are to offer advice related to preparation of documents. During the preparation of documents, they are to follow up on the training agenda and check (evaluate) the outcome of the training.

11) Technology transfer seminar

Objectives:

① Based on the implemented transfer of technology, the trainees are to prepare documents for presentation at the seminar, and then do the presentation. This would help the trainees to become familiar with the content of the training program. The experts are to follow up the training and evaluate it by preparation of documents and through presentations. If necessary, the experts are to offer proposals and suggestions.

② The technology transferred and related to water distribution management techniques are to be shared by the entire WAJ.

Description:

① Summarization of the training by experts

② Presentation by trainees (main topics: pipeline network data analysis, distribution data analysis, operation and maintenance data analysis, pipeline network analysis simulation and operation plan for water transmission and distribution)

For:

Altogether 50 persons expected including representatives of the WAJ head office, persons associated with the WAJ head office (Study and Design Directorate), persons associated with the WAJ Tafieleh office, general participants, JICA, Embassy of Japan, and trainees.

Location:

To be held at one location, either at Tafieleh city or Amman. The location should be finally decided by the person in charge at WAJ.

12) Duties of Jordanian side

a. Probability of implementation

The personnel in charge of the WAJ head office know that efficient water distribution and non-revenue water management are possible when the completed facility is utilized more effectively

by soft components. The desire to participate and cooperate at the level of the personnel in charge is high, and the possibility of implementation is likewise high. No new operation and maintenance equipment are necessary for this component, and the existing equipment below are sufficient. The probability of implementation is high if the staff participate.

- Use computer equipment, software, printer, etc.
- Ensure training location
- Use ArcGIS

b. Factors causing obstacles and its countermeasures

Since there is no training room, it is necessary to ensure training space in the office.

To ensure that the training is successful, the trainees need to have appropriate knowledge beforehand. The WAJ Tafieleh office and the experts must select the trainees carefully. The following are the necessary conditions for selection of trainees:

- Should have experience in water distribution management
- Should have interest in the training program
- Should be able to communicate in English
- Should be familiar with basic operations of the computer
- Should be familiar with basic operations of basic software (MS-Excel and MS-Word)
- Should be able to devote adequate time for training (at least 3 hours per day)
- Should have experience in using GIS software.

(1) Project Design Matrix

Table 2-48 shows the Project Design Matrix (outline) of the soft component.

Table 2-48 Soft-Component Project Design Matrix（PDM）

Project:	The Project for Rehabilitation and Improvement of the Water Facilities in Tafieleh Governorate in the Hashemite Kingdom of Jordan		Period: From December, 2013 to February, 2014
Target Area	Jordan, Governorates of Tafieleh	Target Group:	Engineers and technicians in WAJ of Tafieleh	Date: October, 2010

Narrative summary	Objectively verifiable indicators	Means of verification	Important assumptions
Overall goal 1. Reduced NRW and leakage ratio 2. Fair (equitable) water distribution	1. To reduce the water leakage rate from 25% (presumed) to 15% in Tafieleh 2-1 No area of excessively low water pressure 2-2 The water distribution pressure at 25m to 60m	1-1 Data of NRW rates from WAJ, Tafieleh 2-1 Data of grievances from WAJ, Tafieleh 2-2 Data of water pressure from WAJ, Tafieleh	• The Jordan side will implement the network rehabilitation plan continuously
Project purpose Establish capacity to effectively operate and maintain distribution networks including the management and analysis of network data, O&M data and distribution data	Three water distribution management engineers are trained and have enough skills and knowledge.	• Result of achievement test and reporting • Comprehensive report by Japanese expert	• Engineers participating in transfer of technology will keep working in WAJ Tafieleh
Outputs 1. Conditions of distribution network can be easily grasped by GIS. 2. Hydraulic characteristics of network can be easily grasped. 3. Conditions of networks can be easily grasped 4. Data of transmission and distribution can be utilized for the distribution management and reduction of NRW	1-1 Can browse required information of network by ArcGIS 1-2 Can collect data on condition of distribution network 2-1 Input the O&M data on distribution operation 2-2 Formulate distribution control system 3-1 Can utilize more than 70% functions of network analysis software EPANET2 3-2 Understand the distribution management of whole system 3-3 Understand the NRW control of whole system	1-1 Japanese expert will judge by test 1-2 Japanese expert will judge by test 2-1 Japanese expert will judge 2-2 Japanese expert will judge by test 3-1 Judged by test and report 3-2 Judged by test and report	• Data of present distribution network can be collected to the greater extent • The Jordan side cooperate during data collection
Activities 1-1. Input of network information 1-2. Visualization of O&M data by GIS 2-1. Utilization and Analysis of transmission and distribution data 2-2. formulation of network model and simulation 3-1. Utilization of input data for transmission and distribution management 3-2. Utilization of input data for NRW control	Input <u>The Japanese side</u> Human resources Expert for distribution management :3.0M/M Local consultants: Software EPANET2 (Software for network analysis) Machinery	<u>The Jordanian side</u> Human resources Engineers in WAJ (Trainees) Facilities Setting up the training room in WAJ Tafieleh Equipment 3 computers Printer and Plotter Software ArcGIS (Existing software)	• The Jordanian side allocate enough time to this component • Appropriate WAJ trainees are selected. • Appropriate experts is dispatched for the component

2-2-4-9 Implementation Schedule

Expecting implementation schedules is shown in figure below.

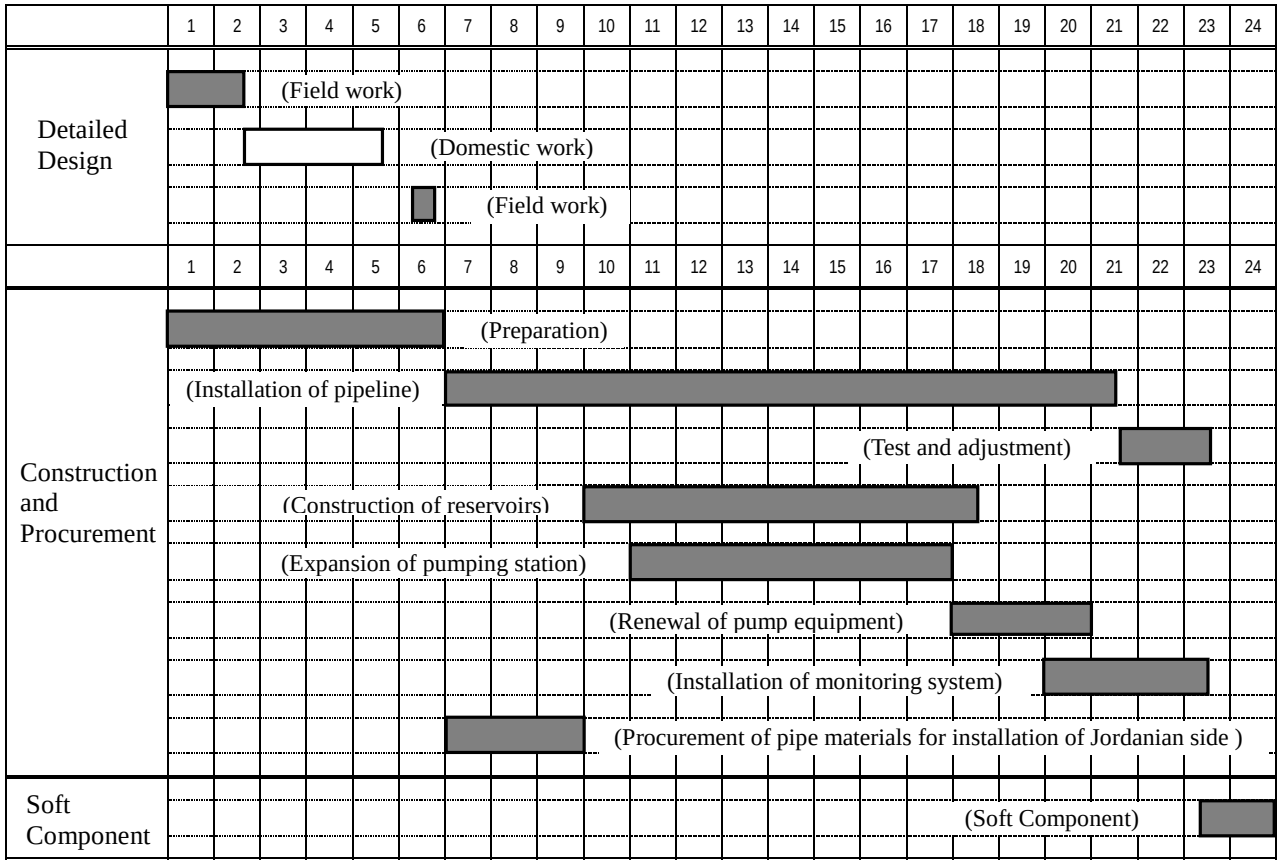


Figure 2-21 Implementation Schedule

2-3 Obligations of Recipient Country

The project is composed of Japanese cooperation and the works to be undertaken by Jordanian side with self-effort. The necessary measures and obligations with scheduling of Jordanian side activities for the project are listed as follows:

Table 2-49 Obligation of Recipient Country

Items
1. Installation work of distribution reservoir
(1) To acquire the land for reservoir construction sites and to reclaim and level the land before the start of construction work by Japanese side
(2) To supply primary power of required capacity
(3) To acquire land for access road of reservoirs in Gharandal and Bsaira before August 2011
(4) To construct access road to the reservoirs in Gharandal and Bsaira before the start of construction work by Japanese side
(5) To construct road paving, lighting, vegetation, fencing, gates, etc., within the site
(6) To lay drain pipe from the site to discharge place (Japanese side will lay it within the site boundary.)
2. Renewing and expansion work of pumping station
(1) To provide, reclaim, level the land for expansion pumping station in the site of existing pumping station
(2) To supply primary power of required capacity and install a transformer with a transformer panel or replace existing ones
3. Installation work of transmission and distribution pipeline
(1) To design pipelines to be installed by Jordanian side
(2) To install distribution pipelines to be procured by Japanese side (OD 63 mm)
(3) To install house connections (diameter 25 mm and 20 mm) and customer water meters
(4) To coordinate for required approvals and permissions to implement construction works, procedure for traffic control during construction period in the road
(5) To cooperate in piping work, such as coordination in water cut off, communication for water cut, presence at site in piping works when required, etc.
4. Installation work of distribution monitoring system
(1) To secure the land for installation of equipment
(2) To supply primary power of required capacity
5. Soft Component
(1) To provide required equipment for implementation of soft component and training room
6. Common Items for construction works
(1) To provide temporary stock yards for construction materials and machineries and lands for temporary works
(2) To take all necessary measures to secure disposal sites for excavation debris and drains for wastewater from construction works
(3) To provide necessary water and chemicals (chlorine) for trial operation of the facilities constructed
7. Other Items
(1) To check the necessity of Environmental Impact Assessment (EIA) to related authorities and, in case EIA is required, to conduct and complete it before March 2011.
(2) To coordinate for required approvals and permissions from relevant authorities to implement detailed design studies and construction works
(3) To cooperate in consultation with residents living near the construction sites and to coordinate procedures for traffic control in works with relevant authorities
(4) To carry out necessary procedures for issue of A/P required for payments to Japanese Consultants and Contractor and to bear the commissions for advising and payment to a bank in Japan for banking services based upon the Banking Arrangement
(5) To ensure prompt unloading and customs clearance of the goods for the project at the port of disembarkation in Jordan
(6) To accord Japanese nations whose services may be required in connection with the supply of products and services under the verified contract such facilities as may be necessary for their entry into Jordan and stay there for the performance of their works.
(7) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in Jordan with respect to the supply of the products and services under the verified contract. And to take necessary measures for such tax exemption.
(8) To use, operate and maintain properly the facilities and equipment constructed or procured under the Japan's Grant Aid program.
(9) To bear all the expenses, other than to be borne by the grant Aid, necessary for construction of the facilities

2-4 Project Operation Plan and Maintenance Plan

2-4-1 Basic Principle of Operation and Maintenance

Basic policies for operation and maintenance (O & M) of planned facilities are listed as following.

a) Pipelines and facilities planned in this project are the facilities which are currently operated and maintained by WAJ staff, and therefore, they can be operated and maintained by the existing staff without increase in the staff. . The number of water supply facilities will be increased. However, the O & M of the planned distribution would be much easier than the current complicated distribution system. Therefore, these facilities could be operated and maintained without any increase in the current number of the staff.

b) The capacity of water distribution management which is required for effective utilization of the planned facilities shall be improved through soft component.

c) It is planned to assign a distribution manager who will be responsible for distribution monitoring system, and planning and implementation of efficient management of distribution water, utilizing the monitoring system.

2-4-2 Assignment of Distribution Manager

The distribution manager will collect all the data and information related to water distribution system from the operation & maintenance department and other engineering departments and the collected information would be digitized and compiled in digital formats which could be used also for effective operation and maintenance activities for other department and for making distribution plans. The distribution manager will be trained through soft component. The following are responsibilities of distribution manager.

- To collect the data and information related to water distribution system from the other departments
- To collect water monitoring data and interpret the data for improvement of water distribution management
- To study for effective water transmission and distribution and prepare study reports
- To prepare annual water distribution plan
- To prepare a plan for effective operation of transmission pumps
- To prepare fair water rationing plan
- To disseminate the reports and plans with other department

2-4-3 Organization of Operation and Maintenance

The main component of the project is renewal of the existing water distribution system. The planned water supply system will reduce the effort of WAJ staff because planned transmission and distribution system will reduce daily valve operation for water rationing in the service area and water will be effectively distributed with less effort. In addition, leakage accidents will be reduced as water pressure is optimized. Therefore, the planned network will be operated within the current staff and additional staff is not required for maintenance work. Saved time for network maintenance can be used for preventive maintenance of network or to carry out active leakage control measures.

Currently, Erawath pumping station is operated by resident operation with one person with 4 sifts. The same organization structure will be kept for operation and the maintenance of rehabilitated and expanded pumping station. The operation and maintenance of planned 2 reservoirs in Bsaira and Gharandal will be carried out by patrol monitoring. Since technology transfer of distribution management will be carried out for existing staff through soft component, the distribution monitoring system will be utilized effectively. Operation and maintenance of monitoring system will be in charge of responsible person for distribution management.

(1) Facilities for Operation and Maintenance and Monitoring Items

Existing and planned facilities and its equipments under the project and their inspection methods and monitoring items are shown table below. These inspection items have already been implemented by WAJ staffs in daily basis and, therefore, the ability of operation and maintenance for planned facilities is sufficient.

Table 2-50 Major Facilities and Equipments for Management and Control

Facilities	Facility Name		Inspection system	Equipments for monitoring and control
Distribution reservoir	Existing	Tafieleh high	Routine patrol	Distribution management by open/close of valve, flow meter and water level gauge
		Tafieleh low	Routine patrol	
		Ain-El Baidha	Resident management	
		Qhadesiyeh	Routine patrol	
	New	Bsaira	Routine patrol	Distribution management by open/close of valve, flow meter and water level gauge
		Gharandal	Routine patrol	
Pumping station	Renewing and Expansion	Erawath	Resident management	Flow meter, pressure gauge and operation of ON/OFF
Pressure reducing valve	New	22 locations	Periodical inspection	
Monitoring system for water distribution	New	Flow meters: 15 locations, Pressure gauge: 3 locations	Periodical inspection	

(2) Periodical Inspection

The inspection items and period to be implemented in pumping station, distribution reservoirs, transmission pipelines and distribution pipelines are shown in below.

Table 2-51 Standard Inspections Items for Pumping Stations

Equipments	Inspection interval	Inspection items
Pumps	Daily inspection (in operation)	・ Daily operation record ① Recording of water transmission volume ② Visual check of various sections ③ Check for abnormal sounds ④ Check for axial temperature ⑤ Check for water leakage ⑥ Recording of suction and discharge pressures
	Monthly inspection	・ Check bearings (bearing oil deterioration, measuring of bearing temperature)
	Three-month inspection	・ Change bearing oil and replenish bearing grease ・ Measure shaft center accuracy ・ Measure vibrations and noise levels
	Six-month inspection	・ Change bearing grease and gland packing
	Annual inspection	・ Overhaul ・ Check accessories and auxiliary machines
Motors	Daily inspection (in operation)	・ Daily operation record ① Measure current value ② Visual check of various sections ③ Check for abnormal sounds ④ Check for axial temperature
	Six-month inspection	・ Replenish bearing grease ・ Measure vibrations and noise levels, axial temperature
	Annual inspection	・ Check bearings ・ Measure insulation resistance

Table 2-52 Periodical Inspection Items for Reservoirs

Inspection item	Inspection interval	
	Monthly	Annually
① State of water leakage, if any		○
② Damage due to uneven ground subsidence, etc.		○

Table 2-53 Periodical Inspection Items for Transmission and Distribution Pipes

Inspection item	Inspection interval	
	Monthly	Annually
① State of water leakage, if any		○
② State of ground subsidence, if any	○	
③ Conditions of valves, plugs and lids	○	
④ State of damage, if any	○	
⑤ Availability of emergency equipment and tools		○
⑥ Blow-off valve function	○	
⑦ State of interior of manholes	○	
⑧ State of damage to aqueduct painting, if any		○

Table 2-54 Periodical Inspection Items for Flow Meter and Pressure Reducing Valve

Equipment	Inspection items
① Flow meter	Should measure accuracy and correct proofs of equipments by periodical inspection and arrangement
② Pressure reducing valve	Should manage pressure reducing valve data (Setting pressure, manufacturer, installation year and date of periodical inspection, etc.) Periodical inspection by visual check for finding cavitation damages (Six-month inspection) Periodical inspection for soil removal of strainer

2-5 Project Cost Estimation

2-5-1 Initial Cost Estimation

The part of estimated costs for this project covered by Jordanian side is summarized in table below.

Table 2-55 Summary of Estimated Costs to be covered by Jordanian Side

Items	Project cost (thousand JD)	Remarks
1. Construction of reservoir (Bsaira reservoir and Gharandal reservoir)		
(1) Land acquisition and creation and leveling of land	32.7	Governmental land
(2) Supply of primary power of required capacity for the reservoirs	-	It is supplied by electric power company.
(3) Land acquisition for access road to the site and construction	51.6	Cost for land acquisition is not included.
(4) Road pavement in the site of reservoirs, setting of light, construction of fences, gates and planting along the site boundary of reservoirs	49.3	
(5) Construction of reservoir drain pipe from the boundary of reservoirs to the nearby existing discharge place	53.4	
(6) Provision of necessary water and chemicals (chlorine) for trial operation of the facilities constructed	3.6	
2. Construction of pumping station (Renewing and expansion of Erawath pumping station)		
(1) Provision of land for expansion of pumping station, and creation and leveling of land	-	Leveling by WAJ labour
(2) Supply of primary power of required capacity for the reservoirs (construction of power receiving equipment)	-	It is assumed to use WAJ reserve equipment.
3. Laying work of transmission and distribution pipelines		
(1) Laying work of distribution pipelines (OD 63 mm) procured by Japanese side and laying work of house connection	2,404.8	
(2) Laying work of house connection (diameter 25 mm and 20 mm)	4,829	
(3) Provision of necessary water and chemicals (chlorine) for trial operation of the facilities constructed	4.1	
4. Installation of monitoring system for water distribution		
(1) Supply of primary power of required capacity for the monitoring system	-	It is supplied by electric power company
(2) Commissions for issue of A/P (Authorization to pay) and B/A (Banking Arrangement) to a bank for banking services	5.0	
Total	7,433.8	

Note: The breakdown of the cost for laying work of pipelines is given in Data 11 in Appendix 6.

Estimated conditions

1) Date of Estimation : July 2010
2) Work Period : The work period for detailed design and construction is shown in the implementation schedule stated above.
3) Other : The estimation of the project cost is made in accordance with the grant aid scheme of the Government of Japan

2-5-2 Operation and Maintenance Cost

The biggest item of expenditure in WAJ Tafieleh is salary and wage. Electricity expense for pump operation is also share large portion of the total expenditure. In this section, operation and maintenance cost for newly constructed facilities and effect of decreasing of operation and maintenance cost by reduction of leakage and improvement in efficiency of existing pump equipment.

(1) Operation and maintenance cost of constructed facilities

Major operation and maintenance items for the planned facilities are operation of Erawath pumping station, routine patrol to each reservoir, repair of pipelines and maintenance of monitoring system for water distribution. The staffs already have been assigned for routine patrol, repair of pipelines and existing Erawath pumping station. Therefore, operation and maintenance for renewing and expansion facility can be implemented by current manpower and manpower cost will not increase.

Annual maintenance cost of Erawath pumping station in 2015 is estimated at 45 thousand JD in table below. It is 6.9% of electricity expense in WAJ Tafieleh and 2.1% of total maintenance cost; therefore, the capacity to pay operation cost is sufficient.

Table 2-56 Operation and Maintenance Cost of Erawath Pumping Station in 2015

Items	Transmission pump for Gharandal	Transmission pump for Qhadesiyeh	Total
Daily average water flow (m^3/d)	761	1230	1,991
Motor load (kWh)	32	88	120
Operation time(24 hours)	775	2,116	2,891
Annual electric power consumption (kWh)	282,973	772,443	1,055,416
Annual electric expense (JD)	12,168	33,215	45,383

(2) Effect of decreasing of operation and maintenance cost by reduction of water leakage

1) Reduction of water leakage by implementation of the project

Reduction volume of leakage with the project is estimated in table below. Reduction volume of leakage is 340 thousands m^3/year, equivalent of 47 % of the total leakage without the project.

Table 2-57 Reduction Volume of Water Leakage with and without the Project

Area	Water consumption (m^3/d)	Ave daily supply include leakage (m^3/d)	①Without the project (m^3/d)	②With project (m^3/d)	③Reduction ①－② (m^3/d)	Reduction (m^3/y)	ratio % ③/①
Tafieleh city	2, 959	3, 482	986	523	463	169, 105	
Bsaira	1, 298	1, 528	433	230	203	74, 071	
Gharandal	646	761	215	114	101	36, 877	
Qhadesiyeh	1, 045	1, 230	348	185	163	59, 458	
Total	5, 948	7, 000	1, 983	1, 052	930	339, 511	47%

2) Reduction of electricity expense by reduction volume of water leakage

Since water resource is ground water in the water supply systems in the Tafieleh Governorate and served area has hilly topographic feature, pump is required for intake of ground water, transmission and distribution of water. Electricity consumption per cubic meter of produced water is calculated from annual electricity consumption of intake and transmission pumping stations excluding distribution pump and annual total water discharge amount of intake pump. The result is shown in Table 2-58 and unit electricity consumption is 3.52 kWh/m^3. Multiplying the annual leakage reduction volume by unit electricity consumption, annual reduction of electricity consumption is estimated; furthermore, multiplying unit electricity charge, annual reduction of electricity cost is estimated. Reduction of electricity expense is 51 thousands JD as shown in Table 2-59.

Table 2-58 Electricity Consumption per Cubic Meter of Water Produced

Annual electricity consumption in 2009*1 (kWh/year)	Total intake water amount*1 (m^3/year)	Electricity consumption per 1 cubic meter of water produced (kWh/m^3)
14, 597, 565	4, 141, 955	3. 52

Source: *1 WAJ Tafieleh office data in 2009

Table 2-59 Estimation of Electricity Cost Reduction with and without the Project in 2015

Estimated annual reduction volume of leakage(m^3/y)	Annual reduction of electricity consumption (kWh/year)	Annual reduction of electricity cost with project (JD/year)	Without project		Reduction ratio %
			Electricity consumption (kWh/year)	Electricity cost (JD/year)	
339,511	1,195,078	51,388	2,547,202	109,530	47%

Note: unit electricity charge = 0.043 JD/kWh

3) Revenue increase by reduction of leakage water

Revenue of waterworks is increased by selling reduced volume of leakage. The estimation of revenue increase is shown in below. The unit cost of water production is estimated 0.374 JD/m^3 in Tafieleh Governorate. Assuming that the rate of non-revenue water is 35 % in 2015, leakage reduction will contribute to revenue increase of about 82 thousands JD.

Table 2-60 Estimation of Revenue Increase by Reduction of Leakage in 2015

Estimated annual reduction volume of water leakage (m^3/year)	Unit cost per cubic meter of revenue water in 2009 *1 (JD/m^3)	Revenue increase (JD/year)
339,511	0.374	82,535

*1: It is estimated from customer data of the Tafieleh Governorate in 2009

2-5-3 Other Relevant Issues

(1) Land acquisition for construction of planned distribution reservoirs

The Jordan side shall acquire the land for the distribution reservoirs and access roads for both Bsaira and Gharandal.

(2) Installation of transformer for expansion and renewing of the pumping station

The Jordan side shall provide p primary power of required capacity and install a transformer with a transformer panel or replace existing ones, which covers the required capacity of the pumping station for expansion and renewing. The transformer must be installed corresponding to the power consumption of the pump which shall be installed by the contractor.

(3) Installation of service and distribution pipes

The Jordanian side shall prepare a detailed design of service and distribution pipes which the Jordanian side must install and implement installation works of the distribution pipes procured by Japanese side (OD 63 mm) and connection works of service pipes (diameter 25 mm and 20 mm) and customer water meters. This construction must complete simultaneously with the completion of the construction by the Japanese side, in order to start the water supply when the both constructions are complete. To achieve this, the Jordanian side shall prepared a plan of implementation, purchase of equipment and materials, and construction order to finish within the project implementation schedule of the Japanese side, and must

secure required budget.

(4) Soft-component

In the project area, USAID is planning to establish a GIS database including facilities and operation and maintenance data related to the water supply and sewage systems, and establish a development plan for the facility as well as carry out an investment project in around the four years from May 2010.

Regarding the GIS data management and distribution network analysis to be implement in soft component of the project, more applied technical cooperation shall be conducted utilizing the basic skills of GIS database management and network analysis which will be acquired in the USAID project.

CHAPTER 3 PROJECT EVALUATION

Chapter 3 Project Evaluation

3-1 Preconditions of the Project

3-1-1 Preconditions for Implementing the Project

(1) Land acquisition for the distribution reservoirs

Both lands for the reservoirs of Gharandal and Bsaira are government-owned, therefore prompt transfer of land from the government to WAJ must be executed. Both lands for the access roads to the distribution reservoirs are private property, therefore must be acquired before the due date (August 2011) as agreed in the M/D at the explanation of the Draft Outline Design Report, in order to proceed with the project smoothly. Furthermore, construction of access roads, site preparation, and land leveling must be complete by the Jordanian side before the start of construction of the reservoirs by the Japanese side.

(2) Budget drafting for the construction borne by the recipient country

The effect of the project will be fully materialized once the installation of water distribution pipes and service connections implemented by the Jordanian side is executed. Therefore, in order to proceed with the construction borne by the Jordanian side simultaneously with the construction of the Japanese side, the Jordanian side must secure required budget.

(3) Environmental impact assessment

The Jordanian side shall confirm the necessity of the environmental impact assessment for the project component to the concerned agencies, and when deemed necessary, the environmental impact study must be implemented and be completed by March 2011.

3-1-2 Preconditions and External Conditions for Achieving the Overall Plan of the Project

The issues that must be addressed by the Jordanian side as the precondition for achieving the overall plan of the project, as well as its external conditions shall be described below.

(1) Securing water transmission volume to the project area

The volume of leakage shall reduce due to the project; therefore the water supply volume of the project area shall increase only 7 % compared to that of 2010. This volume of water can be managed

within the capacity of the existing wells. In order to secure necessary water transmission volume supplied to the demand within the project area, sufficient operation and maintenance of the existing wells and water transmission system (pumping station and water transmission pipes) is required.

(2) Appropriate maintenance and management of the water supply and distribution network

After the completion of the project, the water supply and distribution network will be upgraded and leakage volume will reduce. However, if the maintenance of the distribution network is neglected, the leakage volume will increase again; consequently the maintenance of the distribution network must be continuously carried out in systematic way.

(3) Utilization of capacity improved by the technical cooperation project of JICA

In this project, the following outcomes of the Capacity Development Project for Non-Revenue Water Reduction by JICA implemented from 2005 to 2011 shall be utilized, which are planned as a base of this Project.

- Basic technology transfer related to non-revenue water measures (reduce leakage, replace meters)
- Technology transfer of implementation and formulation of measures for non-revenue water in the pilot zone
- Improvement in public awareness
- Reinforcement of water distribution network management ability as a measure against non-revenue water
- Provision of system for installing service pipes and water meters
- Reinforcement of relationship between WAJ and residents in relation to measures for non-revenue water

These activities are implemented for WAJ Tafieleh office staff, and the capacity of WAJ office for non-revenue water management is expected to be improved. These staff must continuously work for reduction of NON-REVENUE WATER by utilizing the facilities that will be constructed in the project and implementing the non-revenue water management activities.

(4) Utilization of water distribution monitoring system

The water distribution monitoring system shall be established through the project, which enables full-time monitoring of the flow volume from the distribution reservoirs and a pumping station and the flow volume and the water pressure from the district metering area (DMA). By utilizing this system and analyzing the leakage volume and non-revenue water volume, efficient leakage and

non-revenue water management come into effect. Furthermore, regionally-equitable water distribution can be realized. A capacity improvement which can effectively utilize the water distribution monitoring system is included in the soft-component of the project. Continuous reduction of non-revenue water and equitable water distribution must be carried out after the completion of the project, by utilizing the project achievements of the technical cooperation of JICA.

3-2 Project Evaluation

3-2-1 Relevance

1) Beneficiaries and population

The water service for the 70,100 residents in 2015 of the project area in Tafieleh Governorate which is one of the least developed governorates of Jordan shall be improved by implementing the project.

2) Project objective and BHN

The water supply time of the project area is 1~3 days/week, and the average daily revenue water per capita is only 84L, therefore the residents are forced to have inconvenient lives. The implementation of the project can lead to appropriate water supply pressure, reduce the leakage ratio, resulting in increase of water consumption, or enable water supply to more population in the future from the same water resource volume. Additionally, water supply time will be increased. The project enables to upgrade the water supply service to a certain level required for minimum standard of life and can contribute to satisfy the basic human needs (BHN).

3) Improvement of residents' lives and stabilization of standard of life

The implementation of the project contributes to improving the residents' lives through improvement of water supply service and thus the welfare in the remote area from the center of Jordan will improve, thereby contributing to the socioeconomic disparities between urban areas including Amman, and remote areas. Therefore, the project contributes to the stabilization of people's livelihood in Jordan.

4) Facilities that are easily operated and maintained

By upgrading the water distribution network, setting up of water distribution zones, and restructuring the trunk transmission and distribution system, water supply facilities that can easily be operated and maintained will be developed. As a result, amount of work for operation and maintenance, and thus reduction of related costs are expected. Additionally, the reduced work will be utilized for implementing the activities for planned non-revenue water management. Furthermore, the equipment

used in the project can be procured within Jordan or through the agencies. The pump, the main equipment of the project, is manually operated, which can be operated and maintained solely by the Jordanian side.

5) Contribution to mid-to-long term development plan

In the policy of the mid-to-long term plan of Jordan, the “National Water Strategy”, the limited water resource shall be effectively used as much as possible. This project contributes to achieving the objective of the mid-to-long term plan through reducing leakages and non-revenue water.

6) Utilization of technology of Japan

The project area is an extremely hilly terrain where control of water distribution pressure is difficult. Japanese technology is needed for method separating the distribution zone for controlling the water distribution pressure within the appropriate range, and installing pressure reducing valves to appropriate positions in the pipe network to adapt to such terrain.

7) Contribution to measures for environment and climate change

By implementing the project, water volume of intake and transmission can be reduced due to less leakage, and efficiency of the existing pumping station can be improved; therefore, the power consumption is reduced, resulting in reducing CO_2. Japan is addressing assistance for projects that settle the environmental and climate change issues including global warming, thus, the project matches the aid policy of Japan.

3-2-2 Effectiveness

(1) Quantitative effects

Index	Base year (2010)	Target year (2015)
Non-revenue water ratio	47%	35%
Leakage ratio	25%	15%
Service population of water supply (area for upgrading pipe network)	43,200 persons	47,600 persons
Service population of water supply (target area for water distribution monitoring system)	64,500 persons	70,100 persons
Daily revenue water volume per capita (target population in the area for upgrading pipe network)	84L	96L
No water supply days in southern areas of Tafieleh Governorate (Bsaira, Gharandal, and Qhadesiyeh)	4-6 days/week	Average of 3.5 days/week
Reduction of water leakage volume	Comparison of "with" and "without" project in 2015)	339,500m^3/day per year
Reduction of power consumption due to reduction of leakage and improved efficiency of water transmission pumps	Comparison of "with" and "without" project in 2015)	Approx. 3,488 MWh per year
Maintenance & operation cost reduction due to reduction of power consumption	Comparison of "with" and "without" project in 2015)	Approx. 147,834 JD [1] per year
CO_2 reduction due to reduction of power consumption	Comparison of "with" and "without" project in 2015)	Approx. 2,132 tons[2] per year

Note: [1] 3,438MWh/year (power consumption reduction) x 0.043JD/kWh (electric charge)

[2] 3,438MWh/year x 0.62kg-CO_2/kWh

(2) Qualitative effects

- The living environment of the residents is improved because of the increase of consumable water volume, improvement of water supply pressure, tar detached from aged pipes, and elimination of rust-colored water.
- The capacity concerning water distribution management and non-revenue water management of WAJ Tafieleh office staff improves as an outcome of implementation of the soft-component.

As stated above, the project contributes to the improvement of the living environment of the residents in Tafieleh city and the southern area of the Tafieleh Governorate and can expect the aforementioned effects, therefore the relevance of implementing the grant aid project is at high degree, and is potentially effective.

APPENDICES

Appendix 1: Member List of the Study Team

Appendix 2: Study Schedule

Appendix 3: List of Parties Concerned in the Recipient Country

Appendix 4: Minutes of Discussions

Appendix 5: Soft Component (Technical Assistance) Plan

Appendix 6: Other Relevant Data

Data 1. Water Quality in the Target Area in the Governorates of Tafieleh and Ma'an

Data 2. GIS Basic Map and Database of Transmission and Distribution Pipelines

Data 3. Socio Condition Survey

Data 4. Proposed served population and Proposed water supply in the Target Area in the Governorates of Tafieleh and Ma'an

Data 5. Result of Well Pumping Test

Data 6. Result of Hydraulic Calculation for Transmission System in Tafieleh governorate

Data 7. Result of Analysis for Prevention Countermeasure of Water Hummer in Erawath Pumping Station

Data 8. Hydraulic calculation result of distribution system in Tafieleh governorate

Data 9. Result of Corrosion Test

Data 10. Study of Existing Pressure Reducing Equipments

Data 11. Cost Estimation for Jordanian Side Cost Obligation (Laying Cost of pipelines)

Data 12. Outline Design in the Target Area of Ma'an Governorate

Data 13. Review of Water Supply Plan for Hussiniyyeh, Ashari, and Abu Dnneh in Ma'an Governorate

Data 14. Study of the Project as Grant Aid for Environment and Climate Change Measures

Data 15. Planned Assess Road for Planned Distribution Reservoir in Bsaira and Gharandal

Appendix 1: Member List of the Study Team

Member List of the Study Team in the Preparatory Survey

Name	Job title	Occupation	Period (arr. – dep.)
Mr. OKIURA Fumihiko	Team Leader	Director, Water Resources Management I, Water Resources and Disaster Management Group, Global Environment Dep. JICA	Apr 10 to 16 , 2010
Mr. NAKAO Yushin	Project Coordinator	Program Officer, Water Resources Management I, Water Resources and Disaster Management Group, Global Environment Dep. JICA	Apr 10 to 16 , 2010
Mr. SATO Hirotaka	Chief Consultant/Operation & Maintenance	Tokyo Engineering Consultants Co., LTD.	Apr 10 to May 20, 2010 Jun 23 to Jul 16, 2010
Mr. OKAGA Toshifumi	Water Supply Facilities	Tokyo Engineering Consultants Co., LTD.	Jun 1 to Jul 5, 2010
Mr. KAWAMURA Masashi	Water Distribution Planning/GIS Planning	Tokyo Engineering Consultants Co., LTD.	Apr 10 to May 20, 2010 Jun 18 to Jul 16, 2010
Mr. MORIGUCHI Takashi	Water Distribution Network	Tokyo Engineering Consultants Co., LTD.	May 17 to Jul 15, 2010
Mr. TANAKA Norio	Equipment Planning	Tokyo Engineering Consultants Co., LTD.	May 9 to Jun 12, 2010
Mr. IWASHIGE Hiroto	Construction Planning/Cost Estimation	Tokyo Engineering Consultants Co., LTD.	Jun 17 to Jul 16, 2010

Member List of the Study Team in Explanation of the Draft Outline Design Report

Name	Job title	Occupation	Period (arr. – dep.)
Mr. OKIURA Fumihiko	Team Leader	Director, Water Resources Management Ⅰ, Water Resources and Disaster Management Group, Global Environment Dep. JICA	Oct 25 to 28, 2010
Mr. IKEDA Ryusuke	Survey Planning	Program Officer, Water Resources Management Ⅰ, Water Resources and Disaster Management Group, Global Environment Dep. JICA	Oct 23 to 30, 2010
Mr. SATO Hirotaka	Chief Consultant/Operation & Maintenance	Tokyo Engineering Consultants Co., LTD.	Oct 23 to 30, 2010
Mr. KAWAMURA Masashi	Water Distribution Planning/GIS Planning	Tokyo Engineering Consultants Co., LTD.	Oct 23 to 30, 2010

Appendix 2: Study Schedule

Study Schedule in the Preparatory Survey

		Team Leader/ Project Coordinator	Chief consultant/Operation & Maintenance	Water Distribution Planning/GIS Planning	Water Distribution Network	Construction Planning/ Cost Estimation	Water Supply Facilities	Equipment Planning
		OKIURA Fumihiko/ NAKAO Yushin	SATO Hirotaka	KAWAMURA Masashi	MORIGUCHI Takashi	IWASHIGE Hiroto	OKAGA Toshifumi	TANAKA Norio
10-Apr	Sat	Leaving Narita, Tokyo						
11-Apr	Sun	Arriving at Amman, Meeting with JICA Jordan office, Meeting with WAJ Headquarter						
12-Apr	Mon	Meeting with Ministry of Planning and International Cooperation, MD meeting, Hearing survey （USAID and KfW）						
13-Apr	Tue	Site visiting (Ma'an and Tafieleh governorates)						
14-Apr	Wed	Modification of MD and Signing of MD						
15-Apr	Thu	Report to JICA Jordan office and EOJ / Leaving Amman						
16-Apr	Fri	Arriving at Narita, Tokyo	Confirmation of background, aim and contents of the Project / Confirmation of Master Plan regarding the plan of water supply system / Survey for the past similar projects and other project by other donor and organization(Amman, WAJ)	Procurement and arrangement of GIS basic map (Amman, RJC and DLS)				
17-Apr	Sat							
18-Apr	Sun							
19-Apr	Mon							
20-Apr	Tue							
21-Apr	Wed		Moving (Amman-Petra), Meeting with Tafieleh branch office					
22-Apr	Thu		Meeting with Ma'an branch office					
23-Apr	Fri		Field survey for reservoirs, pump station and pipelines Collection of quotation, meeting with sub-contract company and agreement for local consultants (a) Natural Condition (b) Social Condition (Amman)	Field survey for reservoirs, pump station and pipelines				
24-Apr	Sat							
25-Apr	Sun							
26-Apr	Mon							
27-Apr	Tue							
28-Apr	Wed							
29-Apr	Thu							
30-Apr	Fri		Analysis of collected data and material					
1-May	Sat		Holiday					
2-May	Sun		Meeting with Tafieleh branch office and data collection for operation and maintenance	Field survey (Confirmation of existing pipelines) in Tafieleh				
3-May	Mon							
4-May	Tue							
5-May	Wed							
6-May	Thu							
7-May	Fri		Analysis of collected data and material					
8-May	Sat							
9-May	Sun		Meeting with Ma'an branch office and data collection for operation and maintenance	Field survey (Confirmation of existing pipelines) in Ma'an				Leaving Narita, Tokyo
10-May	Mon							Arriving at Amman
11-May	Tue							Collection of information from WAJ (Design standard, as-build drawing, others)
12-May	Wed							
13-May	Thu							
14-May	Fri		Analysis of the collected data and material					
15-May	Sat		Moving (Petra-Amman)					Calculation of water demand and allocation of water demand
16-May	Sun		Meeting with WAJ and Analysis of the collected data and material					
17-May	Mon				Leaving Narita, Tokyo			Meeting with WAJ
18-May	Tue				Arriving at Amman			Meeting with Tafieleh and Ma'an branch office
19-May	Wed		Report to JICA Jordan office / Leaving Amman		Meeting with Sub-contract company			Field survey (Tafieleh governorate) Data collection and survey for existing facilities (intake, transmission and distribution) Facility plan and equipment plan
20-May	Thu		Arriving at Narita, Tokyo					
21-May	Fri				Analysis of the collected data and material			
22-May	Sat				Moving (Amman-Petra)			
23-May	Sun				Instruction to sub-contract company (Tafieleh and Ma'an governorate)			
24-May	Mon							
25-May	Tue							
26-May	Wed				Field survey of existing pipeline (Tafieleh governorate)			Field survey (Ma'an governorate) Data collection and survey for existing facilities (intake, transmission and distribution) Facility plan and equipment plan
27-May	Thu							
28-May	Fri				Analysis of the collected data and material			
29-May	Sat				Field survey of existing pipeline, Confirmation of the location for the proposed pipelines (Tafieleh governorate)			
30-May	Sun							
31-May	Mon							
1-Jun	Tue						Leaving Narita, Tokyo	
2-Jun	Wed						Arriving at Amman / Meeting with JICA Jordan office	Analysis of material Facility plan and equipment plan (Amman)
3-Jun	Thu						Collection of information from WAJ (Design standard, as-build drawing, others)	
4-Jun	Fri				Analysis of the collected data and material			
5-Jun	Sat				Field survey of existing pipeline, Confirmation of the location for the proposed pipelines (Ma'an governorate)			
6-Jun	Sun							
7-Jun	Mon						Calculation of water demand and allocation of water demand	Analysis of the result of field survey (Amman)
8-Jun	Tue							
9-Jun	Wed						Meeting with WAJ	
10-Jun	Thu						Meeting with Tafieleh and Ma'an branch office	

		Team Leader/ Project Coordinator	Chief consultant/Operation & Maintenance	Water Distribution Planning/GIS Planning	Water Distribution Network	Construction Planning/ Cost Estimation	Water Supply Facilities	Equipment Planning
		OKIURA Fumihiko/ NAKAO Yushin	SATO Hirotaka	KAWAMURA Masashi	MORIGUCHI Takashi	IWASHIGE Hiroto	OKAGA Toshifumi	TANAKA Norio
11-Jun	Fri				Analysis of the collected data and material		Field survey (Tafieleh governorate) Data collection and survey for existing facilities (intake, transmission and distribution) Facility plan and equipment plan	Leaving Amman
12-Jun	Sat				Facility plan and equipment plan			Arriving Narita, Tokyo
13-Jun	Sun							
14-Jun	Mon							
15-Jun	Tue							
16-Jun	Wed							
17-Jun	Thu					Leaving Narita, Tokyo		
18-Jun	Fri			Leaving Narita, Tokyo	Moving (Petra-Amman)	Arriving at Amman / Meeting with JICA Jordan office	Field survey (Ma'an governorate) Data collection and survey for existing facilities (intake, transmission and distribution) Facility plan and equipment plan	
19-Jun	Sat			Arriving at Amman	Pipeline network plan (Amman)	Survey of local company, Request of quotation and Collection of quotation (Amman)		
20-Jun	Sun			Study of Transmission/ Distribution plan and DMA				
21-Jun	Mon							
22-Jun	Tue							
23-Jun	Wed		Leaving Narita, Tokyo					
24-Jun	Thu		Arriving at Amman			Field survey (Tafieleh governorate) Construction plan, Confirmation of pipeline route		
25-Jun	Fri		Meeting with WAJ	Study of transmission/distribution plan, DMA, compilation of GIS database for water supply facilities	Analysis of the collected data and material		Analysis of material Facility plan and equipment plan (Amman)	
26-Jun	Sat		Survey for Structure of Operation & Maintenance (Tafieleh and Ma'an governorate)		Receiving of the survey result from sub-contract company and request of revision (Amman)			
27-Jun	Sun							
28-Jun	Mon					Field survey (Ma'an governorate) Construction plan, Confirmation of pipeline route		
29-Jun	Tue		Planning of structure for operation & maintenance Study of validity of grant aid, basic concept, necessity of technical cooperation					
30-Jun	Wed						Analysis of the result of field survey (Amman)	
1-Jul	Thu							
2-Jul	Fri					Analysis of collected data and material		
3-Jul	Sat		Internal Meeting					
4-Jul	Sun		Compilation of the result of survey (Amman)			Collection of Cost data	Leaving Amman	
5-Jul	Mon						Arriving Narita, Tokyo	
6-Jul	Tue							
7-Jul	Wed							
8-Jul	Thu		Preparation of Technical Note (Amman)					
9-Jul	Fri							
10-Jul	Sat		Meeting for Technical Note (Tafieleh branch office)					
11-Jul	Sun		Meeting for Technical Note (Ma'an branch office)					
12-Jul	Mon		Meeting for Technical Note (WAJ)		Meeting for Technical Note (WAJ)	Meeting for Technical Note (WAJ)		
13-Jul	Tue							
14-Jul	Wed				Report to JICA Jordan office and EOJ / Leaving Amman			
15-Jul	Thu		Report to JICA Jordan office and EOJ / Leaving Amman		Arriving at Narita, Tokyo	Report to JICA Jordan office and EOJ / Leaving Amman		
16-Jul	Fri		Arriving at Narita, Tokyo			Arriving at Narita, Tokyo		

Study Schedule in Explanation of the Draft Outline Design Report

		Team Leader	Project Coordinator	Chief consultant/Operation & Maintenance	Water Distribution Planning/GIS Planning
		OKIURA Fumihiko	IKEDA Ryusuke	SATO Hirotaka	KAWAMURA Masashi
23-Oct-10	Sat		Arriving at Amman (from Tel Aviv)	Leaving Narita, Tokyo	
24-Oct	Sun		Field survey (NRW Phase 2) Explanation of draft report to WAJ	Arriving at Amman/ Explanation of draft report to WAJ	
25-Oct	Mon	Leaving Narita, Tokyo	Meeting with WAJ (WAJ : Eng. Bassam) and JICA Jordan office		
26-Oct	Tue	Arriving at Amman	Meeting with WAJ (WAJ : Eng. Bassam) , Courtesy call on Secretary General of WAJ and Explanation of draft report		
27-Oct	Wed	MD meeting (WAJ), Explanation of draft report (MoPI)			
28-Oct	Thu	Signing of MD, Report to JICA Jordan office and EOJ, Leaving Amman	Signing of MD, Report to JICA Jordan office and EOJ		
29-Oct	Fri		Leaving Amman	Leaving Amman	
30-Oct	Sat		Arriving at Narita, Tokyo	Arriving at Narita, Tokyo	

Appendix 3: List of Parties Concerned in the Recipient Country

1. Preparatory Survey

<Jordanian side>

1. Ministry of Planning and International Cooperation

Ms. Maha Al Zu'bi	Director, Projects Department
Mr. Saif Baniata	Asian Relations Section, International Cooperation Department
Ms. Eba'a Al Eysa'a	Engineer, Water and Agriculture
Ms. Wafa Al Saket	Head of Asian and Arab Relations Divisions, International Cooperation Department

2. Water Authority of Jordan (WAJ)

Mr. Munir Oweis	Secretary General
Mr. Bassam Saleh	Assistant Secretary General, Technical Department
Mr. Waleed Sukkar	Advisor for the Minister of Water & Irrigation, Project Manager of capacity Development for NRW Reduction
Ms. Reham Bani-Hani	Head of Study and Feasibility Study Division
Ms. Haneen Qublan	Engineer
Ms. Asma Wahadneh	Engineer
Mr. Adnan Khaiat	Director, WAJ Tafieleh Governorate
Mr. Mustafa Al Zananeen	Director of Operation & Maintenance and Non Revenue Water, WAJ Tafieleh Governorate
Mr. Akram Al Zananeen	Director of WAJ Ma'an Governorate

3. USAID

Mr. Bader Kasssa	Project Management Specialist, Office of Water Resources & Environment

4. KfW

Ms. Sandra Gmelin	Project Manager, Water Resources and Solid Waste
Dr. Manuel Schiffler	Senior Water Specialist, Middle East and North Africa Division
Ms. Anna Lena Muller	International Economist, Sector and Policy Division, Water and Waste Management
Dr. Stefan Gramel	Engineer, Water Resources and Solid Water Middle East, Water Sector Policy Division

<Japanese side>

1. JICA Jordan Office

Mr. OKAMOTO Shigeru	Chief Representative
Mr. MORIMOTO Yasuhiro	Deputy Resident Representative
Ms. OKUMURA Makiko	Representative
Mr. Hani H. Al-Kurdi	Deputy Chief Program Officer

2. Embassy of Japan

Mr. SHIOGUCHI Tetsuo	Ambassador of Japan
Mr. YOSHIDA Kunihiko	Second Secretary, Economic Section
Mr. OKACHI Toshiki	Second Secretary, Economic Section

2. Explanation of the Draft Outline Design Report

<Jordanian side>

1. Ministry of Planning and International Cooperation

Ms. Wafa Al Saket	Head of Asian and Arab Relations Divisions, International Cooperation Department
Mr. Ahmad Al-Jazzar	Active Head of Water and Agriculture Section, Program & Projects Department
Mr. Wa'ed Al-Ja'afreh	Civil Engineer, Water and Wastewater Sector, Program & Projects Department
Ms. Eba'a Al Eysa'a	Engineer, Water and Agriculture

2. Water Authority of Jordan

Mr. Munir Oweis	Secretary General
Mr. Bassam Saleh	Assistant Secretary General, Technical Department
Mr. Waleed Sukkar	Advisor for the Minister of Water & Irrigation, Project Manager of capacity Development for NRW Reduction
Ms. Reham Bani-Hani	Head of Study and Feasibility Study Division
Ms. Boshra Faourz	Engineer
Mr. Nabil Saleh	Engineer

3. CDM

Mr. Don Houser	Deputy Project Manager
Mr. Yousef Hussein	Senior Hydraulic Modeling Specialist
Mr. John Harwood	Senior Water / Wastewater Engineer
Mr. Mehran K. Meserlian	Associate

<Japanese side>

1. JICA Jordan Office

Mr. OKAMOTO Shigeru	Chief Representative
Mr. MORIMOTO Yasuhiro	Deputy Resident Representative
Ms. OKUMURA Makiko	Representative
Mr. Hani H. Al-Kurdi	Deputy Chief Program Officer

2. Embassy of Japan

Mr. SHIOGUCHI Tetsuo	Ambassador of Japan
Mr. YOSHIDA Kunihiko	Second Secretary, Economic Section
Mr. OKACHI Toshiki	Second Secretary, Economic Section