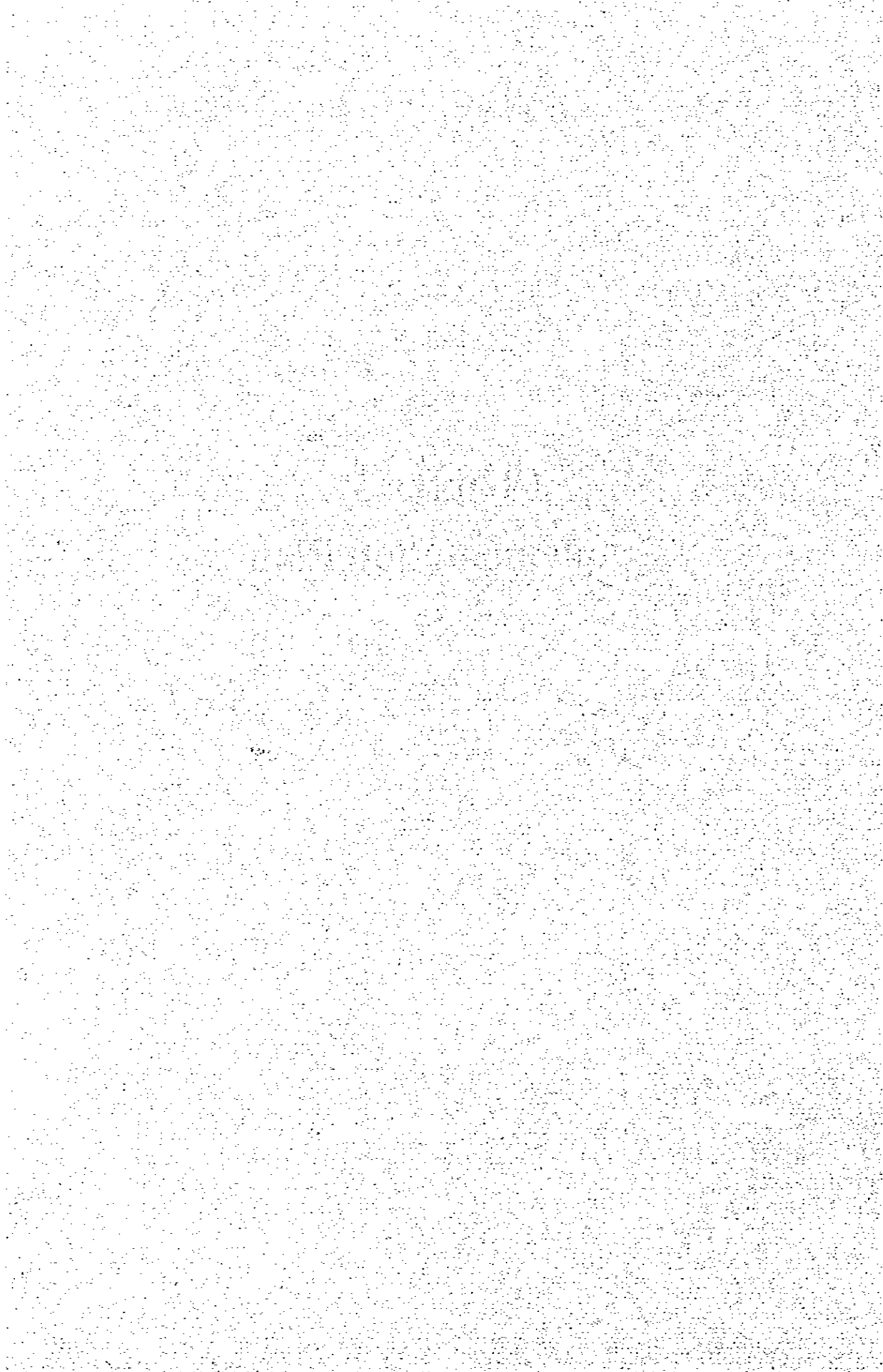


Chapter 3

Implementation Plan



Chapter 3 Implementation Plan

3.1 Implementation Plan

3.1.1 Implementation Concept

(1) Tendering package

A water treatment facility is set up by installing civil structures, buildings, pipelines (pipelines in plant and in filtering basins), dosing devices, water treatment equipment, electrical equipment, instrumentation, and control equipment, and integrating all these equipment to form a single system. Consequently, it is preferable to examine the qualifications of various tenderers, call for tenders in one package, and unify the contract. Particularly, when work is supervised by a small number of persons, the inconveniences in preparation of documents for piecework payments and payment acknowledgment formalities, working drawings for joints in pipelines and wiring in civil and construction work, are mitigated; the responsibility of each subcontractor becomes the responsibility of the main contractor, and the lines of responsibility become clearly defined.

(2) Considerations

Long period stoppage of treatment plant or pumping station is not allowed. Accordingly, construction methods that incur the minimum time for stoppages when fitting pipelines to existing structures or connecting distribution pipelines to existing pipelines should be adopted. This requires close contact and discussions with WAJ.

(3) Fields and methods in which sub-contractors work

Already many sub-contractors in the civil engineering, architecture, mechanical and electrical field are registered with the Ministry of Public Works for receiving contracted work from public organizations, and these contractors should be employed for the work as sub-contractors. Particularly, the work of authorization, arrangements for laborers, procurement and transport of construction materials and machinery, transport and assembly of formworks and reinforcements, placing and hardening of concrete and other works can be shared among the sub-contractors.

(4) Organizations and departments responsible during the implementation stage

Supervision of the project falls under the jurisdiction of the WAJ Planning and Design Department. Operation and maintenance fall under the purview of the WAJ Zai Water Treatment Department.

3.1.2 Implementation Condition

(1) Pump renewal sequence

After renewing three pumps at one location (for instance at the No. 1 pumping station), the renewal of three pumps at other locations (for instance No. 2 pumping station) is beneficial from the work and cost aspects. However, this method should not be adopted because water supply has to be limited to one large pump capacity during the renewal period (more than 6 months) for all the pumps. To ensure continuous water supply during the renewal, one pump of large capacity renewed during the rehabilitation stage and 2 small pumps should continue to operate while one pump from each pumping station is simultaneously renewed (first time). With this renewal, two pumps of larger capacity will be installed in each pumping station, therefore the capacity of 45 million m³/year will be maintained. Accordingly, during the second renewal, two pumps can be simultaneously renewed at each pumping station.

(2) Transportation of pipes, valves, equipment and machinery in areas with steep slopes

The treatment plant and pumping stations in this Project are located in the Jordan Valley, about 20 km from the Amman city boundary to the north west, with very little traffic in these parts, steep slopes, and many S-shaped curves traversing the slopes. Excavated material, pipes, valves and machinery need to be transported with adequate care and precautions.

(3) Precautions in placing concrete in dry areas

The concrete in the treatment plant should be watertight. After placing, no cracks should occur in the concrete due to drying shrinkage or changes in temperature. Consequently, control of slump during mixing of concrete is essential. Until the concrete hardens after it is placed, adequate precautions need to be taken by sprinkling water when direct rays of the sunlight fall on the concrete.

(4) Relocation of existing drain pipes and cables in the treatment plant

At the location where the settling basin and filter basin are to be constructed in the expansion stage, overflow pipes from the mixing basin, rain water drain pipes, sludge drain pipes to the sludge drying bed and cathode cables for preventing corrosion of steel pipes are buried in the ground and run parallel to the structure. These items need to be relocated before excavation for the structures to be erected.

(5) Reinforcement of 33 kV power receiving cable route

Power receiving equipment for dosing / coagulation and sedimentation equipment are installed on the west side of the existing dosing building and diesel generator building, and H.T. cables are buried between the existing settling basins and newly constructed settling basins. Due to access of heavy machinery during the construction work, these cables may be damaged. To prevent this damage, reinforcement of the cable route by covering the cables with steel plates is

necessary.

(6) Procurement of materials, machinery and equipment for work

Pumps, motors, dosing devices, water treatment machinery, steel pipes and vales are to be imported. Almost all other construction materials and machinery (portland cement, aggregates, reinforcing bars, formwork material, construction materials) can be procured in Jordan, and heavy construction machinery can be leased also in Jordan. Since the soil in the treatment plant and pumping station is acidic, anti-acidic cement is prescribed in the original design. For the design in this Project also, sulfide-resistant cement should be used. However, the local production quantity will not be able to satisfy the demand for this Project, therefore imports to meet the concrete placing schedule should be considered.

3.1.3 Scope of Works

(1) Works to be carried out by the Japanese side

The works to be carried out by the Japanese side are listed below.

Pumping station

- * Renewal of three existing pumps and motors at four pumping stations (to large capacity)
- * Renewal of pipes and valves for the work above
- * Renewal of monitoring and operating equipment for each pumping station
- * Additional installation of one pressure surge tank in each pumping station

Water treatment plant

- * New effluent pipeline from the existing raw water regulating basin
- * New mixing basins
- * New flocculating basins
- * New settling basins
- * New rapid filter basins and effluent weir
- * New pipeline from effluent weir to existing clean water reservoir
- * New dosing equipment
- * Installation of water treatment machinery and equipment
- * New connection pipelines, drain pipe lines
- * New electric / store building
- * Relocation and addition of generator room
- * New chlorination room
- * New central monitoring and control equipment
- * Relocation of sludge drying bed

(2) Works to be carried out by the Jordanian side

The works to be carried out by the Jordanian side are listed below.

- * Replacement of 1,200 mm pipes between No.4 pumping station and Zai treatment plant for 660 m
- * Protection of eroded soils along the pipeline between No. 1 and No.2 pumping stations
- * Arrangements for temporary sites outside the treatment plant premises
- * Ensuring availability of power and water supply for work
- * New sludge drying bed
- * Renewal of existing dosing equipment

Name of equipment	Specifications	Quantity
Chlorinator	Vacuum-type, self-standing, capacity 900 kg/day	1
Vaporizer	Type: Electrothermal, capacity 3,600 kg	1
Polymer dosing device	Flowmeter: Model Rotormeter (dia. 25 mm, capacity 0.05 to 0.5 l/s)	2
	Batchmeter: Type Integrator (dia. 25 mm)	1
Potassium permanganate dosing device	Dosing ball tap	1
	Dosing pump air pressure gauge: Indicating range 0 to 100 psi (7 kgf/cm ²)	2
Activated carbon dosing device	Dosing pump air pressure gauge: Indicating range 0 to 100 psi (7 kgf/cm ²)	2

- * Renewal of existing monitoring and control equipment

Equipment name	Specifications	Quantity
Water level gauge	Indication, records, warnings (raw water regulating reservoir, clean water basin)	2
	Indication, warnings (wash water drainage basin, wash water tank)	2
	Indication, regulation (filter basin)	1
Flowmeter	Indication, regulation, integration (raw water regulating reservoir, filter basin, water supply within plant)	3
	Indication, regulation (filter basin)	6
Gauge indicating degree of opening of valve	Indication (valves in raw water regulating reservoir, filter basin flow regulating valve)	7
Filter basin head loss gauge	Indication, warnings	6
Water quality gauge	Filter basin turbidity gauge (indication)	6
	Same as above (indication, records)	1
	Filter basin pH meter (indication, warnings)	1
	Wash water tank thermometer (indication)	1
	Residual chlorine gauge (indication, records)	1
Dosage meter	Indication, regulation (potassium permanganate, activated carbon)	2

3.1.4 Consultant Supervision

The supervisory system should account for the points mentioned below particularly when the detail design and work supervision are enforced under grant aid for this Project.

- 1) Understand the contents and background of basic design study.
- 2) Understand the concept of grant aid cooperation.
- 3) Study the contents of E/N concluded between the two countries.
- 4) Study the basic concepts of WAJ and trends of other aid organizations.
- 5) Re-check the implementation conditions for work to be implemented by the Jordanian government requested during basic design.
- 6) Re-check the customs formalities and measures for exemption of duties on materials and equipment to be brought into Jordan, and hold discussions with WAJ to ensure that there is no effect on the work completion period.
- 7) Strive to study and understand the Islamic religion and customs. (Haj, Ramadan, etc.)

(1) Contents of consultancy services

After the E/N are exchanged between the governments of the two countries, the Jordanian government should conclude contract with consultant. The consultant will conduct the detail design and construction supervision for the Project.

1) Detail design

- * Preparation of tender documents
- * Assistance for evaluating tenderers' qualifications
- * Tender opening
- * Evaluation of tenders
- * Assistance for concluding construction contract

2) Construction supervision

Construction supervision is broadly divided into the three categories below.

(i) Supervision work

- * Discussions with concerned parties before start of work
- * Approval of shop drawings
- * Inspection of materials and equipment before their shipment
- * Management of works on site
- * Witnessing the installation of machinery and equipment
- * Preparation of progress reports
- * Issue of work completion certificates and payment certificates
- * Inspection of completed work
- * Inspection for locating defects

(ii) Tasks after completion of work

- * Issue of work completion certificate
- * Handing over formalities
- * Preparation of completion report

(iii) Operations and maintenance

Preparation of operation and maintenance manuals for pumping stations and plans for operations and maintenance

- * Training to WAJ personnel (maintenance and operations department staff of pumping stations)
- * Tests and run of water treatment plant (including water quality monitoring) and training

The allocation of supervisors listed below for the detail design and construction supervision is considered based on the considerations above.

Pump expansion

Detail design (total 7 persons)

Chief - 1 person

Civil and building design - 1 person

Mechanical equipment design - 1 person

Electrical equipment design (monitoring and operational equipment) - 1 person

Electrical equipment design (power receiving equipment) - 1 person

Cost estimation- 1 person

Specification writer - 1 person

Construction supervision (total 5 persons)

Chief (spot) - 1 person

Resident supervisor - 1 person

Civil and Architect (spot) - 1 person

Mechanical (spot) - 1 person

Electrical (spot) - 1 person

Expansion of water treatment plant

Detail design (total 14 persons)

Chief - 1 person

Treatment process - 1 person

Design of civil structures (on site) - 1 person

Design of civil structures (domestic) - 1 person

Mechanical design - 1 person
Electrical design - 1 person
Building design - 1 person
Survey and soil - 1 person
Pipe line design - 1 person
Specifications (civil) - 1 person
Specifications (mechanical) - 1 person
Specifications (electrical) - 1 person
Cost estimation - 1 person
Tender documents - 1 person

Construction Supervision (total 10 persons)

Chief (spot) - 1 person
Treatment facilities design (spot) - 1 person
Civil structural design (spot) - 1 person
Resident supervisor (overall) - 1 person
Resident supervisor (civil and building) - 1 person
Mechanical design (spot) - 1 person
Electrical design (spot) - 1 person
Building design (spot) - 1 person
Pipe line design - 1 person
Water quality operations management - 1 person

3.1.5 Procurement Plan

(1) General

Such main equipment as pump, motor and transformer are procured either from Japan or European countries. Other materials such as pipe, reinforced bar, cement, timber and fuel can be procured in Jordan.

Existing dosing equipment, water treatment machinery and equipment, steel pipes and valves conform to ANSI (American National Standards Institute), ASTM (American Society for Testing and Materials) and AWWA (American Water Works Association). These equipment are not manufactured in Jordan and are imported. Periodic inspections and maintenance of these equipment are performed by the Jordanian side. A major problem faced currently is the very high cost of spare parts. These parts cannot be easily procured by WAJ, which has a deficit budget. Each one set of equipment should be purchased at a time, but the procurement sources for water treatment materials and equipment should be decided after considering the reliability, parts procurement and convenience.

(2) Dosing equipment

Dosing equipment (aluminum sulfate, chlorination) are very important for quality control of water in the treatment plant, and the regulation of dosing quantity is likewise an important function. The consumption of parts for handling corrosive chemicals is rapid, and existing parts used for dosage have already been replaced. For this project, such parts should be procured from Japanese sources because of their high reliability and accuracy.

(3) Water treatment equipment

Rapid mixer and flocculator are rotating machines with large impeller diameters. Good precision finish and good balance of the impellers will reduce the frequency of breakdown and extend the service life of the machines. Sludge extractors have a span of 18 m, travel distance of 90 m and are large moving machines. It consists of a large number of components such as sludge pump, sludge extracting plates, sludge suction hoses, extractor plates winding device, power cable winding device, operations control panel, rails, limits switch for control, etc. Since the components are procured separately and the extractor assembled on site, they should have good accuracy for the assembly. Consequently, Japanese products, which have good reliability, are selected.

Steel pipes and valves (including filter basin powered valves) should have the specific paint coating both on the inner and outer surfaces to suit the quality of the pipes used, moreover, the time required for the drying of paints when several coats of paint are applied must be ensured, and this high quality is required. Accordingly, Japanese products, which have good reliability, are selected.

(4) Reinforcing bars

Reinforcing bars of 10 to 25 mm diameter are manufactured as standard products in Jordan. The raw material for these bars is being imported from Brazil and other countries.

(5) Aggregate

Raw materials such as fine aggregate, coarse aggregate, and boulders are available in the Jordan Valley.

(6) Cement

Currently, surplus cement is being produced and the country is also exporting cement. Therefore, this item can be locally procured.

With regard to other materials, efforts should be made to procure them locally, but items that are difficult to procure and which may affect the working schedule, or items expected to cause

problems in quality, should be procured from Japan.

Table below shows the procurement sources of important materials and equipment.

Name of material/equipment	Jordan	Japan	Other country (Europe)	Remarks
Cement	○			Can be procured in Jordan
Crushed stone for concrete	○			Same as above
Admixtures for concrete	○			Same as above
Sand and gravel	○			Same as above
Reinforcing bars (up to D25)	○			Same as above
Wood	○			Same as above
Plywood for formwork	○			Same as above
Asphalt compounds	○			Same as above
Gratings		○		Cannot be procured in Jordan
Welded steel pipes for pipelines	○			Cannot be procured in Jordan
Pumps		○	(○)	Requires good quality and steady supply
Main motors		(○)	○	Same as above
Operating panel		○		Same as above
Special cables		○		Same as above
General electrical materials	○			Same as above
Steel doors	○			Cannot be procured in Jordan
Steel stairways	○			Same as above
ALM sashes	○			Same as above
ALM louvers	○			Same as above
Concrete blocks	○			Same as above
Scaffolding pipes	○			Same as above
Temporary steel material	○			Same as above
Temporary cover plates		○		Cannot be procured in Jordan
Water stop plates		○		Cannot be procured in Jordan
Welded steel material for piping	○			Cannot be procured in Jordan
Reinforced concrete pipes	○			500 to 1000 mm can be procured
Anthracite	○			Cannot be procured in Jordan
Sand for filter basin	○			Cannot be procured in Jordan
Gravel for filter basin	○			Cannot be procured in Jordan
Water treatment plant equipment		○		Requires good quality and steady supply

Regarding the transportation route, materials/equipment are to be transported from Aqaba port in Jordan to the construction sites.

3.1.6 Implementation Schedule

The works are implemented as shown in Table 20.

Detail design - 6.5 months,

Pump expansion works - 26.0 months

Treatment plant expansion works - 33.0 months

Table 20 Implementation Schedule (1/2)

□: Work in Japan ■: Work in Jordan ▨: Work in Third Country

Term	Item	Month												
		1	2	3	4	5	6	7	8	9	10	11	12	
1	Detailed Design	Work in Jordan (Surveying)	■											
		Work in Japan (Detailed Design, Tender Document)			□									
		Approval of Tender Document						■						
		Announce, Tender, Evaluation, Contract for Construction						□						
		(Total 6.5 month)												
		Preparation, Mobilization, Temporary Works	■											
		Earthwork	■											
		(Total 1.0 month)												
2	Supply of Materials and Construction Works	Preparation, Mobilization, Temporary Works	■											
		Earthwork	■											
		Sedimentation Basin and Filter	■											
		Plumbing Work	■											
		Foundation Works for Equipment											■	
		Manufacturing of Purification Equipment				■								
		Manufacturing of Dosing Equipment				■								
		Manufacturing of Pump						■						
		Manufacturing of Motor						■						
								▨						
		(Total 12.0 month)												

Implementation Schedule (2/2)

:Work in Japan
 :Work in Jordan
 :Work in Third Country

Term	Item	Month														
		1	2	3	4	5	6	7	8	9	10	11	12			
3	Supply of Materials and Construction Works	Transportation														
		Dry Bed and Building														
		Plumbing														
		Foundation Works for Equipment														
		Installation of Mechanical Equipment														
		Installation of Electrical Equipment														
		Test Run														
		Manufacturing of Purification Equipment														
		Manufacturing of Dosing Equipment														
		Manufacturing of Pump														
		Manufacturing of Motor														
		(Total 12.0 month)														
		4	Supply of Materials and Construction Works	Transportation												
				Dry Bed and Building												
Plumbing																
Foundation Works for Equipment																
Installation of Mechanical Equipment																
Installation of Electrical Equipment																
Site Arrangement																
Test Run																
Manufacturing of Pump																
Manufacturing of Motor																
(Total 8.0 month)																

3.1.7 Obligation of Recipient Country

The Government of Jordan will take the necessary measures that have been clarified in the minutes of the meetings and are shown below on condition that the Grant Aid assistance by the Government of Japan is extended to the Project

1. To secure the sites for the Project.
2. To clear, level and reclaim the sites prior to commencement of the construction.
3. To undertake incidental outdoor works such as gardening, fencing, gates and exterior lighting in and around the sites.
4. To construct the access road to the sites prior to commencement of the construction
5. To provide facilities for distribution of electricity, water supply, telephone, drainage, sewage and other incidental facilities to the Project sites.
 - 1) Electricity distributing line to the sites.
 - 2) City water distribution main to the sites.
 - 3) Drainage city main to the sites.
 - 4) Telephone trunk line and the main distribution panel of building.
 - 5) General furniture such as carpets, curtains, tables, chairs and others.
6. To bear commissions to the Japanese foreign exchange bank for the banking services based upon Banking Arrangement.
7. To exempt taxes and to take necessary measures for customs clearance of the materials and equipment brought for the project at the port of disembarkation.
8. To accord Japanese Nationals whose services may be required in connection with the supply of products and the services under the verified contract such facilities as may be necessary for their entry into Jordan and stay therein for the performance of their work.
9. To maintain and use properly and effectively the facilities constructed and equipment purchased under the Grant.
10. To bear all the expenses other than those to be borne by the Grant, necessary for construction of the facilities or well as for the transportation and the installation of the equipment.
11. To lay pipes with 1200 mm diameter for 660 m length between No.3 pumping station and No.4 pumping station (Technical information of the pipes are explained in the Draft Report) during "expansion phase".
12. To construct electricity distributing line to the four pumping stations by the time when the replaced pumps conduct test-runs in the "rehabilitation phase".
13. Surface protection on the eroded portions between No.1 and No.2 pumping stations.

3.2 Project Cost Estimation

The breakdown of expenses of Jordan required for implementing this Project through grant aid from Japan is as given below.

(1) Expenses to be borne by the Jordanian side

Item		Thousand dinars
Pump Expansion		
Laying of conveyance pipelines	660m	400
Work sites for conveyance pipelines	10,000m ² , for 1 year	20
Temporary roads for conveyance pipeline work	300m	10
Protection of conveyance pipelines	200m (No.1~No.2)	50
Sub total		480
Treatment Plant Expansion		
Expenses for procuring temporary sites outside treatment plant	11,000 m ² , for 3 years	55
Installation of power and water supply for work	For temporary yard / water treatment plant	10
Fencing around water treatment plant	450m	11
New sludge drying bed	80m X 80m	360
Expenses for renewing dosing equipment		125
Expenses for renewing monitoring and control equipment		230
Sub total		791
Total		1,271

(2) Estimation conditions

- 1) Estimation date: November 1997
- 2) Exchange rate: 1US\$ = 119 yen
1 dinar = 167.61 yen
- 3) Work period: A. Period for detailed design, construction (or procurement of materials and equipment) is as shown in the work schedules.
- 4) Others: This Project is to be implemented under the grant aid by the Japanese government.

3.3 Operation and Maintenance Plan

(1) Operational Aspect

The Zai system is currently being managed by the Director with assistance from the Chief Engineers of Mechanical, Electrical and Water Quality. The system operates full 24 hours a day with two shifts in the Operations Department, with management personnel working regular hours. The operations of each pumping station are being controlled by the remote/ automatic control system and remote monitoring / manual operation system from the Zai treatment plant.

Table 21 Operations and Maintenance of Zai System (As Of October 1997)

Field	Daytime work (08:00 to 15:00)	Number of persons	Nighttime work (15:00 to 08:00)	Number of persons
Mechanical	Engineer	2		
	Technician	5		
	Operator	1	Operator	1
Electrical	Engineer	2		
	Technician	2		
	Operator	1	Operator	1
Water quality	Expert	3		
	Technician	2	Expert	1
	Operator	2	Technician	2

In addition to the above, watchmen are assigned to each pumping station.

(2) Technical Aspect

The ability to maintain and operate the Zai system is quite high, as is evident from examples of the pumping station equipment below. Moreover, the staff have been receiving cooperation from the workshop and Central Water Quality Laboratory when necessary.

- * Shafts, bearings, oil seals of pumps and motors are being replaced on site routinely.
- * Repairs of small components that do not need to be machine, are being carried out on site.
- * Machining of important pump components such as impeller, lining, sleeve and main shaft is being carried out in the workshop. From observations in July, 1996, the finish achieved was smooth and satisfactory.
- * Devices such as pressure gauges breakdown, but temperature control and control of operating conditions are being enforced by using the five senses.
- * Overhauling of pumps being done once in 2 years; overhaul of motors has been done once in the past.
- * The cooling parts of bearings are being cleaned internally once in two weeks (summer).
- * Pumps that have broken down are being replaced with spare ones by WAJ. After replacement, the pump operates without problems. The skill in aligning the shaft during installation is at a high level.
- * Electronic circuit devices in monitoring and control equipment are also being repaired.

After completion of this Project, the supply capacity of the Zai system will be double, but the system is the same as before, and no increase in personnel is necessary. Therefore, the expanded facilities will be operated and maintained by existing personnel and staff.

Parts to be processed such as round bars, and consumable items can be procured in the local market. Parts such as liner rings and sleeves for pumps can also be procured in the local market.

Spare parts that need to be stored are only brushes and bearings for motors. Difficulties faced until now in replenishing parts has been, parts for the compressor, which incurred considerable time. Parts for existing equipment are being replenished periodically, and recorded in the operation ledgers. The use of spare parts required for this Project differs from the existing ones, but looking at the current system, the Jordanian side can cope with the situation adequately.

(3) Financial Aspect

It is confirmed that the WAJ's financial situations after the completion of the Project as below.

1) Water tariff revision

- * Water revenue could almost cover the operation and maintenance costs due to tariff increase by about 15% in 1996. However it could not cover depreciation cost and interests on loans
- * Water tariff will be revised periodically to compensate the increased expenditures.
- * Tariff structure will be improved such as progressive system and division of water usage of commerce and industry.

2) Unaccounted-for Water (UFW)

- * Unaccounted-for water ratio is still high - 54% in 1995 despite the effort of replacing galvanized steel service pipes.
- * The following schemes are under way to decrease UFW with the aid of KfW etc.
 - Inventory, monitoring, control and protection of groundwater resources
 - Procurement of water meters with high accuracy
 - physical rehabilitation of water network
 - Rationalization of water distribution system

3) Prospect of financial situation after completion of the Project

In response to the JICA's request, WAJ submitted the financial statements up to the year 2005 for the "With" (the Project including the related projects before No. 1 pumping station and after No. 5 pumping station) case and "Without" case (See Appendix: WAJ financial statement). The statements are summarized in Table 22 to 24.

a) Profit Loss Statement

Table 22 Profit Loss Statement

(Thousand dinar)

Year	1996		2002		2005	
	With	Without	With	Without	With	Without
Revenue						
Water sales	29,716	29,716	83,348	59,535	100,748	66,969
Sewerage fees etc.	10,901	10,901	20,220	15,188	23,882	17,085
Subscription fee etc.	3,457	3,457	4,346	4,179	4,889	4,701
Others	2,059	2,059	5,917	4,763	6,980	5,336
Total revenue	46,133	46,133	113,831	83,665	136,499	94,091
Expenses						
O & M						
Salaries & wages	19,363	19,363	23,004	23,004	26,630	26,630
Maintenance & Operation	30,639	30,639	13,283	11,914	15,376	13,792
Electricity bill			34,362	26,154	39,778	30,276
Administration & general	805	805	1,017	1,017	1,178	1,178
Sub total *1	50,808	50,808	71,666	62,089	82,962	71,876
Operational profit #	-4,675	-4,675	42,165	21,576	53,537	22,215
Depreciation(*2)	32,986	32,986	51,731	51,731	52,551	52,551
Interest on loans(*3)	17,560	17,560	35,556	38,424	18,427	29,945
Total expenses (*1+*2+ *3)	101,354	101,354	158,953	152,244	153,940	154,372
Profit	-55,221	-55,221	-45,122	-68,579	-17,440	-60,281
Foreign exchange loss	3,887	3,887	6,926	6,926	6,926	6,926
Profit for the year	-51,334	-51,334	-52,048	-75,505	-24,366	-67,206
Accumulated profit	-390,140	-390,140	-769,697	-820,221	-886,007	1,043,861

Operational profit = Total revenue - sub total (*1)

- * Total revenue will cover operational costs but still will not cover total expenses in both With and Without cases.
- * In the Without case, financial situation will improve because total expenses will be 1.6 to 1.8 times of total revenue. However, the accumulated loss will still keep increase.
- * In the With case, the accumulated loss will keep increase as is the same as the With case. However, deficit will decrease as the total expenses will be 1.1 to 1.4 times of the total revenue due to revenue increase generated by the Project.

b) Balance Sheet

Table 23 Balance Sheet

(Thousand dinar)

	1996		2002		2005	
	With	Without	With	Without	With	Without
Assets						
Fixed asset	520,799	520,799	670,134	670,134	517,944	517,944
Current asset	37,888	37,888	44,582	36,139	52,069	45,639
Total asset	558,687	558,687	714,716	706,273	570,013	563,583
Capital & Liabilities Equity						
Liabilities						
Fixed liabilities						
Long term loans	281,811	281,811	481,025	523,105	307,234	458,658
Provision for contingencies	1,386	1,386	1,386	1,386	1,386	1,386
Total	283,197	283,197	482,411	524,491	308,620	460,044
Current liabilities	302,466	302,466	250,202	250,202	245,600	245,600
Total liabilities	585,663	585,663	732,613	774,693	554,220	705,644
Capital						
Capital	363,164	363,164	751,800	751,800	901,800	901,800
Accumulated deficit	-390,140	-390,140	-769,697	-820,221	886,007	-1,043,861
Net capital	-26,976	-26,976	-17,897	-68,421	15,793	-142,061
Total	558,687	558,687	714,716	706,273	570,013	563,583

* In the Without case, ratio of current liabilities to current asset will be improved to 5.4 to 6.9.

* In the With case, it will be further improved to 4.7 to 5.6. However, still financial situation will be difficult.

* The capital will keep decrease due to the increasing accumulated deficit

c) Cash Flow

Table 24 Cash Flow

(Thousand dinar)

	1996		2002		2005	
	With	Without	With	Without	With	Without
Deficit for the year	-51,334	-51,334	-52,048	-75,505	-118,879	-118,879
Foreign exchange loss	-3,887	-3,887	6,926	6,926	6,926	6,926
Depreciation	32,986	32,986	51,731	51,731	52,551	52,551
Accounts receivable	-1,662	-1,662	0	0	-7,360	-7,360
Spare parts & Materials	-4,461	-4,461	-659	-659	-742	-742
Other debt balance	-419	-419	0	0	0	0
Account payable	-1,015	-1,015	0	0	0	0
Retention of contractors	-214	-214	0	0	0	0
Deposits	3,685	3,685	0	0	0	0
Net cash used in operating activities	-26,321	-26,321	5,950	-17,507	-67,504	-67,504
Net changes in fixed assets & project in progress	-72,747	-72,747	-33,405	-33,405	78,141	78,141
Banks payable	12,648	12,648	0		-4,602	-4,602
Long term loans	32,915	32,915	-22,544	913	-56,035	-56,035
Interest on loans	22,782	22,782	0	0	0	0
Changes in capital	30,442	30,442	50,000	50,000	50,000	50,000
Provision for contingencies	0	0	0	0	0	0
Net cash provided by Financing activities	98,787	98,787	27,456	50,913	-10,637	-10,637
Net change in cash & cash equivalent	-280	-280	2,234	-257	-3,588	0
Cash End of the year	283	283	9,443	1,000	7,430	1,000

d) Financial Improvement Measures

WAJ will not yield profit for both With and Without cases. But, WAJ should try to yield profit in the near future, considering that WAJ can not go bankruptcy. In addition to the tariff revisions and UFW decreasing measures for improving financial situation, the following measures are also to be considered;

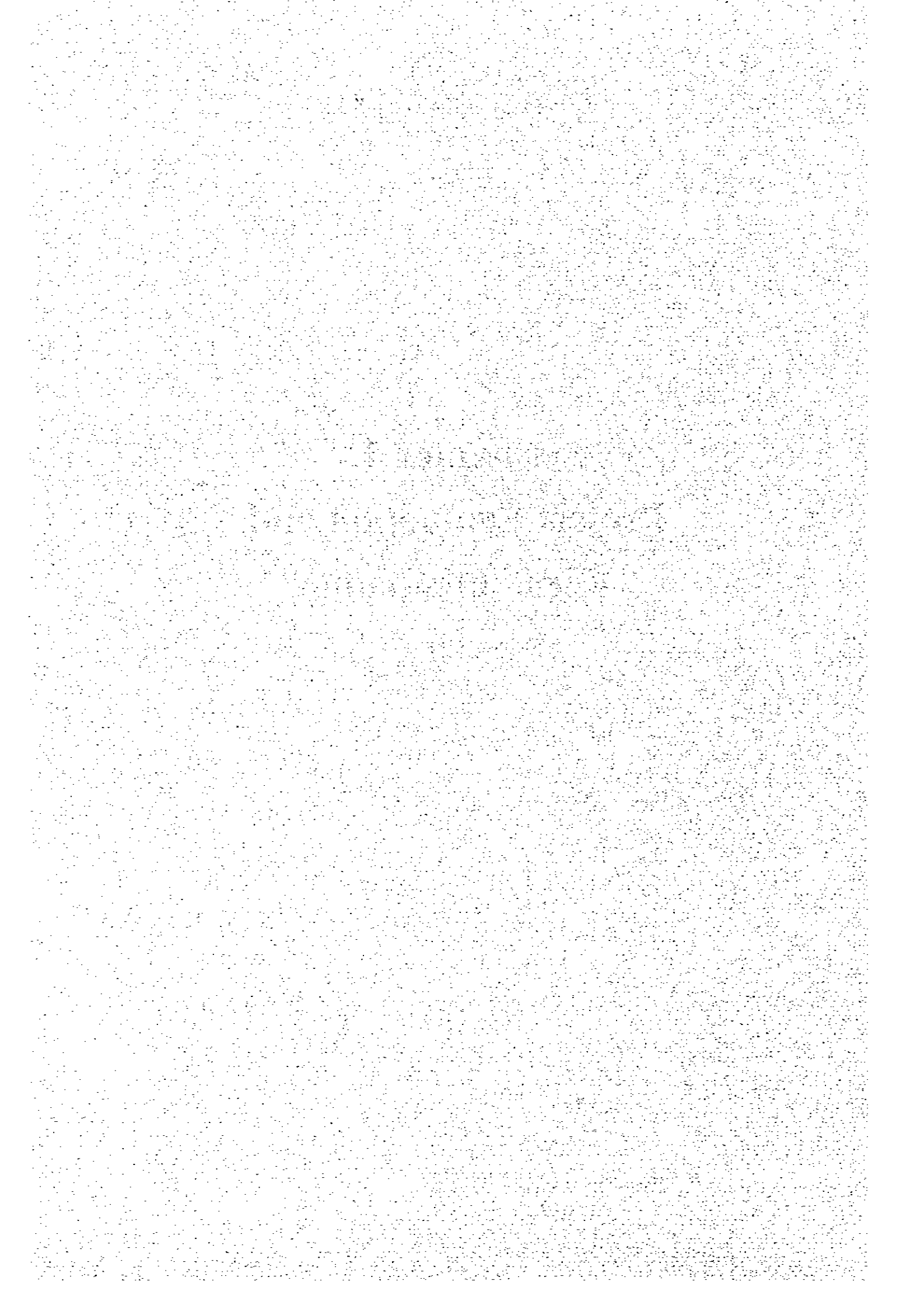
* Tariff

- Establishment of an up-to-date subscribers data base
- Control of unregistered subscribers
- Linkage of water subscribers data with sewer subscribers data
- Transferring collector from one zone to other zone

* Electricity Bill

- Optimization of pump distribution system

Chapter 4
Project Evaluation and
Recommendation



Chapter 4 Project Evaluation and Recommendation

4.1 Project Effect

- (1) A water supply capacity of 90 million m³/year can be assured after expansion of the Zai system.¹ Consequently, this Project is one of the targets marked in the Economic and Social Development Plan, and is considered to coincide with the "Development of Water Resources and Energy."
- (2) The quantity of water apportioned to Jordan after the Peace Treaty between Jordan and Israel is partly to be supplied to Amman city, so that the inhabitants of Amman can experience peace in the real sense, and is therefore a Project of significance.
- (3) If the entire water quantity mentioned above is supplied to inhabitants of the Amman city area (approx. 1,500,000 persons in 1995), the habitual rationing of water in summer (2 days per week) can be eliminated, and the effect on the inhabitants will be significant.
- (4) The effects will not only reach Amman, but also the citizens of the whole country. That is, the tight water supply and demand situation is faced not only by Amman but by other areas all over the country. If the tight water supply-demand situation in Amman is mitigated, a part of the water from sources supplying water to Amman can be diverted to other areas, mitigating the severe situation in other areas.
- (5) Furthermore, the continued pumping up of excess water from wells can be decreased to some extent, and the life of wells that are likely to dry up or deteriorate, can be extended.
- (6) The operations and maintenance of the existing Zai system is satisfactory. Facilities expanded in this Project, will basically be the same as the existing facilities, therefore adequate maintenance and operation of the expanded facilities can be anticipated.
- (7) WAJ's financial situation will be improved according to the estimated financial statements made by WAJ when the Project is implemented. Therefore, WAJ is expected to properly operate and maintain the facilities from view point of finance.
- (8) Environmental effect from the Project could be overcome.
- (9) The Project could be implemented under the Japanese grant aid system.

¹ Although the capacity of the facilities is 90 million m³/year, the actual water delivered, based on its relation with usable water quantity is approximately 87 million m³/year.

4.2 Recommendation

As mentioned above, large beneficial effects may be anticipated by implementing this Project. At the same time, improvements to BHN of the inhabitants over a large area of the country may be anticipated, therefore, the implementation of this Project through grant aid will have profound significance. However, there are problems mentioned below, in the implementation of this Project, and if these problems are not solved, it will become difficult to implement this Project smoothly.

- (1) WAJ has understood the current bad WAJ's financial situation and the importance of improving WAJ's financial situation. Among the measures towards improvement, tariff revision will be one of the most important issues so that WAJ should implement it (see Appendix: WAJ financial statement).
- (2) For attaining sound financial situation, reducing unaccounted-for-water will be other important measures. WAJ should execute and continue such measures particularly for Amman city (see Appendix: WAJ financial statement).
- (3) The autonomous enterprize of WAJ should adopt an appropriate measures to yield the required budget for updating / replacing the existing facilities together with the repairing budget from its operating profit.
- (4) The completion of the part of the Project assigned to Jordan is also indispensable for attaining the benefits of the Project. Particularly, improvement of electricity transmission lines, and reinforcement of conveyance pipelines are very important and should be executed according to the required schedule (see Appendix: WAJ financial statement).
- (5) THM measures
WAJ should initiate such measures that is suggested in Appendix to mitigate THM.

Appendices

- Appendix 1 Member List of Survey Team**
- Appendix 2 Survey Schedule**
- Appendix 3 List of Party Concerned in the Recipient Country**
- Appendix 4 Minutes of Discussions**
- Appendix 5 Soil Data**
- Appendix 6 WAJ Financial Statements**
- Appendix 7 Recommendation on THM**
- Appendix 8 Pipeline for Expansion Stage**
- Appendix 9 Water Flow in the KAC**

Appendix 1 Member List of Survey Team

Appendix 1 Member List of Survey Team

Haruo Iwahori	Team Leader	Development Specialist, Institute for International Cooperation, JICA
Yuichiro Tamaki	Cooperation Policy	First Middle East Division, The Middle Eastern and African Affairs Bureau, Ministry of Foreign Affairs
Tsutomu Tanaka	Coordinator	First Project Study Division, Grant Aid Project Study Department, JICA
Kazufumi Momose	Chief Consultant / Operation & Maintenance Planning	Tokyo Engineering Consultants
Katsutoshi Iwasaki	Water Supply Planner	Tokyo Engineering Consultants
Tokuji Okada	Cost Estimator / Procurement Planner	Nippon Koei

Appendix 2 Survey Schedule

Appendix 2 Survey Schedule

Date	Day	1. Iwahori	2. Tamaki	3. Tanaka	4. Momose	5. Iwasaki	6. Okada
Oct. 12	Sun				4. Leave Japan, Arrive Frankfurt		
13	Mon				4. Discussion with KfW 5. Leave Japan, Arrive Frankfurt		
14	Tue				4. 5. Leave Frankfurt, Arrive Amman		
15	Wed				Survey		
16	Thu				ditto		
17	Fri				ditto		
18	Sat				ditto		
19	Sun	Leave Japan, Arrive Bon			6. Leave Japan, Arrive Paris		
20	Mon	Discussion with KfW and Ministry of Economic Cooperation			6. Leave Paris, Arrive Amman		
21	Tue	Leave Bon, Arrive Amman			Survey		
22	Wed	Call to EOJ, JICA, MWI, WAJ					
23	Thu	Explanation and discussion of IC/R with WAJ					
24	Fri	Site Survey					
25	Sat	Site Survey					
26	Sun	Discussion					
27	Mon	Discussion of Minutes of Discussion					
28	Tue	Signing on Minutes of Discussion, Report to EOJ and JICA					
29	Wed	Leave Amman					
30	Thu	Arrive Tokyo					

Appendix 3 List of Party Concerned in the Recipient Country

Appendix 3 List of Party Concerned in the Recipient Country

Ministry of Planning (MOP)

Assistant secretary general
Deputy director

Mr. Salem O. Ghawi
Dr. Nael J. H. Alhajaj

Ministry of Water and Irrigation (MOW&I)

Minister
Secretary General
Director

Dr. Munther Haddadin
Eng. Koussai A. Quteishat
Mr. Othman Ahmed Al-kurdi

Water Authority of Jordan (WAJ)

Secretary General
Director, Zai
Electric Engineer
Chemist

Mr. Munther A. Khleifat
Mr. Mohammad Abu Taha
Mr. Jamal Alla'eddin
Ms. Majeda Al-Zoubi

Jordan Valley Authority (JVA)

Secretary General
Director
Computer Specialist

Dr. Dureid Mahasneh
Mr. Shafiq Habash
Mr. Mahmoud Bashtawy

Kreditanstalt für Wiederaufbau (KfW)

Mr. Henning rudd Von Collenberg
Mr. Richard Avedikian

Appendix 4 Minutes of Discussions

MINUTES OF DISCUSSIONS

STUDY FOR THE IMPLEMENTATION REVIEW
OF THE PROJECT FOR
IMPROVEMENT OF WATER SUPPLY SYSTEM
TO GREATER AMMAN
IN
THE HASHEMITE KINGDOM OF JORDAN

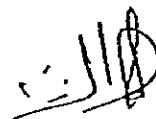
In October 1997, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched a study team (hereinafter referred to as "the Team") for the implementation review on "The Project for Improvement of Water Supply System To Greater Amman" (hereinafter referred to as "the Project") to the Hashemite Kingdom of Jordan. The Team held discussions with the officials concerned of the Government of Jordan and conducted a field survey at the study areas.

In the course of discussions and the field survey, both parties have confirmed the points described on the attached sheets.


Amman, October 28, 1997

岩 堀 春 雄

Mr. Haruo Iwahori
Leader,
Study Team,
JICA



Eng. Koussai Quteishat
Secretary General,
Ministry of Water and Irrigation



Dr. Nabil Ammari
Secretary General
Ministry of Planning

ATTACHMENT

1. Objective

The objective of the Project is upgrading the water supply systems to enhance the water supply for Greater Amman.

2. Project Sites

The project sites are located at Zai water treatment plant and four (4) pumping stations (PS. 1 to PS.4) from Deir Alla to Zai water treatment plant.

3. Executing Agencies

The Ministry of Water and Irrigation is responsible for administration of the Project, and the Water Authority of Jordan (WAJ) is responsible for execution of the Project.

4. Water Source

The Government of Jordan ensured that 90 Mm³/year (250 Ml/d) of municipal water source for the Project would be secured by the end of year 2001 as described in ANNEX I.

5. Relevant Projects

The Government of Jordan ensured that the following projects would be implemented by the end of year 2001.

- 1) Construction of 17km pipeline from Zai to Dabouq
- 2) Expansion of Pumping Station No.5
- 3) Expansion of Intake Pumping Station and construction of settling basin
- 4) Construction of 660m pipeline between Pumping Station No.4 and Zai Water Treatment Plant
- 5) Other relevant projects required to complete the whole project such as mentioned in ANNEX II.

6. The Government of Jordan ensured that the financial shortfall to complete the whole project would be financed by her. Anticipated budget provision is attached in ANNEX III.

7. Japan's Grant Aid System

- 1) The Government of Jordan has understood the system of Japan's Grant Aid explained by the Team as described in ANNEX IV.

- 2) The Government of Jordan will take the necessary measures described in ANNEX V, for smooth implementation of the Project on condition that Grant Aid Assistance by the Government of Japan is extended to the Project.

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ANNEX I

WATER FLOW OF KING ABDULLAH CANAL (KAC)

Water Resource	Yarmouk River at Adasiya				Allocation from the Peace Treaty			Water Flow of KAC		
	Total Flow	Non-effective Flow	to Israel	to KAC	from desalination (from lake Tiberias provisionally)	from lake Tiberias	from lake Tiberias after May 1997 agreement	Total	Zai	Irrigation
Phase										
Before Peace Treaty	268	148		120	-	-	-	120	45	75
After Peace Treaty	268	83	25	140	10	20	30	200	90	110
After Construction of Adasiya Dam	268	46	25	177	10	20	30	237	90	147

.J/D

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ANNEX II WORKS TO BE CARRIED OUT BY THE JORDANIAN SIDE

The works to be carried out by the Jordanian side are listed below.

1. Protection of eroded sections along the pipeline between No.1 and No.5 pumping stations
2. Arrangements for temporary sites outside the treatment plant premises
3. Ensuring availability of power and water supply for work
4. New sludge drying bed
5. Renewal of existing dosing equipment

Name of equipment	Specifications	Quantity
Chlorinator	Vacuum-type, self-standing, capacity 900 kg/day	1
Vaporizer	Type : Electrothermal, capacity 3,600 kg	1
Polymer dosing device	Flowmeter : Model Rotometer (dia. 25 mm, capacity 0.05 to 0.5 l/s)	2
	Batchmeter : Integrator (dia. 25 mm)	1
Potassium permanganate dosing device	Dosing ball tap	1
Activated carbon dosing device	Dosing pump air pressure gauge : Indicating range 0 to 100 psi(7 kgf/cm ²)	2
	Dosing pump air pressure gauge : Indicating range 0 to 100 psi(7 kgf/cm ²)	2

6. Renewal of existing monitoring and control equipment

Equipment name	Specifications	Quantity
Water level gauge	Indication, records, warnings (raw water regulating reservoir, filter, clean water basin)	2
	Indication, warnings (wash water drainage basin, wash water tank)	
	Indication, regulation (filter basin)	2
Flowmeter	Indication, regulation, integration (raw water regulating reservoir, filter basin, water supply within plant)	3
	Indication, regulation (filter basin)	6
Gauge indicating degree of opening of valve	Indication (valves in raw water regulating reservoir, filter basin flow regulating valve)	7
Filter basin head loss gauge	Indication, warning	6
Water quality gauge	Filter basin turbidity gauge (indication)	6
	Same as above (indication, record)	1
	Filter basin pH meter (indication, warning)	1
	Wash water tank thermometer (indication)	1
	Residual chlorine gauge (indication, records)	1
Dosage meter	Indication, regulation (potassium permanganate, activated carbon)	2

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ANNEX III BUDGET

Component	1998 MJD*	1999 MJD*	2000 MJD*	2001 MJD*
Electrification	4.000	4.000	1.500	1.500
ANNEX II Items		0.200	0.200	0.471
Government of Jordan / KfW**	0.770	3.130	1.750	0.750
Total	4.770	7.330	3.450	2.721

*Million Jordanian Dinars

**Includes 660 m pipeline construction

J/D

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ANNEX IV Japan's Grant Aid Scheme

1. Grant Aid Procedures

1) Japan's Grant Aid Program is executed through the following procedures.

Application	(Request made by a recipient country)
Study	(Basic Design Study conducted by JICA)
Appraisal and Approval	(Appraisal by the Government of Japan and Approval by Cabinet)
Determination of Implementation	(The Notes exchanged between the Governments of Japan and the recipient country)

2) Firstly, the application or request for a Grant Aid project submitted by a recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to determine whether or not it is eligible for Grant Aid. If the request is deemed appropriate, the Government of Japan assigns JICA (Japan International Cooperation Agency) to conduct a study on the request.

Secondly, JICA conducts the study (Basic Design Study), using (a) Japanese consulting firm(s).

Thirdly, the Government of Japan appraises the project to see whether or not it is suitable for Japan's Grant Aid Program, based on the Basic Design Study report prepared by JICA, and the results are then submitted to the Cabinet for approval.

Fourthly, the project, once approved by the Cabinet, becomes official with the Exchange of Notes signed by the Governments of Japan and the recipient country.

Finally, for the implementation of the project, JICA assists the recipient country in such matters as preparing tenders, contracts and so on.

2. Basic Design Study

1) Contents of the Study

The aim of the Basic Design Study (hereafter referred to as "the Study"), conducted by JICA on a requested project (hereafter referred to as "the Project") is to provide a basic

document necessary for the appraisal of the Project by the Japanese Government. The contents of the Study are as follows:

- a) Confirmation of the background, objectives, and benefits of the requested Project and also institutional capacity of agencies concerned of the recipient country necessary for the Project's implementation.
- b) Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, social and economic point of view.
- c) Confirmation of items agreed on by both parties concerning the basic concept of the Project.
- d) Preparation of a basic design of the Project
- e) Estimation of costs of the Project

The contents of the original request are not necessarily approved in their initial form as the contents of the Grant Aid project. The Basic Design of the Project is confirmed considering the guidelines of Japan's Grant Aid Scheme.

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

2) Selection of Consultants

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

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



3. Japan's Grant Aid Scheme

1) What is Grant Aid?

The Grant Aid Program provides a recipient country with non-reimbursable funds to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles in accordance with the relevant laws and regulations of Japan. Grant Aid is not supplied through the donation of materials as such.

2) Exchange of Notes (E/N)

Japan's Grant Aid is extended in accordance with the Notes exchanged by the two Governments concerned, in which the objectives of the Project, period of execution, conditions and amount of the Grant Aid, etc., are confirmed.

3) "The period of the Grant Aid" means the one fiscal year which the Cabinet approves the Project for. Within the fiscal year, all procedures such as exchanging of the Notes, concluding contracts with (a) consultant firm(s) and (a) contractor(s) and final payment to them must be completed.

However in case of delays in delivery, installation or construction due to unforeseen factors such as weather, the period of the Grant Aid can be further extended for a maximum of one fiscal year at most by mutual agreement between the two Governments.

4) Under the Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased.

When the two Governments deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country.

However the prime contractors, namely, consulting constructing and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality.)

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5) Necessity of "Verification"

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

6) Undertakings required of the Government of the Recipient Country

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

- (1) To secure land necessary for the sites of the Project and to clear, level and reclaim the land prior to commencement of the construction.
- (2) To provide facilities for the distribution of electricity, water supply and drainage and other incidental facilities in and around the sites.
- (3) To secure buildings prior to the procurement in case the installation of the equipment.
- (4) To ensure all the expenses and prompt execution for unloading, customs clearance at the port of disembarkation and internal transportation of the products purchased under the Grant Aid.
- (5) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the products and services under the Verified Contracts.
- (6) To accord Japanese nationals whose services may be required in connection with the supply of the products and services under the Verified contracts, such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.

(7) "Proper Use"

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



(8) "Re-export"

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

(9) Banking Arrangements (B/A)

- a) The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in an authorized foreign exchange bank in Japan (hereinafter referred to as "the Bank"). The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.
- b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an authorization to pay issued by the Government of the recipient country or its designated authority.

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ANNEX V: Necessary measures to be taken by the Government of the Recipient Country in case Japan's Grant Aid is extended to the Project

- (1) To provide data and information necessary for the Project.
- (2) To secure land for the sites of the Project.
- (3) To clear the sites prior to commencement of the construction.
- (4) To provide facilities for distribution of electricity, water supply, drainage and other incidental facilities outside the site.
- (5) To bear commissions to the Japanese foreign exchange bank to execute the banking services based upon the Banking Arrangement.
- (6) To ensure prompt unloading and customs clearance at port(s) of disembarkation in the recipient country and facilitate internal transportation therein of the products purchased under the Grant.
- (7) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the Verified Contract(s).
- (8) To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the Verified contract(s), such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.
- (9) To assign the necessary staff and secure the necessary budget for operation and maintenance of the equipment purchased under the Grant.
- (10) To maintain and use properly and effectively the equipment and materials purchased under the Grant .
- (11) To maintain and use properly and effectively the facilities constructed under the Project.
- (12) To coordinate and solve any issues related to the Project which may be raised from the third parties or inhabitants in the Project area during implementation of the Project.
- (13) To bear all the expenses other than those to be borne by the Grant necessary for the Project implementation.

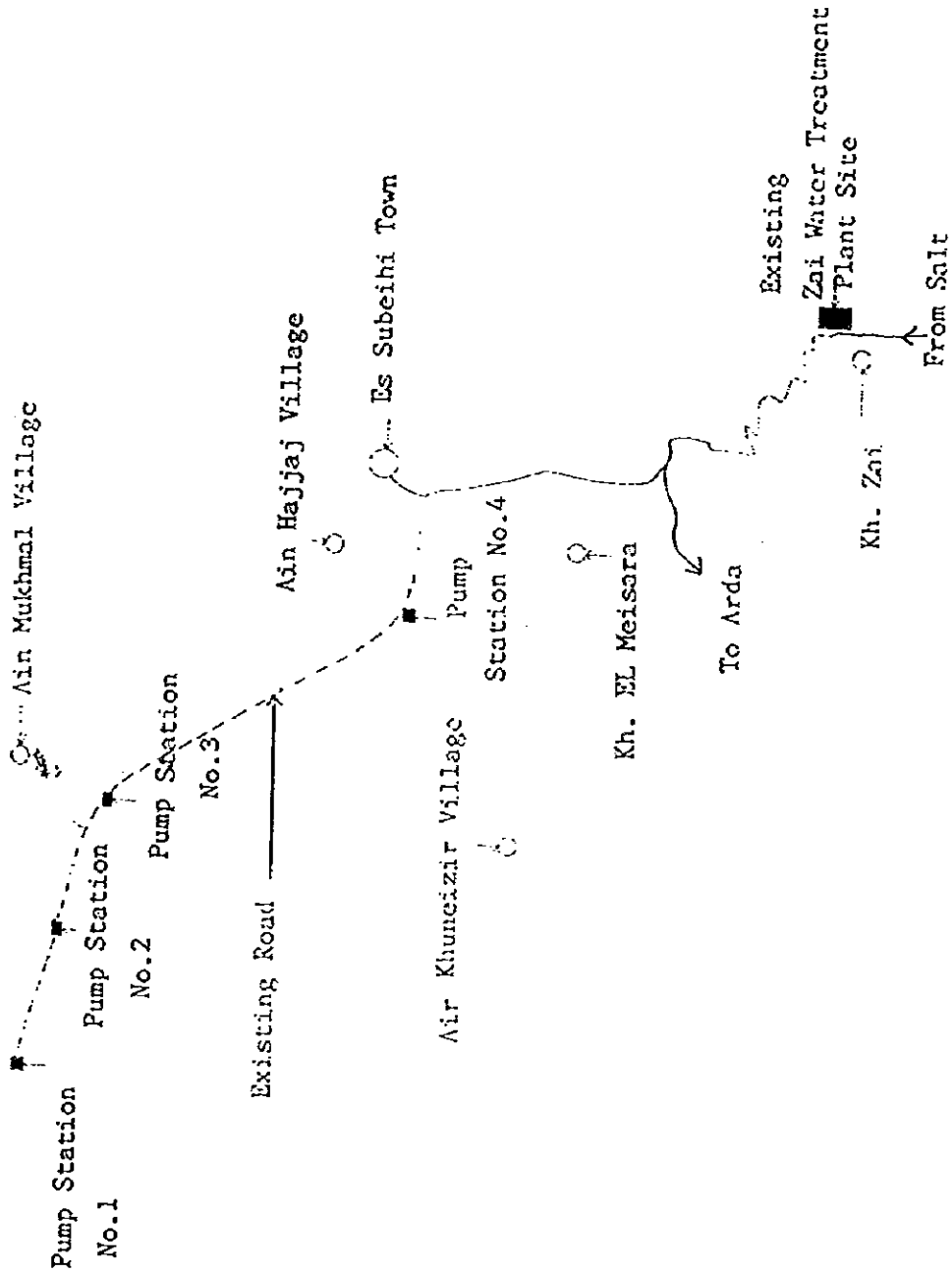




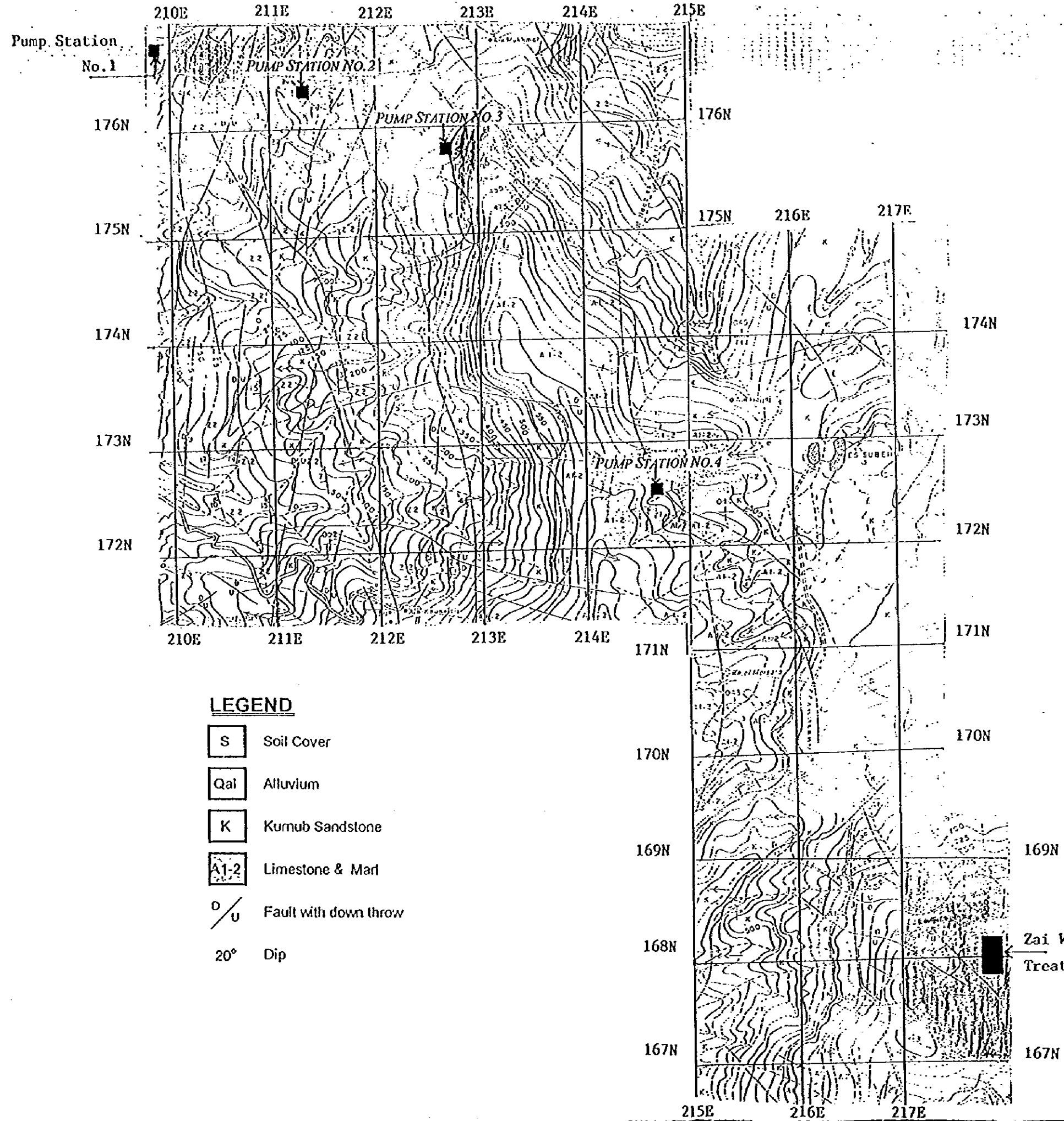
Appendix 5 Soil Data

Deir Alla Village

IMPROVEMENT OF ZAI WATER SUPPLY SYSTEM PROJECT



LOCATION MAP
REDUCED SCALE



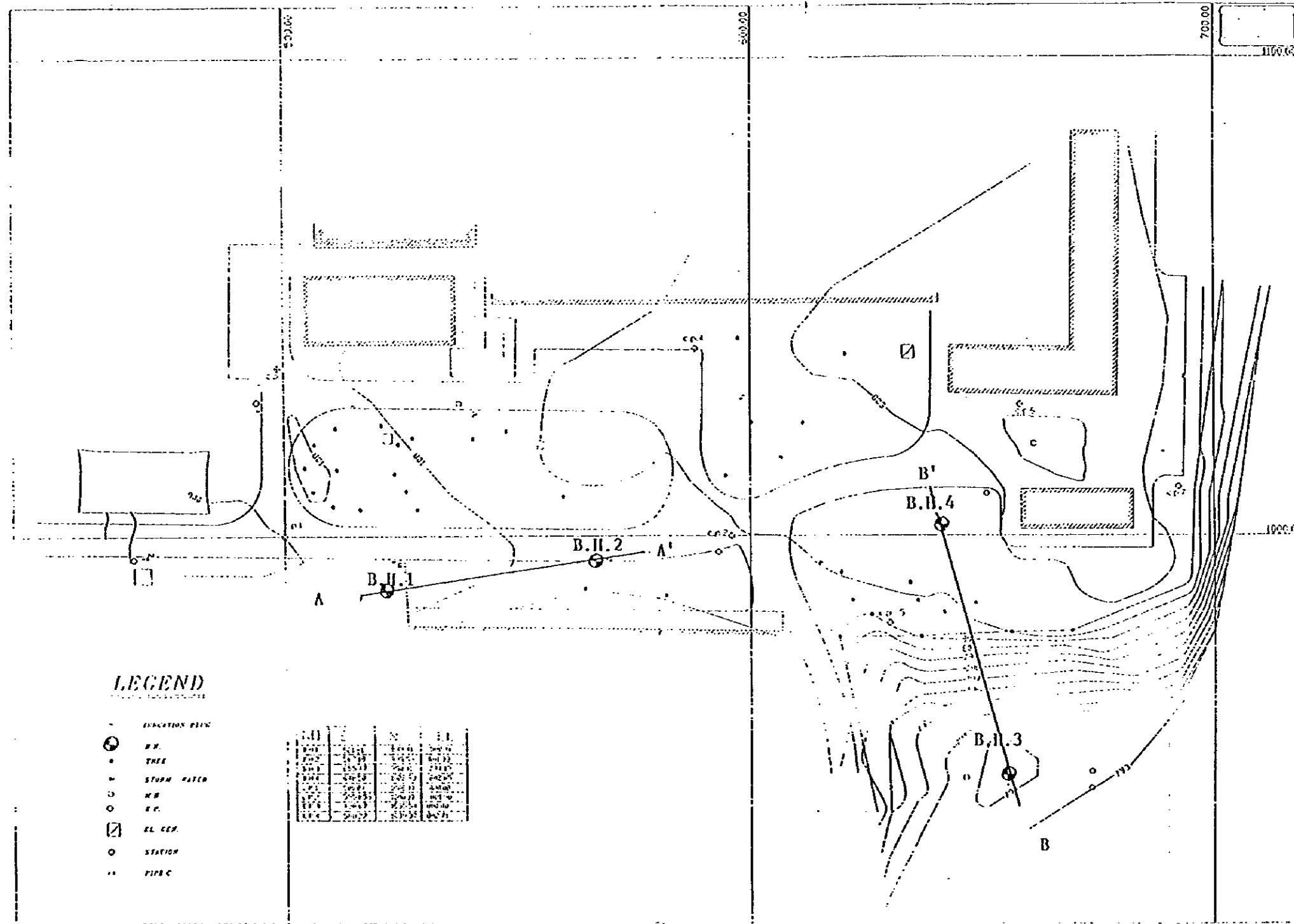
LEGEND

- S Soil Cover
- Qal Alluvium
- K Kumub Sandstone
- A1-2 Limestone & Marl
- D/U Fault with down throw
- 20° Dip

IMPROVEMENT OF ZAI WATER SUPPLY SYSTEM PROJECT

GEOLOGIC MAP
SCALE 1:40000

Zai Water Treatment Plant



LEGEND

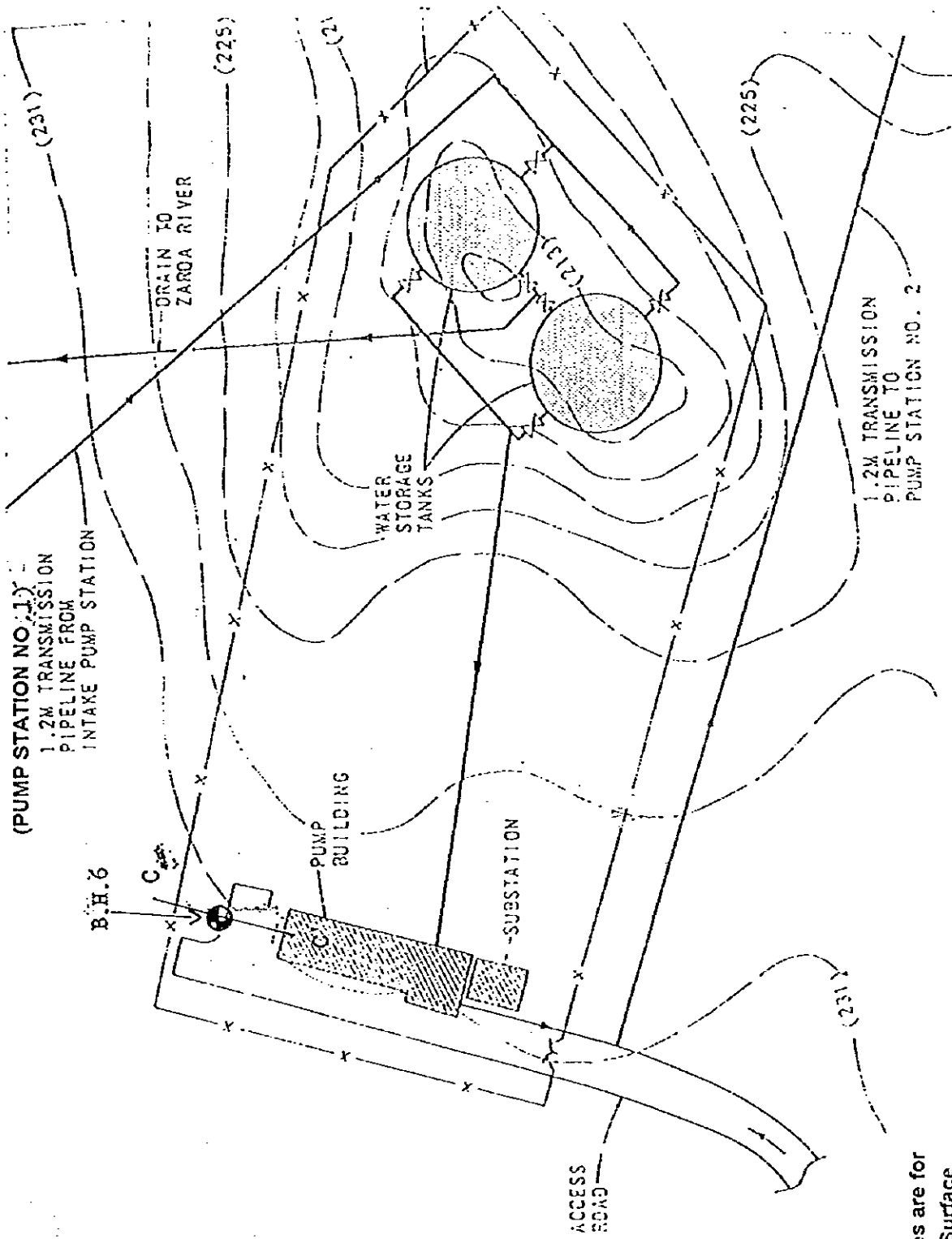
- - - IRRIGATION LINE
- ⊙ WATER
- TREE
- - - STORM WATER
- M.H.
- E.P.
- ⊠ EL. CON.
- STATION
- PIPE

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
61	62	63	64
65	66	67	68
69	70	71	72
73	74	75	76
77	78	79	80
81	82	83	84
85	86	87	88
89	90	91	92
93	94	95	96
97	98	99	100

IMPROVEMENT OF ZAI
 WATER SUPPLY PROJECT
 ZAI WATER TREATMENT PLANT
 LAYOUT OF BORINGS
 SCALE 1:1000



IMPROVEMENT OF ZAI WATER SUPPLY SYSTEM PROJECT



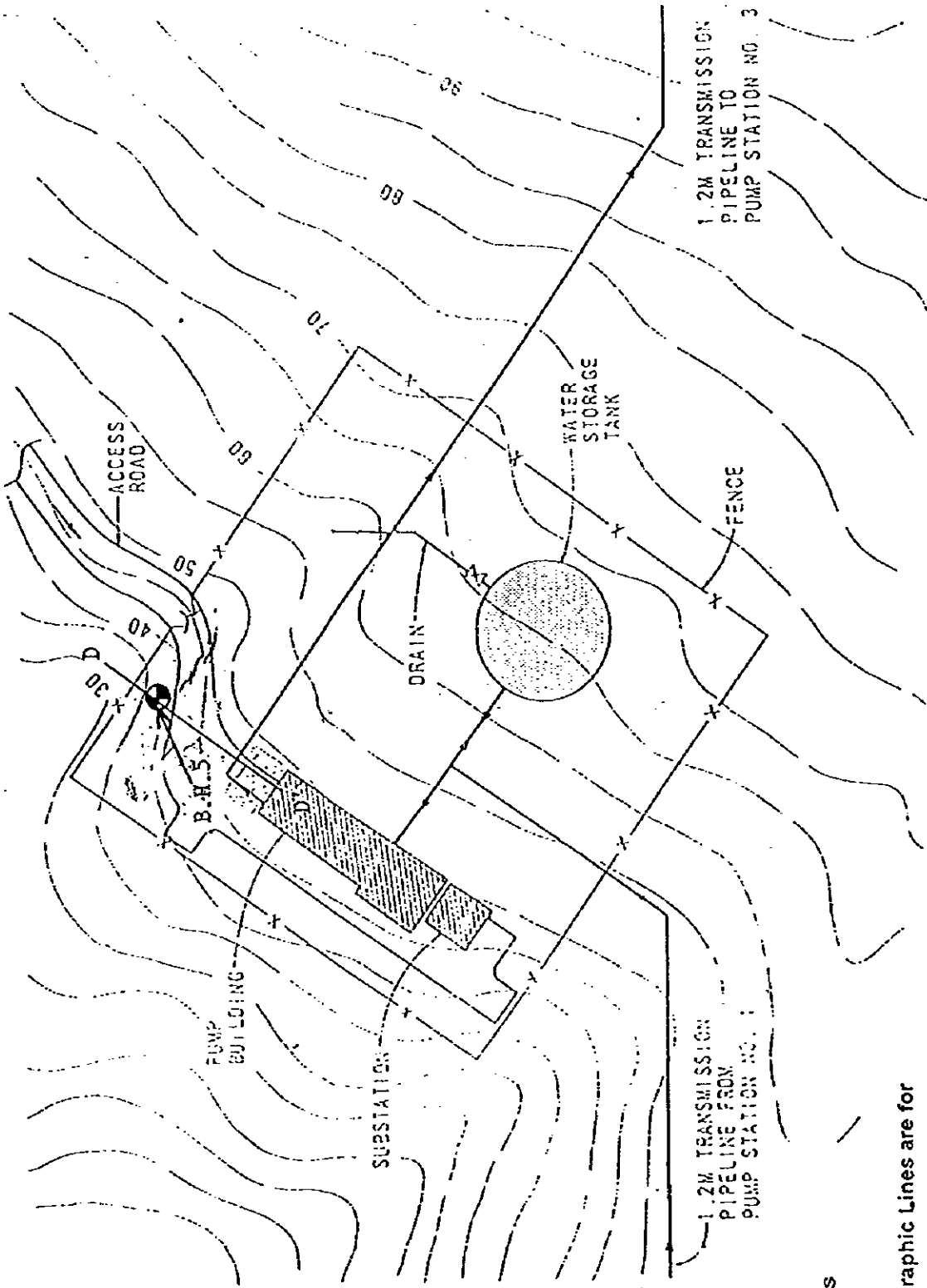
(PUMP STATION NO. 1)
1.2M TRANSMISSION
PIPELINE FROM
INTAKE PUMP STATION

1.2M TRANSMISSION
PIPELINE TO
PUMP STATION NO. 2

Note: Topographic Lines are for
Original Ground Surface
Before Construction

LAYOUT OF BORINGS
SCALE 1:1250

IMPROVEMENT OF ZAI WATER SUPPLY SYSTEM PROJECT
(PUMP STATION NO.2)



LAYOUT OF BORINGS
SCALE 1:1250

Crakes
 Note: Topographic Lines are for
 Original Ground Surface
 Before Construction



LOG OF BORING NO.1

MESSRS. TOKYO ENGINEERING CONSULTANTS
IMPROVEMENT OF ZAI WATER SUPPLY SYSTEM PROJECT
ZAI WATER TREATMENT PLANT

112 Double-tube-core barrel
2 in. Standard Penetration Test

LOCATION: E:521.81
N:989.41

DEPTH m	SYMBOL	SAMPLE TYPE	DESCRIPTION OF MATERIAL ELEVATION: 800.441	RECOVER %	RQD %	BLOW COUNTS /ft	UNCONFINED COMPRESSION, Kg/cm ²						DENSITY g/cm ³
							O		WC%		LL		
							10	20	30	40	50	60	
1			FILL: Intermixed compacted gravels and boulders	85									
2			of marly limestone, chalky marl with brown silty clay	50									
3					22								
4				70									
5				75					No. 200 = 65%				
6				40									
7				50									
8				90									
9				Ref									
10			Creamish, yellowish, moderately weathered highly fractured, MARLSTONE, medium weak with creamish, yellowish, weathered CHALKY MARL, weak and thin bands of whitish LIMESTONE, strong.	70	10								72 O-->
				80	10		5 O	+					2.00
				80	10								510 O-->

COMPLETION DEPTH: 10m

DATE: June 22, 1996

JOB NO.: 196 - 121

GEOTECHNICAL ENGINEERING AND MATERIALS TESTING COMPANY



LOG OF BORING NO.2

MESSRS. TOKYO ENGINEERING CONSULTANTS
IMPROVEMENT OF ZAI WATER SUPPLY SYSTEM PROJECT
ZAI WATER TREATMENT PLANT

412 Double-tube-core barrel

LOCATION: E:567.18
N:995.50

DEPTH m	SYMBOL	DESCRIPTION OF MATERIAL	RECOVERY %	RQD %	BLOW COUNTS /ft	UNCONFINED COMPRESSION, Kg/cm ²						DENSITY g/cm ³
						O						
						PL	WC%		LL			
1		FILL Intermixed compacted gravels and boulders of marly limestone, chalky marl with brown silty clay	80									
2			80	0								
3		Creamish, yellowish, moderately weathered highly fractured MARLY LIMESTONE, with creamish weathered CHALKY MARL, weak	90	0								
4		and creamish yellowish weathered, highly fractured MARLSTONE, medium weak	90	0								
5			90	0								
6			60	0								
7			90	20							320	O-->
8			90	0								
9			60	0								
10			70	0								

COMPLETION DEPTH: 10m

DATE: June 22, 1996

JOB NO.: 195 - 121

GEOTECHNICAL ENGINEERING AND MATERIALS TESTING COMPANY



LOG OF BORING NO.3

MESSRS. TOKYO ENGINEERING CONSULTANTS
 IMPROVEMENT OF ZAI WATER SUPPLY SYSTEM PROJECT
 ZAI WATER TREATMENT PLANT

412 Double-tube-core barrel

LOCATION: E:655.47
 N:950.41

DEPTH m	SOIL TYPE	DESCRIPTION OF MATERIAL ELEVATION: 794.19m	RECOVER %	RELATIVE DENSITY %	UNCONFINED COMPRESSION, Kg/cm ²						DENSITY g/cm ³
					O						
					PL	WC%			LL		
			10	20	30	40	50	60			
1		Brown TOPSOIL, of silty clay with gravels of limestone.	85								
2			90	0							
3		Creamish, yellowish moderately weathered highly fractured MARLY LIMESTONE.	90	10	4.5	+					1.996
4		medium strong with creamish, yellowish weathered, CHALKY MARL, weak and	95	0							
5		creamish yellowish, weathered, highly fractured MARLSTONE, medium weak	95	10						570	O-->
6		Thin bands of whitish LIMESTONE, strong at 6.2m to 6.4m, 7m to 7.1m and 9.4m to 9.4	95	0							
7			95	0							
8			95	10		+					87 O-->
9			70	10							
10			70	0		+					

COMPLETION DEPTH: 10m

DATE: June 20, 1996

JOB NO.: 195 - 121

GEOTECHNICAL ENGINEERING AND MATERIALS TESTING COMPANY



LOG OF BORING NO.4

MESSRS. TOKYO ENGINEERING CONSULTANTS
 IMPROVEMENT OF ZAI WATER SUPPLY SYSTEM PROJECT
 ZAI WATER TREATMENT PLANT

412 Double-tube-core barrel

LOCATION: E:640.50
 N:1002.93

DEPTH m	SYMBOL	SAMPLE ELEVATION	DESCRIPTION OF MATERIAL	RECOVER %	R-Q D %	BLOW COUNTS /ft	UNCONFINED COMPRESSION, Kg/cm ²						DENS g/cm ³
							PL	WC%		LL			
							10	20	30	40	50	60	
1			FILL: Intermixed compacted gravels and boulders	60									
2			of marly limestone, chalky marl with brown silty clay	80									
3				60			+		No. 200 = 70%				
4				90									
5				60			+		No. 200 = 68%				
6			Brown SOIL, of silty clay with gravels of limestone	70									
7				80	0								
8			Creamish, yellowish, moderately weathered highly fractured, MARLSTONE, medium weak with creamish, yellowish, weathered CHALKY	85	10			+					68 O
9			MARL, weak and thin bands of whitish LIMESTONE, strong	95	20								531 O-->
10				50	0						50 O		

COMPLETION DEPTH: 10m

DATE: June 19, 1996

JOB NO.: 196 - 121

GEOTECHNICAL ENGINEERING AND MATERIALS TESTING COMPANY



LOG OF BORING NO.5

MESSRS. TOKYO ENGINEERING CONSULTANTS
IMPROVEMENT OF ZAI WATER SUPPLY SYSTEM PROJECT
PUMP STATION No. 2

42 Double-tube-core barrel
2 in. Standard Penetration Test

LOCATION: See Plate 3.2

D E P T H m	S Y M B O L	S A M P L E	DESCRIPTION OF MATERIAL ELEVATION:	R E C O V %	R E Q U I R E D	B L O C K S /R	UNCONFINED COMPRESSION, Kg/cm ²						D E N S g/cm ³		
							O								
							PL		WC%		LL				
		+													
								10	20	30	40	50	60		
1			FILL: Intermixed gravels and boulders of limestone and sandstone.	80											
2				90											
3				70		15	+								
4				80											
5				50		Ref	+	No. 200 = 50%							
6				80											
7				80		27	+								
8			Brown, clayey sandy SILT	70											
9			Multi colored moderately to highly weathered, SANDSTONE, medium weak with thin bands of sandy SHALE	80	20										
10				85	15										

COMPLETION DEPTH 10m

DATE: June 23, 1996

JOB NO.: 196 - 121

GEOTECHNICAL ENGINEERING AND MATERIALS TESTING COMPANY



LOG OF BORING NO.6

MESSRS TOKYO ENGINEERING CONSULTANTS
 IMPROVEMENT OF ZAI WATER SUPPLY SYSTEM PROJECT
 PUMP STATION No. 1

4 1/2 Double-tube-core barrel
 2 in. Standard Penetration Test

LOCATION: See Plate 3.3

D E P T H m	S Y M B O L	S A M P L E	DESCRIPTION OF MATERIAL ELEVATION:	R E C O V %	R E Q U I R E D	B L O W S /ft	UNCONFINED COMPRESSION, Kg/cm ²						D E N S g/cm ³
							O						
							PL	WC%			LL		
		10	20	30	40	50	60						
1	oo		ALLUVIAL DEPOSITS: Intermixed gravels and boulders of limestone and sandstone with brown sandy silt and clay	80									
2	oo			70									
3	oo			20	Ref								
4	oo			50									
5	oo			90	Ref								
6	oo			70									
7	oo			90	49					No. 200 = 60%			
8	oo			50									
9	oo			50	Ref								
10	oo			85									

COMPLETION DEPTH: 10m

DATE: June 23, 1996

JOB NO.: 196 - 121

GEOTECHNICAL ENGINEERING AND MATERIALS TESTING COMPANY



TERMS & SYMBOLS USED ON BORING LOGS

MATERIAL TYPE

(Shown in Symbols Column)



SAMPLER TYPE

(Shown in Symbols Column)



DEFINITIONS

Blows / ft. Unless noted otherwise, number of blows of a 140-lb hammer falling 30in. required to produce one foot penetration of 12-in. split-barrel sampler

Ref.: Refusal to penetration in a Standard Penetration Test (S.P.T.)

% Recovery: Ratio of length of recovered sample to total length cored

R.Q.D.: Rock Quality Designation representing ratio between total length of intact core greater than 10cm in length to total length cored

No. 200%: Percent by weight passing the No. 200 sieve

Massive: Homogeneous rock strata or bed lacking in sedimentary material

Fissured: Containing shrinkage cracks, frequently filled with soil

Laminated: Composed of thin layers of varying color and / or texture

Calcareous: Containing appreciable quantities of calcium carbonate

Well graded: Having wide range in grain sizes and substantial amounts of all intermediate particle sizes

Poorly graded: Predominantly one grain size or having a range of sizes with some intermediate size missing

TERMS DESCRIBING CONSISTENCY OR CONDITION

COARSE GRAINED SOILS:

(major portion retained on No. 200 sieve)

Includes: (1) clean gravels and sands

(2) silty or clayey gravels and sands

Condition is rated according to relative density

as determined by laboratory tests or based on

standard penetration values

Descriptive Term	Penetration Resistance Blows/ft	Relative Density
Loose	0 - 10	0 to 40 %
Medium Dense	10 - 30	40 to 70 %
Dense	30 and above	70 to 100%

FINE GRAINED SOILS:

(major portion passing No. 200 sieve)

Includes: (1) inorganic and organic silts and clays

(2) gravelly, sandy, or silty clays and (3) clayey

silts. Consistency is rated according to shearing

strength or estimated from standard penetration test

values

Descriptive Term	Penetration Resistance Blows/ft	Unconfined Compressive strength (Kgf/cm ²)
Very soft	Less than 2	0.25 to 0.5
Soft	2 - 4	0.5 to 1.0
Firm	4 - 8	1.0 to 2.0
Stiff	8 - 15	2.0 to 4.0
Very stiff	15 - 30	4.0 and higher
Hard	30 and higher	

ROCK CORING INFORMATION:

Includes: (1) measured cored and

recovered lengths, and (2) hardness

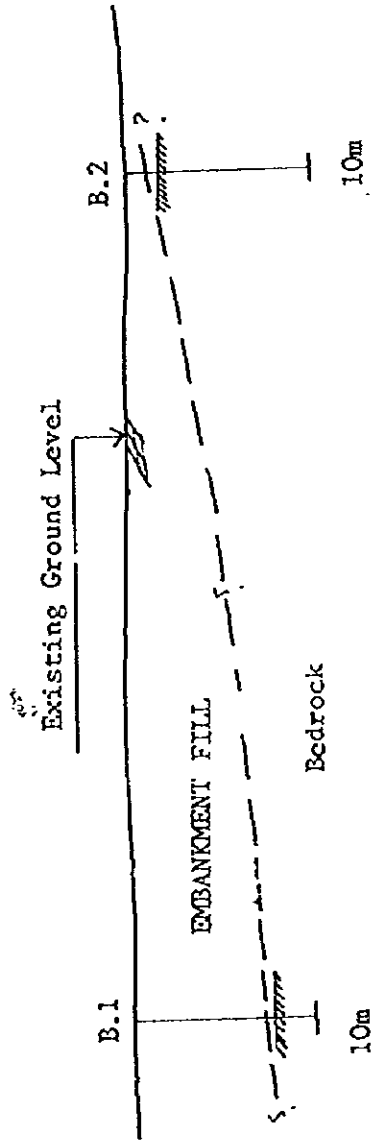
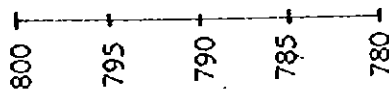
rating based on unconfined compressive

strength data

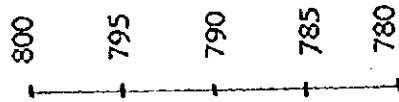
Description of Rock Quality	R.Q.D.-Rock Quality Designation	Rock hardness	Unconfined Compressive Strength (Kgf/cm ²)
Very poor	0 - 25%	Weak	Less Than 50
Poor	25 - 50%	Medium weak	50 to 150
Fair	50 - 70%	Medium strong	150 to 500
Good	70 - 90%	Strong	More than 500
Excellent	90 - 100%		

Section A

Elevation, meters



Elevation, meters



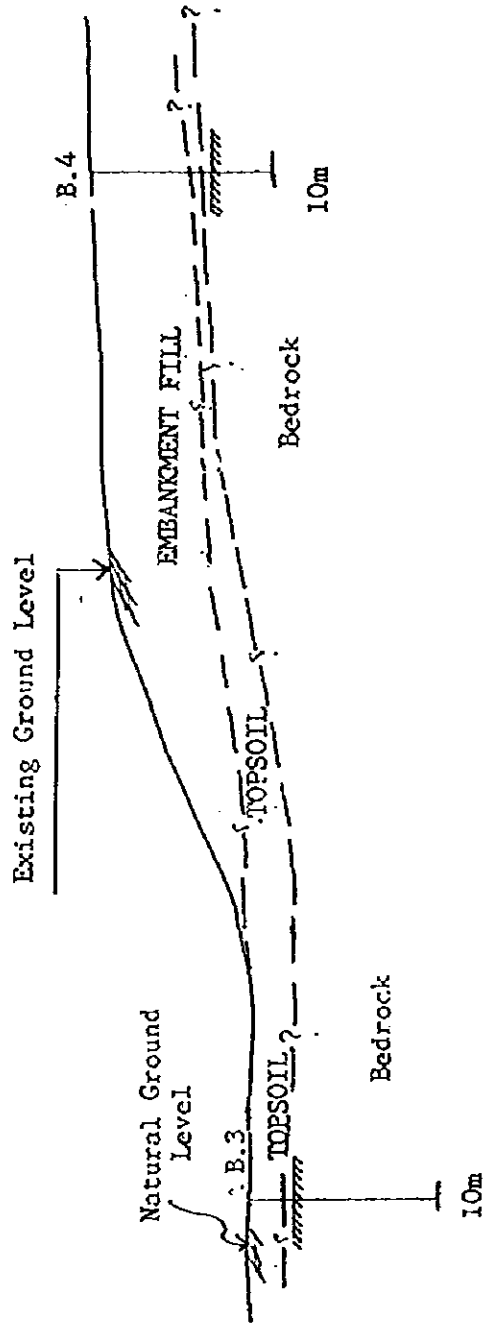
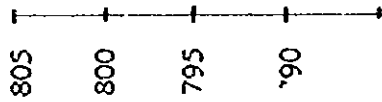
A'

Recommended Foundation Levels

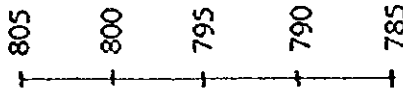
GENERAL STRATIGRAPHIC PROFILE
AND
FOUNDATION LEVELS
Section : A - A'
Scale 1:400

Section B

Elevation, meters



Elevation, meters



B'

Recommended Foundation Levels

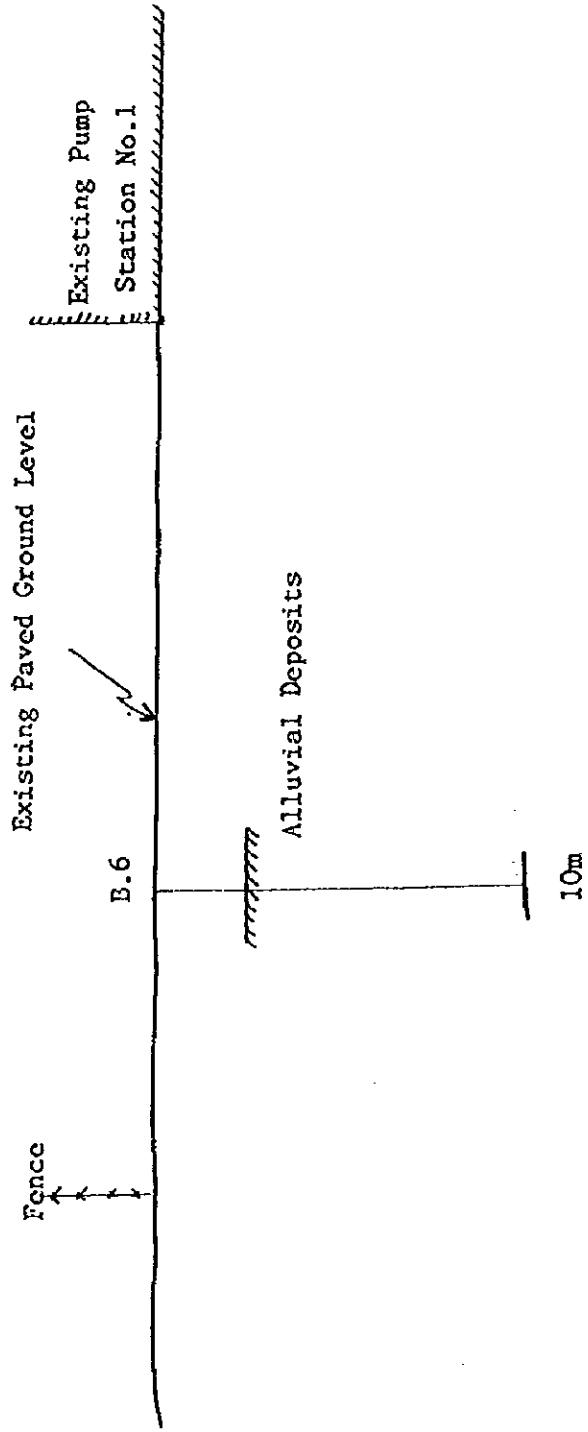
GENERAL STRATIGRAPHIC PROFILE
AND
FOUNDATION LEVELS
Section: B - B'
Scale 1:400

Section C

C'

Elevation, meters

Elevation, meters



Recommended Foundation Levels

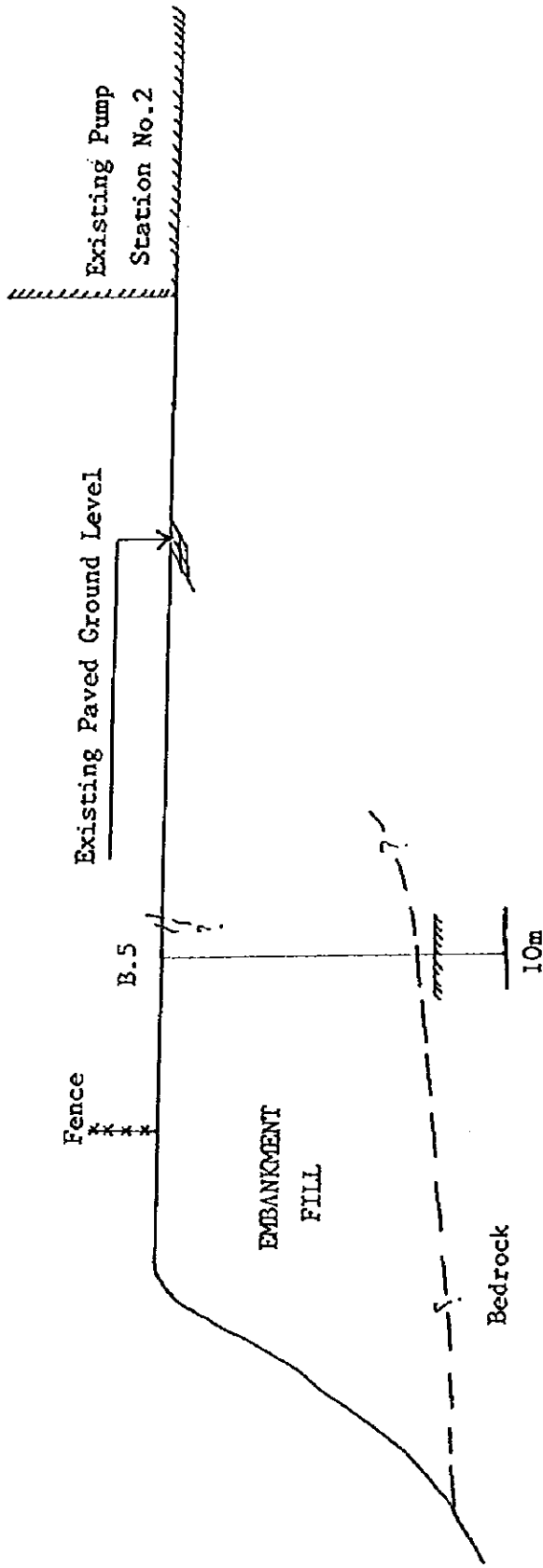
GENERAL STRATIGRAPHIC PROFILE
AND
FOUNDATION LEVELS
Section : C-C'
Scale 1:200

D'

Elevation, meters

Section D

Elevation, meters



GENERAL STRATIGRAPHIC PROFILE
AND
FOUNDATION LEVELS
Section : D-D'
Scale 1:200

Recommended Foundation Levels
Cracks within Paved Yard

Appendix 6 WAJ Financial Statements

Appendix 6 WAJ Financial Statements

The financial improvement measures are proposed by WAJ which consist of four parts.

Attachment 1: Financial Statements

Estimated financial statements both for With the Project (including related projects before No. 1 pumping station and after No. 5 pumping station) and for Without the Project and their bases.

Attachment 2: Answers to the Pre-requisites as stipulated in the Minutes of Discussions

Attachment 3: WAJ's Audit Report 1995.

Attachment 4: Annual Expenditures of WAJ for the Project



بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ
وزارة المياه والري
سلطة المياه
Ministry of Water & Irrigation
Water Authority



The Hashemite Kingdom
of Jordan

Ref.	WA/7/2/20324	Date	04.12.1996	التاريخ	الرقم
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Mr. Harou IWAHORI
Leader
Basic Design Study Team
Japan International Cooperation Agency (JICA)

Reference: The Improvement of the Water
Supply System to Greater Amman

Dear Mr. IWAHORI

Enclosed herewith please find the following, including documents supporting WAJ's plan for financial improvements in order to achieve cost recovery at and after the date of completion of the Project:

Attachment 1.

Financial statements.

Attachment 2.

Answers to the pre-requisites as stipulated in the Minutes of Discussions.

Attachment 3.

WAJ's Audit Report 1995.

Attachment 4.

Annual Expenditures.

In addition to other related issues.

Best regards


Eng. Koussai Quteishat
Secretary General

