DEPARTMENT OF STATE
AGENCY FOR INTERNATIONAL DEVELOPMENT

Washington, D.C. 20523

PROJECT PAPER

JORDAN - AQABA WASTEWATER PROJECT

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT PAPER FACESHEET

FSN = 1626

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8. ESTIMATED FY OF PROJECT COMPLETION: FY 82

9. ESTIMATED DATE OF OBLIGATION: A. INITIAL FY 79; B. QUARTER 4 (Enter 1, 2, 3, or 4); C. FINAL FY 79

10. ESTIMATED COSTS ($000 OR EQUIVALENT $1 =)

A. FUNDING SOURCE	FIRST FY			LIFE OF PROJECT		
	B. FX	C. L/C	D. TOTAL	E. FX	F. L/C	G. TOTAL
AID APPROPRIATED TOTAL	5,497	2,093	7,500	5,407	2,093	7,500
(GRANT)	( )	( )	( )	( )	( )	( )
(LOAN)	(5,407)	(2,093)	(7,500)	(5,407)	(2,093)	(7,500)
OTHER U.S. 1.						
OTHER U.S. 2.						
HOST COUNTRY	35	65	100	0,940	4,240	6,180
OTHER DONOR(S)						
TOTALS	5,442	2,158	7,600	0,940	6,333	12,680

11. PROPOSED BUDGET APPROPRIATED FUNDS ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	PRIMARY TECH. CODE		E. 1ST FY 79		H. 2ND FY ___		K. 3RD FY ___	
		C. GRANT	D. LOAN	F. GRANT	G. LOAN	I. GRANT	J. LOAN	L. GRANT	M. LOAN
(1) ESF	501B		541		7,500				
(2)									
(3)									
(4)									
TOTALS					7,500				

A. APPROPRIATION	N. 4TH FY ___		Q. 5TH FY ___		LIFE OF PROJECT	
	O. GRANT	P. LOAN	R. GRANT	S. LOAN	T. GRANT	U. LOAN
(1) ESF						7,500
(2)						
(3)						
(4)						
TOTALS						7,500

12. IN-DEPTH EVALUATION SCHEDULED: MM 10 YY 83

13. DATA CHANGE INDICATOR. WERE CHANGES MADE IN THE PID FACESHEET DATA, BLOCKS 12, 13, 14, OR 15 OR IN PRP FACESHEET DATA, BLOCK 12? IF YES, ATTACH CHANGED PID FACESHEET.

1 (1 = NO, 2 = YES)

14. ORIGINATING OFFICE CLEARANCE

SIGNATURE: Edgar S. Hardcastle

TITLE: Mission Director, USAID/Jordan

DATE SIGNED: MM 09 DD 27 YY 79

15. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION: MM 07 DD 09 YY 79

AID 1330-4 (3-76)

TABLE OF CONTENTS

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ANNEXES TO PROJECT PAPER

AQABA WASTEWATER PROJECT

PROJECT PAPER

HASHEMITE KINGDOM OF JORDAN

AQABA WASTEWATER PROJECT

SUMMARY AND RECOMMENDATIONS

1. Borrower: The Government of the Hashemite Kingdom of Jordan (GOJ) which will make the proceeds of the loan available to the Water Supply Corporation (WSC), the semi-autonomous organization with responsibility for the collection and treatment of sewage (and the production and distribution of water) in the city of Aqaba.

2. The Loan: Not to exceed Seven Million Five Hundred Thousand U.S. Dollars ($7,500,000) funded under the appropriation for FY 1979 to finance the procurement of equipment, materials and construction services. Procurement will be limited to Jordan and countries included in AID Geographic Code 941.

3. Loan Terms: Repayable in U.S. Dollars over a period of forty (40) years, including a 10-year grace period for principal repayments, with interest at an annual rate of two percent (2%) during the grace period and three percent (3%) thereafter.

4. Description of the Project: The proposed project will provide wastewater collection and treatment facilities for the city of Aqaba which should provide sufficient capacity until sometime in the 1990's, when, depending upon the rate of growth, the population nears 60,000. Total estimated project cost is $12.7 million. The project represents the first in a series of planned investment phases which, when completed, will provide wastewater services to an ultimate Aqaba population of 82,000. The project will include the following three major elements:

(a) Installation of a sewerage collection system serving all developed areas of the City of Aqaba. While largely involving new construction, where practicable the new collection system will incorporate parts of the limited existing collection network, which will be upgraded to the standards of the new system;

(b) Construction of a sewage treatment plant designed to provide secondary treatment of up to 9,000 cubic meters of sewage per day; and

(c) Irrigation system to utilize effluent from the treatment plant to irrigate ornamental greenery in Aqaba.

Design of the wastewater facilities has been based on increased water availabilities to Aqaba, to be provided by a $42.5 million water supply and distribution project. Construction of the water project facilities began in mid-1979; completion is scheduled for mid-1981. The water project is being financed by the Government with the assistance of development loans from the Saudi Fund for Development, the Arab Fund for Economic and Social Development and the U.K. Ministry of Overseas Development.

5. Summary Findings:

(a) Technical Analysis: Detailed feasibility studies, including preliminary design and detailed cost estimates, were completed in mid-1978 by an experienced sanitary engineering consulting firm. These have been reviewed by AID and are judged to be fully adequate for the purpose of establishing the technical soundness of the project. The feasibility studies were the basis for this project paper and are available from NE/PD. The Consultants will be providing technical engineering/consulting services through completion of the wastewater project, to include final design; tendering and contracting documents for all construction, equipment and materials; and engineering supervision of construction, installation and start-up of all facilities.

(b) Financial Analysis: Under what appear to be most likely conditions obtaining in Aqaba through the 10 years following system inauguration, the combined water and wastewater charges required to finance all debt repayment (for construction and for a continuing extension and improvement program for the collection system) and all operating and maintenance costs should be affordable to the average resident of Aqaba.

(c) Economic Analysis: The primary benefits expected will be in the areas of improved health and amenities in Aqaba. Because of the well-known difficulty of quantifying such benefits from water and sewerage projects, no benefit/cost or economic return rates were attempted for the wastewater project. The feasibility study established that the project as proposed represents the least-cost solution to the problem of providing acceptable wastewater services for the City of Aqaba.

(d) Social Analysis: The project will benefit all the residents of Aqaba by providing the entire city with sewerage services and by increasing protection for the surrounding environment, particularly the coral reefs in the gulf. The chief benefits will be in the form of improved health and amenities. The project is expected to contribute to a substantial enhancement of the total quality of Aqaba's communal life. It is believed that no aspects of the project will conflict with any of the social norms or cultural patterns of Aqaba's residents.

(e) Environmental Considerations: An environmental assessment was conducted by the Consultant utilizing the guidelines of both A.I.D. and the U.S. Water Resources Council. The basic findings are that the project will have the normal short-run negative impacts associated with major construction but that the long-term impacts will be positive and substantial.

6. Statutory Checklist: All statutory criteria have been met (see Annex G).

7. AID Funding Sources: Economic Support Fund, FY 1979.

8. Mission's Views: The USAID Mission supports the project fully. The FAA Section 611(e) certification executed by the Mission Director is included as Annex H. The project directly addresses the priority development objective of the Government of Jordan of meeting basic human needs in the field of sanitation.

9. Issues: There are no unresolved issues. A discusssion of issues considered during project development can be found in Sections III.A.2 and IIIB.4.

10. Recommendation: That a loan be authorized in an amount not to exceed $7.5 million from the 1979 appropriation subject to the terms and conditions found in the draft loan authorization (Annex L).

I. PROJECT BACKGROUND

A. Introduction:

Aqaba, with a 1979 population estimated between 25,000 and 30,000, is small in relation to the other main cities of Jordan, but it does share with them the characteristics of rapid growth coupled with inadequate housing and other facilities, particularly water supplies and wastewater (sewage) services. As the growth of urban areas in Jordan has accelerated, so has awareness of the absolute necessity to health and well-being of meeting their inhabitants' basic human needs for adequate amounts of safe water and for wastewater services. The proposed project for wastewater services in Aqaba is part of a program initiated by the Government of Jordan to meet these critical needs in all of the nation's major urban areas. The proposed loan will be part of an on-going AID effort to support this Government initiative as fully as possible and will respond directly to the AID Country Strategy for Jordan of priority for assistance to the water sector, including wastewater facilities.

B. Aqaba Background:

Aqaba occupies a strategic position in the southwestern corner of Jordan on the country's only seaboard, about 27 kilometers of coastline at the northeast tip of the Gulf of Aqaba. To the west of Aqaba lies the southern end of Wadi Araba, which is part of the massive Rift Valley extending northwards to the Dead Sea where it becomes the Jordan Valley. To the north and the east of Aqaba are rugged, barren mountains of granite rising to over 1500 meters, virtually without vegetative cover (see Figure I.A and I.B).

Aqaba climate is hot and dry with an annual rainfall average around 30 mm and temperatures reaching a mean maximum of about 40 degrees centigrade in the summer and about 20 degrees in the winter. Relative humidity is very low in the summer, ranging from 15% to 45%, but rises in the winter to between 30% and 90%. The prevailing wind is from the north and seldom abates, occasionally causing severe dust storms over the city.

Since 1975, the growth rate of Aqaba's population has recovered strongly from the slump it went into in 1967. While estimates place Aqaba's growth rate at 13% through the 1950's and around half that through the 1960's until 1967, from 1967 until 1975 it was in the neighborhood of only 1%. Since 1975, however, economic activity

[NOTE: FIGURE I.A IS BEHIND THIS PROTECTIVE SHEET]

FIGURE I.A

5M

MAP OF JORDAN

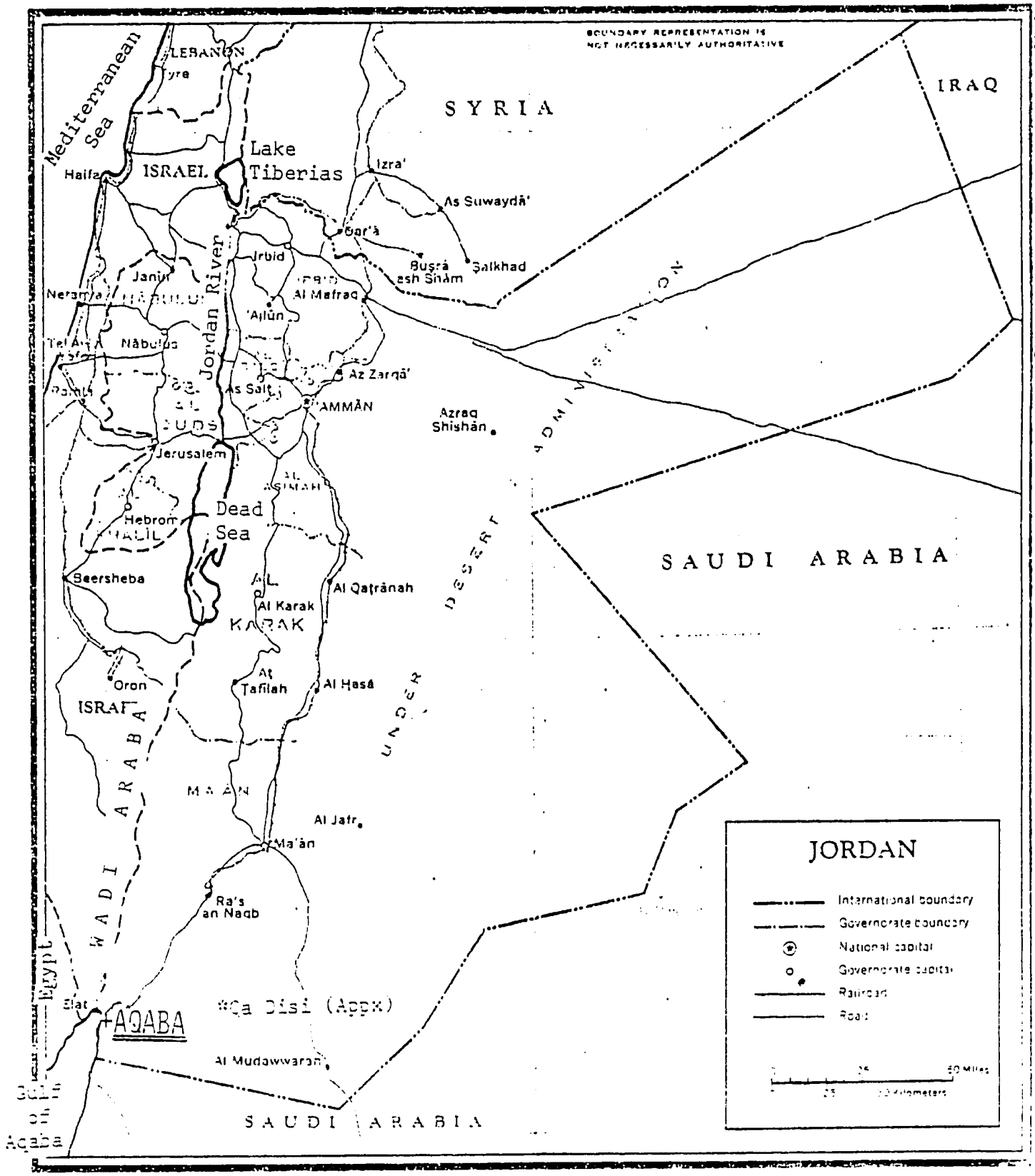
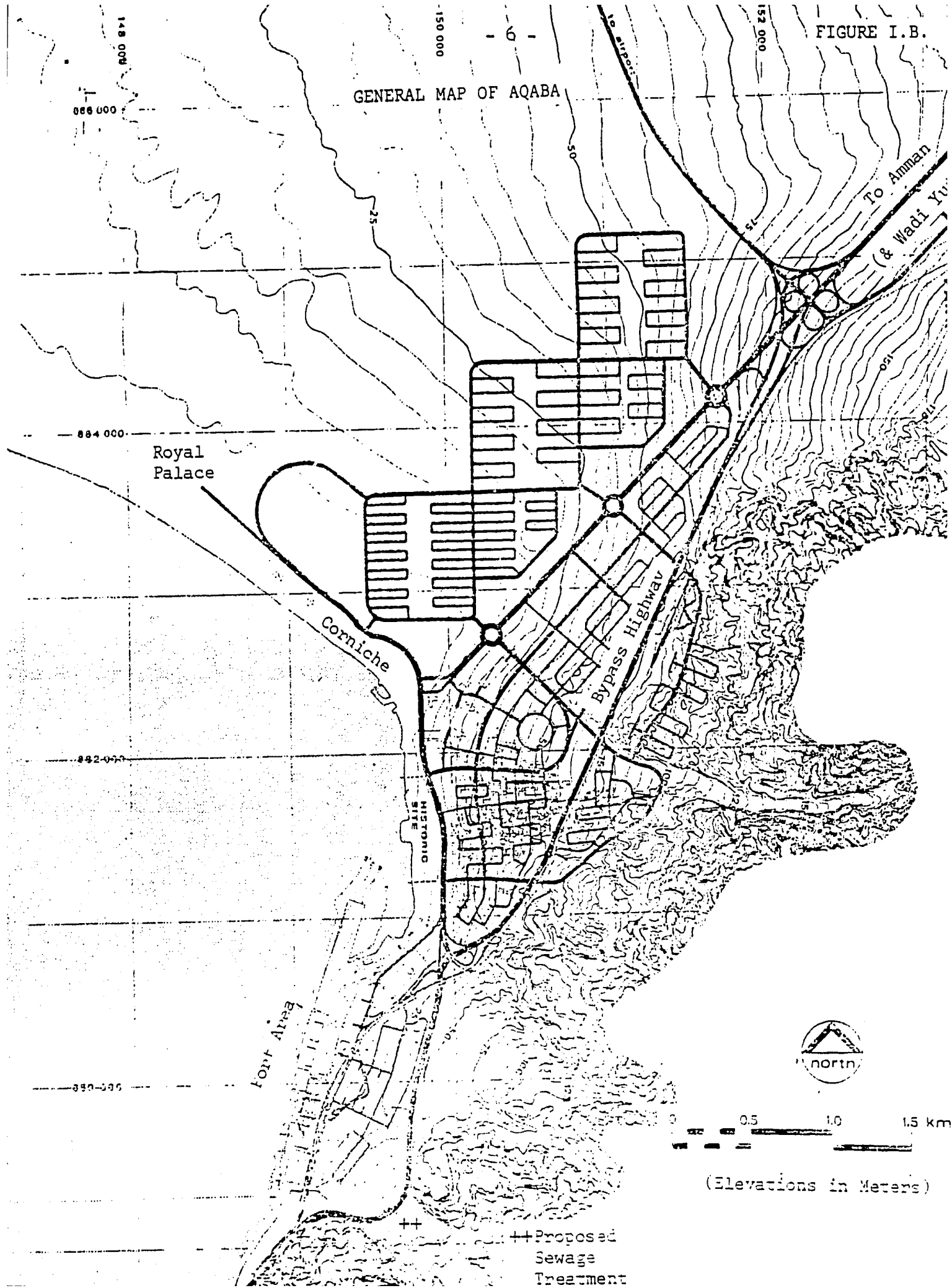


FIGURE I.B.


GENERAL MAP OF AQABA
To Amman
(& Wadi Yu
Royal
Palace
Corniche
Bypass Highway
HISTORIC
SITE
Fort Area
north
0.5
1.0
1.5 km
(Elevations in Meters)
++Proposed
Sewage
Treatment

has increased markedly and the population growth rate has followed it. Today, the rate is in the range of 5% to 7% and it is projected to remain around the level of 5% per annum through the end of the century, by which time it will have grown from its present level of 25,000 to 30,000 to a level between 60,000 and 80,000. Today, the port directly employs at least one-third of Aqaba's current workforce (see below). It is anticipated that port employment will decrease over the coming years as the construction and modernization programs are completed, but this decrease should be more than balanced by the increase in employment required for the industrial expansion planned in and around the city.

Aqaba's chief economic importance is a Jordan's only port, making the city a vital component in the nation's transportation sector. Port traffic has grown rapidly since the port authority was established in 1960, but traffic growth has been particularly impressive during the recent past, with an average annual rate of increase of about 24% during the past five years. 1978 saw a total of 3.7 million tons pass through the port and it is anticipated that the figure will increase to about 4.5 million tons for 1979. The most important single commodity passing through the port is phosphate rock for export, which regularly constitutes over half the tonnage handled (and 95% or more of the exports). Imports span the wide variety of consumer and producer goods required for the Jordanian economy. In addition to Jordanian goods, the port is handling increasing -- but still relatively small -- volumes of transit goods to and from neighboring countries, in particular Iraq and Saudi Arabia.

The physical growth of the port since the establishment of the port authority has also been very rapid. Today, the port has available four stationary and two floating berths, with four more stationary berths under construction. A number of plans for further improvement and expansion of the port's facilities are under implementation or under study, as authorities foresee increases in both domestic and transit traffic, particularly the addition of potash and fertilizer exports from Jordanian production.

Phosphate rock is the only commodity brought to Aqaba by rail, over a special spur line from the Hejaz Railway which was completed in 1974 especially for its transportation. In the port, the phosphate is loaded into waiting ships via a special bulk loading facility. All the rest of Jordan's exports and imports now move to and from Aqaba over a paved road leading to Amman. A new road was recently completed from the south end of the Dead Sea to Aqaba especially to transport the Potash to be produced by the new facilities on the Dead Sea (partially financed by AID Loan No. 278-H-021), for export through Aqaba. This road should also begin to serve as a major economic artery for other activities in the area south of the Dead Sea, particularly truck farming.

To date, the tourist industry has been the only large-scale economic activity in Aqaba aside from the port activities. Although there have been three international class hotels and a number of other tourist-oriented facilities in Aqaba for some years, until the last season (roughly October to March) tourism activity in the city has been generally sluggish. Much of the lack of interest in Aqaba as a tourist goal for non-Jordanians has been attributed to a lack of effective promotional efforts and the fact that it was difficult for outsiders to make reservations and other arrangements for a trip to Aqaba -- indeed, until the past season, there was virtually no way of reaching Aqaba without at least one night's stay in Amman. While difficult to describe in absolute terms because of a lack of statistics, there has been a dramatic increase in the Aqaba tourist industry during the past year. This has been almost entirely due to a special program started last year to provide tourists, particulary northern Europeans, with package trips to Aqaba. The response to this program has been substantial and during the past season occupancy in the existing hotel facilities has regularly been at or near 100 percent. To meet the accelerating demand, four new international class hotels are joining the "big three" already established ones; two of these new hotels are already open and the remaining two are to open before the start of the next season. Also, in support of tourism development at Aqaba, the Ministry of Tourism has contracted for a master plan for the comprehensive and extensive development of the tourist facilities in and around the city. Plans have already been announced for projects which will offer a broader range of accommodations and make Aqaba more accessible to larger numbers of people, but within a framework established to protect Aqaba's unique environment and ambience. The Ministry of Tourism has indicated particular interest in making Aqaba more accessible to Jordanians as a recreation area.

The Government has established a policy of support for further general development of Aqaba, including a program of incentives for industrial development. In the recent past, a number of major investments in addition to those already mentioned for improvement of the port and development of tourism have been undertaken. These projects are designed to broaden and deepen the economic base in Aqaba, and are in support of the Government's development strategy of spreading economic activities more evenly throughout Jordan. They include inter alia a large new grain elevator, upgrading of airport facilities, improvements to the main road to Aqaba from Amman and a new hospital (military, but available to the civilian population). The first major fruit of the Government's program of incentives for industrial investment is a 740,000 ton fertilizer plant to be built on the south coast next to the border with Saudi Arabia. Work on this plant has already begun and startup is scheduled in 1981.

C. Aqaba Wastewater Project Background

Without exception the most important single constraint on the development of the rapidly growing urban areas of Jordan, Aqaba included, is inadequate water and wastewater services, the proximate causes of which are insufficient water supplies and non-existent or woefully inadequate wastewater collection and treatment facilities. With regard to water for Aqaba, demand far outstrips supply, all of which now comes from boreholes in the Wadi Yutm, a narrow, rather steep wadi joining the Wadi Araba some 10 kilometers northeast of the city. These boreholes have been producing at the full capacity of the Wadi's aquifer for a number of years now, and as population (and economic activity) in Aqaba have grown, the amount of water per capita has declined. With regard to wastewater facilities, less than 25% of Aqaba residences are now connected to a deteriorating sewerage system, which feeds into a treatment plant in the port area of small capacity providing only primary treatment. Unfortunately, the treatment plant's equipment is often out of order. The plant's effluent is released to the gulf (and the sludge most often is dumped in uninhabited areas). The many residences not served by this inadequate wastewater system have either septic tanks or soakaways.

For a number of reasons, including the large investments required, the relatively small population of Aqaba and uncertainty about the Government's policy vis-a-vis the city's development, through 1975 no actions were taken for improvement of this deteriorating water and wastewater situation beyond a series of studies. (Since the late 1950's, the future water supply for Aqaba has been the subject of over 20 reports.) By 1976, however, a policy of expansion and diversification of development at Aqaba had been formulated by the Government. As a first step in implementing the policy, in 1976 the Government committed itself to provide part of the investment for construction of a major fertilizer plant at Aqaba and made an ancillary commitment to supply the plant with up to five million cubic meters per annum (MCM/a) of water by its completion in 1981 (with a possible increase to a 8 MCM/a at sometime in the future).

Because the initial commitment by the Government to supply water promised more than twice the amount of water now available to the city, it necessarily entailed a commitment to development of a new supply source. It was immediately recognized that development of any new water source not only should meet the commitment to the new fertilizer plant, but also should provide water to meet Aqaba's requirements as far as possible into the future. Planners also immediately recognized that increased water supplies to the city would entail generation of increased sewage loads which would both overwhelm the already inadequate treatment facilities (to the extent that the sewage entered the limited collection system) and add to the dangers of environmental pollution, particularly of the seafront

through underground seepage (because most of the increased load would go into septic tanks and soakaways if a new sewerage system were not provided). Thus to the growing awareness in Jordan of the need in urban areas for wastewater collection and treatment for general health and well-being was added in the case of Aqaba an awareness of the acute need to protect the Gulf from wastewater pollution. It was feared that if this pollution were not stringently controlled, it could destroy both the fragile environment of the uniquely beautiful coral reefs and their surrounding undersea community and the developing tourist industry for which the coral reefs are a central feature. These considerations formed the bases for the decision by the Government to proceed in Aqaba with the projects for (i) water (supply and distribution) and (ii) wastewater (sewerage system, sewage treatment plant and effluent irrigation system).

As a first step in the development of the plans for the two projects in late 1976 the Government commissioned a pre-feasibility study on ways to augment the Aqaba region's water supply which was carried out by the British firm Howard Humphreys & Sons under a grant from the U.K. Ministry for Overseas Development (ODM). A preliminary report submitted in December 1976 identified the Qa Disi aquifer, about 55 kilometers east-northeast of Aqaba, as the most promising and most economical new source of dependable water for the city. This was followed by completion of detailed hydrogeological investigations in July 1977 which confirmed the existence of adequate supplies of water at Qa Disi for project purposes.

Successful completion of the first stage of feasibility studies led to the signature on June 20, 1977 of a further contract with Humphreys for the firm to provide final feasibility studies, detailed engineering design, final bid documents and supervision of construction for both the water and wastewater projects. This second contract was jointly financed by the Government and ODM. It was signed between Humphreys and the semi-autonomous Water Supply Corporation which will have responsibility within the Government for implementing and administering both projects. Humphreys has associated with the Arabtech Consulting Engineers of Amman to perform the contract.

In December 1977, the draft economic and financial feasibility study, which included preliminary engineering design, was completed for the water supply projects; this was followed in June 1978 by the combined draft studies for the water distribution and "sewerage" (wastewater) projects. Both of these reports have subsequently come out in final form. As the primary basis for the AID project analysis, these reports are incorporated into this Project Paper by reference in Annex A and are available for reference in ME/PD. Since submission and acceptance of these feasibility studies, Humphreys has completed final engineering and design work and development of contracting documents for the water project; similar work is currently underway for the wastewater project.

As designed, the Aqaba water supply and distribution project ("the water project") will basically (i) augment Aqaba's water supplies by construction of a new wellfield at Qa Disi and a 92 kilometer pipeline to bring the supplies from the wellfield to Aqaba and then beyond along the coast south of Aqaba to the border with Saudi Arabia and (ii) upgrade Aqaba's water distribution system, largely through new installations (but also by upgrading parts of the extensive existing system) so that it will be capable of conveying the augmented water supplies to an increasing population and its concomitant economic activities. The bids for the water project were tendered in the fall of 1978; all awards had been made by the late spring of 1979 and active construction work is scheduled to begin by the end of June 1979. The project should be completed in early-to mid-1981. A fuller description of the water project is found in Annex J.

The $42.5 million equivalent cost of the water project is being financed by the Government, largely through development loans from three international donors, the Arab Fund, the Saudi Fund and ODM. At the time of writing the AID Project Paper, the Government had signed all three loan agreements, which total $34.2 million. The Government is fully committed to supply any additional funds required to complete the project; unless some unforeseen contingency arises, the Government's contribution will be $8.3 million remaining to fund the project fully. The Project Paper recommends that the loan agreement for the wastewater project contain a covenant pledging the Government to full implementation of the water project.

For the wastewater projects, tendering is scheduled for the fall of 1979 and bid awards for the spring of 1980, about one year behind the water project. The wastewater project is also expected to be completed about one year after the water project, i.e., early-to mid-1982.

II. PROJECT DESCRIPTION

A. Introduction

Following is a description of the proposed AID Loan-financed project. This description is based on the very comprehensive feasibility studies for the project done by the U.K. firm of Howard Humphreys & Sons, which were extensively drawn on to complete this paper. These four volumes, as listed in Annex A, are available for reference in NE/PD, AID/W.

B. Existing Situation

1. Existing Sewers:

The main components of the existing sewerage system were commissioned in the mid-1960s, and consist of a main collector sewer following approximately the line of the Corniche Road from the Royal Palace in the north to the sewage treatment works situated in the port complex (see Figure II.A and II.B).

Virtually all existing sewers in Aqaba have been constructed in concrete pipes. The system currently has three sewage pumping stations. The total number of residential units which are connected to the sewers is about 650, less than 25% of the total. In addition, the whole of the commercial areas, the Royal Palace and the three main hotels are also connected. Those areas not served by the rather limited sewerage systems particularly the old town area and the residences on the southeastern heights, are served mostly by septic tanks, but also by some soakaways and similar installations, with fairly frequent evidence of overloading in the form of overflows. Overflowing tanks are pumped out by a tanker operated by the sewerage staff.

Much of the system was poorly installed and maintenance has sometimes been poor, exacerbating the normal tendency in hot climates for the build up of septicity which then attacks the concrete pipes. The system requires considerable remedial work and the standards of construction and maintenance for the system should be upgraded.

2. Existing Wastewater Treatment Plant

The existing wastewater treatment plant is located on the coast some 3 kilometers south of central Aqaba in the congested port area. The plant has been designed to provide only primary treatment prior to disposal of the effluent to sea via an outfall which discharges some 3 meters or so below sea level and approximately 40 meters from the shore line. The settled sludge is treated by digestion prior to

final disposal by dumping in uninhabited areas considered safe for such purposes. The plant was commissioned in 1967 and has a capacity of only approximately 1150 cubic meters per day (for comparison, the plant to be installed under the project will have a capacity of 9000 cubic meters per day and is anticipated to treat about 4,500 cubic meters per day at startup).

The plant is operated by a small staff from the Water Supply Corporation (WSC) which work one shift per day only during normal Government working hours. This pattern of operation prevents the proper functioning of the plant and its various units. While it appears that maintenance has generally been to a reasonably good standard, the skill in maintenance has not been matched by a similar knowledge of the requirements of operation.

Although not operated continuously the plant produces an effluent which does not show any visual evidence in the sea of sewage pollution in the vicinity of the outfall. The extremely limited capacity of the units and the fact that the plant can provide primary treatment only mean, however, that this plant cannot undertake a significant part of Aqaba's future sewage treatment requirements. In addition, the high demand for competing uses of extremely scarce land in the crowded and busy port area mandates removal of any sewage treatment facilities to some less intensely used location.

C. Proposed Project

The proposed wastewater project consists of the following three principal elements:

-- Sewerage Collection System

-- New main sewers (principally two main interceptor sewers sized to serve Aqaba's expansion to an ultimate population of 82,000).

-- Upgrading of two of the three existing pumping stations and construction of a new main pumping station.

-- Limited upgrading of and remedial work to the existing sewerage system.

-- Treatment Plant

-- Treatment plant providing secondary treatment of up to 9,000 cubic meters of raw sewage per day.

-- Irrigation System

-- Irrigation system employing gravity to utilize treatment plant effluent for irrigation of greenery in the city.

A detailed description of all of these elements of the proposed project is found in Annex B.

The Consultants followed generally accepted planning principles in designing the Aqaba wastewater system. For instance, design calls for a system which will service the ultimate expected population of 82,000 when all phases have been completed. In every instance where economic practice dictates, facilities have been designed in two stages, with Stage I designed to serve a population between one-half and three-fourths of the ultimate population and with facilities so designed as to allow an expansionary Stage II which will bring them up to the capacities required for the ultimate population. Thus, the pumping stations, the treatment plant and the initial collection system of Stage I (the proposed project) have been designed for a maximum population of around 60,000. Stage II (essentially construction of a second sewage treatment plant and increasing the capacity of the sewerage system's pumping stations) will be begun in time to increase capacity as needed until the final full design capacity for 82,000 people is provided for all facilities. At this point, the consultants believe that Stage I will provide adequate capacity until sometime between 1990 and 2000, depending upon the rate of population growth. Finally, in every case possible, usable elements of the present sewage collection system have been incorporated into the new system to minimize capital outlays.

D. Extension and Maintenance Program for Sewerage System

As the project description in the last section indicates, with regard to the sewage collection (sewerage) system the project is concerned largely with the installation of main, or primary, collectors. Installation of most of the secondary collectors and the connection of residences and other buildings to them will be accomplished under a separate extension and maintenance program termed by the consultants the "on-going development" program. The main purpose of this program will be to see that within Aqaba all residences and other buildings as appropriate are connected to the sewerage system, largely through the installation of required new secondary collectors and individual connections to them, but also by regular maintenance of the already installed system, including remedial work where necessary. To help insure continuing implementation of the extension and maintenance program as envisioned, one of the conditions precedent being recommended for the AID Loan Agreement requires

promulgation of legal measures compelling connection to the sewerage system of all residences and other designated buildings in Aqaba.

E. Project Costs and Financing

1. Construction Cost Estimates

Total estimated costs of construction of the three major wastewater project elements are $12.7 million equivalent. Table II gives the breakdowns by component and foreign exchange/local currency for these estimated costs. The table is based on estimates made by the consultants of the Jordan Dinar equivalent prices which contractors would have bid for fixed-price (or fixed unit-price) contracts in September 1977 for the facilities for both the water and wastewater projects for Aqaba. In order to be able to retain consistency among the estimates for purposes of comparison, September 1977 prices were utilized for all estimates regardless of estimated dates for actual bidding for the different projects. In the case of the wastewater project, bids will actually be submitted between 2 and 2.5 years after the time base for the estimates of September 1977. Despite this, the project cost estimates make very little allowance for inflation, which is included in the 10% contingency provided for all three major project elements. Thus, while the contingency is meant to be general purpose, including provision for possible increases caused by both inflation and the need for extra work, it is believed that the chances are very good that none of it will be required for inflation. This is basically because of the record of bidding for the two other main project elements - water supply and distribution - for which the actual prices bid were an average of less than 75% of the consultants' estimates, even though the bids were received between 1 and 1.5 years after the September 1977 time base. This result for the earlier bidding is attributable to two factors: (1) conservative estimating on the part of the consultants and (2) a very competitive bidding atmosphere in Jordan. In any case, the loan agreement will commit the Government of Jordan to provide financing for any unforeseen cost overruns. The Government understands its commitment in this regard, but is confident that the table's estimated amounts will prove adequate for project financing.

2. Financing Plan

(a) Capital (Construction) Costs Financing

The proposed Government and AID contributions to the project costs are also set out in the Table II.

TABLE II

ESTIMATED PROJECT CONSTRUCTION COSTS AND PROPOSED FINANCING

	AMOUNTS[1/]			
	FX	LC	TOTALS	(PERCENTAGES)
A. Costs:				
1. Main Sewers and Pumping Stations	2.252	1.880	4.132	
A. (Civil Works)	(0.942)	(1.776)	(2.718)	
B. (Pipe Supply)	(0.892)	(0.068)	(0.960)	
C. (Pumps and accessories E & M)	(0.418)	(0.036)	(0.454)	
2. Treatment Works	2.267	2.783	5.050	
A. (Civil Works)	(1.372)	(2.681)	(4.053)	
B. (Electrical and Mechanical)	(0.895)	(0.102)	(0.997)	
Subtotal (1 + 2)	4.519	4.663	9.182	
Contingency (10%)	0.452	0.466	0.918	
I. Subtotal-Wastewater Facilities	4.971	5.129	10.100	(79.6%)
Irrigation	0.888	0.602	1.490	
A. (Civil Works)	(0.115)	(0.511)	(0.626)	
B. (Pipe Supply)	(0.655)	(0.045)	(0.700)	
C. (E & M)	(0.118)	(0.046)	(0.164)	
Contingency (10%)	0.089	0.060	0.149	
II. Subtotal-Irrigation Facilities	0.977	0.662	1.639	(12.9%)
III. Consultant Supervision	0.399	0.115	0.514	(04.1%)
A. (Wastewater)	(0.272)	(0.073)	(0.350)	
B. (Irrigation)	(0.127)	(0.037)	(0.164)	
Project Subtotal (I + II + III)	6.347	5.906	12.253	(96.6%)
IV. Interest during Construction	-0-	0.427	0.427	(03.4%)
PROJECT TOTALS	6.347	6.333	12.680	100.0%
B. Financing				
AID	5.407	2.093	7.500	(59.1%)
GOJ	0.940	4.240	5.180	(40.9%)
TOTALS	6.347	6.333	12.680	(100.0%)

1/ In Millions of U.S. Dollars converted at the rate Jordan Dinar 1 JD = $3.37 ($1.0 = JD 0.297)

The proposed AID Loan of $7.5 million will finance no more than 65% of the total project costs, assuming that none of the contingency is required; for comparison, as shown in Table II, if all of the contingency were used the AID-financed share would be 59%.

The GOJ has a policy of providing financing for water and wastewater projects on its standard loan terms regardless of the terms of the original loans from donors. These standard terms are 20 years for capital repayment with a 5-year grace period and 6% annual interest on the unrepaid balance. In many cases - such as the development loans for the water projects - the terms of donors' loans to the GOJ are such that there is very little "spread" accruing to the Government when it employs its standard terms in its reloans for project financing. Because the AID loans terms are significantly more concessionary, however, the spread to the GOJ if it incorporated its standard terms into the reloan agreement for the AID funds would be significant. Because of the relatively high cost of the providing wastewater services to Aqaba's residents and because of the high priority the Government is attaching in its current development plans to the provision of such services to urban populations, it is considered appropriate in the case of the Aqaba wastewater project that the Government not maintain its standard loan terms when it relends the AID funds, but instead that the GOJ relend the AID loan funds to WSC on the same terms as it receives them. The Government has this proposal under consideration. (N.B. Despite USAID advocacy of use of AID terms in the reloan to the WSC, to remain on the safe - or conservative - side, the financial analysis is based on the Standard Government reloan terms and not on the "softer" AID terms.)

(b) Operating Costs Financing

Once project construction is completed, with one exception it is planned to finance all the costs of project operations, including debt servicing, administrative overhead, and operations and maintenance, by current revenues from user charges. One of the covenants being recommended for the AID Loan Agreement pledges the Government to develop water and watewater services user charges (tariff schedule) which both apportion costs on a reasonable basis and insure that all costs for all services including both regular tariff charges and any initial connection charges remain affordable to Aqaba's lower-income residents. The exception to the plan for financing from current revenues is the program for continuing extension and maintenance of the sewerage system discussed earlier, which the consultants estimate will require up to JD 250,000 (about $850,000) per year for at least the next ten years. While there is some opinion that the consultants might have overestimated the costs of this program, analysis shows that if they are as high as estimated,

they would impose a significant burden on system user"s" if they were financed from current revenues instead of from debt (see Financial Analysis below). Therefore, another recommended covenant pledges the Borrower to provide sufficient outside financial resources on reasonable terms both to meet operating capital needs and to carry out necessary extensions and improvements of the sewerage system on a continuing basis, to the extent that funds for such purposes are not available from the rates developed in accordance with the previously discussed tariff schedule covenant.

III. PROJECT ANALYSIS

A. Technical Feasibility

1. General

As already mentioned the project's feasibility and design were undertaken by a professional consulting firm, H. Humphreys & Sons of the U.K. Humphreys have had many years' experience in water supply and wastewater treatment, much of that experience having been gained in tropical environments such as Aqaba's. As a result, the consultants' feasibility and initial design reports provide a thorough, in-depth analysis and explanation of the bases for detailed design. A detailed review of these reports indicates the project as proposed by the consultants represent a technically sound and least-cost solution to the problems of wastewater collection and treatment at Aqaba.

2. Technical Issues

During the course of USAID's technical analysis two issues were identified. These concern the correctness of judgements made about two aspects of the basic design of the total wastewater system. The underlying issue is how much environmental protection should be provided to Aqaba and environs by the new wastewater system, given that more protection means in every case higher costs and that the amount of protection provided by a given unit of resources invested decreases steadily as more intensive protection is stipulated. The two main design decisions involved were the following:

(i) What should be the degree of treatment to be provided to the collected sewage -- primary, secondary or tertiary? (Secondary was chosen.)

(ii) Should the secondary treated effluent be disposed of by dispersal to sea in the Gulf or should some other system be employed? (The decision was not to allow dispersal in the Gulf and to utilize the effluent for an irrigation system for ornamental greenery in Aqaba)

In both of the above cases, the consultants and/or the Government chose the option providing greater environmental protection to Aqaba and its environs. At the same time, of course, the choices involved in each case the more expensive alternative, thus increasing the project's costs. After careful consideration of the factors involved, the USAID project committee concurs with the decisions made. Following is a discussion of the two issues and their implications for project costs.

(a) Degree of Treatment

The design of a sewage treatment process can specify treatment to three basic degrees, primary, secondary or tertiary. The higher the degree of treatment specified, the lower will be the polluting load remaining in the effluent (which is the liquid remaining after treatment, usually comprising at least 95% of the volume of sewage entering a treatment plant). In general terms, primary treatment will remove between 30% and 60% of the total polluting load of sewage, secondary treatment leaves an effluent with 85% to 90% of the polluting load removed while tertiary treatment will remove a further 5% of the polluting load. Thus, progressively less of the total incoming polluting load is removed with each increasing degree of treatment.

The degree of treatment required depends primarily on the quality of effluent needed to allow satisfactory effluent disposal, given the disposal possibilities available. The consultants identified three possibilities for effluent disposal in Aqaba, i.e., (i) discharge to sea, (ii) artificial recharge of aquifers for later use in irrigation and (iii) re-use for irrigation, industrial uses, fish culture or potable water. All of these possible disposal possibilities required treatment at least through the secondary stage. On the other hand, the consultants judged that tertiary treatment for reuse as potable water would be excessively expensive for Aqaba, considering that adequate amounts of water will be available from Qa Disi. Thus the consultants recommended that a secondary treatment process be provided.

(b) Disposal of Effluent

The consultants believe that at Aqaba it probably would be safe to discharge secondary treated effluent into the Gulf, given correct siting of the out-fall point and sufficient dispersion of the effluent through a suitable outfall design. However, there is no way of knowing exactly what the long-term effects of such disposal would be on the fragile ecology of the Gulf short of opting for such discharge and then monitoring the results.

There is already significant pollution of the Gulf from Aqaba sources, particularly phosphate dust from the port loading operation and thermal pollution from the discharge of warm water into the sea from the generating plant south of the city. Thus, discharge of effluent into the Gulf would not occur in isolation but rather would be additive to the ongoing pollution. Also, if Aqaba installs such a system, then all significant disposal of sewage effluent into the Gulf will have been eliminated because the only other major urban area on the Gulf already has an operating system to utilize its sewage effluent for city irrigation.

After considering these factors, the Government made the decision that discharge to the Gulf would not be an acceptable option and ruled it out as a possible means of effluent disposal. After a review of the technical and economic implications of the other possibilities for disposal the consultants recommended that the effluent be used in a scheme to irrigate ornamental greenery in Aqaba. In particular, the consultants noted that at least during the initial stages of operation of the new water system, there should be sufficient extra water available from the Qa Disi source for the purpose of irrigation and that it would be marginally cheaper to produce the water from Qa Disi instead of producing it by installing the irrigation system. However, once the decision has been made that the effluent cannot be discharged into the Gulf, then the irrigation system is the most cost effective of the remaining possibilities for its disposal. In addition, use of the Qa Disi water for irrigation would mean a further lowering of the aquifer, however small, which, given the general scarcity of water in Jordan, was judged not to be good public policy at this time if there are any alternative sources available for the needed water. For a fuller discussion of this issue, see Chapter 5 and Section 13.3.5 of Volume 2 of Humphreys' "Aqaba Water Distribution and Sewerage".

The Government and USAID concurred in the consultants' recommendation and project design is proceeding on the basis of secondary treatment and effluent disposal by means of an irrigation system.

(c) Cost Considerations For Technical Issues

In rough orders of magnitude, provision of secondary treatment increases the costs of treatment by 20%. Stipulation of an irrigation system to distribute the treated effluent increases costs of the total system by another 10% to 15%, so the total for stipulating secondary treatment with use of the effluent for irrigation is some 30% to 35% above a primary system with discharge to the sea.

The question, of course is whether the increased benefits are worth increased costs of the magnitude indicated. Unfortunately, it is not possible to respond to the question with anything more than an answer based upon informed judgment, basically because there is no method of placing a quantifiable financial or economic value on the increased benefits. The Government will have to consider carefully how these increased costs should be financed, particularly considering that the increased benefits in terms of protection of the Gulf from further pollution will accrue not only to the residents of Aqaba but also to some degree to the rest of Jordan and the wider international community. These considerations lead to the belief that at least the irrigation costs should be financed by some method other than normal user charges and that this account would be appropriate for consideration for outside subsidy by the Government.

(d) USAID Position

USAID concurrence with the judgments made by the Government in regard to these issues is based on the belief that there is a good prima facie case that the ecology of Gulf is fragile enough to require absolute protection against further pollution. It should be emphasized that there is virtually no way to provide a final answer a priori on the effects of introducing additional pollutants into the Gulf. But if they were introduced on the basis of a judgment that they would not produce significant negative effect and the judgement proved wrong, the deleterious consequences would likely be irreversible. USAID agrees that the risk is simply too high to accept and that the extra cost involved is worth its avoidance.

B. Administrative Analysis

1. General

Analysis of the capability of the implementing agency, the Water Supply Corporation, to oversee construction of and operate the wastewater project facilities has raised a major project issue revolving around the question of whether or not the WSC would be able to recruit, train as required and retain enough capable people to discharge these responsibilities adequately. After a full consideration of the staffing and training issue, particularly the relatively large number of relatively well-trained people required, the project committee has concluded that the problem can be solved provided that sufficient attention is devoted early in project implementation to development of detailed staffing and training plans. It is therefore recommended that appropriate provisions for such plans be included in the loan agreement, in the form of a condition precedent and a covenant (see below).

2. Aqaba Water and Sewage (Wastewater) System

Responsibility for implementation of the Aqaba water and wastewater projects has been assigned by the Government to the semi-autonomous Water Supply Corporation (WSC). The WSC was organized in 1973 and thus has had ever five years' experience in both management and operation, including installation, of water supply and distribution systems throughout Jordan. While the proposed AID-financed project will be the WSC's first expereince with large-scale wastewater facilities, many of the skills required to manage and operate such wastewater facilities successfully are similar enough to those needed for water systems to allow a fairly high degree of transferability from the latter to the former. (In addition, the WSC has had the limited experience of operating the present wastewater facilities at Aqaba since late 1976, when the responsibility was transferred to WSC from the Aqaba Town Planning Committee which had held it previously.)

While WSC does have the basic background needed for implementing the Aqaba water and wastewater projects successfully, it is obvious that it does not yet have sufficient depth, in the form of enough trained personnel, to discharge both its ongoing "traditional" responsibilities (which have themselves tended to grow with increasing Government concern about water sector development) and its recently assumed responsibility for the projects at Aqaba. The total number of personnel required for full operation of both the water and wastewater projects at Aqaba is estimated at a minimum of 150, at least half of whom will have to be skilled or semi-skilled. WSC today is an organization of fewer than 1,000 people, of whom no more than 100 can be considered trained or skilled personnel. Thus, while some of the current WSC staff can be released from their present duties for transfer to Aqaba to start the new organization there, it is clear than in order to discharge its responsibilities at Aqaba, the WSC will have to recruit new personnel, particularly for the positions which require trained or skilled people. Because so few people in Jordan have the particular skills required for the Aqaba water and wastewater systems, WSC undoubtedly will have to recruit people with a basic educational background and then provide training for the required skills.

Providing trained people both for actual operations and for administration of projects is one of the most difficult problems facing Jordan's development planners, particularly in view of the "talent drain" of such people to the higher-paying jobs in other areas of the Middle East. The situation is exacerbated by the low pay rates for public sector jobs in Jordan and the tendency for increases in those rates to lag cost-of-living increases much more than wage rates in non-governmental sectors. It can be noted, however, that the record of the Government to date in meeting its obligations for staffing and training of personnel for development projects can be rated as fairly good, despite these difficult obstacles to success.

WSC recognizes the magnitude of the task it faces. It has already engaged a major international management consulting firm (Peat, Marwick and Mitchell) to study the full range of its responsibilities and then to develop a plan for management and organization, including a training plan, to meet them. The WSC has also already begun the task of staffing the Aqaba division to implement the water and wastewater projects. As overall project manager for the Aqaba projects, WSC has appointed a former army officer who is a trained engineer and who has had more than three years' prior experience as WSC's deputy director in Amman. The project manager is currently assembling a staff of about 10 trained technical people, each of whom will assume responsibility for one major element of the projects during construction and startup, such as the wellfield, the transmission pipeline, the sewage treatment plant, etc. These people will work closely with the supervisory engineers (Humphreys), the prime contractors and the technical representatives who supervise installation of the

various items of electrical and mechanical equipment during construction in order to obtain in each case a full understanding of the design and operation of the involved facilities. The schedules for implementation of the water and wastewater projects is quite advantageous from the point of view of the AID-financed wastewater project because each of the latter's implementation activities will have been preceded by a similar activity for the water projects. Thus, by the time any particular wastewater project activity is undertaken, the WSC will have gained the experience of completing similar activities for the water projects (for which the facilities are generally larger and more complicated than those of the wastewater project).

It is planned that the technicians in the "Implementation Team" will provide a highly competent core around which the remainder of the technical operations staff can be assembled. These core people also will assume responsibility for overseeing development and execution of training programs for particular operations of the Aqaba systems, such as the wellfield at Qa Disi and the sewage treatment plant. WSC is fully aware that a similar process will have to be initiated in the area of management and administration, particularly to provide sufficient staff trained for fiscal administration.

3. Staffing for Wastewater Project

Although a final organizational structure has not yet been drawn up, it is estimated that all facets of operating and managing the wastewater facilities will require about 50 people, half for management and administration (principally accounting and billing) and half for line operations.

For the actual operating, or line, staff, the consultants have drawn up a recommended organizational chart, which is presented in Figure III.A. Under this proposed organization, of the 25 persons required for actual operations, two, the Assistant Manager and the Assistant Engineer/Manager, will be qualified engineers. About one-half, or 12 of the remaining 23 personnel will have to have the equivalent of a U.S. high school education with qualifications normally associated with the term "skilled laborer". The remaining 11 positions can be filled with unskilled laborers.

No equivalent recommended organization chart has been prepared yet for the management side of the wastewater operations, but the consultants have recommended that these accounting and administrative functions be performed jointly for the water supply and distribution division and the wastewater division, and discussions with WSC indicate that it is inclined to accept this recommendation. It is estimated

STAFF ORGANIZATION CHART FOR THE AQABA SEWAGE TREATMENT PLANT STAGES I AND II

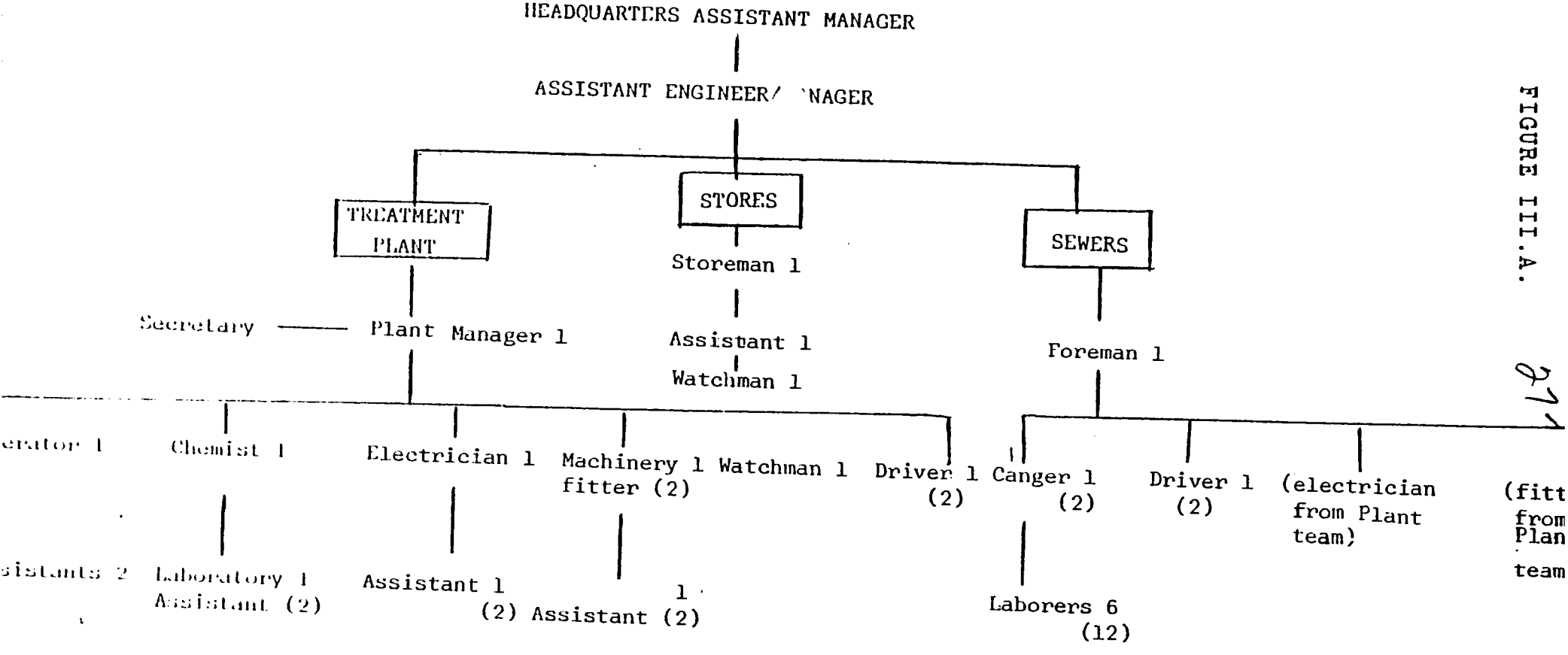


FIGURE III.A.

Note: figures in brackets apply to Stage II requirements.

that the total staff required to perform the management functions for both organizations will be 70 persons and that about 35% of the staff's time will be devoted to activities which can be allocated to the wastewater division. Thus, one can consider that about 25 persons of the joint management staff -- on an allocated basis -- will be working for the wastewater division.

4. Trained Personnel Issue

It is believed that the problem of obtaining an appropriately skilled workforce will be particularly acute in water sector projects in Jordan in the near future for two reasons: (i) there will be a large number of such projects undertaken within a relatively short time period; thus the demand for the required skills should increase very steeply; and, (ii) many of the skills required demand very specific training (e.g. operation and maintenance of the sewage treatment plant); they are not the sort that someone with a good general background can easily "pick up" within a very short period.

All involved recognize that obtaining and retaining capable staff will be one of the most difficult problems associated with both the water and the wastewater projects at Aqaba. Clearly, it will be necessary to provide a great deal of training, both for adminstrative (management) and line (operations) staff to tackle this problem effectively. It is anticipated that training needs will be particularly great in the areas of system accounting and in specialized line operations, particularly the operation and maintenance of the sewage treatment plant.

Because of their importance to the success of the proposed project it is being recommended that provision of both a satisfactory staffing plan and a satisfactory training plan for the wastewater treatment facilities be included in an initial condition precedent to disbursement of funds from the proposed AID loan and that an appropriate covenant be included pledging the Government and WSC to review the continued relevance and the implementation of these plans on a regular basis.

C. Economic Analysis

1. General

Economic evaluation of water and wastewater projects is notoriously difficult, essentially because of the difficulty of assigning quantitative values to the project benefits. Thus, while adequate water supply and sanitary waste treatment facilities are known to be necessary for development, they are not sufficient by themselves to produce the benefits expected in, for instance, the area of public health. Efforts to isolate the effects of providing

adequate water and wastewater treatment for the purpose of measuring benefits directly have so far proved fruitless. In the face of these difficulties, two general quantitative approaches are usually taken in economic analysis of water supply and wastewater projects. The first is to show that the particular project proposed is the least-cost solution to the problem of providing services of a particular type, often at particular minimum required standards, such as liters per capita per day of water supply. The second is to take consumer willingness to pay for services as a proxy value for the economic benefits to be obtained and to calculate a rate of return based on comparing the anticipated revenues from services to the costs of the project. As explained below, only the least-cost method was considered appropriate for economic analysis of the Aqaba wastewater project.

2. Economic Evaluation of Aqaba Wastewater Project

While quantitative economic evaluations for wastewater projects are sometimes performed by utilizing the "proxy benefit" method often employed for water projects, the project committee believes that this would not be a useful exercise for the Aqaba wastewater project for two reasons, one general and one related to the Aqaba situation. The general objection involves the fact that wastewater services benefit the community collectively and there are large externalities to wastewater systems. It is thus difficult to assign as proxy benefits the charges paid by individuals connected to the system. But even if this general problem could be dismissed, the "proxy benefit" method would be ruled out because wastewater services as such have been "free" for all Aqaba residents in the past, so there is no experience base, however inadequate, on which to peg service charge to serve as a proxy for wastewater benefits. There is simply no way of assigning a meaningful economic value to the benefits anticipated from the Aqaba wastewater project. In the face of this situation, no calculation of any sort of benefit/cost ratio has been attempted for the project, the only quantitative analysis being the least-cost analysis performed by the consultants and described below.

Least-cost analysis shows the proposed scheme to be the cheapest means of providing full wastewater collection and treatment in Aqaba. The next cheapest alternative to the proposed scheme of providing a full sewerage collection system in Aqaba would most likely be the development of a dual system with sewerage collection only in those areas already served or not suitable for septic tanks, and with septic tanks in all other areas. The septic tanks would then be emptied periodically by a tanker and the sludge taken to the sewage plant for treatment. The undiscounted capital costs of the dual system are

estimated to be about 1.5 times those of the proposed scheme. In addition, the operating and maintenance costs of the dual system would be significantly more than those of the proposed scheme because of the need to empty the septic tanks periodically and also because of the inevitable need to replace some of the drainage fields. Altogether, on a discounted basis (at the rate of 8% per annum), it is estimated that implementation of the dual system would increase the cost of providing primary treatment by some 24% over the forty-year life of the project. For further discussion, see Volume 2 of the Humphreys' "Aqaba Water Distribution and Sewerage" (p.120 ff.).

A qualitative review of the project's benefits show them to be significant, even if unquantifiable. The proposed secondary treatment scheme utilizing the resulting effluent for irrigation will enhance greatly the general environment of Aqaba, by eliminating totally the presence of open septic sewage in the town (a not uncommon occurrence which both increases the danger to public health and produces objectionable odors), by obviating the necessity to discharge effluent of any sort into the Gulf (expect during periods of malfunction of the system) and by permitting continous irrigation for extensive green areas in town.

In the final analysis, economic justification is based upon the subjective valuation of responsible Government officials of the benefits which the proposed wastewater system would provide to Aqaba in comparison with the system's cost. The high valuation these officials obviously have placed on the benefits enumerated above stems from a number of factors. One is the general view within Jordan (which is particularly strong in Aqaba) that the Gulf and its undersea life constitute a national treasure which must be protected at all costs. Additionally, the high valuation reflects increasing awareness within Jordan in general and the Government in particular of the importance of providing adequate wastewater services to all urban areas, primarily to protect public health but also to increase the amenity factor in the cities, where more than half of all Jordanians now live. Finally, the valuation undoubtedly reflects the belief that a major tourism industry can be developed in Aqaba and the recognition of the absolute need for a pollution-free environment to do so.

D. Financial Analysis

1. Procedures and Results

The basic policy of the Government of Jordan is that all water sector projects should be able to support themselves financially from the proceeds of user charges. Such charges should cover all "direct"

costs of the facilities involved, to include all debt repayments (principal and interest) and all costs of operation and maintenance, (both direct and administrative). While all such costs can normally be broken down in the aggregate into the two mentioned categories, i.e., (a) debt service (usually for initial construction) and (b) operating (including maintenance) expenses, as explained in Annex C, the consultants believe that the annual costs of a continuing extension and maintenance program for the sewerage collection system for Aqaba are going to be quite high (up to $850,000 equivalent -- 1977 amounts), at least for the first years of operation. Therefore, for the financial analysis, the anticipated expenses for this continuing sewerage maintenance and extension program are treated as a separate and additional cost category and there are thus three such categories for the wastewater system instead of two.

The financial analysis tested the reasonableness of a policy of paying for all costs of the Aqaba water and wastewater systems from user charges. It was conducted by constructing five basic cash flow tables for a period extending 15 years from 1977, or 10 years after completion of construction of the wastewater project in 1982. Each cash flow table was based on a different set of assumptions about the four parameters considered as having the greatest actual potential to affect costs and/or average charges, i.e., the terms of financing for intital construction, the method of financing the continuing extension and maintenance program for the sewerage system, the population growth of Aqaba and the per capita water consumption. Thus, each of the five different cash flows represented a different "case," i.e., a change in the assumptions for the four main variables.

For each case, then, the initial table presents costs of running the water and wastewater systems year-by-year through 1992 at current prices assuming an annual inflation rate of 10%. In a second table these costs are discounted back to 1977 for each case, again assuming a 10% inflation rate. A final table shows for each year and each case the average monthly charges which would have to be leveled on an average six-person family to finance all system costs and compares the charges to the average monthly family income in Aqaba in 1977 of Jordan Dinar (JD) 110. The standard of comparison used was the IBRD's guidelines stipulating that a family should not have to expend more than 5% of its monthly income for water charges, or 3% for wastewater charges, or summing, 8% for combined charges.

The tables and a discussion of the assumptions on which they and the cases were based are found in Annex C. It should be noted that the basic principle followed in preparing the tables and cases was that of "conservatism," i.e., in almost all instances whenever two alternatives presented themselves which were considered to have roughly equal chances of occurring, the less favorable was deliberately chosen in order to produce a sort of "worst case" analysis. The more significant of these assumptions of the less favorable possibility are all identified in the financial analysis annex.

Following is a table presenting the five cases, showing for each case the assumptions made with regard to the four variables tested.

Case	Loan Terms	Sewerage Continuing Extension And Maintenance	Domestic Water Consumption	Population Estimate
1.	Standard	Revenues	200 lcd	Intermediate
2.	Standard	Annual loans	200 lcd	Intermediate
3.	Standard (except 10-yr grace)	Annual loans	200 lcd	Intermediate
4.	Standard	Annual loans	100 lcd	Intermediate
5.	Standard	Annual loans	100 lcd	80% of Intermediate

Following is a review of the findings for the five cases:

- Case 1. Tested the financial burden under the basic assumptions, with continuing extension and maintenance program for the sewerage system financed from current revenues and with the irrigation system financed by inclusion in the sewerage surcharges. This results in an average monthly charge per family above the 8% guideline.

- Case 2. Tests the burden with sewerage extension and maintenance financed by debt and the irrigation system from other sources. This brings the burden under the 8% guideline.

- Case 3. The burden is brought down further, at least during the earlier years, by a 10-year intead of 5-year grace period for the basic loans, but the reduction is not large.

- Case 4. Assuming that domestic water consumption is 100 lcd instead of 200 lcd further reduces the financial burden for water on residents, by shifting it to the fertilizer plant (note that the burden for wastewater remains unchanged).

- Case 5. The case 4 effect is enhanced for water charges by assuming that the population is only 80% of the consultants' "intermediate" projection, although this latter assumption brings overall charges for water and wastewater back up somewhat because there is no way of "shifting" the resulting average increase in wastewater surcharges to others, i.e., the fertilizer plant. Thus, with a lower population the wastewater surcharges must increase by the inverse of the population decrease (in this case 25%).

The general finding from these tests is that there can be a high degree of confidence that the overall water and wastewater user charges required to finance all "direct" costs of the systems will fall within the combined guideline of not requiring more than 8% of an average family's monthly income, provided that the continuing extension and maintenance program for sewerage is financed by debt instead of charges to current revenue.

Finally, while the financial analysis demonstrates that in most of the cases tested the combined charges for water and wastewater services should be less than the 8% of income established as an upper limit by combining the two IBRD guidelines for water and wastewater services (see earlier discussion), an examination of the appropriate tables in the financial analysis presented in Annex C will show that while the charges required to finance the water project costs fall under the 5% guideline, those for the wastewater project generally exceed the 3% guideline. Thus, exceeding the 8% combined guideline is avoided only because the water charges are lower than the guideline would allow; the wastewater charges standing alone would exceed the IBRD 3% guideline amount for such services. The project committee believes that considering the two projects as one in the financial analysis is acceptable for the reason that, for financial purposes, the residents of Aqaba themselves will tend to look at the two projects as combined, thinking in the case of each household of the combined amount which must be paid for water and wastewater services. This will be true particularly if the WSC adopts the consultants' recommendation that for administrative simplicity the wastewater charges be in the form of surcharges to the water charges.

2. Rate (Tariff) Considerations

The question of type and magnitude of water and wastewater charges is a very complex and difficult one. As one example, what should be this basis for charges to the fertilizer plant. As can be seen from Table C. XII on the average, the fertilizer plant will use about half of the water sold through the period of analysis and about 70% of the water from Qa Disi (assuming that all of the pre-project water supply from Wadi Yutm is allocated to residents). Does this mean that the fertilizer plant should pay 70% of early year costs to the Qa Disi project? While it has been assumed for convenience in the financial analysis that all customers are charged the average cost per cubic meter for water, this is not by any means the only possible basis for such charges; the basis actually used can reflect - or balance - a wide range of goals, such as social equity, encouragement for investment, assurance that industry pays its full share of the costs of services, etc. Obviously, the goals will often conflict.

Another complex problem is the question of how to charge for wastewater services. For administrative convenience, the consultants recommend that Aqaba adopt the system in use in Amman, i.e., wastewater surcharges on the basic water charges. This can be rationalized on the basis that the uses of water and of the wastewater system are correlated. This is a technically equitable method in communities, like Aqaba, where there are no industries contributing heavy pollutional loads that would require additional treatment facilities per unit of water used. It would also seem to serve social equity goals in that the larger users of water will also pay a greater proportion of the wastewater costs. But, again, there is a wide spectrum of possible ways to charge for wastewater services; the final decision need not necessarily be based on a surcharge system.

Because of the importance and complexity of the subject of setting tariff schedules which are both equitable and effective, two special covenants are being recommended for inclusion in the AID loan agreement which will directly involve the rates established for user financing of the water and wastewater services to be provided by the new projects at Aqaba. The first pledges the Borrower to develop a tariff schedule for the services from both projects which, while providing sufficient revenues "normally associated with the provision of such services," is to be established only after special consideration has been given to assuring that various classes of consumers pay rates which reflect "in a reasonable manner" the costs associated with providing the services to them and that all costs of the services remain affordable to lower-income residents of Aqaba. The second, in effect, pledges the Borrower to give special consideration to the systems' need for working (operating) capital and to the possibly heavier-than-normal costs of a continuing extension and maintenance program for the sewerage system, and, if sufficient revenues cannot be generated to cover these costs from user charges under the rates established on the basis of the principles set down in the earlier covenant (above), to make sufficient funds available "on reasonable terms" to the Aqaba division of the WSC to meet these special needs. The reasons for the possible need for outside financing from the Government for the extension and maintenance system program for the sewerage system is discussed above. With regard to the possible need for outside financing for working capital, while it is believed that as a general rule the water and wastewater system in Aqaba will have relatively low requirements for working capital, particularly if the WSC continues the policy of terminating water service to any delinquent customers, it is recognized that establishment of a "clearance" tariff level matching expenses and revenues will by necessity be a matter of trial and error, with equal changes for "loss" as for "profit", at least during earlier periods. This is the reason that the second covenant includes a pledge for special consideration of working capital requirements.

3. Repayment Prospects

Repayment prospects are judged good to very good. The latest country report for Jordan of the IMF, dated April 27, 1979, reports on the debt service situation as follows: "Jordan's debt service remains low, reflecting the concessional terms secured on the bulk of Jordan's foreign debt. Interest and amortization on foreign debt, as a ratio of earnings on exports of goods and services, fluctuated between 4 and 8 per cent in the period 1974-1978." It is believed that the proposed loan will not have a significant impact on the debt service ratio, considering its relatively small size and the concessionary repayment terms recommended.

E. Social Analysis (including Impact on Women)

The city of Aqaba has a population between 25,000 and 30,000 people. In comparison with other cities in Jordan, particularly Amman, Aqaba tends by and large to have a smaller stratum of persons with very high incomes. The population therefore tends to be comprised of only two groups - one with low and the other with moderate incomes. Port workers comprise an obvious group at the lower end of the income scale. They are largely separated physically, with most living in the newly opened port housing area at the northern limits of the town. Otherwise, Aqaba tends to resemble Amman in the characteristic of having no necessarily hard and fast segregation of people into living areas on the basis of income; however, moderate income residents do tend to live in the "northern loops" area while lower income residents tend to in other residential areas, particularly in the "Core Residential" and "Southeastern Heights" areas.

When the proposed water and wastewater projects are completed, all residents of Aqaba will have access to the systems and thus all residents, regardless of income levels, will benefit from them. As is usual in such projects, the anticipated benefits largely comprise improvements in the quality of life, particularly improved health, which are virtually impossible to quantify.

However, it can be noted that in addition to sharing the general benefits, lower income residents will benefit from the project specifically in two ways. First, with regard to water, the provision of a constant water supply will eliminate the requirement for water storage facilities, which are necessary now even to attempt to provide continuous supply. Also, the wastewater services will provide a total lower cost service than the septic tanks now utilized in most lower income-housing in Aqaba and thus should bring the costs for sewage disposal down while greatly reducing any risk to health posed the present system.

As indicated in the financial analysis section, under most assumptions the total average charges for water and wastewater services should not exceed 8% of an average family's estimated 1977 salary of JD 110 per month, and should be in the range of JD 6 to JD 8 per month (in 1977 prices). It is true that this average figure could be high for residents at the extreme lower end of the income scale (say 1977 monthly family income of JD 60), but this burden can be relieved by providing in the tariff schedules for an initial "block" of servies to give a minimum required amount (say the first ten cubic meters of water per month used by a family) for which a relatively low tariff rate is charged. The "loss" incurred by selling the initial "block" at less than average cost then can be made up by charging more than average costs for subsequent service units. It also should be noted

that most of Aqaba's lower-income residents will be living in housing for which they most typically will be making mortgage payments (instead of renting) and which will have all water and sewerage connections included as part of the dwelling price. Thus, most of these residents will not be facing the initial lump-sum connection charges which are proving such a difficult burden for many of Amman's lower-income residents and instead will have their connection charges already financed -- as part of the dwelling's financing -- when they move in. In any event, as explained in the financial analysis section above, the covenant concerning the establishment of tariff schedules for water and wastewater services at Aqaba pledges the Government to insure that "all costs of services, including both initial connection charges and regular tariff charges, remain affordable to lower-income residents of Aqaba".

At the present time, the Aqaba Municipality is planning to relocate the residents -- between 4,500 and 5,000 people -- of the "unauthorized" housing area on the "Southeastern Heights" area of the city (in Zone 9 see map, FigureIII.B to new apartment and other high density housing in Zone 6 which will be provided with a full range of services and facilities (including built-in connections to water and sewerage) and which the new tenants will purchase with mortgages with very low terms. Because of the plans for relocation of these residents, as an exception to the general principle that all residential areas of Aqaba are to be provided with sewerage, there have been no provisions made under the continuing extension program for sewerage in this area. If for some reason the municipality did not carry through its plans to relocate the 'Southeastern Heights" residents, the short-term effects of continued occupation of the area without sewerage services should prove no problem because the area is underlaid by well-drained gravels which can accommodate relatively intensive use of septic tanks. In the longer-term, however, lack of sewerage facilities could cause very real sanitation problems as the area's residents avail themselves of the greater amount of water to be supplied from Qa Disi. This situation obviously bears special monitoring; the project committee suggests that it be a topic for particular attention during the discussion in the initial implementation letter on the condition precedent requiring appropriate legal provisions for the connection to the sewerage system of all Aqaba residences and business establishments. Specifically, it is recommended that the implementation letter contain language by which the Government will report to AID within 18 months of the signature of the loan agreement on the status of the relocation plan and, if it has not been carried through, will develop plans satisfactory to AID for providing sewerage services to the area in the manner affordable to its residents.

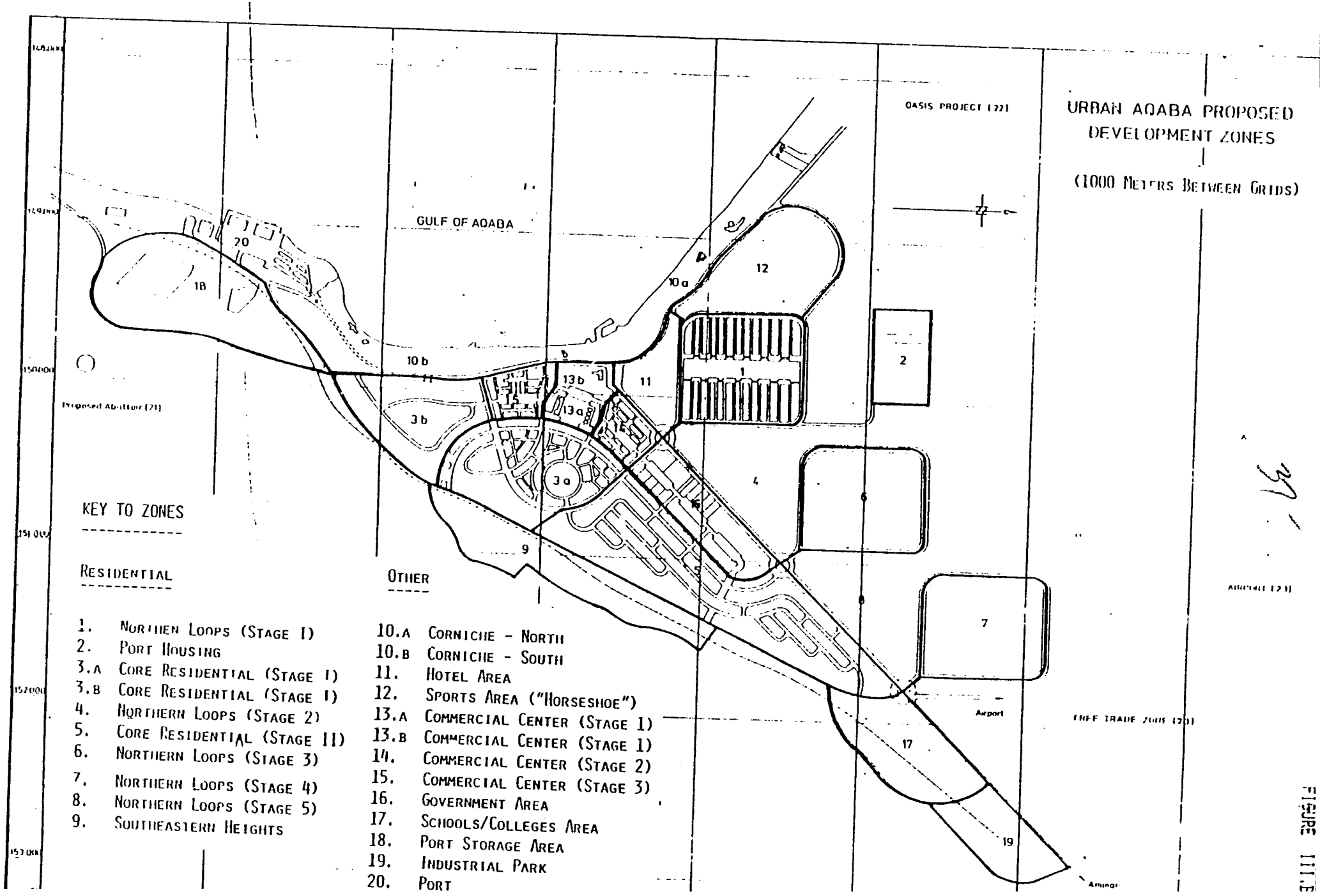

URBAN AQABA PROPOSED
DEVELOPMENT ZONES
(1000 METERS BETWEEN GRIDS)
GULF OF AQABA
OASIS PROJECT (22)
KEY TO ZONES
RESIDENTIAL
1. NORTHERN LOOPS (STAGE I)
2. PORT HOUSING
3.A CORE RESIDENTIAL (STAGE I)
3.B CORE RESIDENTIAL (STAGE I)
4. NORTHERN LOOPS (STAGE 2)
5. CORE RESIDENTIAL (STAGE II)
6. NORTHERN LOOPS (STAGE 3)
7. NORTHERN LOOPS (STAGE 4)
8. NORTHERN LOOPS (STAGE 5)
9. SOUTHEASTERN HEIGHTS
OTHER
10.A CORNICHE - NORTH
10.B CORNICHE - SOUTH
11. HOTEL AREA
12. SPORTS AREA ("HORSESHOE")
13.A COMMERCIAL CENTER (STAGE 1)
13.B COMMERCIAL CENTER (STAGE 1)
14. COMMERCIAL CENTER (STAGE 2)
15. COMMERCIAL CENTER (STAGE 3)
16. GOVERNMENT AREA
17. SCHOOLS/COLLEGES AREA
18. PORT STORAGE AREA
19. INDUSTRIAL PARK
20. PORT
Airport
FREE TRADE ZONE (23)
Aminar

FIGURE III.E

There are no anticipated special benefits to accrue to women as a result of the water and sewerage projects, although provision of constant water supply might well lessen the burden of daily housekeeping and child rearing for many of them, particularly those in the lower income groups.

The full social analysis is listed in Annex D . The above draws on the full analysis for many of its conclusions.

F. Environmental Analysis

The following section provides a concise summary of both the beneficial and adverse environmental impacts of the proposed water and sewerage project. The analysis is based upon the findings of professionally conducted studies by Minster Agriculture, Minster Technical Services Ltd. (1977) and Dr. N.C. Hulings(1977)*. These studies involved both field investigation and literature research and are included as Annex E to Volume 2 of the consultants' report. The environmental assessment was prepared in accordance with the guidelines of 22 CFR, Section 216, "AID Environmental Procedures" and those of the U.S. Water Resources Council. These studies have been reviewed by the NE Bureau's Environmental Coordinator who has found them to be technically adequate (see Annex E).

Analysis of the proposed project identified the principal adverse impact to be the short-term, localized physical disturbance associated with the construction of the water and sewerage systems. Such impacts would be minimal and their extent limited by the enforcement of proper pre- and post-disturbance procedures such as proper regrading of disrupted slopes and provision of proper drainage courses.

Beneficial impacts would result from the provision of secondary treatment of sewage and the elimination of an existing and possible future increment of pollution into the fragile waters of the Gulf of Aqaba and its internationally significant marine ecosystem**. Reduction of point source marine pollution would also serve to protect public health and enhance the opportunities to expand the evolving water recreation-based tourist industry of Aqaba. In addition, a benefit would accrue from the recycling of properly treated wastewater for municipal irrigation purposes in Aqaba, besides aesthetically enhancing the city, the growth of such vegetation will result in the creation of animal habitat; provide windbreaks, thus lowering urban dust levels and provide for a more comfortable humidity level within the city.

* 1. Minster Technical Services Ltd. Minister Agriculture 1977. Aqaba-Water Supply and Sewerage Disposal System Environmental Impact Assessment Pp. 20

2. Hulings, N.C. 1977. The Effect of the Discharge of Sewer Effluent into the Jordan Gulf of Aqaba.

** The coastal areas of the Gulf of Aqaba have been identified as a "nature reserve of international importance" by the International Union for the Conservation of Nature and Natural Resources, Morges, Switzerland. In addition, concern for the environmental protection of this area has been expressed to AID by the National Oceanographic and Atmospheric Agency (NOAA) and the Smithsonian Institution.

IV. PROJECT IMPLEMENTATION AND EVALUATION

A. Project Implementation Schedule

Table IV.1 is a summary schedule for the implementation of the AID-financed wastewater project. (The AID-financed project is phased just about one year behind the corresponding water project activities, thus avoiding a "bunching up" of similar implementation actions for the two different projects.)

B. AID Loan and Disbursement Schedules

Table IV.2 is the AID loan schedule and Table IV.3 the AID loan disbursement schedule.

C. Project Implementation

1. Government of Jordan

The Government of Jordan has named the Water Supply Corporation (WSC) as implementing agency. The WSC has been given full responsibility for all facets of project implementation, subject only to normal Government procedures, such as final approval of all contracts by the Office of the Prime Minister.

2. Supervisory Engineering

All technical and engineering services for the implementation phases of both the water and wastewater projects at Aqaba -- including tendering, construction and installation supervision, startup and final acceptance of all facilities -- is being provided by same firm which performed feasibility and design for the projects, Howard Humphreys & Sons of the U.K. (Financing of Humphreys' services for feasibility and design of the two projects was mostly from a U.K. development grant; for the wastewater project, financing will be part of the Government's contribution.) The contract for Humphreys' services has already been signed; submission of a copy of the contract is being recommended as a condition precedent to AID loan disbursements.

3. Project Procurement

Foreign exchange procurement under the AID loan will be conducted by host country contracting in conformity with AID Handbook 11 and local currency cost reimbursement will in accordance with standard procedures already established by the Mission for other projects.

The Government and the consultants understand that all tender documents will have to be written with U.S. specifications and that procurement source/origin will be restricted to AID Code 941 countries and Jordan. Given the standard nature of the equipment and materials and the routine nature of the construction, no unusual or difficult procurement problems are foreseen.

D. Project Monitoring

1. AID Monitoring

USAID/Jordan will be responsible for AID project monitoring. Within the Mission, primary monitoring responsibility will rest with the office of Capital Development. The Project Manager will be the Mission's Sanitary Engineer, currently the Chief Engineer.

2. Project Evaluation

All project elements will be monitored continuously at the output level to confirm the rate of progress in construction. Monthly progress reports will be prepared by the consulting engineers and submitted to AID through the WSC. Because successful completion and operation of the water supply and distribution project is a precondition for success of the AID-financed wastewater project, the monthly reports will detail the progress in completing all elements of both projects.

Evaluation of the project will be conducted by the Government and AID. In accordance with the standard AID evaluation covenant to be included in the loan agreement, the two parties are jointly pledged to develop an intensive evaluation program to be conducted during and after project implementation. In addition, an in-depth, in-house AID evaluation is scheduled for October 1983, by which time all of the wastewater facilities (and the administrative system) should have been in full operation for more than one year.

E. Negotiation Status

USAID Officers have discussed the preparation of this project paper with appropriate officials of the Government of Jordan at various stages during its development and have made them aware of the conditions precedent and special covenants which are being recommended for inclusion in the project loan agreement as a result of the project committee's analysis of the project's feasibility. No difficulty is foreseen in the negotiation of the loan agreement.

TABLE IV.1

IMPLEMENTATION SCHEDULE FOR AID-FINANCED WASTEWATER PROJECT

ACTIVITY	DATE
1. Contract for consulting engineering services signed	6/77
2. Consultant submits draft bid documents for (i) Construction (including irrigation system) and (ii) electrical & mechanical contracts	7/79
3. Final irrigation system design submitted for approval	7/79
4. CBD notices for contractor prequalification published	7/79
5. Detailed bid documents (including irrigation system components) completed	9/79
6. Bid documents issued to prequalified firms	10/79
7. Bid opening	1/80
8. Contracts approved	3/80
9. NTP to construction contractor delivered	4/80
10. Electrical and mechanical equipment delivery begins	9/80
11. Equipment installation (including suppliers' training programs) begins	3/81
12. WSC accounting and administration training program begins	5/81
13. WSC wastewater facilities operations and maintenance (on-the-job training) program begins	8/81

14.	E & M equipment installation completed.	2/82
15.	Construction work - including irrigation system - completed	2/82
16.	Beginning of full operations	3/82

TABLE IV. 2

AID LOAN SCHEDULE

LOAN AUTHORIZATION	AUGUST 16, 1979
LOAN SIGNING	AUGUST 30, 1979
INITIAL CONDITION PRECEDENTS MET	DECEMBER 31, 1979
PACD	DECEMBER 31, 1982
FIRST IN-DEPTH AID EVALUATION	OCTOBER, 1983

TABLE IV. 3

AID LOAN DISBURSEMENT SCHEDULE

	1980	1981	1982	Totals
Foreign Exchange	1.445	2.831	0.855	5.131
Local Currency	0.782	1.066	0.521	2.369
Totals	2.227	3.897	1.376	7.500

FEASIBILITY STUDIES FOR AQABA WATER AND WASTEWATER PROJECTS

The comprehensive feasibility studies and preliminary design work for the water and wastewater ("sewerage") projects were performed by Howard Humphreys, Ltd. of the U.K., in collaboration with Arabtech Consulting Engineers of Jordan, with financing provided by the GOJ and the U.K.'s ODM. The results of their work were presented in four volumes and one portfolio which are hereby incorporated by reference into this project paper. Following is a listing of these volumes:

1. Aqaba Region Water Supply -- Main volume (1977) (Blue Cover)

2. Aqaba Region Water Supply -- Appendices (1977) (Blue Cover)

3. Aqaba Water Distribution and Sewerage -- Volume 1, Water Distribution (1978) (Brown Cover)

4. Aqaba Water Distribution and Sewerage -- Volume 2, Sewerage (1978) (Brown Cover)

5. Aqaba Water Distribution and Sewerage -- Volume 2 Drawings (1978) (Brown Cover)

For the sewage effluent irrigation system, the consultants completed a preliminary engineering report in March 1979 which was also drawn on to prepare the project paper. The full title of this report is "Provisional Summary of Preliminary Engineering Report on Irrigation Development Using Treated Sewage Effluent in Aqaba Sewerage Project".

Copies of all of these works are available in the Project Development Office of the Near East Bureau (NE/PD) in AID/Washington.

ANNEX B

DESCRIPTION OF THREE MAJOR ELEMENTS OF AQABA WASTEWATER PROJECT

Following is detailed description of the three major elements of Stage I of the Aqaba wastewater system. As explained, in the main text, Stage I comprises the wastewater project to be financed jointly by the Government of Jordan and AID as recommended by this project paper. Stage II will principally comprise additional pumping facilities to bring the sewage collection system up to full design capacity and appropriate extensions to the treatment plant. Additional details of the Stage I facilities and a description of Stage II can be found in Volume 2 of "Aqaba Water Distribution and Sewerage" (see Annex for further reference).

1. Sewerage System: Sewers and Pumping Stations

Following is a summary of the proposed project sewers and pumping stations (see maps, figures II.A and II.B):

-- A new 1500 meter main sewer between the area currently being developed in the northern loop (Zone 6) and the proposed Pumping Station No. 4 (to be construction during Stage II). This sewer will be connected temporarily to the existing sewer until the flow requires construction of Pumping Station No. 4.

-- An up-grading of Pumping Station No. 1 to accommodate additional flows by the installation of two new pumps (one duty one standby), and the installation of a new pumping main to Pumping Station No. 2.

-- A new gravity trunk sewer starting southeast of the new hospital (approximately the northeastern limit of current intensive development), running through the central area of town for just over 2 kilometers and discharging into the new Main Pumping Station. This trunk sewer will be the main element of the collection system. Under the AID project, this trunk sewer will be constructed to serve areas of current or imminent development only but its design will permit its extension to serve all areas of subsequent development.

-- A new Main Pumping Station to be sited to the south of the existing port housing area which will pump all sewage collected to the proposed treatment works in Wadi Jushiya. The Main Pumping Station will have three pumps (two duty and one standby), will be designed to handle an ultimate Stage I flow of 9000 cubic meters per day and will be capable of expanding to accommodate the Stage II flow when necessary. An emergency outfall pipeline is to be constructed from the Main Pumping Station to permit discharge into the Gulf in the event of failure of the Main Pumping Station.

-- Some remedial work to parts of the existing sewers.

-- Retention of Pumping Station No. 3 as constructed.

2. Sewage Treatment Plant

The proposed sewage treatment plant consists of a facility capable of achieving secondary treated effluent. On the basis of the projected sewage flow build-up curves, the Stage I capacity at Aqaba will be 9000 cubic meters/day. The sewage treatment plant has been designed to treat flows of up to a maximum of 3x the Dry Weather Flow (DWF).

The treatment plant will be located in the lower end of the Wadi Jushiya, about 1.5 kilometers south of the built-up areas of Aqaba and inland from the shoreline about 900 meters. The site is due east of the port area and lies at an elevation of about 65 meters. It was chosen after careful consideration of six other sites and ten possible schemes with various combinations of primary and secondary treatment and possibilities for effluent disposal (to the sea or for irrigation). All the sites (and schemes) were carefully considered with regard to discounted costs, probable future land use requirements and environmental and esthetic considerations. The decision for Wadi Jushiya was based on its comparative low cost in combination with its undesirability as a location for other activities and its satisfaction of environmental and esthetic criteria (see Chapter 9 of Volume 2 of Humphreys' "Aqaba Water Distribution and Sewerage").

The proposed plant will provide secondary treatment to the incoming sewage by the extended process of the oxidation-ditch type. The process will produce an effluent to a standard allowing its use for restricted irrigation after chlorination. Under normal operating conditions and extended aeration plant can reduce the biochemical oxygen demand (BOD) of wastewater by about 90% to 95%.

The extended aeration process itself is a simplification of the conventional activated sludge process in which the primary sedimentation tank is omitted and screened wastewater undergoes oxidation in a relatively long and shallow continuous channel. Aeration is effected with semi-submerged cage rotors which are reliable and simple to maintain.

For efficient treatment it is necessary to maintain a high concentration of biomass in the aeration tanks. This is achieved by continously returning the sludge settled-out from the aeration tank effluent back to the aeration tank inlet. This sludge is known as activated sludge. A surplus of activated sludge is produced and this is of a stable nature and may be dried on beds prior to final disposal.

The energy input by the rotors must be sufficient to prevent settlement in the aeration tanks which is ensured by maintaining a flow velocity of at least 0.15 meters per second. This velocity is also sufficient to prevent breeding of mosquitos.

A process flow diagram of a plant incorporating extended aeration by the oxidation ditch process is shown in Figure B.I. The main advantages of a modified oxidation ditch plant area:

- elimination of primary sedimentation
- no primary sludge produced requiring treatment
- small site area requirements
- easy maintenance
- good resistance to organic and hydraulic shock loads
- production of stabilized sludge
- reliable performance
- capability of consistently producing good quality of effluent

Major disadvantage of the system when compared to other possible methods are the following:

- relatively high power consumption
- additional pumping required for returning activated sludge
- moderately skilled operators required

A close consideration of all involved factors has caused the consultants to recommend a modified oxidation system (a full discussion of these consideration can be found in Chapter 4, Volume 2 of Humphreys' "Water Distribution and Sewerage").

The sewage treatment plant itself will comprise the following elements (See Figure B.I)

(i) Inlet Works
(ii) Aeration Tanks
(iii) Final Settlement Tanks
(iv) Chlorination
(v) Sludge Thickening Tanks
(vi) Sludge Drying Beds.

Following is a brief description of each of these units and its function:

(i) Inlet Works: This will incorporate a mechanical raked screen for removal of gross solids together with a mechanically cleared detritor for the removal of grit and other heavy particles.

(ii) Aeration Dank: Oxidation of the sewage will be achieved by an electrically-driven, partially-submerged, multi-bladed, horizontal rotor. The rotor agitates the sewage, introducing air into it and maintaining circulation in the tank at a velocity high enough to prevent the settlement of solids.

(iii) Final Settlement Tanks: An integral part of the aeration process, the final settlement tanks serve to clarify the mixed liquor from the aeration tanks, thereby producing a satisfactory final effluent for reuse.

(iv) Chlorination: Effluent from the final settlement tanks will gravitate to the effluent/irrigation water reservoir from where water will be drawn off as required for the proposed irrigation scheme. Disinfection of the effluent will be provided in a chlorination plant.

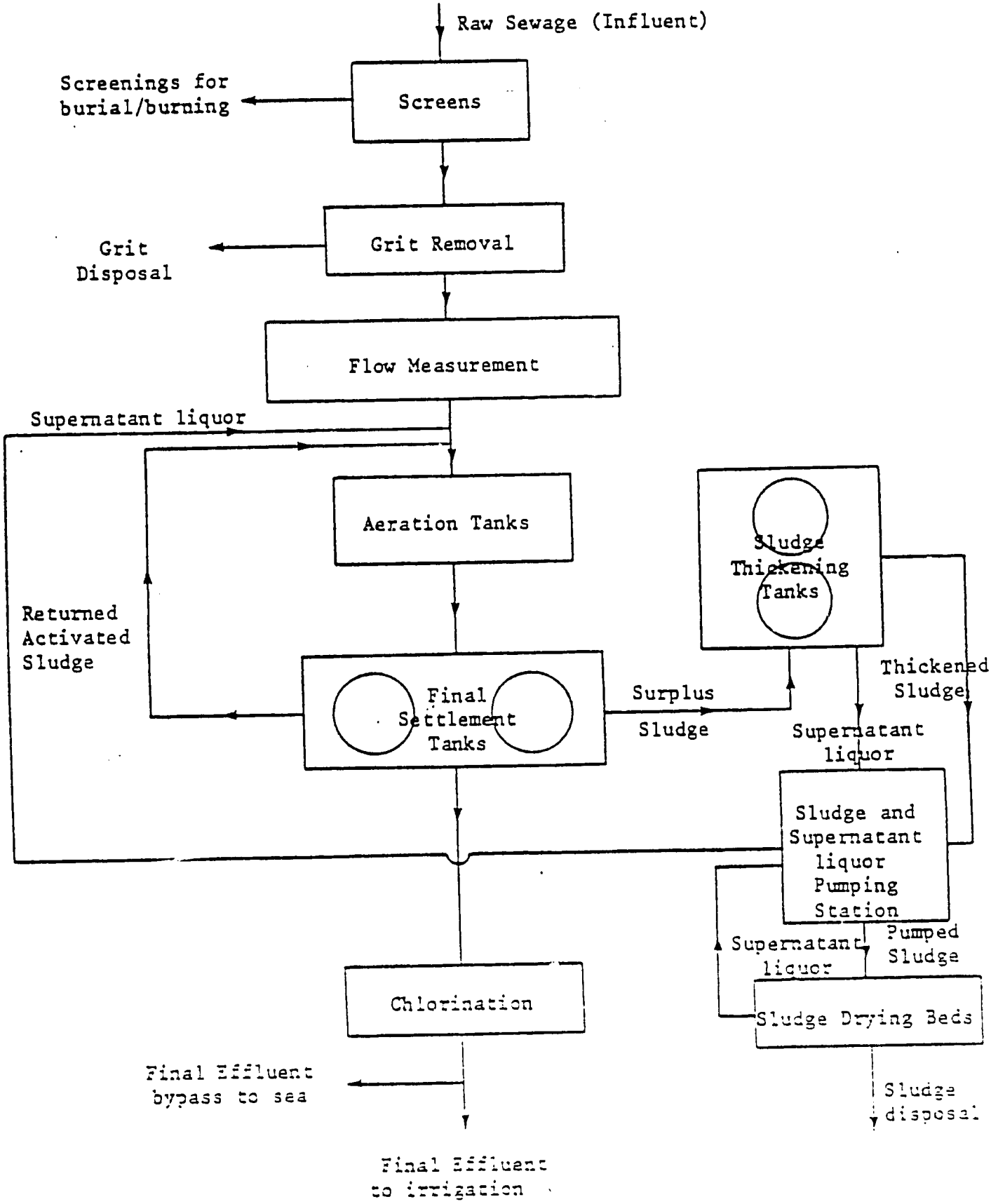
(v) Sludge Thickening Tanks: Two reinforced concrete sludge thickening tanks are proposed to received the surplus activated sludge from the final settlement tanks. They will provide the facility for balancing and thickening the sludge prior to its application to the sludge drying beds.

(vi) Sluge Drying Beds: These will receive sludge for drying by gravity pipeline from the thickening tanks.

-- Ancillarly Works: These will include an administration building, generator house, chlorine storage building, sludge pumping stations, roads, fencing, pipelines, standby generator, etc.

FIGURE B.I

PROCESS FLOW DIAGRAM: OXIDATION DITCH PROCESS
(Sewage Treatment Plant)



-- Sludge Disposal: Stable sewage sludge has moderate agricultural value as a fertilizer, and is also of valve as a conditioner to provide humus content. Great care must be taken to ensure that sludge contains no grease or toxic substances, however. Sludge from extended aeration plants is stabilized and does not require further treatment other plan drying before disposal.

3. Irrigation System

After exhaustive study of all factors involved, the consultants have developed a preliminary engineering report for the sewage effluent irrigation system which is based on the principle that all effluent produced must be used for irrigation, i.e., that none of the effluent should be discharged into the Gulf. Only preliminary designs could be formulated in the initial report because the results were not yet available from a series of soil and water tests arranged for by the consultants. However, the general characteristics of the soils and water are well enough known that it is highly unlikely that the test results will produce significant design changes; therefore, the preliminary design can be considered final for most intents and purposes. The results of the detailed preliminary design are laid out in a separate Humphreys' booklet, "Provisional Summary of Preliminary Engineering Report on Irrigation Development Using Treated Sewage Effluent in Aqaba Sewerage Project," dated March 1979. A copy of this publication is available at NE/PI for reference.

The consultants have designed the irrigation system to be constructed in four consecutive phases as the amount of effluent increases with the population and growth of Aqaba. The first stage, to be constructed as a part of the AID-financed project, will provide for irrigation of 26 hectares of greenery with the 4500 cubic meters of effluent anticipated as being produced per day by the sewage treatment plant when it starts up in 1982. This amount of effluent can be entirely utilized for irrigation of selected target areas in the city without the use of pumps; because the sewage treatment plant lies at 65 meters elevation, gravity alone will deliver the effluent to the initial areas. The second, third and fourth stages will install facilities to use progressively more effluent. By completion of the fourth and final stage, the system will provide irrigation to 100 hectares or more, utilizing all of the 18,000 cubic meters of effluent produced by the treatment plant when it if fully developed at the end of Stage II. The initial stage is estimated to cost $1.3 million dollars (including $164,000 for consultant supervision); completion of all stages is estimated to cost about $2.9 million (in 1979 dollars).

The initial stage will involve an earthen reservoir, lined with a suitable impermeable membrance, at the treatment plant site which is capable of storing up to 5,000 cubic meters of effluent. This is judged to be sufficient storage capacity to serve through the time when the full stage I treatment volume of 9,000 cubic meters/ day is reached. Other infrastructure invclves the laying of 5,400 meters of 600 mm pipe and 2,600 meters of 400 mm pipe. This basic design will allow irrigation during a week of 7 hectares along the Corniche Road, 9 hectares in the "Horeseshoe" (at the western end of the Corniche Road) and 10 hectares along the Amman/Aqaba Road.

Irrigation will be either by sprinklers or portable hose pipe. In either case, flow will be controlled from sealed hydrant points attached to a buried pipeline running along the center of areas to be irrigated. The hydrant points will only be able to be opened by using detachable valves, to insure that human contact with the effluent is avoided.

Basic design is based on the hottest period of the year, the months of June and July. The consultants are recommending that during the cooler months when irrigation demand is less, arrangements be made to discharge excess quantities of effluent into forest areas to the west of the "Horseshoe" to insure that spillage into the Gulf of Aqaba is avoided to the maximum extent possible.

A final design and operation report for the irrigation system is being recommended as a condition precedent to disbursements for the system from AID Loan.

FINANCIAL ANALYSIS

A. Purpose

This annex is intended to be an expansion of the Financial Analysis in the project paper text, Section III.D, and it should be read in conjunction with that section.

B. Financial Analysis Tables

The tables mentioned in the project paper's financial analysis and in this annex can be found at the end of the annex. For convenience, they are preceded by a listing of the eleven tables and the material presented in each and a table of the five cases tested for the financial analysis.

C. Discussion of Variables, Assumptions and Data Utilized in Preparing Tables

Following is a review of the variables involved, assumptions made and data utilized in preparing the cash flow tables and performing the financial analysis.

1. Loan Terms. The basic assumption is that all construction for both the water and wastewater projects is financed with loans at the Government's "standard" terms, i.e., 6% per annum interest, capital repayment in 20 years and a 5-year grace for repayment of capital. One case assumes a 10-year instead of a 5-year grace period. The basic assumption concerning loan terms can be considered highly realistic for the tests performed insofar as over half of the financing for the combined water and wastewater projects -- that portion of the water project being financed by loans from outside donors -- has already been extended on the Government's standard terms. Final decisions have still not been made on two important aspects of the remaining financing required: (i) What portion, if any, of the Government's contributions will be financed by grants, as opposed to loans; and (ii) The financing terms of the reloan to the WSC of the funds being lent to the Government by AID. The project committee is urging that the Government make the remaining financing available to the two projects on as concessionary basis as is possible; in the project paper we recommend strongly that the AID funds be relent at terms no more stringent than those at which the AID funds are made available to the Government. This position has been assumed in view of the relatively high per capita costs of the projects at Aqaba. However, to retain a conservative cast in the financial analysis, as indicated above,

most cases assume that all project construction costs are financed by loans with the Government's "standard" financing terms.

2. Method of Financing the Continuing Extension and Maintenance Program for the Sewerage System

The consultants have made provision in both the water and wastewater projects for a continuing program of extension to and maintenance of the respective systems(which they call the "on-going development" programs). As the names indicate, the basic purposes of these programs are to extend services to new areas of development and to maintain and, when necessary,renew existing facilities. While the programs are similar in purpose, they are much different in terms of estimated costs. For the water supply and distribution system, the consultants estimate that the program costs will be in the range of 5% to 10% of total yearly expenses. The consultants' estimates of the program costs for the sewerage system, however, are much higher and generally lie in the range of 50% of estimated annual costs of operating all of the wastewater facilities.

For the water project, the relatively small magnitude of the estimated costs for the continuing extension and maintenance program means that it can be financed from current revenues with no particular consequences for the rate levels. For the wastewater project, however, the high costs of the program for the sewerage system mean that financing from current revenues would impose a significant burden on the Aqaba residents using the system (see Case 1).

It can be noted that there is some question among observers with experience with sewerage system operations about whether the large expenditure envisioned by the consultants (JD 250,000 per year in 1977 amounts -- about $850,000) will actually be necessary for an effective continuing development program at Aqaba. As indicated, however, the financial analysis accepts the consultants' estimates, in accordance with the policy of presenting a "conservative" analysis.

In order to lighten the direct financial charges on users, the consultants have suggested as one possibility that the costs of the continuing development program be financed from the profits made by the municipality on land sales. While such a policy would have very attractive features from the point of view of social equity, the municipality to date has made no commitment regarding this suggestion. Therefore, it is assumed in the financial analysis that the costs of the program are entirely financed by WSC's Aqaba division, either through charges to current revenue or through debt financing in the form of loans from the Government at its standard terms.

3. Population Levels. Using standard techniques, for feasibility and design purposes, the consultants have developed a series of projections of future population in Aqaba, based upon varying assumptions about future economic growth which are then extrapolated to produce totals for future population levels. Ten different projections were developed, which ranged from very low to very high, depending upon the assumptions made. For the financial analysis, in all but one case, the consultants' "intermediate" projection of population growth was used. (The compound growth rate for this projection is about 7% per annum.) For one case, (Case 5), a population level of 80% of the consultants' intermediate projection is used (representing a compound growth rate of about 5.5% per annum). (For more information on the consultants' methodology and assumptions in developing the population estimates, consult Appendex C of Humphreys' "Aqaba Region Water Supply".)

4. Per Capita Water Consumption. In most cases, the consultants' "intermediate" estimate of per capita domestic water consumption was used. This is 200 liters per capita per day (lcd). In two cases (Cases 4 and 5), half this amount, or 100 lcd, is used.

The estimation of per capita water consumption is a particularly uncertain exercise because there is no known way to correlate the many factors which play a part in its determination, such as climate, cultural and social patterns, including health attitudes and sanitation practices, etc. A further factor about which there is considerable unresolved debate is whether or not the price of water has a significant and determinable effect on the level of use.

Given the hot, dry nature of Aqaba's climate and its relative prosperity, the consultants' estimate of 200 lcd would not seem unreasonable as an estimate of average domestic water use. For comparison, much higher consumption rates are encountered in many other Middle Eastern cities. Given the amounts of water to be available from Qa Disi, it would be possible to supply virtually "unlimited" amounts of water for domestic purposes to Aqaba's population, at least in the early years of project operation (whether this would advisable is another question). In any case, the supply available after completion of the water project will be considerably greater than at present. Aqaba residents might respond to the greatly increased supply of water by using significantly greater amounts than they now do, regardless of the cost involved in doing so. On the other hand, if wastewater service surcharges are based entirely on water consumption, then from the consumer's point of view, the cost of a cubic meter of water is the sum of the water charge plus the surcharge for wastewater, which will increase the unit water costs significantly. Perhaps this high price will move people down their demand curves to the point where average consumption is relatively low. At any rate, Cases 4 and 5 test the situation with regard to tariff rates if it turns out that the estimate for domestic use of 200 lcd is twice as high as actual use.

Finally, water use -- or apparent use -- is obviously greatly influenced by the amount of water lost in the system from various leaks and other unutilized wastage. All of the assumptions for water use at Aqaba include system losses of 25% for domestic water, 5% for water supplied to the fertilizer plant and 15% for other non-domestic uses, the latter category lumping together all uses for tourism, commercial establishments and small industry. Given the newness of much of the system and the waste prevention system to be installed, these estimates should prove quite "conservative". (Further details of water use estimation can be found in Appendex C of Humphreys' "Aqaba Region Water Supply".)

5. Cost Estimates. Construction cost estimates are based on actual awards made in the case of the water project and on the consultants' estimates, in the case of the wastewater project (see Section II.E.1 of the Project Paper). With regard to operating costs, the consultants' estimates were used. These are believed to be quite conservative; in any event, the consultants have demonstrated that total costs are largely insensitive to changes in operating costs, so estimates were kept constant for all financial analysis cases. The inflation rate estimate was kept at a constant 10% based on the judgement that the Government is likely to make every effort to insure that it does not exceed this rate on the average during the period of analysis so that while it might be lower than 10% it is unlikely to be higher. (For more information on the basis for the cost estimates, consult Chapter 12 of Humphreys' "Aqaba Region Water Supply" and Chapter 12 and Appendices G and H of "Aqaba Water Distribution and Sewerage" -- Volume 2.)

6. Average Family Size and Income. For the average family size, the financial analysis follows the consultants' use of six members as the estimate. While, like other population figures in Jordan, the average family size of six has no solid statistical backing, it does seem to be fairly widely accepted as the minimum estimate for average family size, even by interested observers who disagree on other basic population estimates, such as total size and/or growth rate. It is true that the present population of Aqaba has a large number of single workers who either are unmarried or have left their families at home while working in the port (thus significantly lowering the average family size in the city). Despite this, it is believed that utilization of the average family of six for the financial analysis is justified by the fact that the port authority definitely plans to reduce the port labor force dramatically after the current construction program is completed, thus greatly reducing the number of single workers in the city.

The consultants based their estimate of the average monthly family income of Jordan Dinar 110 (in 1977 amounts) essentially on estimates by others supplemented by limited spot checks on various wage and other rates of pay at the time. As it turns out, the estimate corresponds very closely to the IBRD's estimate for GNP per capita for Jordan in 1977 of $710 (in current prices), the consultants' figure for monthly income of JD 110 turning out to be equivalent to a per capita amount of about $733. Indeed, the slightly higher figure developed by the consultants' for Aqaba would accord with the general belief within Jordan that wages (and prices) are higher in Aqaba than in other parts of the country.

7. Standards for Monthly Family Expenditures for Water and Wastewater Services.

The standards against which anticipated charges for water and wastewater services were compared were taken from those used by the consultants, based upon minimum percentages developed by the IBRD. It has been possible to verify independently the minimum of 5% of family income as an IBRD standard -- see p. 40 ff. of "Village Water Supply -- A World Bank Paper" (IBRD, Washington, D.C.; March 1976). While it has not been possible to verify the 3% figure used as a minimum standard for wastewater services, the level would seem reasonable, when it is compared to the 5% level for water.

8. Charges. It is assumed in all cases that water charges are based on the average cost per cubic meter of producing and delivering water to consumers and that the wastewater charges are levied in the form of surcharges to the water charges which are derived by dividing total wastewater costs by the number of cubic meters of domestic water sold.

9. Irrigation System Costs. For Case 1, it is assumed that the irrigation system costs are included in user charges for the system. For other cases, they are not included, based on the assumption that the irrigation system costs are financed from other revenues, perhaps the Aqaba city budget. This is not in any case a very important issue for two reasons: (i) The irrigation system costs are marginal in comparison to costs for the other components of the system; and, (ii) Through taxes or other charges, the system's users will probably be paying for most of the irrigation costs, regardless of financing method chosen.

D. Fertilizer Plant Water Use and Costs

The financial analysis shows that for a reduction in the daily per capita domestic use of water in Aqaba, or for a reduction in overall use caused by a smaller-than-expected population, the charge for water on residential consumers in reduced, if all customers are charged an average cost per cubic meter of water delivered.

This result stems from the fact that the fertilizer plant will be such a large user of water from the system, at least through the early years after system inauguration. This is shown by Table XI, which gives an indication of the importance of the fertilizer plant as a consumer of water from the system and an indication for Cases 2, 4 and 5 of cost for water per ton of fertilizer produced at an annual production of 740,000 tons (again, if all consumers in Aqaba are charged the average cost of water).

Assuming the higher projections for domestic use (200 lcd), the fertilizer plant will utilize an average of about 50% of the water from the entire system over the period of analysis and about 68% on the average, of the water sold from Qa Disi. (It is assumed that the consumption by the fertilizer plant is constant, once production is built up to capacity.) Thus any assumption of decreased use by other sectors of demand in Aqaba will increase the percentage use by the plant. These increases in the percentage of the total available water used by the plant combine with the higher average cost of water caused by decreased domestic use to increase the fertilizer plant's relative contribution to revenue as the use by other consumers decreases. However, even under the assumptions entailing highest contribution to revenue by the plant the cost of water per ton of fertilizer produced in 1977 prices never rises above JD 1, with the highest cost being about $2.75 in equivalent dollars, when the average cost of fertilizer in a depressed market was reported to be in the range of $120 per ton. Thus, the cost of water to the fertilizer plant, if the plant is changed the average cost of production, appears reasonable, particularly when one considers that the relative costs of feedstock raw material quite likely will be increasing steadily and rather strongly throughout the period of analysis.

E. Tariff Considerations

1. Present Water Tariffs

At the present, there are two sets of water tariffs in effect in Jordan, one for Amman and one for the rest of the country (the latter is of course, applicable to Aqaba). The two tariff schedules are set out in Table A . As can be seen, after the first five cubic meters, when the rates are the same, marginal and average water costs per cubic meter are considerably cheaper for the Amman resident than for those in the rest of the country, and this situation continues to the point when they both are consuming at least 100 cubic meters per billing period at which time the unit price becomes the same (although, of course, the average cost at this point remains considerably cheaper for the Amman resident).

For both of these tariff schedules, the average cost increases steadily and continuosly after an initial steady rate for a set amount of consumption. Given the extreme scarcity of water throughout the country this basic approach is correct. It permits minimum consumption at low rates, thus protecting lower-income residents, and continuously increases the costs of water as use increases.

While the principles on which the rates are based are considered good, it can be noted that the rates per se do not in any way reflect current reality. Theoretically, the rates can be used to construct a supply curve by which one can tell for any given amount of money which a consumer is willing to spend the amount of water which the water authority is willing to provide him. It is certain that Amman does not have anywhere near enough water to provide it to Amman consumers along the supply curve which can be constructed from its tariff schedule; moreover, it is doubtful that the tariff schedule for the rest of the country is realistic in any of the places where it is applied.

The two tariffs distort reality not only absolutely but also relatively, to the extent that they offer water for sale much more cheaply in Amman than in the rest of the country, as they purport to do. Overall, the actual situation is the reverse; water is much more scarce in Amman than elsewhere. Obviously, other than purely economic considerations went into the preparation of these tariffs.

2. Future Tariff Schedules for Aqaba

Ideally, the function of a water tariff schedule is to equate water supply and demand at a level of total revenue which will cover costs. Thus, in order to construct a tariff schedule on this basis, one needs two major sorts of information: the costs to the water authority of producing and distributing the water and the integrated demand curve of the residents for water. In Aqaba, the information on costs can be estimated quite closely and will be quickly verifiable for any period of operations. Information on the residents' demand curve, however, will not be forthcoming in any way but trial and error -- thus, there is no way of knowing whether the tariff as now set by the Government would be a "clearance" tariff in Aqaba once the water system is operating.

It must be noted, however, that if wastewater services at Aqaba are charged for by means of a wastewater surcharge to the regular water rate (as is done in Amman), it might have an important effect on the consumption of water. This is because from the consumer's point of view, the effect will be to increase the price of water significantly at all points on the supply curve. The apparent price increase will be very steep if one assumes that the fertilizer plant pays no share of the wastewater system costs, which is unlike the water system for which the fertilizer plant is anticipated to pay at least 50% of the costs for the first ten years or so of operation. The total result of this situation is that two-thirds or more of the average cost of a meter^3 of water to Aqaba residents could represent wastewater surcharges.

While from the point of view of economic theory there would be only one correct tariff schedule, more than purely "economic" factors can be considered when establishing a tariff, and there are, therefore, a number of possible "right" tariff schedules which will cause supply and demand to be balanced in a way considered right from the community's overall point of view. The potentially high sewerage surcharges mentioned above provide an example of the type of situation which must be looked at carefully when establishing tariff schedules. Given the fact that these costs will be very high in Aqaba, averaging them over all the water sold in the form of a flat surcharge per cubic meter would undoubtedly impose a heavy burden on residents at the lower end of the income scale. (While this is the method used in Amman, the rate charged is far below the actual costs of services and therefore is quite bearable, even to lower income residents.) Thus, if Aqaba does adopt the surcharge system for wastewater, for reasons of social equity officials there might wish to consider a system whereby both the water and wastewater charges are lower for an initial amount of water used, in order to shift more of the burden for both types of services to the more fortunate members of the community.

TABLE A

WATER TARIFFS FOR

AMMAN AND REST OF JORDAN

AMOUNT SOLD (M^3)	RATE PER BLOCK (Fils/M^3)
0 - 20	80
21 - 40	120
41 - 100	250
100 and Up	300

REST OF JORDAN (INCLUDING AQABA)

0 - 5	80
6 - 15	140
16 - 25	240
20 and Up	300

LIST OF TABLES AND CASES

Table X: CHARGES REQUIRED TO COVER COSTS

(Case 5 - same as case 4 but population estimate at 80% of previous)

Table XI: FERTILIZER PLANT WATER USE AND COSTS

(If charged average cost per cubic meter)

Case	Basic loan terms	Financing for Wastewater continuing development	Domestic Water consumption	Population estimate
1	Standard	Current revenues	200 lcd	Intermediate
2	Standard	Annual loans	200 lcd	Intermediate
3	Standard except 10-yr. grace.	Annual loans	200 lcd	Intermediate
4	Standard	Annual loans	100 lcd	Intermediate
5	Standard	Annual loans	100 lcd	80% of Intermediate

TABLE I - PROJECT INDEBTEDNESS (CASE 1)

	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
A. WATER SUPPLY AND DISTRIBUTION														
1. Indebtedness at beginning of year	0	5239	11868	12883	12935	12935	12379	11790	11165	10503	9801	9057	8268	7436
2. Expenditures during year	5043	6115	292	50	-	-	-	-	-	-	-	-	-	-
2.a (Construction)	(4860)	(5940)	(250)	(50)	-	-	-	-	-	-	-	-	-	-
2.b (Consulting)	(183)	(175)	(42)	-	-	-	-	-	-	-	-	-	-	-
3. Interest on Year's Expenditure	151*	183*	9*	2*	-	-	-	-	-	-	-	-	-	-
4. Interest on indebtedness at year start	0	314*	712*	773	776	776	743	707	670	630	588	543	496	446
5. Commitment Fee	45*	17*	2*	-	-	-	-	-	-	-	-	-	-	-
6. Capital Repayments	-	-	-	-	-	556	589	625	662	702	744	789	836	886
7. Indebtedness at year end	5239	11868	12883	12935	12935	12379	11790	11165	10503	9801	9057	8268	7436	6550
B. WASTEWATER COLLECTION AND TREATMENT														
1. Indebtedness at beginning of year	0	10	1300	2970	3468	3468	3468	3319	3161	2994	2817	2629	2430	2219
2. Expenditure during year	10	1240	1541	310	-	-	-	-	-	-	-	-	-	-
2.a (Construction)	-	(1188)	(1505)	(304)	-	-	-	-	-	-	-	-	-	-
2.b (Consulting)	(10)	(52)	(36)	(6)	-	-	-	-	-	-	-	-	-	-
3. Interest on Year's Expenditure	-	37*	46*	9*	-	-	-	-	-	-	-	-	-	-
4. Interest on indebtedness at year start	-	1*	78*	178*	208	208	208	199	190	180	169	158	146	133
5. Commitment Fee	-	12*	5*	1*	-	-	-	-	-	-	-	-	-	-
6. Capital Repayments	-	-	-	-	-	-	149	158	167	177	188	199	211	224
7. Indebtedness at year end	10	1300	2970	3468	3468	3468	3319	3161	2994	2817	2629	2430	2219	1995
C. IRRIGATION SYSTEM														
1. Indebtedness at beginning of year		0	219	522	598	598	598	572	544	515	484	451	416	379
2. Expenditures during year		211	281	44	-	-	-	-	-	-	-	-	-	-
3.a (Construction)		(190)	(263)	(34)	-	-	-	-	-	-	-	-	-	-
2.b (Consulting)		(21)	(18)	(10)	-	-	-	-	-	-	-	-	-	-
3. Interest on Year's Expenditure		6*	8*	1*	-	-	-	-	-	-	-	-	-	-
4. Interest on indebtedness at year start		-	13*	31*	36	36	36	34	33	31	29	27	25	23
5. Commitment Fee		2*	1*	-	-	-	-	-	-	-	-	-	-	-
6. Capital Repayments		-	-	-	-	-	26	28	29	31	33	35	37	39
7. Indebtedness at year end		219	522	598	598	598	572	544	515	484	451	416	379	340

* Interest/Finance Charge Capitalized during Construction

TABLE II - TOTAL PROJECT COSTS

CASE 1

Category:	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
A. Water Supply and Distribution:												
1. Repayment of Debt	-	773	776	1332	1332	1332	1332	1332	1332	1332	1332	1332
1.a Interest	-	(773)	(776)	(776)	(743)	(707)	(670)	(630)	(588)	(543)	(496)	(446)
1.b Capital	-	-	-	(556)	(589)	(625)	(662)	(702)	(744)	(789)	(836)	(886)
2. Recurrent Costs	325	419	475	532	594	674	786	890	989	1097	1218	1353
3. On-Going Development	-	-	107	126	118	151	2901	192	378	238	300	300
TOTALS	325	1202	1358	1990	2044	2157	5019	2414	2699	2712	2850	2985
B. Wastewater Collection and Treatment												
1. Repayment of Debt			208	208	357	357	357	357	357	357	357	357
1.a Interest			(208)	(208)	(208)	(199)	(190)	(180)	(169)	(158)	(146)	(133)
1.b Capital			-	-	(149)	(158)	(167)	(177)	(188)	(199)	(211)	(224)
2. Recurrent Costs	-	161	184	206	229	260	293	337	370	414	463	500
3. On-Going Development	388	427	470	516	568	624	687	756	831	914	1006	1106
TOTALS	388	588	862	930	1154	1241	1337	1450	1558	1685	1826	1963
C. Irrigation System:												
1. Repayment of Debt			36	36	62	62	62	62	62	62	62	62
1.a Interest			(36)	(36)	(36)	(34)	(33)	(31)	(29)	(27)	(25)	(23)
1.b Capital			-	-	(26)	(28)	(29)	(31)	(33)	(35)	(37)	(39)
2. Recurrent Costs		13	14	16	17	19	21	23	25	28	30	33
TOTALS		13	50	52	79	81	83	85	87	90	92	95
Amounts in 1977 Prices, assume inflation at 10%		8	28	27	37	34	32	30	28	26	24	23

TABLE III - WATER PRODUCTION, SALES AND CONSUMPTION

CASE 1

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
1. Water Produced	2720	2720	2720	5758	8001	8668	9176	9567	9829	10184	10679	10876	11024	11527	11763
2. Water Sold	2176	2176	2176	4970	7083	7659	8108	8461	8676	8964	9366	9527	9784	10059	10250
2.a (Fertilizer Plant)	-	-	-	1976	3952	4185	4418	4650	4650	4650	4650	4650	4650	4650	4650
2.b (Domestic)	1676	1646	1616	2500	2501	2786	2933	3011	3154	3401	3719	3838	4029	4230	4400
2.c (Other)	500	530	560	594	630	688	757	800	872	913	997	1039	1105	1179	1200
3. Population	24740	27628	27024	32877	34255	38167	40182	41243	43207	46592	50948	52580	55192	57500	60000
4. No. of Families (residences) (Av. 6/Family)	4123	4605	4504	5480	5709	6361	6697	6874	7201	7765	8491	8763	9199	9583	10000
5. M^3/ Family/Yr.	407	357	359	438	438	438	438	438	438	438	438	438	438	438	438
6. M^3/Family/MO	34	30	30	37	37	37	37	37	37	37	37	37	37	37	37
7. Domestic Consumption (lcd)	186	163	163	200	200	200	200	200	200	200	200	200	200	200	200
8. Average Consumption (lcd)								562					486		

TABLE IV - CHARGES REQUIRED TO COVER COSTS (1977 PRICES) - CASE 1

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Water Charges	1.628	3.922	3.700	4.662	4.181	3.922	7.992	3.330	3.330	2.960	2.775	2.590
% of Monthly Income (110) (5% IBRD)	1.5	3.6	3.4	4.2	2.8	3.6	7.3	3.0	3.0	2.7	2.5	2.4
Sewerage Surcharges	4.070	5.402	6.438	6.031	6.623	6.179	5.624	5.069	4.773	4.477	4.218	3.959
% of Monthly Income (110) (3% IBRD)	3.7	4.9	5.9	5.5	6.0	5.6	5.1	4.6	4.3	4.1	3.8	3.6
Irrigation Surcharges	-	.117	.367	.336	.449	.393	.344	.294	.266	.236	.209	.192
% of Monthly Income	-	0.1	0.3	0.3	0.4	0.4	0.3	0.3	0.2	0.2	0.2	0.2
Total Monthly Income (8% IBRD)		9.441	10.505	11.029	11.253	10.494	13.960	8.693	8.369	7.673	7.202	6.741
		8.6	9.6	10.0	10.2	9.5	12.7	7.9	7.6	7.0	6.5	6.1

NOTE: Assumes 200 lcd Consumption or 37 cubic meters/month for 6 person family. Under current tariff. 37 M^3 = JD 7.800 = JD 0.211/M^3 for water alone. This equivalent to JD 6.446 or JD 0.174/M^3 in 1977 prices.

TABLE V - WASTEWATER PROJECT INDEBTEDNESS (CASE 2)

		1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
B.	WASTEWATER COLLECTION AND TREATMENT														
1.	Project Indebtedness at beginning of year	0	10	1288	2952	3448	3448	3448	3300	3143	2977	2801	2614	2416	2206
2.	Project Expenditure during year	10	1240	1541	310	-	-	-	-	-	-	-	-	-	-
	a. (Construction)		(1188)	(1505)	(304)	-	-	-	-	-	-	-	-	-	-
	b. (Consulting)	(10)	(52)	(36)	(6)										
3.	Interest on Year's Expenditure		37*	46*	9*										
4.	Interest on Indebtedness at year Start.		1*	77*	177*	207	207	207	198	189	179	168	157	145	132
5.	Capital Repayments for Project		-	-	-	-	-	148	157	166	176	187	198	210	223
6.	Project Indebtedness at year end		1288	2952	3448	3448	3448	3300	3143	2977	2801	2614	2416	2206	1983
7.	On-Going Development (OGD) indebtedness at year begin				388	815	1285	1801	2369	2976	3627	4325	5073	5875	6739
8.	OGD Expenditure			338	427	470	516	568	624	687	756	831	914	1006	1106
9.	OGD Interest			12	36	60	92	125	161	199	240	285	331	383	437
10.	OGD Capital Repayment								17	36	58	83	112	147	186
11.	OGD Indebtedness at year end			388	815	1285	1801	2369	2976	3627	4325	5073	5875	6734	7654

TABLE VI - WASTEWATER PROJECT INDEBTEDNESS - CASE 3

		1985	1986	1987	1988	1989	1990	1991	1992
B.	WASTEWATER COLLECTION AND TREATMENT								
1.	Project indebtedness at beginning of year	3448	3448	3448	3448	3448	3448	3187	2910
4.	Interest on Indebtedness	207	207	207	207	207	207	191	175
5.	Capital Repayments for Project	-					261	217	293
6.	Project Indebtedness at year end	3448	3448	3448	3448	3448	3187	2910	2617

*Note: Prior Years as in Table V

TABLE VII - PROJECT COSTS* (CASES 2 AND 3)

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
CASE 2												
B. WASTEWATER COLLECTION AND TREATMENT												
1. Repayment of Debt	12	36	267	299	480	533	590	653	723	798	885	978
a. Project Interest	-	-	207	207	207	198	189	179	168	157	145	132
b. Project Capital					148	157	166	176	187	198	210	223
c. On-going Development Interest	12	36	60	92	125	161	199	240	285	331	383	437
d. On-going Development Capital						17	36	58	83	112	147	186
2. Recurrent Costs		161	184	206	229	260	293	337	370	414	463	500
TOTALS	12	197	451	505	709	793	883	990	1093	1212	1348	1478
CASE 3**												
1. Repayment of Debt	....	Same	.....		332	385	442	505	575	911	998	1091
a. Project Interest	....	Same	.....		207	207	207	207	207	207	191	175
b. Project Capital	....	Same	.....		-	-	-	-	-	261	277	293
TOTALS	....	Same	.....		561	645	735	842	945	1325	1461	1591

NOTES:

* Water distribution and supply costs for both cases 2 and 3 same as for Case 1

** Other costs for Case 3 same as Case 2

TABLE VIII - CHARGES REQUIRED TO COVER COSTS (1977 PRICES) CASES 2 and 3

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Sewerage Surcharges (Case 2)	0.111	1.813	3.367	3.256	4.070	3.922	3.700	3.441	3.367	3.219	3.108	2.960
% of Monthly Income	0.1	1.6	3.1	3.0	3.7	3.6	3.4	3.1	3.1	2.9	2.8	2.7
Sewerage Surcharges (Case 3)	0.111	1.813	3.367	3.256	3.219	3.219	3.071	2.923	2.886	3.515	3.367	3.219
% of Monthly Income	0.1	1.6	3.1	3.0	2.9	2.9	2.8	2.7	2.6	3.2	3.1	2.9
Total* (Case 2)	1.739	5.846	7.511	8.325	8.806	8.362	12.136	7.141	7.030	6.475	6.142	5.772
% of Monthly Income	1.6	5.3	6.8	7.6	8.0	7.6	11.0	6.5	6.4	5.9	5.6	5.2
Total* (Case 3)	1.739	5.846	7.511	8.325	7.955	7.659	11.507	6.623	6.549	6.711	6.401	6.031
% of Monthly Income	1.6	5.3	6.8	7.6	7.2	7.0	10.5	6.0	6.0	6.2	5.8	5.5

*Water Charges same as Case 1

TABLE IX - CHARGES REQUIRED TO COVER COSTS (1977 Prices)- CASE 4

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Number of Families	5480	5709	6361	6697	6874	7201	7765	8491	8763	9199	9583	10000
Water use (thousand cubic meters/a)	1200	1250	1393	1466	1505	1577	1705	1859	1919	2014	2115	2200
Fertilizer Plant Use + Other Use	2570	4582	4873	5175	5450	5522	5563	5649	5689	5755	5829	5850
TOTAL USE	3770	5832	6266	6691	6955	7099	7268	7508	7608	7769	8044	8050
Cost/Cubic meter	059	128	122	154	137	129	267	113	112	101	093	089
Monthly water tariff for 6-person - family *	1078	2342	2233	2818	2507	2361	4886	2068	2050	1848	1702	1629
% of monthly income (JD 110)	01	2.1	2.0	2.6	2.3	2.1	4.4	1.9	1.9	1.7	1.5	1.5
Total: Water and Sewerage *	1189	4155	5600	6074	6577	6283	8586	5509	5417	5067	4810	4589
% of monthly income (JD 110)	1.1	3.8	5.1	5.5	6.0	5.7	7.8	5.0	4.9	4.9	4.4	4.2

* Sewerage Costs same as Case 2

TABLE X - CHARGES REQUIRED TO COVER COSTS (1977 PRICES) - CASE 5

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
No. of Families (0.8 estimate)	4384	4567	5089	5358	5500	5761	6212	6793	7011	7359	7667	8000
Annual Use if 6 - Person family uses 100 lcd (18.3 M^3/MO.)	963	1003	1118	1177	1208	1265	1364	1492	1540	1616	1684	1757
Fertilizer Plant Use (1.0 estimates)	1976	3952	4185	4418	4650	4650	4650	4650	4650	4650	4650	4650
Other Use (0.9 estimate)	535	567	619	681	720	784	822	897	935	995	1061	1080
Total Use	3474	5522	5972	6276	6578	6699	6836	7039	7125	7211	7395	7487
Cost (1977 PRICES)	222	747	767	1022	964	915	1936	846	850	786	751	715
Cost/M^3	064	135	130	163	145	137	283	120	119	109	102	095
Monthly Water Charge for 6-Person Family	1171	2471	2379	2983	2654	2507	5179	2196	2178	1995	1867	1739
% Monthly Income (JD 110)	1.1	2.2	2.2	2.7	2.4	2.3	4.7	2.0	2.8	1.8	1.7	1.6
Monthly Sewerage Surcharges (1.25xprevious)	139	2266	4209	4070	5088	4903	4625	4301	4909	4024	3885	3700
% Monthly Income (JD 110)	0.1	2.1	3.8	3.7	4.6	4.5	4.2	3.9	4.5	3.7	3.5	3.4
Monthly Tarrif Water & Sewerage	1310	4737	6588	7053	7742	7410	9804	6497	7087	6019	5752	5439
% Monthly Income (JD 110)	1.2	4.3	6.0	6.4	7.0	6.7	8.9	5.9	6.4	5.5	5.2	4.9

TABLE XI - FERTILIZER PLANT WATER USE AND COSTS

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
A. Water Produced	2720	2720	2720	5758	8001	8668	9176	9567	9879	10184	10679	10876	11024	11527	11763
B. (Of which Qa Disi)	-	-	-	3038	5281	5948	6456	6844	7109	7464	7959	8156	8304	8807	9043
C. Water Sold (Cases 1,2, and 3)	2176	2176	2176	4970	7083	7659	8108	8461	8676	8964	9366	9527	9784	10059	10250
D. (Of which Qa Disi)	-	-	-	2794	4907	5483	5932	6285	6500	6788	7190	7351	7608	7883	8074
E. Fertilizer Plant	-	-	-	1976	3952	4185	4418	4650	4650	4650	4650	4650	4650	4650	4650
F. Fertilizer Plant as % of Qa Disi (E/D)															
Average % 81-92: 68.5	-	-	-	70.7	80.5	76.3	74.5	74.0	71.5	68.5	64.7	63.3	61.1	59.0	57.6
G. Fertilizer Plant as % of Water Sold (E/C)	-	-	-	39.8	55.8	54.6	54.5	55.0	53.6	51.9	49.6	48.8	47.5	46.2	45.4
Total Water Costs	-	-	-	325	1202	1358	1990	2044	2157	5019	1414	2699	2712	2850	2985
1977 Prices	-	-	-	222	747	767	1022	954	915	1936	846	850	786	751	715
AA. Fertilizer Water Cost - Case 2				86944	418912	418500	556668	525450	492900	1004400	418500	418500	372000	348750	325500
AB. Fertilizer Water Cost - Case 4				116584	505856	510570	680372	637050	599850	1241550	525450	520800	469650	432450	413850
AC. Fertilizer Water Cost - Case 5				126464	533520	544050	720134	674250	637050	1315950	558000	553350	506850	474300	441750
AB/AA				1.34	1.21	1.22	1.22	1.21	1.22	1.24	1.26	1.24	1.26	1.24	1.27
AC/AB				1.08	1.05	1.07	1.06	1.06	1.06	1.06	1.06	1.06	1.08	1.1	1.07
AC/AA				1.45	1.27	1.3	1.3	1.28	1.29	1.31	1.33	1.32	1.36	1.36	1.36

Cost Per ton of Fertilizer: Case 2 JD 0.710 = $ 2.132 @ 1 JD = $ 3.00
(740,000 tons/a) Case 4 JD 0.861 = $ 2.59
Case 5 JD 0.911 = $ 2.74

ANNEX D

AQABA WASTEWATER PROJECT

SOCIAL ANALYSIS

The full social analysis for this project is found in a paper entitled, "Aqaba Water and Sewerage, Beneficiaries and Benefits," by Dr. Peter Benedict, Office of Technical Support, Near East Bureau, AID/Washington (dated October 1978).

This paper is available for reference from NE/TECH or NE/PD, AID/W.

UNITED STATES GOVERNMENT

memorandum

DATE: May 9, 1979

REPLY TO ATTN OF: NE/PD/PDS, Stephen F. Lintner, Bureau Environmental Coordinator

SUBJECT: Jordan: Aqaba Water and Sewerage (278-0206) - Environmental Clearance

TO: NE/PD/SJIL, James Watson, Project Chairperson

I have reviewed the following studies:

1. Minister Technical Services Ltd. Minister Agriculture. 1977. Aqaba - Water Supply and Sewerage Disposal System Environmental Impact Assessment. Pp. 20.

2. Haulings, N. C. 1977. The Effect of the Discharge of Sewer Effluent into the Jordan Gulf of Aqaba. Pp. 13.

In the context of the proposed project, I feel that they are technically adequate and fulfill the requirements of CFR 22, Section 216, "AID Environmental Procedures".

Attached is my proposed draft of the environmental analysis for inclusion in the project paper.

Attachment

Narrative Summary of Planned Objectives	2. Objectively Verifiable Indicators		3. Planning Assumptions
	a. Indicators of Progress Toward Planned Targets	b. Indicators of Benefit Incidence-Employment, Income Distribution Social Equity, etc.	
Sectoral Goal Increase in wastewater collection and treatment services, particularly in all major urban areas.	Measures of Goal Achievement: Numbers and percentages of urban residents provided with sewage collection services. Percentage of sewage collected which is given acceptable treatment (with acceptability of treatment determined in context of local conditions).	Measures of Benefit Incidence at Goal Level: Percentages of residents served in different income levels.	Assumptions affecting the linkage between project purpose and Sector Goal: None - achievement of project purpose will directly assist in sector goal achievement.

1. Narrative Summary of Planned Objectives	2. Objectively Verifiable Indicators		3. Planning Assumptions
	a. Indicators of Progress Toward Planned Targets	b. Indicators of Benefit Incidence-Employment, Income Distribution Social Equity, etc.	
B. Project Purpose Provide wastewater services to all Aqaba city residents (and businesses) at rates which are affordable (in form of combined water and wastewater rates).	Conditions Expected at End of Project (EOPs): All residences and businesses in Aqaba city connected to fully functioning wastewater collection and treatment system.	Indicators of Benefit Incidence Expected at EOPs: No family in Aqaba using at least 80 lcd must expend (on average) more than 8% of monthly income on combined water and wastewater charges.	Original Assumption affecti linkage between Project Outputs and Project Purpose (a) Water Supply and distribution subprojects completed and operated as designed. (b) Consultants' plans and designs adequate to achieve declared performance of project facilities. (c) Consultants' constructio and operating cost estimates are realistic. (d) Aqaba population continu to grow at or near consultants' "intermediate" projection.

1. Narrative Summary of Planned Objectives	2. Objectively Verifiable Indicators		3. Planning Assumptions
	a. Indicators of Progress Toward Planned Targets	b. Indicators of Benefit Incidence-Employment Income Distribution, Social Equity, Etc.	
C. Project Outputs	Magnitudes of Outputs:	Indicators of Benefit Incidence Expected at Output Level:	
(a) Fully installed and operating sewage collection system.	(a) Connected to all residences and businesses	(a) All raw sewage from Aqaba city collected by system.	(for all components) (i) Technical design has been well executed to provide services at desired levels.
(b) Operating sewage treatment plant.	(b) Capable of providing secondary treatment to up to 9000 cu.m. of raw sewage per day in urban Aqaba and capable of collecting all raw sewage in Aqaba and of delivering up to 9000 cu.m. per day to treatment plant.	(b) All sewage collected given secondary treatment to acceptable standards.	(ii) WSC will oversee project implementation adequately.
(c) Operating effluent irrigation system.	(c) Capable of utilizing for irrigation up to 4,500 cu.m. of treated effluent per day. Distributed by gravity through system providing health safeguards.	(c) Capable of utilizing for irrigation in manner causing no health hazard to population.	(iii) WSC will be able to hire (and train if necessary) adequate skilled staff to operate system components correctly.

1. Narrative Summary of Planned Objectives.	2. Objectively Verifiable Indicators		3. Planning Assumptions
	a. Indicators of Progress Toward Planned Targets	b. Indicators of Benefit Incidence	
b. Project Inputs All necessary equipment and materials, construction services and engineering services to construct and begin operating anticipated outputs.	Input Categories: - Sewers and pumping Stations (Pipes) (Pumps) (Civil Works) - Treatment Works - Irrigation System - Construction Supervision - Contingency & Interest Total	Budget and Implementation Schedule: 4.1 (1.0) (0.4) (2.7) 5.1 1.5 0.5 1.5 12.7 --Bids tendered: 10/79 --Bids awarded: 3/80 --Construction completed 2/80	Provision of Inputs: All AID and Government funds made available in full on timely basis as follows: ($ millions) AID $ 7.5 GOJ 5.2 $12.7

STATUTORY CRITERIA
PROJECT CHECKLIST

A. General Criteria for Project

1.	FY 79 App. Act Unnumbered; FAA Sec. 653(b); Sec. 634A. (a) Describe how Committees on Appropriations of Senate and House have been or will be notified concerning the project; (b) is assistance within (Operational Year Budget) country or international organization allocation reported to Congress (or not more than $1 million over that figure)?	(a) Notification will be accomplished by submission of an Advice of Program Change to the Congress. (b) Yes
2.	FAA Sec. 611(a)(1). Prior to obligation in excess of $100,000, will there be (a) engineering, financial, and other plans necessary to carry out the assistance and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?	(a) Yes (b) Yes
3.	FAA Sec. 611(a)(2). If further legislative action is required within recipient country, what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purpose of the assistance?	No further legislative action is required.
4.	FAA Sec. 611(b); FY 79 App. Act Sec. 101. If for water or water-related land resource construction, has project met the standards and criterial as per the Principals and Standards for Planning Water and Related Land Resources dated October 25, 1973?	Yes
5.	FAA Sec. 611(e). If project is capital assistance (e.g., construction), and all U.S. assistance for it will exceed $1 million, has Mission Director certified the country's capability effectively to maintain and utilize the project?	Yes. Certification included among Annexes of Project Paper.
6.	FAA Sec. 209. Is project susceptible of execution as part of regional or multilateral project? If so why is project not so executed? Information and conclusion whether assistance will encourage regional development programs.	Project is not so susceptible, Assistance will not encourage Regional Development Programs.

7. FAA Sec. 601(a). Information and conclusions whether project will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; (c) encourage development and use of cooperatives, credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions.	Project will encourage efforts under "a" and "b". Under "a", Project will foster increased flow of international trade by improving health and amenities in Jordan's only port. Project also will be constructed by private sector under competitive bidding.
8. FAA Sec. 601 (b). Information and conclusion on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).	U.S. private enterprise is expected to furnish a major portion of the equipment required for the project.
9. FAA Sec. 612(b); Sec. 636(h). Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized to meet the cost of contractual and other services.	The Loan agreement will so provide.
10. FAA Sec. 612(d). Does the U.S. own excess foreign currency and, if so, what arrangements have been made for its release?	Jordan is not an excess currency country.
11. FAA Sec. 601(e). Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise?	Yes
12. FY 79 App. Act Sec. 608. If assistance is for the production of any commodity for export, is the commodity likely to be in surplus on world markets at the time the resulting productive capacity becomes operative, and is such assistance likely to cause substantial injury to U.S. producers of the same, similar or competing commodity?	N/A

B. Funding Criterial for Project (Project Criteria Solely for Economic Support Fund)

a. FAA Sec. 531(a). Will this assistance support/promote economic or political stability? To the extent possible, does it reflect the policy directions of Section 102?	The project will promote the economic and political stability of Jordan by contributing to the fulfilment of the country's five-year development plan.
b. FAA Sec. 533. Will assistance under this chapter be used for military or paramilitary activities?	No

STATUTORY CRITERIA

STANDARD ITEM CHECKLIST

A. Procurement

1.	FAA Sec. 602. Are there arrangements to permit U.S. small business to participate equitably in the furnishing of goods and services financed?	All procurement will be by competitive bidding.
2.	FAA Sec 604(a). Will all commodity procurement financed be from the U.S. except as otherwise determined by the President or under delegation from him.	Yes
3.	FAA Sec. 604(d). If the cooperating country discriminates against U.S. marine insurance companies, will agreement require that marine insurance be placed in the U.S. on commodities financed.	Yes
4.	FAA Sec. 604(e). If offshore procurement of agricultural commodity or product is to be financed, is there provision against such procurement when the domestic price of such commodity is less than parity?	N/A
5.	FAA Sec 608(a). Will U.S. Government excess personal property be utilized wherever practicable in lieu of the procurement of new items?	N/A
6.	FAA Sec. 603 - MMA Sec 901 (b). Compliance with requirement that at least 50 percentum of the gross tonnage of commodities (computed separately for dry bulk carriers, dry cargo liners, and tankers) financed shall be transported on privately owned U.S. - flag commercial vessels to the extent that such vessels are available at fair and reasonable rates.	Appropriate provision will be made.
	FAA Sec 621. If technical assistance is financed, will such assistance be furnished to the fullest extent practicable as goods and professional and other services from private enterprise on a contract basis. If the facilities of other Federal agencies will be utilized, are they	N/A

	particularly suitable, not competitive with private enterprise, and made available without undue interference with domestic programs?	
8.	International Air Transport. Fair Competitive Practices Act, 1974 If air transportation of persons or property is financed on grant basis, will provision be made that U.S. flag carriers will be utilized to the extent such service is available?	Yes
9.	FY 79 App. Act Sec. 105. Does the contract for procurement contain a provision authorizing the termination of such contract for the conveience of the United States.	Appropriate provisions will be included in all contracts for procurement.
B.	Construction	
1.	FAA Sec. 601(d). If a capital (e.g., construction) project, are engineering and professional services of U.S. firms and their affiliates to be used to the maximum extent consistent with the national interest?	Yes
2.	FAA Sec. 611(c). If contracts for construction are to be financed, will they be let on a competitive basis to maximum extent practicable.	Yes
3.	FAA Sec. 620(k). If for construction of productive enterprise, will aggregate value of assistance to be furnished by the U.S. not exceed $100 million?	N/A
C.	Other Restrictions	
1.	FAA Sec. 201(d). If development loan, is interest rate at least 2% per annum during grace period and at least 3% per annum thereafter?	Yes
2.	FAA Sec. 301(d). If fund is established solely by U.S. contributions and administered by an international organization, does Comptroller General have audit rights.	N/A

3. FAA Sec. 620(h). Do arrangements preclude promoting or assisting the foreign aid projects or activities of Communist-Bloc countries, contrary to the best interest of the U.S.? Yes

4. FAA Sec. 636(i). Is financing not permitted to be used, without waiver, for purchase, long-term lease, or exchange of motor vehicle manufactured outside the U.S. or guaranty of such transaction? Yes

5. Will arrangements preclude use of financing:

a. FAA Sec. 104(f). to pay for performance of abortions or to motivate or coerce persons to practice abortions, to pay for performance of involuntary sterilization, or to coerce or provide financial incentive to any person to undergo sterilization? Yes

b. FAA Sec 620 (g). to compensate owners for expropriated nationalized property? Yes

c. FAA Sec. 660. to finance police training or other law enforcement assistance, except for narcotics programs? Yes

d. FAA Sec. 662. for CIA activities? Yes

e. FY 79 App. Act Sec. 104. to pay pensions, etc., for military personnel? Yes

f. App. Sec. 106. to pay U.N. assessments? Yes

g. FY 79 App. Act Sec. 107. to carry out provisions of FAA Sections 209(d) and 251(h)? (transfer to multilateral organization for lending?) Yes

h. FY 79 App. Act Sec. 111. To finance the export of nuclear equipment, fuel, or technology or to train foreign nations in nuclear fields? Yes

i. FY App. Act Sec. 601. To be used for publicity or propaganda purposes within U.S. not authorized by Congress?	Yes

AQABA WASTEWATER PROJECT

RECOMMENDED CONDITIONS PRECEDENT AND SPECIAL COVENANTS

A. Conditions Precedent to Initial Disbursement

Prior to any disbursement or the issuance of any commitment documents under the Project Agreement, the Cooperating Country shall, except as AID may otherwise agree in writing, furnish in form and substance satisfactory to AID:

1. An executed contract for engineering design and consulting supervision services for construction and start-up of the wastewater facilities.

2. A copy of an executed and delivered Reloan Agreement between the Borrower and the Water Supply Corporation (WSC) by which the Borrower agrees to make available to WSC the proceeds of the Loan for the purposes stated in Section ___ and Annex ___ herein.

3. With regard to staffing of Aqaba Water and Sewerage Office of the Water Supply Corporation, the following:

(a) A staffing plan for both the WSC and the consulting engineers for supervising construction and start-up of wastewater facilities and the names and qualifications of all key personnel, including project manager.

(b) Staffing plan for administering, operating and maintaining the wastewater facilities after start-up, including provisions for personnel to perform fiscal administration (particularly accounting, budgeting and studies to establish and evaluate rates) and a description of the relationships between the wastewater staff and that responsible for water supply and distribution; and

(c) A training plan for operating and administration personnel for the Aqaba wastewater facilities.

4. Evidence that appropriate legal measures have been or will be promulgated requiring all residences and business establishments in the project area to be connected to the sewerage system once the main collectors have been installed and the treatment plant placed into operation.

5. A final design and operation report for the sewage effluent irrigation system including a schedule for installation and start-up, a financial plan for construction and operation and a plan for operation, to include an organizational table and identification of the organization that will have ultimate operating authority.

B. Special Covenants

1. Water and Wastewater User Charges

Borrower covenants to develop a rate and charges schedule for all water and wastewater services in Aqaba which provides sufficient revenue to cover all costs associated wtih the provision of such services, including provision for debt service requirements. In developing such a tariff schedule, Borrower shall give special consideration to:

(a) ensuring that charges paid by various classes of consumers reflect in a reasonable manner the costs associated with providing services to each group, and

(b) ensuring that all costs of services including both initial connection charges and regular tariff charges remain affordable to lower income residents of Aqaba.

2. Staffing and Training

Borrower covenants to provide adequate staff and to implement a staff training program as required to manage and operate the wastewater facilities at Aqaba in accordance with generally accepted standards, to evaluate the effectiveness of the staffing and training programs on a regular basis and to effect such revisions in the programs as the evaluations indicate are required to meet program goals.

3. Effluent Irrigation System

Borrower covenants to continue development and expansion of the effluent irrigation system in such a manner that all effluent produced by the sewage treatment plant(s) at Aqaba is utilized for irrigation purposes in a manner posing no significant health or other hazards to the city's inhabitants.

4. Ca Disi Water Supply and Distribution Project

Borrower covenants to implement fully the project designed to supply to, and distribute within, Aqaba up to 17.5 million cubic meters of water per annum from a well-field in the Ca Disi area.

5. Sufficient Borrower Financial Support

Borrower covenants that, to the extent not made available from revenues, sufficient funds on reasonable terms will be made available to the Water Supply Corporation (WSC) from Borrower resources to allow the WSC's Aqaba division to meet its operating capital needs and to carry out necessary extensions and improvements of the sewerage system on a continuing basis.

ANNEX J

AQABA WATER SUPPLY AND DISTRIBUTION PROJECT

PROJECT DESCRIPTION AND COST ESTIMATE

While the Aqaba water-supply and distribution projects being financed by the Government and three international donors are separate from the Aqaba wastewater project being financed by the Government and AID, their completion on time and proper functioning thereafter are pre-requisites for the success of the wastewater project. This annex provides a description of the water projects which is - like that for the wastewater project - based on the feasibility and initial design studies performed by the firm Howard Humphreys (HH) of the United Kingdom. Readers interested in more detail are referred to the volumes by Humphreys referenced in Annex A which are available for reference in NE/PD, AID/W.

The feasibility work for the water projects was completed in 1977. All contracts were tendered for bidding in the fall of 1978 and bids were received and evaluated in the spring of 1979. Active work on the projects began in June 1979 with completion scheduled for early - to mid-1981.

The water supply and distribution scheme comprises three principal elements, as follows:

1. The Qa Disi wellfield, including the interconnecting pipework, reservoir, generating station, administration center and staff housing.

2. Two trunk pipelines, one from the wellfield to the principal terminal reservoir north of Aqaba (including break-pressure tanks) and one continuing from the principal terminal reservoir to Wadi 2 on the coast south of Aqaba city, location of the new fertilizer plant.

3. The water distribution system in urban Aqaba.

In the following description, the first two elements are considered part of one project, that for water supply, while the last element is treated as separate water distribution project.

A. WATER SUPPLY

1. Wellfield

The northwestern edge of the proposed Qa Disi wellfield lies about 55 kilometers from Aqaba, a little north of a line due east from the city. The wellfield will be controlled from this point, which will be the location of the reservoir tank, generating station,

administrative center and staff housing and will extend some 15 kilometers southeast. Extensive tests have led HH to the conclusion that the Qa Disi aquifer can supply at a minimum between 17 and 19 MCM/a of water for at least the next fifty years. The aquifer is already being utilized to a limited extent for agricultural purpose and the above abstraction figures, which are considered to be conservative, are based on over forty wells already constructed in the aquifer for both groundwater investigation and supply. The water is considered to be of good quality.

The wellfield will consist of the following elements:

a. Seven to nine wells collecting water from the sandstones of the Disi Formation. An ultimate number of 13 operating wells is envisioned to provide water for the pipeline, with the requirement increased by one, to 14, to provide for one standby well at all times. The plan is to begin with a first stage of seven to nine wells and to expand as experience with both wellfield production and water demand in Aqaba indicate is necessary.

b. Pump units and other equipment associated with the abstraction of water.

Each well installation will have a sanitary seal, appropriate air vents, water level indicator, flow meter and indicator, check value, isolating valve, pressure sustaining valve, air valves, pressure guages,sample tap and washout.

c. Water Collection Pipework System

To provide a steady flow of water into the trunk pipeline to Aqaba, a reinforced concrete collecting reservoir will be provided with a total capacity of approximately 2500 cubic meters.

d. Power Station and Transmission System

The nearest power supplies to the wellfield are in Aqaba and are limited. Furthermore. there is no transmission system for bringing power to the site. Therefore, the consultants propose that the project provide for local generation of electricity at the wellfield. The transmission line will generally follow the route of the well collection pipes so that access and maintenance are facilitated. The power station building will have sufficient space for the addition of two more generators at any time after installation of the initial four.

e. Administrative Center and Housing

The administrative building will provide areas for management and administrative staff, a control center, a communication room (radio link to Amman and/or Aqaba and internal telephone switchboard)

and a meeting room. There will be housing units for five families (managers and superintendents) and a bachelor housing building for 28 further staff members. All housing will be relatively comfortable as an inducement to skilled technicians to accept assignment at the site.

f. Monitoring and Control

To facilitate efficient and prompt control of the Qa Disi well field, remote indication of the status of each well pump will be provided to the control center. The wells themselves will be unattended and the start/stop operations will be carried out manually by visiting operations staff following instruction from central control.

2. Transmission Pipelines

There will be two "trunk" pipelines. The first will be 63.7 kilometers long and carry water from the wellfield collecting reservoir to the principal terminal reservoir for Aqaba, which is to be sited approximately ten kilometers north of Aqaba at the junction of the Wadi Yutm and the Wadi Araba. The second trunk pipeline, 28.5 kilometers long, will transport the water from the principal terminal reservoir through the city and along the south coast to the Wadi 2 industrial area, site of the new fertilizer plant. In addition to conveying water for the fretilizer plant and other users along the coast, the second trunk line will feed from its upper reaches the four service reservoirs for the city distribution system. Each of these two trunk pipeline is described in more detail in the following sections. (To differentiate between the two lines, the consultants have called the upper line the "trunk pipeline" and the lower one the "South Coast pipeline" and this same usage has been adopted here.)

a. Trunk Pipeline

The pipeline will be constructed with a capacity of 17.5 MCM/a based on a peak wellfield discharge of 663 l/s. The total fall over its 63.7 kilometer length is approximately 590 meters. Because of the high pressure developed along this fall, the pipeline has been broken into three separate pressure zones with two break-pressure tanks, one located at kilometer 41.4 and the other at kilometer 59.2.

The water will be chlorinated at Qa Disi prior to entering the trunk pipeline to ensure sterility of the pipeline and to prevent any growth of algae or bacteria.

b. South Coast Pipeline

This will be a pipeline running through the town of Aqaba and serving the entire south coast to Wadi 2, the site of the new fertilizer plant and the ultimate terminal at 92.2 kilometers from the wellfield collecting reservoir. Branch lines off this line will feed the existing and proposed service reservoirs for the Aqaba distribution system, sited on the low hills east of town. The mean capacity of the pipeline from kilometer 63.7 (terminal reservoir) to the final branch to the city service reservoir at kilometer 70.7 will be 17.5 MCM/a. Beyond this point, the mean capacity to kilometer 87 will be 13.0 MCM/a, thus providing for a minimum drawoff of Aqaba of 4.5 MCM/a (which will be in addition to the current supplies of about 2 MCM/a from Wadi Yutm).

The final 5.2 kilometers to the fertilizer plant will have a capacity of 11.3 MCM/a, providing about twice the requirements of the fertilizer plant to accommodate increases in fertilizer plant usage, future industrialization or tourism on the south coast.

c. Flow Control

At the top of the system at the wellfield, control is exercised by monitoring the level of the collecting reservoir. The two further reservoirs at each of the two break-pressure points on the trunk pipeline and the storage reservoirs in Aqaba all have float controlled valves to shut off inflow after stored water approaches the top level.

It is of course intended that normally any adjustment should be preceded by telephone warnings but the system would in fact operate entirely satisfactorily without any communication along the line, if necessary. For success it depends, however, on the provision of adequate capacity at the various reservoirs, capacity which is being provided at every stage by the proposed designs.

B. WATER DISTRIBUTION SYSTEM IN AQABA

1. Existing System

The early water supply for Aqaba was derived from two wells in the alluvial deposits of Wadi Araba. The increasing salinity of the water from these two wells has made them unsuitable for domestic consumption. The present supply comes from a number of wells in the lower Wadi Yutm. The water from these wells is delivered to a collecting reservoir just downstream of the Wadi Yutm road bridge and from there it is conveyed by gravity trunk main to Reservoirs 1 and 2 for distribution to Aqaba. From Reservoir 2, one 200-mm diameter pipe supplies the town and a second 200-mm diameter pipe supplies the port area.

There are two booster stations, one to supply the housing area uphill from the town by-pass highway (the "southeastern heights" area) and the other to boost the pressure in the older section of the city. (These stations will be phased out with the commissioning of the new system with its higher pressures.)

The two service reservoirs 1 and 2 are situated in a fenced area to the south east of Aqaba railway station. Reservoir 1 has a capacity of 500 m^3, and reservoir 2, a capacity of 2,250 m^3. In the port area there is an elevated steel storage tank situated near the port fire station.

Virtually all consummers in Aqaba now have metered connections. Consummers provide their own meters and the tendency has been for the installation of cheaper, less reliable types. The Water Supply Corporation is now insisting on all new or replacement meters to be those of the Kent inferential type or other approved meter.

Due to the present inadequacy of the supply, especially during the hot summer months, supplies are restricted and for equitable distribution the town is divided into three areas:

(1) residential area;
(2) hotels, the palace and commercial areas; and
(3) the old town.

Area 1 is supplied for twelve hours every other night from 1800 hours to 0600 hours. Area 2 is supplied for twelve hours every day from 0600 hours to 1800 hours. If, however, the pressure in this area is sufficiently high, additional supplies are given to the residential area (this normally occurs only during the colder winter months). Area 3 is given supplies for twelve hours every other night from 1800 hours to 0600 hours on the days when the residential area is not supplied. The port area is supplied from 0600 hours to 1800 hours every day and the port housing area from 1800 hours to 0600 hours.

2. Proposed Project

(a) Design Parameters and Criteria

The first task in water distribution design is estimation of demand. The consultants followed the standard practice of estimating for each area of the city the ultimate water consumption, assuming ultimate overall development, to preclude the necessity for adding to the system once it is installed. The system as designed by the consultants is based on an ultimate population of 82,000 people, an average residential usage of 240 liters per capita per day (lcd) and an average overall usage of about 380 lcd. To this was added a margin

sage figure for waste. Altogether, the cosultants
ese parameters will provide a very conservative basis
gn, containing a margin of overcapacity. However,
ty will be created at a small marginal increase in
ost and this is viewed as a small insurance "fee"
ssibility of installing a system with inadequate capacity.
n criteria employed in laying out the proposed
stem in Aqaba have been selected to provide a system
ccommodate all of Aqaba's requirements into the
ure.

First Stage of Distribution System

The first stage of distribution system construction
s, to be included in the current project, involves
2,300 meters of primary mains and about 10,400 meters
ins. Akso planned is the procurement of about 6,200
ional secondary distribution pipe. The latter
l provide flexibility to meet any unforeseen need
istribution which develops during the construction
uch a need does not develop, will provide sufficient
short on-going distribution program after the end
per se.

The basic purpose of the first stage of construction
ribute the additional water to be available from Qa Disi
s of Aqaba already developed and those to be developed
ure; thus, the first stage will both supply water
d improve the services to developed areas where
are inadequate.

The complete proposed distribution system, both
ondary, has been laid out and its adequacy checked
eling to insure that it will be capable of
sign pressures and maintaining flow requirements,
nsidering the relatively large amount of the system
omposed of retained sections of the existing network.

Pressure Zoning and Service Reservoir

The consultants believe that development in Aqaba will
reas below 140 meters of elevation by the steep granite
d the city everywhere above this level. Thus, distribution
sidered above this level. Below 140 meters, pressure
istribution system will be necessary to limit the
ttings and to reduce leakage. After careful consideration
ons of either a two-zone or a three-zone pressure
sultants have decided on the two-zone system. The break
areas will run at about the 70-meter contour.

9

The consultants recommend a total first stage storage reservoir capacity of 7,500 cubic meters. One advantage of the plan to utilize a two-zone pressure system is that the existing service reservoirs are situated at the 86.6 meter level and therefore can be incorporated into the two-zone system as reservoirs for the lower level. Based on their judgement that development in the higher pressure zone will be much less than in the lower, particularly during the next ten years, the consultants recommended that storage of only 500 cubic meters be provided for the upper level, with the remaining 7,000 cubic meters allocated to the lower level. There is at present no service storage at the level (155 meter) required for the upper pressure zone, so the project will include construction of a 500 cubic meter pressed steel sectional tank to serve the upper zone. As discussed earlier, the two existing reservoirs are exactly the right height for use for the lower pressure zone. Combined capacity of these two reservoirs is 2,750 cubic meters, leaving a requirement at the 85-meter level for a further 4,250 cubic meter service storage reservoir.

(d) Waste Measurement and Control

The consultants have specified outlet meters on the service reservoirs, both old and new, and arrangements to allow isolation of various sections of the distribution network and meters to measure nightime flows in each section. This will provide a system for waste measurement in the distribution network. This system, along with implementation of requirements for the installation of more accurate user meters, should provide the Aqaba system with comparatively accurate data to monitor the amount and location of waste within the system -- an important consideration in a location where water is as scarce as it is in Aqaba.

C. STAFFING

The consultants recommend a total staffing level of about 130 for water supply and distribution in Aqaba after commissioning of the Qa Disi pipeline, as follows:

System Section	Staff Number
Qa Disi Wellfield	41
Qa Disi - Aqaba Pipeline	4
Lower - Wadi Yutm Wellfield	15
Aqaba Distribution System (including overall administration and accounting)	70
	130

D. COST ESTIMATES AND FINANCIAL PLAN

Total costs of the water supply and distribution subprojects are $42.5 million equivalent. The costs, broken down by contract and by foreign exchange and local currency, are set out below. These costs are based on contracts actually awarded on unit-cost basis at the end of 1978 and beginning of 1979 and there are, therefore, no contingencies for inflation or otherwise.

PROJECT COMPONENT (BY CONTRACT)	AMOUNTS 1/ FX	LC	TOTAL	(PERCENTAGES)
1. Pipes (main pipeline)	11.175	0.626	11.801	(32.5)
2. Borehole Construction	4.145	0.454	4.599	(12.6)
3. Borehole Pumps	0.471	0.175	0.646	(01.7)
4. Generating Equipment	1.087	0.273	1.360	(03.7)
5. Civil Works	11.519	3.818	15.337	(42.2)
6. Valves	0.192	0.010	0.202	(00.6)
7. Pipes (distribution)	0.643	0.074	0.717	(02.0)
8. Civil Works (distribution)	1.091	0.609	1.700	(04.7)
Subtotals	30.323	6.039	36.362	(100.0)
9. Consultant Supervision	1.050	0.296	1.346	
Subtotals	31.373	6.335	37.708	
Interest during Construction	-0-	4.832	4.832	
Totals	31.373	11.167	42.540	
(Percentages)	(73.7)	(26.3)	(100.0)	

1/ In millions of U.S. dollars converted at the rate Jordan Dinar 1.0 = $13.37 ($1.0 = JD 0.297)

This amount will be financed by development loans from three international donors, and the Government, as follows:

	AMOUNTS MILLIONS	
Source	Original	$ Equivalent
Saudi Fund	US $20,000	20,000
Arab Fund	US $ 7,500	7,500
UK Overseas Development Ministry	£ 3.283	6,741
Government of Jordan	JD 2,465	8,299
		42,540

The GOJ will provide any financial resources required in excess of the above amounts required to complete the projects.

Donor	Principal Repayment	Grace Period	Interest
Saudi Fund	20 years	5 years	3%
Arab Fund	20 years	4 years	6%
ODM	20 years	7 years	2%

All funds will be relent to the Water Supply Corporation, the implementing agency. Terms of the reloans to the WSC are uniformally 20 years for repayment, 5-year grace period and 6% interest per annum.

بسم الله الرحمن الرحيم

ANNEX K

THE HASHEMITE KINGDOM
OF JORDAN
NATIONAL PLANNING COUNCIL
AMMAN
Tel. 44456 - 44470
P. O. B. 555
Teleg. NPC - Amman

No. 51/5/9461
Date 24/4/1979
Ref. .....

Mr. Christopher Russell
Director
USAID/J
American Embassy
Amman.

Dear Mr. Russell,

I am writing to you on behalf of the Government of Jordan to request a loan from the Government of the United States of America in the amount of Seven Million and Five Hundred Thousand Dollars ($ 7,500,000) to assist in financing the Aqaba Sewerage Project.

Best regards.

Yours sincerely,

President

cc: Water Supply Corporation

PROJECT AUTHORIZATION AND REQUEST FOR ALLOTMENT OF FUNDS

PART II

Name of Country: Hashemite Kingdon of Jordan

Name of Project: Aqaba Wastewater

Number of Project: 278-0206

Pursuant to Part II, Chapter 4, Section 532, of the Foreign Assistance Act of 1961, as amended, I hereby authorize a Loan to the Hashemite Kingdom of Jordan (the "Cooperating Country") of not to exceed Seven Million Five Hundred Thousand United States Dollars ($7,500,000) (the "Authorized Amount") to help in financing certain foreign exchange and local currency costs of goods and services required for the project, which consists of providing waste water collection and treatment facilities in the city of Aqaba (hereinafter referred to as the "Project"). The entire amount of the AID financing herein authorized for the project will be obligated when the Project Agreement is executed.

I hereby authorize the initiation of negotiation and execution of the Project Agreement by the officer to whom such authority has been delegated in accordance with AID regulations and Delegations of Authority subject to the following essential terms and covenants and major conditions; together with such other terms and conditions as AID may deem appropriate.

a. Interest Rate and Terms of Repayment

The Cooperating Country shall repay the Loan to AID in United States Dollars within forty (40) years from the date of first disbursement of the Loan, including a grace period of not to exceed ten (10) years.

100

The Cooperating Country shall pay to AID in United States Dollars interest from the date of first disbursement of the Loan at the rate of (a) two percent (2%) per annum during the first ten (10) years, and (b) three percent (3%) per annum thereafter, on the outstanding disbursed balance of the Loan and on any due and unpaid interest accrued thereon.

b. Source and Origin of Goods and Services

Goods and services, except for ocean shipping, financed by AID under the project shall have their source and origin in the Cooperating Country or in the United States or in countries included in AID Geographic Code 941 except as AID may otherwise agree in writing. Ocean shipping financed under the Loan shall be procured in the U.S. or the Cooperating Country, except as AID may otherwise agree in writing.

c. Conditions Precedent to Initial Disbursement

Prior to any disbursement or the issuance of any commitment documents under the Project Agreement, the Cooperating Country shall, except as AID may otherwise agree in writing, furnish in form and substance satisfactory to AID:

1. An executed contract for engineering design and consulting supervision services for construction and start-up of the wastewater facilities.

2. A copy of an executed and delivered Reloan Agreement between the Borrower and the Water Supply Corporation.

3. With regard to staffing of the AQABA Water and Sewerage Office of the Water Supply Corporation, the following:

(a) A staffing plan for both the WSC and the consulting engineers for supervising construction and start-up of all wastewater facilities; and

(b) A staffing plan for administering, operating and maintaining the wastewater facilities after start-up.

d. Special Covenants

1. Water and Wastewater User Charges

Borrower covenants to develop a rate and charges schedule for all water and wastewater services in Aqaba which provides sufficient revenue to cover all costs associated with the provision of such services, including provision for debt service requirements. In developing such a tariff schedule, Borrower shall be given special consideration to:

(a) ensuring that charges paid by various classes of consumers reflect in a reasonable manner the costs associated with providing services to each group, and

(b) ensuring that all costs of services including both initial connection charges and regular tariff charges remain affordable to lower income residents of Aqaba.

2. Qa Disi Water Supply and Distribution Project

Borrower covenants to implement fully the project designed to supply to, and distribute within, Aqaba up to 17.5 million cubic meters of water per annum from a well-field in the Qa Disi area.

Joseph C. Wheeler
Assistant Administrator
Bureau for Near East

Clearance:
Name, Symbol, date,_____

102