

AQABA WATER AND SEWERAGE
BENEFICIARIES AND BENEFITS

PROJECT NO. 278-0206
AQABA SEWERAGE

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1. Introduction

Socio-economic data concerning Aqaba are meager. The most comprehensive recent statements concerning population, economic structure, and physical infrastructure are the following

A. Aqaba Development Plan. Tippetts - Abbett-McCarthy - Stratton/Dar Al Handasah Consultants. 4 Vols. 1976.

B. Aqaba Region Water Supply. H. Humphreys Ltd./Arabtech. Vol. 1 and Appendices. 1977.

C. Aqaba Water Distribution and Sewerage. H. Humphreys Ltd./Arabtech. 2 Vols. - 1978.

These reports are based upon the following sources of data: on-site surveys, published sample surveys such as the 1974 Multi-purpose Household Survey, the 1961 Census of Population, and aggregate data from various governmental sources. Throughout these reports one can find substantial caveats with reference to the thin, inadequate and often inconclusive statistical base.

Circumstances have radically altered the demographic base of Aqaba since the 1961 Census. Few, if any, projections remain reliable as a framework for establishing rates and trends of social change. There has never been a single sociological, anthropological or economic study of Aqaba which can offer any insight into the behavior, customs or beliefs of any social economic group in Aqaba. There is no information on community organization, local institutions or any other aspect of social organization. Despite the breath of issues covered in the various consultant reports, the level of generality of data does not permit adequate analysis of the characteristics of proposed project

beneficiaries and potential differential impact of project benefits. This is particularly true when one attempts to delineate aspects of the urban poor; their location, their economics, their methods of coping with deficits in basic services such as mains sewerage and water supply, their values placed upon increased physical and economic access to basic services, etc.

The following sections of necessity are based almost solely upon the reports cited above, brief discussions with several officials in the Aqaba Town Planning Committee, Port Authority and Water Supply Corporation, and a windshield survey of residential zones on the morning of the October 18, 1978. Field data were useful in updating the observations of TAMS/DAR and Humphreys Ltd. Other findings were suggestive of the problems which lie ahead in implementing the extensive urban redevelopment program to be undertaken as a basic prerequisite in improving services such as water and sewerage in Aqaba.

The purpose of this annex is to assess the probable impacts of the proposed expansion of the water supply and sewerage distribution networks in Aqaba. It is not possible to do more than indicate in the most general terms how physical access to improved services will be achieved, and to what extent the cost of the improved systems will be borne by beneficiaries.

2. Population

The improvement of both water and sewerage systems impact upon the well being of households and individuals as well as the efficiency

of functionally specific economic activities. The parameters of systems improvement include crucial components such as: characteristics of beneficiaries; (how many, where, how dense, how organized, how young, how much in need of what, rate of growth, status of health, economic standing) characteristics of the economy which affect the well-being of the population; (employment generation, levels of inflation and income, etc.) and urban planning which determines basic living conditions; (why people live where they do,) in what type of housing, with what degree of access to physical infrastructure and services).

All of the fundamental areas of concern begin with basic assumptions about the nature of the population in Aqaba. In fact, there is no reliable statistical base or set of projections to accurately describe beneficiaries of projects such as water and sewerage. To begin with no one knows how many people there are in Aqaba. The Town Planning Committee estimates 20,000-23,000 population, the Department of Statistics estimates 18,000-20,000, and knowledgeable sources at the Port Authority estimate 32,000-35,000 population. A national census is scheduled for November 1979 which will consist of a census of housing, buildings and population.

Projections used in feasibility studies are based upon: (a) average rate of population growth; (b) projections and extrapolations from the 1961 Census of Population and the 1974 Multi-purpose Household Survey; and (c) rates of in-migration supported by data from major employers. Table 1, somewhat modified, is adapted from Humphreys, Ltd.

The "high range" seems to fit the current situation in Aqaba. It accounts for the recent surge in foreign temporary labor related to base sector construction and at the same time represents a seemingly reliable estimate of Aqaba's permanent population supported by statements of the Planning Committee. It also rightly anticipates a future sharp decline in foreign labor requirements but tends to project little if any out-migration of the permanent population. Reliable independent observations support the view that secondary support sector activities are not growing as rapidly as anticipated and that a certain degree of out-migration should be expected. Thus, a rough working estimate of Aqaba's 1978 population is about 27,000.

The age structure of Aqaba is greatly affected by the large number of single male temporary laborers. It is unlikely that more than 100 of an estimated 3,000 laborers live with dependents. Exclusive of these 3,000 laborers, the more "permanent" population of Aqaba over the past 5 years has shown a significant increase in women and children as a result of reuniting families. As amenities in Aqaba improve more family members join male family members to form households.

Table 2 indicates the results of the 1974 Multi-purpose Household Survey exclusive of transient males which at that time might have amounted to 1,000. The labor force of the then "permanent" part of the population sampled was about 23% of the total population.

Labor force participation is high in Aqaba with full participation for males and a rising rate for women. Per capital income is above national averages, a fact which is tied to the uniqueness of Aqaba's economic structure.

TABLE 1

ESTIMATED POPULATION IN AQABA
(including the South Coast)

High Range

<u>Year</u>	<u>Permanent Residents</u>	<u>Outside Const. Workers</u>	<u>Total</u>
1975	15,000 ⁺	1,100 1	16,000 ⁺
1976	15,800	3,600 2	19,400
1977	17,300	4,700 2	22,000
1978	23,600	3,400 2	27,000
1979	34,800	2,100 2	36,900
1980	42,100	1,400 2	43,500
1981	47,100	1,300 2	48,400
1982	52,800	3,000 2	55,800
1983	58,000	3,400 2	61,400
1984	64,400	2,200 2	66,600
1985	72,100	700 2	72,800
1986	77,600	600 2	78,200
1987	81,900	800 2	82,700
1988	86,900	400 2	87,300
1989	93,100	400 2	93,500
1990	98,000	-	98,000

-
1. Includes labor employed on Aqaba - Safi Road and labor needed for the Aqaba Port.
 2. "End of Year" figure: Includes estimated construction force, less number of construction workers that would normally be found in a population of this size, workers employed outside Aqaba on regional road and rail improvements and the pipeline from Qa Disi.

TABLE 2

AGE STRUCTURE IN AQABA TOWN (1974)

<u>Age Group</u>	<u>Resident Population¹</u>		<u>Percent of Total Population</u>	
	<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Female</u>
0-4	2,000	1,780	12.9	11.5
5-9	1,080	1,050	7.0	6.8
10-14	1,160	1,050	7.5	6.8
15-19	810	830	5.2	5.3
20-24	390	510	4.2	3.3
25-29	450	460	5.2	3.0
30-34	340	300	3.7	1.9
35-39	350	340	2.9	2.9
40-44	260	210	1.7	1.4
45-49	230	210	1.5	1.3
50-54	170	130	1.1	0.8
55-59	110	60	0.7	0.4
60-64	70	30	0.5	0.2
65 +	120	50	0.7	0.3
	<hr/>	<hr/>	<hr/>	<hr/>
TOTAL	7,540	7,010	54.8	45.2

1. Calculated from percentages given in Multi-purpose Household Survey Sample, 1974

3. Economic Development

The specific pattern of recent economic development in Aqaba establishes an important parameter of residential and non-domestic demand for water and sewerage and ability to pay for such services. Growth has been characterized by a boom-bust series of economic and political events over the past 30 years or so. Until World War II, Aqaba's importance as a port was extremely limited. Beginning in 1953 national economic policies were established to make Aqaba a deep water port replacing minimal lighterage operations. The first import cargo berth and export berth for phosphate rock was completed in 1959. a second cargo berth was added in 1963. Between 1952 and 1961 Aqaba's population grew at a rate of 13% annually increasing from 2,500 to 8,900. By 1968 growth had slowed to a 6% annual increase with an estimated 13,500 population. Accelerating port construction, growth of tertiary services and commercial establishments, families joining workers, and the proliferation of government services contributed to overall growth during this period. Between 1968 and 1974 annual population growth seemed to taper off to about 2%. Regional political conflict contributed to a radical decline in port activities and stemmed the flow of in-migration. The 1974 population estimate was only about 16,000.

Aqaba's current phase is decidedly a boom period. Commercial adjustments to the geopolitical situation, the opening of the Suez Canal, rapid economic development in Jordan, and reliance of several Arab States on Aqaba as a replacement entrepot for Beirut are a few

causes for this period of growth. Ironically, Aqaba's current economic importance might presage yet one more bust period or, at best, a leveling at a lower economic plateau than anticipated by planners. This possibility can be seen in the trend of current economic activities and the resultant labor force.

A. Employment: There are several important variables in understanding characteristics of Aqaba's labor force, particularly in relation to income distribution:

(1) As stated earlier the current (1978) demographic profile of Aqaba is unknown (size, geographical, density, age, sex, rates of in-migration and out-migration, etc). All estimates are projected from the 1961 Census and from the small frame of the 1974 Multi-purpose Household Survey.

(2) Recent surges in construction activities have accelerated male in-migration particularly non-Jordanian Arab and non-Arab.

(3) Incomes are increasing rapidly although no one is quite sure by what magnitude. Also, the relative cost of living is judged to be higher than elsewhere in Jordan by at least 25-30%. (Cost of Living Index estimates: 1975-76 + 25, 1976-77 + 38).

(4) Demand for goods and services are difficult to estimate essentially because many such expenditures are made outside of Aqaba, e.g. most all imports are retailed from sites external to Aqaba even though they are imported through Aqaba.

The structure of employment estimated in 1974 by TAMS/DAR is shown in Table 3.

TABLE 3

ESTABLISHMENT AND EMPLOYMENT IN AQABA - 1974

<u>Type</u>	<u>Number</u>	<u>Employees</u>
Local	-	50
Retail Trade		
Restaurants, cafes, etc.	62	120
Local hotels	5	30
Personal Services	51	75
Taxis & pass. transport	9	50
Food stores	156	247
Pharmacies	2	5
Cinemas	3	10
Clothing, etc.	22	35
Consumer durables	19	39
Petrol & auto repairs	11	35
Miscellaneous	27	32
Travel agents	4	8
Unclassified (old towns)	100	100
Finance and Insurance	5	44
Shipping and Transportation	22	46
Local Contractors	2	5
First Class Hotels & Rest Houses	3	110
Jordan Fisheries Co.	1	6
Total Private Sector	<u>504</u>	<u>1,047</u>
Government employees, incl. port and maritime Establishment Permanent Staff		1,100
Manual Labor: Port Dept.		164
Maritime Establishment		400
Construction		<u>400</u>
Total Civilian Work Force		3,000
Security And Armed Forces		200-300

This Table clearly shows the importance of the port in base sector employment. In checking with Port Authority Officials* an informed estimate of manual labor at the port is 3,000 of which 95% are non-Jordanian. This is a three-fold increase over the 1974 survey by TAMS/DAR. Of this, 3,000 the Port Authority provides subsidized housing for 1,100 single laborers and 50 families (est. 7 per household) or a total of 4,450 individuals. The remaining port workers live in dormitory-like quarters throughout the older sections of town.

The economically active population of Aqaba as stated is high as elsewhere in Jordan. Full male employment and noticeable increases in child and female employment are reported but the latter are difficult to quantify without adequate manpower studies. With well over two-thirds of employment in the base sector it is well to look briefly at the growth potential for labor in this sector.

(1) Port of Aqaba: With the completion of construction over the next two to three years, employment is scheduled to decline and level off at 1,400 (e.g. 400 skilled employees and 800-1,000 manual laborers).

(2) Rock Phosphate: This highly mechanized activity has little employment generation potential.

(3) Iraqi Transshipment: Minimal employment

(4) Free Trade Zone: (Plus manufacturing) - the 400 jobs projected for 1978 have not materialized.

* Personal communication with Mr. Theyallah Sweidan, Assistant Director, Aqaba Port.

(5) Fertilizer Plant: These 500 jobs are still some two years away.

(6) Tourism: Projections at 400-450 seem reasonable given facilities now under construction.

Other spin-off industries, e.g. a refinery, small scale mineral industries, nearby mining, and support services are far from reality and will continue to be problematic with current capital and labor deficits. More importantly there is no firm regional development priority which would infuse Aqaba with government financing.

B. Income: The general employment picture suggests several important trends:

(1) There has been a much higher rate of growth of unaccompanied foreign workers than anticipated. These workers have a much higher level of net disposable income than other workers due to subsidies (free housing and 70% subsidy on food), spend less on goods and services, and export most of their earnings as remittances.

(2) There has been a slower build up of employment in the secondary sectors than anticipated. Aqaba is not selling goods and services at a level commensurate with the growth of personal earnings.

(3) There is little manufacturing activity of note.

(4) There are more "complete" families now in Aqaba affecting the worker/dependent ratio. It is unlikely that economically active members of households (6.5 - 8 in size) exceeds 1-1.5 individuals.

Data on income levels in Aqaba are limited. TAMS/DAR conducted surveys in 1973 and obtained several indices for income distribution. Conditions have changed markedly since 1973 both in terms of increases in income levels and rate of inflation. The only up-to-date information is for wages paid to specific groups, e.g. port workers, civil servants. The 1977 Humphreys Ltd. report hypothesizes an average earnings figure of between JD 90 and JD 110/month for Aqaba general (exclusive of imputed values of all types of benefits).

Port manual workers now earn JD 1.500 for an eight hour shift. Working two shifts and collecting assorted bonuses, the average monthly wage is JD 90-110 (Humphreys Ltd. gives the figure of JD 110-130 for port workers in 1976). These workers are provided with free housing (no longer tents) plus utilities, and subsidized food. The total imputed benefit of these items can run as high as 60% (housing 30%, food, misc. 30%). Using an average basic monthly wage of JD 100, inclusive of benefits, port workers can earn as much as JD 160 monthly.

Other estimated earnings of specific groups of workers cited in the Humphreys Ltd. report are summarized in Table 4.

The average earnings data provide little evidence as to distribution of income, particularly for categories of workers beyond port activities. How many people earn less than this and how many other incomes do people muster from rent, commercial endeavors, and from sources exogenous to Aqaba is highly uncertain. TAMS/DAR and Humphreys Ltd. tend to

utilize an earnings pyramid described as follows:

<u>Group</u>	<u>Percent of Population</u>
1 Lowest	20
2 Low	30
3 Modest	30
4 Middle	10
5 High	5

This distribution is highly speculative and correlation with other factors is difficult. For example, a quick examination of what is considered to be the lowest income, unserviced part of Aqaba suggests that:

- A number of families (up to 50%) are collecting rent from properties elsewhere.
- A number of obviously wealthy families continue to reside in these neighborhoods for social and economic reasons.
- Apparent "low" standard dwellings are outfitted with amenities and luxury consumer goods.
- Low standard housing is not readily correlated with low status of health or education.

Income will be greater below along with per capita consumption of water. Without further income and expenditure data it is not possible to obtain a workable notion of income distribution in Aqaba.

Efforts to correlate quality of housing, access to services with income are simply not reliable. Tables in consultant reports

TABLE 4

1977 ESTIMATED AVERAGE EARNINGS
FOR SELECTED GROUPS

<u>CATEGORY</u>	<u>JD/MONTH</u>
<u>Industry</u>	
Unskilled construction	75 to 110
Skilled Construction	118 to 240
Plant Operations	225 to 230
<u>Tourism</u>	
Junior domestic	40 to 50
Middle domestic (Excl. gratuities, imputed benefits)	50 to 70
<u>Service</u>	
Retail shop	40 to 100 +
Bank Messengers	50
<u>Clerks</u>	
a) 10 years education	70 +
b) University Education	80 +
c) Senior Status	150 +
<u>Government</u>	
Lowest grade (inclusive of fixed allowances) (Probable average monthly earnings JD 90 to 110)	42 to 50
Annual earnings 1,320 x 1.3 wage earners per family = JD 1,716	

showing correlations between household size/income/quality of housing need validation through independent measures.

4. Zonal Development

To understand the allocation of potential demand for urban services such as water and sewerage it is necessary to examine current urban development activities with prevailing town planning models in mind. Most major residential development and renewal plans for Aqaba continue to be based upon the 1962 Brown Engineers Inc. Master Plan with certain adaptive changes made through experience of the Aqaba Town Planning Committee and from proposals put forward by TAMS/DAR in their Aqaba Development Studies. These various sources of planning policies have contributed to the establishment of twenty development zones for the city of Aqaba (See Figure 1).

There are several unique aspects of urban planning in Aqaba related to the design of both the water distribution and mains sewerage systems:

A. It is difficult to ascertain the maximum levels of water demand and sewerage flows by functional urban zone at various chronological stages of development. Why?

(1) Current demographic base is basically unknown.

(2) Demographic trends are difficult to forecast without an accurate base and without reliable information concerning economic growth potentials.

(3) Future economic cost of water and sewerage as related to ability to pay is still basically unclear.

(4) Specifics of the pace of urban resettlement and urban renewal, zonal densities of new and old residential population, non-domestic demand, etc., are not in hand.

(5) There is a paucity of data on per capita levels and patterns of water consumption.

B. The development of new water and sewerage systems will be paced with key changes such as:

(1) Growth in base economic sectors, e.g. tourism, industry, port activity, all of which is still largely uncertain making it difficult to compute standard economic measures.

(2) Ability to increase resources which are now scarce, e.g. water, labor, capital, additional land.

(3) Formulation of national regional development policies favoring Aqaba; e.g. incentives to develop import substitution industries.

C. A last but considerable consideration is the willingness of the majority of population in Aqaba to move from their "unauthorized" dwellings to the planned residential zones which are to be fully serviced. New services, particularly sewerage, will not be extended to older unplanned residential areas, the latter of which happen to contain the majority of Aqaba's population.

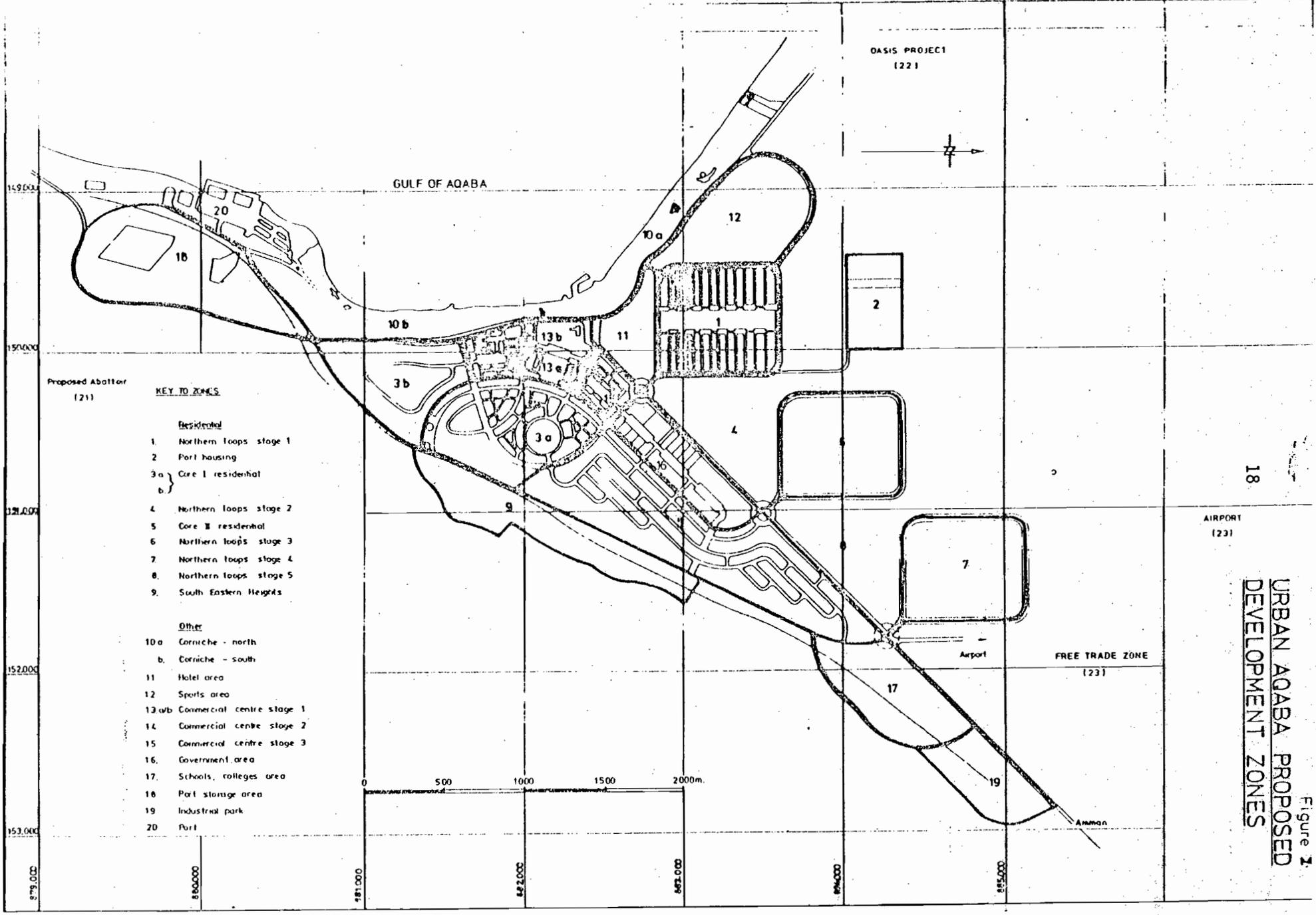
Given these substantial caveats, the consultants' design parameters of water and sewerage basically assume: ultimate levels of water consumption; implementation of development plans e.g., timely

schedule of settlement into new residential zones; maximization of overall economic growth potential, etc. In short, the reduction of risk in the event that urban development tends toward the higher side of all estimates.

Best Estimates of Beneficiaries: There are nine planned residential zones number 1 and 9 in Figure 1. Table 5 prepared by Humphreys Ltd is based upon TAMS/DAR estimates of population holding capacities with the exception of Zone 2 which is based upon information provided by the Aqaba Port Authority.

TABLE 5 RESIDENTIAL DEVELOPMENT ZONES AND POPULATION HOLDING CAPACITIES

RESIDENTIAL ZONE	ESTIMATED ULTIMATE POPULATION
1 Northern loop - stage 1	10 500
2 Port Housing Project	2 000
3 Core I residential	18 000
4 Northern loop - stage 2	6 500
5 Core II residential	18 000
6 Northern loop - stage 3	3 500
7 Northern loop - stage 4	3 500
8 Northern loop - stage 5	6 000
9 South eastern heights	<u>14 000</u>
	82 000



OASIS PROJECT
(221)

GULF OF AQABA

Proposed Abattor
(21)

KEY TO ZONES

Residential

- 1. Northern loops stage 1
- 2. Port housing
- 3 a. Core I residential
- b. } Core II residential
- 4. Northern loops stage 2
- 5. Core II residential
- 6. Northern loops stage 3
- 7. Northern loops stage 4
- 8. Northern loops stage 5
- 9. South Eastern Heights

Other

- 10 a. Corniche - north
- b. Corniche - south
- 11. Hotel area
- 12. Sports area
- 13 a/b. Commercial centre stage 1
- 14. Commercial centre stage 2
- 15. Commercial centre stage 3
- 16. Government area
- 17. Schools, colleges area
- 18. Port storage area
- 19. Industrial park
- 20. Port

0 500 1000 1500 2000m.

18

AIRPORT
(23)

FREE TRADE ZONE
(23)

Figure 1
 URBAN AQABA PROPOSED
 DEVELOPMENT ZONES

A brief windshield survey combined with casual interviews with residents was made of most residential zones on 18 October 1978. Present status of development activities indicates a number of changes from Table 5 which was based upon 1976 data. The major trends can be stated as follows:

Zone 1

This zone consists of a variety of housing types, e.g. villas, duplex, multi-story apartments 1-3 bedrooms, clustered around a core of facilities, namely, schools, shops, play fields and gardens. It is currently totally served by water and sewerage. Density estimates provided range around 1,100 units x 5 per household = 5,500 current population - Maximum capacity was not cited.

Zone 2

Approaching completion, this zone consists of the following units: Section A. 232 - 3 bedroom, B. 192 - 2 bedroom, and C. 232 flats to be rented to port laborers living under dormitory conditions. Water and sewer connections are complete. Current population estimate is 1,400 port laborers without dependents and 200 families x 5 = 1,000. Maximum capacity is not clear and families were not in evidence at time of visit.

Zone 6

At present undeveloped, the plan is to develop one-half of this site for 1,500 apartments financed with highly concessional loans of up to thirty years. Estimate of density provided is 1,500 x 6 = 9,000. The other half will be a sale of 16 x 16 M parcels for "low-income" families (60 JD/monthly income). Density given is 7,000 for this half.

Zone 7

Also undeveloped, recent plans are to sell off 660 parcels of 500 m² for middle-upper income Aqaba-only families. Estimated density of this zone is to be 9,000 (660 x 2 story x 7).

Zone 3a

This centrally located zone now consists of mixed residential, commercial and light manufacturing. Estimates provided indicate that a current residential population of 500 (100 units x 5) resides in this largely unplanned area. The plan is to develop uniform residential plots of 1,000 m² through razing all "unauthorized" and other licensed housing and to offer for sale 124, 1,000 m² parcels for multi-story apartments. Capacity is estimated at 124 x 5 units x 6 = 3,720. Price of 1,000 m² is uncertain but could range from 6,000-8,000 JD. Present residents relocated by this development are to be located in zone 6 over the course of 2-3 years. Some existing wealthy residents have indicated an interest in purchasing 1,000 m² parcels. No sewerage work will be undertaken in zones 3a and 3b until redevelopment occurs and the existing water system modified to accommodate new construction.

Zone 3b

This is a densely settled area of essentially "unauthorized" traditional housing which stretches from the corniche road upslope to the bypass road at the foot of the South Eastern Heights. Density is uncertain but an estimate of 15,000 has been provided by the Town Planning Committee. The plan is to raze this zone transferring much of the population to the Northern loops. The zone would then be converted

into light industrial use. The Committee specifically cited the case of 168 families which are scheduled to soon move into the completed zones 1 and 2.

Zone 9

The South Eastern Heights "squatter" zone rises upward toward the surrounding granite mountains. Consisting of "unauthorized" housing serviced by water connections but no sewers (similar to 3a and 3b) there are about 1,000 families or an estimated 7,000 people in this area. At the periphery are numerous recent dwellings unserved by water. The plan is to raze this area and encourage the population to move into the Northern loops. No redevelopment plan has been mentioned. This is a choice location commanding an excellent view of the harbor and it is likely to be reserved for upper-income housing.

Zone 5

This is a large area of undulating gentle slopes which is largely unoccupied. The plan calls for the development of 400 1,000 m² parcels for villas and multi-story apartments in one section of the zone. The price per 1,000 m² is currently 8,000 JD.

Zones 10a and b

There are an undetermined number of families living in date palm groves along the coast. All such housing currently is being demolished and people are being relocated to the Northern loops.

Based upon the current pace of resettlement and construction of new residential areas, it is possible to revise TAMS/DAR Projections as shown in Table 6. All estimates are imprecise and in places contrary to other sources of information.

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7 Northern loop - stage 4	3 500
8 Northern loop - stage 5	6 000
9 South eastern heights	<u>14 000</u>
	82 000

TABLE 6
UPDATED PLANS FOR RESIDENTIAL DEVELOPMENT
ZONES

<u>Residential Zone</u>	<u>TAMS/DAR Estimates</u>	<u>Existing ^{1/} Plans</u>
1. Northern loop	10,500	5,500?
2. Port housing and other	2,000	2,400
3. Core I residential	18,000	3,700
4. Northern loop	6,500	no plans
5. Core II residential	18,000	12,000 min.
6. Northern loop	3,500	16,000
7. Northern loop	3,500	9,000
8. Northern loop	6,000	no plans
9. South Eastern Heights	14,000	no plans
	82,000	48,600

1/ Based on windshield quick survey and discussion with Mr. Said El Ahmad of the Town Planning Committee.

2/ Household size multipliers for each zone provided by Committee.

There are a number of issues related to this settlement scheme:

A. The high rate of annual growth for recent years through migration and natural increase has resulted in the formation of neighborhoods of "unauthorized" housing. The Town Planning Committee asserts that in 1966 they began to issue permits for construction and to discourage unauthorized housing starts. All houses built without such permits are now considered illegal and for all practical purposes this comprises most of Aqaba's areas of "traditional housing", "shanty-town" and "squatter" settlements and most of its population. The distinction means that such a structure can be demolished without compensation for land or building. Those houses built before 1966 upon land without purchase or title constitute another category. Upon expropriation house, but not land, is reimbursed. There is considerable individual resistance against committee efforts to implement redevelopment in the areas to be demolished.

B. Despite the threatening loss of home and property (e.g. urban gardens, work areas, commercial establishments) many individuals are making a profit on resettlement. In the South Eastern Heights area for example, residents already assigned rental units in the Northern loops at greatly subsidized rates are maintaining both their original squatter home (rent free) and are renting their assigned apartment to new arrivals at four times the rental value. This is widespread throughout Aqaba where priority assignments to new housing have been made but where demolition of the older sections has not occurred.

C. For the urban poor who are to be resettled there is a degree of economic hardship. For example, to resettle in Zone 6, the 16 x 16 m parcel must be purchased from the Town Planning Committee (or a separate agency to be determined). The cost will be roughly JD 50 down payment and JD 9.5 months for four years. This includes imputed infrastructure charges for water and sewerage connections, electricity and roads. Using the land as collateral, a loan for construction can be obtained from the Housing Bank. For an income of JD 50 the Bank, for example, will loan against 33 months of income or JD 1,650. This would finance the construction of a one bedroom core expandable unit. Under this arrangement a low-income family would be paying 6-10% of income for housing and utilities as compared to 0-2% under original conditions. Under other arrangements the Housing Corporation will be extending 20 year low interest mortgages for both land and unit assessed at JD 4,500 at monthly repayment rates of JD 16.5.

D. Most all people to be resettled are to be moved from areas of the town where land values are soaring (e.g. JD 8,000-15,000 1,000 m²) to the northern loops area where, for now at least, values are considerably less. Changes in land use are: for the coast - tourism; central area 3b - light industry and commerce; core area and Heights - upper income villas, high rise offices and apartments. Residents affected have little tenure in their present situation and argue for more compensation and a fair share in Aqaba's future development.

E. Existing System

Water

The present water supply for Aqaba originates from a number of boreholes in the Wadi Yatm alluvial gravels. It is collected in a reservoir at the lower end of the Wadi and from there conveyed by gravity to two reservoirs for further distribution. With the exception of some squatter-type housing at the fringe of the South Eastern Heights, it appears that all of the town is served through municipal connections. These connections reputedly serve all households with the exception noted above. A site visit to the most densely settled areas of Aqaba's squatter housing showed the presence of 1 and 2 inch steel water pipe connections to all households.

Although official statistics are lacking, the Water Supply Corporation records for recent months indicate an average daily production of 6,250 m³ rising in summer months. There is an additional 800 m³/day supplied to all categories of consumers via private, Municipal and Water Corporation Tankers. Of total demand, domestic consumption is estimated to be 40-50%.

Intermittency of supply has improved in the last couple of years. Consultant reports based on 1976 data indicate that zones of traditional housing were supplied only 12 hours every other night. Residents in these areas now report continuous water on an average of five out of seven days. This has lessened dependency upon tanker sources. Most residents retain roof and/or ground level galvanized steel tanks with standard capacities of 1, 2 and 3 m³. Intermittency seemingly has not caused contamination

from back-siphoning. Reports indicate that samples obtained by government officials have not been contaminated although specifics of nitrate, dissolved solids, and bacteria levels are not available.

Tariffs: There has been an intensive campaign to meter all supply of water in Aqaba. By August 1977 the number of domestic and non-domestic metered connections was about 3,000. At present there are nearly 4,000 metered connections with reputedly 1,050 new installations scheduled for November, 1978. The number of inoperative and inaccurate meters is uncertain but probably does not exceed 25%.

Tariffs have been generally adjusted upward and the cost of water in Aqaba is no longer below that prevailing elsewhere in Jordan. The old rate was 50 fils/m³ with a minimum monthly charge of 250 fils. The new rate is shown in Table 7 in contrast with current rates for Amman (See Table 8).

Rates for tanker-supplied water vary and reliable data are not available. Prices obtained for water supplied to domestic users by private tankers ranged from 700 to 1,000 JD/m³. Water wholesaled to all categories of tankers at the Wadi Yutm source is said to be only 160 fils/m³. The Planning Committee states that there are no public taps in Aqaba.

TABLE 7
 UNIFORM WATER TARIFF AQABA
 (BILLING BI-MONTHLY)

<u>Consumption</u> <u>M³</u>	<u>Rate</u> <u>Fils/M³</u>
0 - 5	80
5 - 15	100
15 - 20	181
Over 20	250

TABLE 8
 RETAIL WATER TARIFF - AMMAN
 (BILLING QUARTERLY)

<u>Consumption</u> <u>M³</u>	<u>Rate</u> <u>Fils/M³</u>
0 - 10	600
10 - 20	60
20 - 40	80
40 - 100	180
Over 100	260

Although Aqaba's water supply system is extensive, demand far exceeds current supply. With maximum production in hot summer months, there is inadequate headworks capacity to meet current let alone future needs. Construction of further port, industrial, touristic and residential areas will place a severe burden upon the existing system until improvement is realized in both quantity of supply and the distribution system. Efforts are now underway to do just that. By 1980 new sources will be exploited from distances as great as Qa Disi.

Sewerage

Unlike the water supply system, mains sewerage in Aqaba is limited to a few specific contiguous locations. The majority of the port, commercial, and hotel districts are now serviced by a mains system. Zone 3a (to be demolished and replanned) and Zone 2 are the only residential areas tied to the existing system. In short, the primary residential areas consisting of 3b, 3a (partial) and the South Eastern heights, constituting not less than 75% of the population, are not served by mains sewerage. Within the existing system blockages are frequent, septicity tends to be high and resulting sulphuric acid is corroding sections of the system.

The immediate response to this situation will be a remedial set of actions to minimize pumping, permit expansion of the mains and to incorporate and upgrade the existing system. The two pumping stations will be upgraded, a new main treatment station will be constructed for primary and possibly secondary treatment of effluent. Main collection sewers will be upgraded serving new residential areas and redeveloped Zones.

No mains sewerage will be extended to existing older residential areas slated for redevelopment within the next 2 to 3 years.

The currently unserved areas depend essentially on cesspools, soakaways, and to a lesser degree on septic tanks for waste and waste water disposal. During a brief site visit to the South Eastern heights no sewerage discharge into roads and passageways was observed. No data were obtained on cost and/or frequency of emptying tanks. In one household interviewed, the tank had not been flushed for five years and is functioning without problems. The same situation is said to prevail for neighboring tanks. There is no evidence that cesspools have contaminated piped water or have contributed to any serious environmental problem in these densely occupied residential areas. Located on deposits of alluvial gravels, sands, and silt there is no exploitable aquifer under the town thus eliminating the possibility of aquifer pollution through percolation of sewerage. However, older types of soakaways and septic tanks undoubtedly lead into the shallow ground water table affecting the quality of water from the few local active wells.

The issue of who will benefit from new mains sewerage is a question tied to the rate of implementation of the resettlement activity now underway. As mentioned, no effort will be made to service the extensive area of "unauthorized" housing until redevelopment is undertaken. Those who move into the new housing projects will be connected to the system and will undoubtedly incur some level of cost for water and sewerage service.

Tariff: At present there is no direct charge for sewerage and, as yet, no specific plan for a tariff. Several standard options are

under consideration:

- A. Charge based upon ratable value of property.
- B. Charge based upon metered water consumption.
- C. Multi-rate tariff favoring low income households.
- D. Charge levied on sale of connected parcels of land.
- E. Subsidy.

The major problem in selecting a mode of payment is that efforts to calculate the cost of the new system as a function of demand seem as yet inconclusive. Issues include the following: How much demand will be generated by base section development? Will treatment be limited to primary or extend to more costly secondary treatment? Will there be resistance to the payment of sewerage services - a previously free service? How will the system be managed? There are other issues related to recurrent cost, interest on construction capital, etc., all bearing upon the eventual calculation of the internal rate of return of the project.

Following an IBRD suggestion that sewerage costs not exceed 3% of household income, Humphreys Ltd. has prepared Table 9 indicating how option #2 would keep cost below 3% and not be prohibitive in relation to income.

Water Use and Ability to Pay: It has been pointed out in consultant reports that there are no reliable data relating to level of domestic per capital water consumption. It is even less certain how water usage will change when:

- (a) residents are moved to new housing;
- (b) supply will be continuous;

- (c) high tariffs are increased even further; and
- (d) social change (higher income, aspiration, education, etc.) modifies current water use patterns.

TABLE 9

POTENTIAL MONTHLY SEWERAGE CHARGE FOR
6-PERSON HOUSEHOLD

(Based on Metered Water Consumption)

<u>Unit Charge</u> <u>Fils/m³ water</u>	<u>Per Capita</u>	<u>Water</u>	<u>JD/Month</u> <u>Consumption (1/h/d)</u>	
<u>Consumed</u>	70	100	130	160
50	0.63	0.09	1.17	1.14
75	0.95	1.35	1.76	2.16
100	1.26	1.80	2.34	2.88

Humphreys Ltd. calculated an overall domestic average per capita consumption of 192/liters/head/day. This was obtained by projecting non-base sector consumption (160 to 240 l/h/d) exclusive of system losses* and by assuming that domestic consumption was no more than 80% of the upper range. Density of residential zone and varying size of household were also considered. This figure seems high given what is known of consumption plotted against household income elsewhere in Jordan.**

* Aqaba system losses from mains leakage, flushing, faulty meters, incorrect billings and illegal connections are estimated at 20%

** The IBRD 1977 Syrian Arab Republic Water Supply and Sewerage Sector Report suggests 1970 per capita water consumption in Jordan as follows:
urban-107 l/h/d, rural-55 l/h/d

As a basis for comparison Dajani's report to AID on water consumption in Amman provides the following scale.

AMMAN	
<u>Income Level</u>	<u>Consumption l/h/d</u>
Low ¹ and lower middle	30 - 70
Middle	70 - 110
Upper	110 - 300

The poorest of the urban poor which Dajani estimates to be no more than 2 to 4% of the population in Amman consumes between 15 and 30 l/h/d.

Consultant reports indicate that Aqaba water consumption is above national average. Figures provided are:

AQABA	
<u>Income Level</u>	<u>Consumption l/h/d</u>
Lower	70
Middle - Lower upper	145 - 165
Upper	810 - 990

Similar to Dajani's estimates current water costs alone in Aqaba can range between 9-14% of income for low income families. It is presently not possible to project combined water and sewerage costs per household plotted against income for the improved systems. More precise data are required for determining current usage patterns, anticipated changes in these patterns, and costs of the new systems.

¹ Low income - Dajani assumes 1.27 workers per household, average salary of JD 816 and draws poverty line at JD 600-1,000/annual or JD 60-166 per capita.

6. Summary of issues

Projected changes in the water and mains sewerage systems will undoubtedly impact upon a substantial portion of the resident population and on the efficiency of a number of economic functions, e.g. tourism, commercial sites, and main base sector activities. For most residential beneficiaries change will not be so much a function of a unidimensional improvement such as physical access to sewerage or continuous metered water but will be a function of a package of amenities in which waste and sewerage are but two components. The majority of Aqaba's population currently unserved by sewerage will be resettled into a total benefit scheme which will include:

- new housing (lower per room density, indoor plumbing, indoor kitchen, bathing facility, etc.)
- infrastructure (easy access, street lighting, domestic electricity)
- services (schools, clinics, social services, retail commercial outlets)
- tenure in terms of ownership of land and building (for some at least)
- greatly improved community environmental context (recreational areas for children, sports field, sanitary environment)

Current urban development plans for six out of nine residential zones project a sewerage beneficiary population size of approximately 47,000 (see Table 6). The high estimate which would include zones 4, 8, and 9 provided by TAMS/DAR is projected to include up to 82,000 project beneficiaries. The immediate domestic benefits of improved water and mains sewerage will be felt in existing new residential areas (1 and 2) amounting

to about 8,000 beneficiaries. Other areas, eg. 3, 5-7, will be added as streets and building parcels are laid out.

Improvements in the systems per se will be realized in the form of an adequate supply of uncontaminated water at points conveniently situated in new housing at a higher but seemingly affordable cost. There is no basis for estimating items such as quantifiable increases in water consumption, or costs of sewerage services. Many important economic factors have not yet been calculated and important management decisions have yet to be faced which will impact upon the eventual cost of the service to beneficiaries.

In addition to actual beneficiaries of services, the construction of the project during 1980-81 might conceivably employ up to 100 workers with a maximum of 10-20 for on-going operations. Other generated benefits are probably negligible. Health benefits would be difficult to characterize. There is no estimate of the present impact of sewage septicity upon the residential population of Agaba. Existing methods of water disposal in areas of traditional housing (eg. soakaways, septic tanks and cesspools) do not appear to pose any obvious health problem. New mains sewerage will undoubtedly lessen system blockages, and arrest corrosion of pipes from accumulated acids. Health related benefits of systems improvement could only be quantified through careful analyses which are currently not practical to undertake.